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A revision of the planthopper genus *Chionomus* Fennah (Hemiptera: Fulgoroidea: Delphacidae)

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Abstract

The planthopper genus *Chionomus* Fennah, 1971 (Hemiptera: Fulgoroidea: Delphacidae) currently includes three Neotropical species, removed from the polyphyletic genus *Delphacodes* Fieber, 1866. Morphological and molecular evidence further redefine *Chionomus* to include ten additional species (eight species removed from *Delphacodes*, two described as new, viz. *Chionomus dolonus* n. sp. and *C. herkos* n. sp.), with another four species synonymized. Phylogenetic analyses of morphological and molecular sequence data of the mitochondrial gene Cytochrome Oxidase I provide support for the monophyly of *Chionomus*. We use a mixed model Bayesian optimality criterion to define phylogenetic relationships among *Chionomus* and support paraphyly of the original definition of *Chionomus* (with respect to *Delphacodes*) and monophyly of the revised genus.

Key words: Delphacidae, *Chionomus*, *Delphacodes*, new species, Auchenorrhyncha, Fulgoromorpha, Phylogeny, COI

Introduction

With over 2,217 described species worldwide, the delphacid planthoppers (Hemiptera: Fulgoroidea: Delphacidae) comprise the second largest family in the Fulgoroidea, after the Cixiidae (Bourgoin 2019). The delphacids are basal within the Fulgoroidea and closely related to (possibly derived within) the Cixiidae (Asche 1985, 1988; Ceotto *et al.* 2008, Urban *et al.* 2010). *Chionomus* Fennah, 1971 is a New World genus in the most derived lineage of the tribe Delphacini (Urban *et al.* 2010).

Fennah (1971) described *Chionomus* as a segregate from the polyphyletic genus *Delphacodes* Fieber, 1866 (e.g., Asche & Remane 1983, Urban *et al.* 2010) to include *Delphacodes havanae* Muir & Giffard, 1924 (the type species), *D. balboae* Muir & Giffard, 1924 and *D. haywardi* Muir, 1929. *Chionomus haywardi* has been implicated (along with the primary vector *Delphacodes kuscheli* Fennah, 1955; Argüello Caro *et al.* 2013) as a putative vector of *Mal de Rio Cuarto Virus* (MRCV, *Fijivirus*, Reoviridae) (Remes Lenicov *et al.* 1985, Velázquez *et al.* 2003). Since Fennah's (1971) publication there has been no revisionary work or new taxa described within *Chionomus*; however, some *Delphacodes* display a strong superficial resemblance to *Chionomus* as corroborated by similarities in male genitalic features. Additionally, phylogenetic analyses by Urban and colleagues (2010) using combined molecular data from four genes plus morphology place *Chionomus havanae* as sister to *Delphacodes puella*, a taxon with evident morphological similarities to *Chionomus*.

Here we investigate the taxonomic standing and phylogenetic cohesion of *Chionomus* and morphologically similar *Delphacodes*. We seek to provide: 1) phylogenetic analyses of the genus using data from morphology and the mitochondrial gene *Cytochrome Oxidase I* (COI) to test monophyly of the genus, 2) an adequate morphological revision of *Chionomus* to include previously excluded species, 3) a key to species, and 4) uniform descriptions and illustrations for all included species.

Methods

All three existing members of *Chionomus* and 26 potentially allied species were considered in this work (Table 1).

TABLE 1. Species considered for inclusion in *Chionomus* with location of primary types.

Species	Type Location
<i>Chionomus havanae</i> (Muir & Giffard, 1924)	BPBM
<i>C. balboae</i> (Muir & Giffard, 1924)	BPBM
<i>C. haywardi</i> (Muir, 1929)	INHS
<i>Aethodelphax concavus</i> (Beamer, 1948c)	SEMC
<i>Delphacodes aculeata</i> Beamer, 1948b	SEMC
<i>D. arcuata</i> Beamer, 1948b	SEMC
<i>D. ardentis</i> Beamer, 1948c	SEMC
<i>D. banosensis</i> Muir, 1926	BPBM
<i>D. bellicosa</i> Muir & Giffard, 1924	BPBM
<i>D. culta</i> (Van Duzee, 1907)	CASC
<i>D. dentis</i> Beamer, 1948b	SEMC
<i>D. gluciophila</i> Muir, 1926	BPBM
<i>D. mesada</i> Caldwell, 1951	USNM
<i>D. pacifica</i> (Crawford, 1914)	USNM
<i>D. penepuella</i> Beamer, 1948a	SEMC
<i>D. puella</i> (Van Duzee, 1897)	USNM
<i>D. quadridentis</i> Beamer, 1948b	SEMC
<i>D. quadrispinosa</i> Muir & Giffard, 1924	USNM
<i>D. sagae</i> Beamer, 1946	SEMC
<i>D. saxicola</i> Muir, 1926	BPBM
<i>D. scocholoa</i> Cronin & Wilson, 2007	SEMC
<i>D. securigera</i> Muir, 1926	BPBM
<i>D. serrata</i> Beamer, 1948a	SEMC
<i>D. silvae</i> Beamer, 1946	SEMC
<i>D. tenae</i> Muir, 1926	BPBM
<i>D. vaccina</i> Caldwell, 1951	USNM
<i>Syndelphax dissapatus</i> (Muir, 1926)	BPBM

Phylogenetic methods

Taxon sampling. All specimens available for molecular work (Table 2) were collected and stored in 95–100% ethanol at -80° C and are deposited in the planthopper tissue collection at Pennsylvania State University. Specimens representing six of the in-group species were available for sequencing in this study. Five out-group species were chosen with reference to the Delphacini topology in Urban *et al.* (2010).

Morphological data. Forty multistate morphological characters were coded and compiled (Tables 3 and 4) using Mesquite v 2.75 (Maddison & Maddison 2018).

Molecular data. An approximately 555 base pair section of sequence data was generated from the mitochondrial gene *COI* for available taxa (Table 2). DNA Extractions were made from thoracic or hind leg tissue using Qiagen

DNEasy Kits (Qiagen, Inc. Valencia, CA). Polymerase chain reactions (PCRs) were run in 25 µl volumes using Qiagen Taq core PCR kits (Qiagen, Inc. Valencia, CA) with the following cycling protocol: Initial denaturation of 94°C for 10 minutes, 35–40 cycles of 60 seconds at 94°C, 60 seconds at 41–45°C, and 60–75 seconds at 72°C, followed by 10 minutes incubating at 72°C. Oligonucleotide primers used were COI-RLR (Simon *et al.* 1994) and Calvin (Lin & Wood 2002; all primers were synthesized by Integrated DNA Technologies, Coralville, IA). Amplified DNA was visualized using gel electrophoresis on a 1% agarose gel with ethidium bromide staining and PCR products were purified using Qiagen MinElute DNA kits or extracted directly from gels using Qiagen Qiaquick gel extraction kits (Qiagen, Inc. Valencia, CA). Purified products were sequenced on an ABI Prism 3130XL Genetic Analyzer at the University of Delaware's Delaware Biotechnology Institute (Newark, DE). Complimentary strands were edited and inspected using 4Peaks version 1.7 (Griekspoor & Groothuis 2005) and assembled using CAP3 (Huang & Madan 1999). Additional delphacid *COI* sequences from Urban and colleagues (2010) were added to the data set and aligned using MUSCLE (Edgar 2004). The resulting *COI* sequence data, derived from single specimens, were submitted to GenBank and the accession numbers are provided with species descriptions.

TABLE 2. Taxa included in molecular analysis.

Species	Locality	GenBank Number
<u>outgroups</u>		
<i>Isodelphax basivitta</i> (Van Duzee)	USA: Pennsylvania	HM017485
<i>Prokelisia marginata</i> (Van Duzee)	USA: Delaware	HM017474
<i>Prokelisia dolus</i> Wilson	USA: Delaware	HM017483
<i>Javesella pellucida</i> (Fabricius)	USA: Pennsylvania	HM017472
<i>Muirodelphax arvensis</i> (Fitch)	USA: Pennsylvania	HM017478
<u>ingroups</u>		
<i>C. balboae</i> (Muir & Giffard)	Argentina	MN339592
<i>C. havanae</i> (Muir & Giffard)	Nicaragua	MN339591
<i>C. haywardi</i> (Muir)	Argentina	MN339589
<i>C. pacificus</i> (Crawford)	USA: Louisiana	MN339590
<i>C. puellus</i> (Van Duzee)	USA: Pennsylvania	HM017484
<i>C. tenae</i> (Muir)	Argentina	MN339593

Phylogenetic analyses

Bayesian analysis. A Bayesian analysis, of the combined *COI* and morphological data matrix, was performed using MrBayes 3.1.2 (Ronquist & Huelsenbeck 2003), under a GTR+I+G model for the molecular data, the best scoring model available. This model was selected using JModelTest (Posada 2008), under the Akaike information criterion corrected for small sample size (AICc; Hurvich & Tsai 1989). For the morphological data, a Markov model + G was applied (Lewis 2001). The analysis was run for 1,000,000 generations, model parameters were estimated independently across the two partitions. Two independent runs, with four chains each, were performed. For these analyses three of the chains were heated and one was cold. Uninformative priors and trees were sampled every 100 generations. The first 25% (2,500) of the sampled trees were discarded as burn-in. The 50% majority rule consensus tree was constructed from the remaining trees and the Harmonic Mean of Likelihoods for the remaining trees was calculated.

Morphological taxonomy. Available specimens of *Chionomus* and 26 potentially allied species (Table 1) were examined from the following collections (abbreviations from Arnett *et al.*, 1993, with the addition of Vince Golia Collection (VGC) and the University of Central Missouri (CSMU).

ABSC—Archbold Biological Station, Lake Placid, FL;

BPBM—Bernice P. Bishop Museum, Honolulu, HI;

BYUC—Monte L. Bean Life Science Museum, Brigham Young, University, Provo, UT;

CASC—California Academy of Sciences, San Francisco, CA;

CMNH—Carnegie Museum of Natural History, Pittsburgh, PA;

CSCA—California State Collection of Arthropods, Sacramento, CA;

CSMU—University of Central Missouri Insect Collection (in care of Stephen Wilson), Warrensburg, MO;
INHS—Illinois Natural History Survey, University of Illinois, Champaign, IL;
ISNB—Royal Institute of Natural Science, Brussels, Belgium;
LBOB—Lois O'Brien Collection, Green Valley, AZ (associated with Arizona State University);
LSCU—Louisiana State Arthropod Museum, Louisiana State University, Baton Rouge, LA;
MEMU—Mississippi Entomological Museum, Mississippi State University, Mississippi State, MS;
NCSU—North Carolina State University Insect Collection, North Carolina State University, Raleigh, NC;
SEMC—Snow Entomological Museum, University of Kansas, Lawrence, KS;
UAIC—University of Arizona, Department of Entomology, Insect Collection, Tucson, AZ;
UCDC—Bohart Museum of Entomology, University of California, Davis, CA;
UCRC—University of California, Riverside Entomological Collection, University of California, Riverside, CA;
UDCC—University of Delaware Collection, University of Delaware, Newark, DE;
UKYC—University of Kentucky Collection, University of Kentucky, Lexington, KY;
USNM—National Museum of Natural History, Smithsonian Institution, Washington, DC;
VGC—Vince Golia Collection, FL (associated with Archbold Research Station, Lake Placid, FL);
WIRC—Wisconsin Insect Research Collection, University of Wisconsin-Madison, Madison, WI.

Diagnostic descriptions are provided for all *Chionomus* species. Invariant features provided in the generic description are not repeated in species descriptions except for clarity. Species descriptions are based on macropters with characters of brachypters specified when they are notably different. Distributions were compiled from literature records, material examined, and the Tri-Trophic thematic collection network (TCN; <http://tcn.amnh.org/>). Species descriptions include known plant associations, relevant literature since Metcalf (1943), consistent genitalic illustrations, and the GenBank accession number for a 555 base pair section of the mitochondrial gene *Cytochrome Oxidase I* (COI) when available. Distribution summaries and material examined are given approximately north to south by country (political units within countries alphabetical). US States are abbreviated according to the official US Postal Service abbreviations; Canadian provinces are abbreviated according to Canada Post. Specimen label data for primary types is quoted verbatim, with each line break indicated by “/” and each label separated by “//”. Label data for non-type specimens is compiled in the supplementary materials, with specimen data arranged from general to specific geographic locality, date, collector, collection method or plant association (plus any additional information) with added notes in square brackets. Parenthetically following the label information are the collection(s) where the specimen(s) may be found, and number of specimens usually with numbers of males and females indicated. Specimen data are summarized at the county level for very abundant species at highly represented localities.

Curation and specimen dissection followed standard methodology described in Wilson & McPherson (1980a), Bartlett & Deitz (2000) and Wilson (2005). Morphological terminology follows Asche (1985) except that parameres are referred to as having a proximal ‘basal angle’ and a distal ‘inner angle’ (*sensu* Metcalf 1949). Roman numerals are used to indicate abdominal segment number wherever appropriate. The heading ‘genitalia’ should be understood as male and includes the postgenital segments (i.e., segments X and XI). Antennal segment I references the first segment of the antennae (scape) and II the second (pedicel). The number and arrangement of sensory pits of the antennal pedicel (rhinaria) are described by listing the number found in each vertical row, beginning with the dorsal-most row (i.e., 3, 3–4, 2, 2). Specimens examined were provided 2D barcode labels and data captured using “Arthropod Easy Data Capture” (Schuh *et al.* 2010, Schuh 2012, Arthropod Easy Capture 2015; visualized at discoverlife.org and iDigBio.org). All reported plant associations are compiled from literature and label data. Plant nomenclature, including common names, follows the USDA online PLANTS database (USDA, NRCS 2018).

Morphological observations were made using a Wild-Herbrugg dissecting scope with 20x oculars and a 6–50x objective lens. Photographs and measurements were taken using a Nikon SMZ-1500 Digital Imaging Workstation with Nikon DS-U1 digital camera and NIS Elements Imaging software (version 3.0). Illustrations were produced by tracing photographs with a scale bar using the program Adobe Illustrator CS3. Scale bar length is 0.2 mm for full body and frontal views and 0.05 mm for genitalic images and illustrations unless otherwise noted. Measurements are reported in millimeters (mm) as averages, with the number of specimens measured indicated (‘n’). Total body length was measured from the anterior margin of the vertex to the end of segment X, excluding the anal column (~paraproct *sensu* Bourgoïn & Huang 1990) and wings, in dorsal view. Body width was measured in dorsal view as the distance between the tegulae. Head measurements may include both males and females, and both macropters and brachypters and thus lack these categorical designations.

TABLE 3. Morphological characters and states.

<i>Body</i>	
1. Median vitta: 0 absent, 1 present	
<i>Head</i>	
2. Width of head compared to pronotum: 0 narrower, 1 equal	
3. Color of carinae of frons: 0 concolorous with frons, 1 contrasting	
4. Color of Vertex: 0 concolorous, 1 anterolateral compartments dark, anterior and posterior compartments and all carinae pale, 2 all compartments dark, 3 all compartments dark with carinae pale, 4 just posterior compartments pale, carinae pale	
5. Submedian length of vertex: 0 shorter than pronotum, 1 about equal to pronotum, 2 longer than pronotum	
6. Y-shaped carinae of vertex: 0 weak/absent, 1 strong	
7. Stem of Y-shaped carinae: 0 weak/absent, 1 strong	
8. L:W ratio of basal compartments of vertex: 0 shorter, 1 equal, 2 longer	
9. Ratio of length of anterior and basal compartments of vertex: 0 anterior shorter, 1 equal, 2 anterior longer	
10. Ratio of vertex width at apex and base: 0 apex narrow, 1 equal, 2 apex wider	
11. Head projected in front of eye: 0 not, 1 less than 1/2 width of eye, 2 greatly	
12. Vertex rounding onto frons: 0 rounded, 1 angulate, 2 carinate	
13. Color of frons: 0 concolorous, dark, carinae pale, 2 pale, dark margins, carinae pale, 3 bicolored	
14. Sides of frons: 0 parallel to subparallel, 1 bowed outward, 2 diverging	
15. Color of post clypeus: 0 concolorous, 1 dark with pale carinae, 2 pale, dark margins, pale carinae	
<i>Thorax</i>	
16. Pronotum color: 0 concolorous but different from vertex and mesonotum: 1 concolorous, concolorous with body: 2 median vitta	
17. Paranota: 0 all dark, 1 dark with white apical band, 2 all white/light	
18. Lateral carinae of pronotum: 0 reaching hind margin, 1 terminating prior to margin, not curved, 2 curving to follow contour of eye, not reaching hind margin	
19. Mesonotum color: 0 concolorous, 1 pale median stripe	
20. Scutellum color: 0 concolorous, 1 paler	
21. Mesonotum lateral carinae (macropter): 0 Reaching hind margin, 1 not reaching hind margin	
22. Apical spines on midtibiae: 0 4, 1 5, 2 6, 3 7+	
23. Size of calcar teeth: 0 small, 1 midsized, 2 large	
24. Number of teeth on calcar: 0 none, 1 less than 11, 2 11-15, 3 16-20, 4 21-25, 5 26-30, 6 31+	
25. Apical tooth of calcar: 0 larger than other teeth, 1 similar sized to other teeth, 2 smaller than other teeth, 3 absent	
26. Macropterous wing color: 0 patterned, 1 not patterned, with dark spot at apex of clavus, 2 not patterned, lacking dark spot	
27. Dark spot at wing-coupling mechanism: 0 absent, 1 present	
28. Claval fold on brachypters: 0 absent, 1 present	
<i>Genitalia</i>	
29. Dorsocaudal angles of pygofer: 0 normal, 1 strongly produced, 2 slightly produced	
30. Ventrocaudal margin of pygofer: 0 with process, 1 strongly excavated, 2 shallow U or V excavation, 3 continuous with margin	
31. Armature of diaphragm: 0 absent, 1 present	
32. Direction of armature: 0 not projecting, 1 dorsocaudally projecting, 2 caudally projecting	
33. Shape of armature of diaphragm: 0 boss, 1 fold/shelf, 2 U, 3 bifurcate	
34. Aedeagus: 0 narrow, elongate, 1 stout	
35. teeth on aedeagus: 0 present, 1 absent	
36. Parameres: 0 not flattened apically, 1 flattened apically	
37. Basal angle of parameres: 0 absent, 1 mildly produced, 2 strongly produced	
38. Processes on segment 10: 0 present, 1 absent	
39. Processes on segment 10: 0 1 pair closely approximated: 1 1 pair widely separated, 2 1 pair, lobes, 3 2 pair of spines, 4 absent	
40. Processes on segment 10: 0 straight, 1 hooked	

TABLE 4. Character states for morphological analysis.

Species	Character States
<i>I. basivitta</i>	00131 00011 10101 10100 01131 20002 11110 02010
<i>P. dolus</i>	00010 11100 21220 12000 00220 20102 12010 111--
<i>P. marginata</i>	00010 11100 21220 12000 00220 20102 12010 111--
<i>M. arvensis</i>	01001 11011 10000 02210 11131 20003 02101 101--
<i>J. pellucida</i>	01131 00011 10101 01201 01132 10002 10210 000-0
<i>C. havanae</i>	00131 00011 10101 01201 11141 11002 12001 111--
<i>C. balboae</i>	00131 00011 10101 01201 11141 11002 12000 111--
<i>C. haywardi</i>	10141 00011 10101 02211 11141 11002 12000 11001
<i>C. pacificus</i>	10111 00011 10101 02211 11141 11002 12300 11000
<i>C. puellus</i>	00131 00011 10101 01201 11141 11002 12300 11011
<i>C. tenae</i>	00131 00011 10101 01201 11131 11002 12100 1102-

Results

Phylogenetic analysis

Bayesian analysis. The two independent runs produced two identical 50% consensus trees (Figure 1). The combined harmonic mean of these trees was $-\ln=2805$. *Chionomus tenae* is basal in the lineage with strong posterior probability. Additionally, the broad definition of *Chionomus* is supported as monophyletic, while the original definition is paraphyletic.

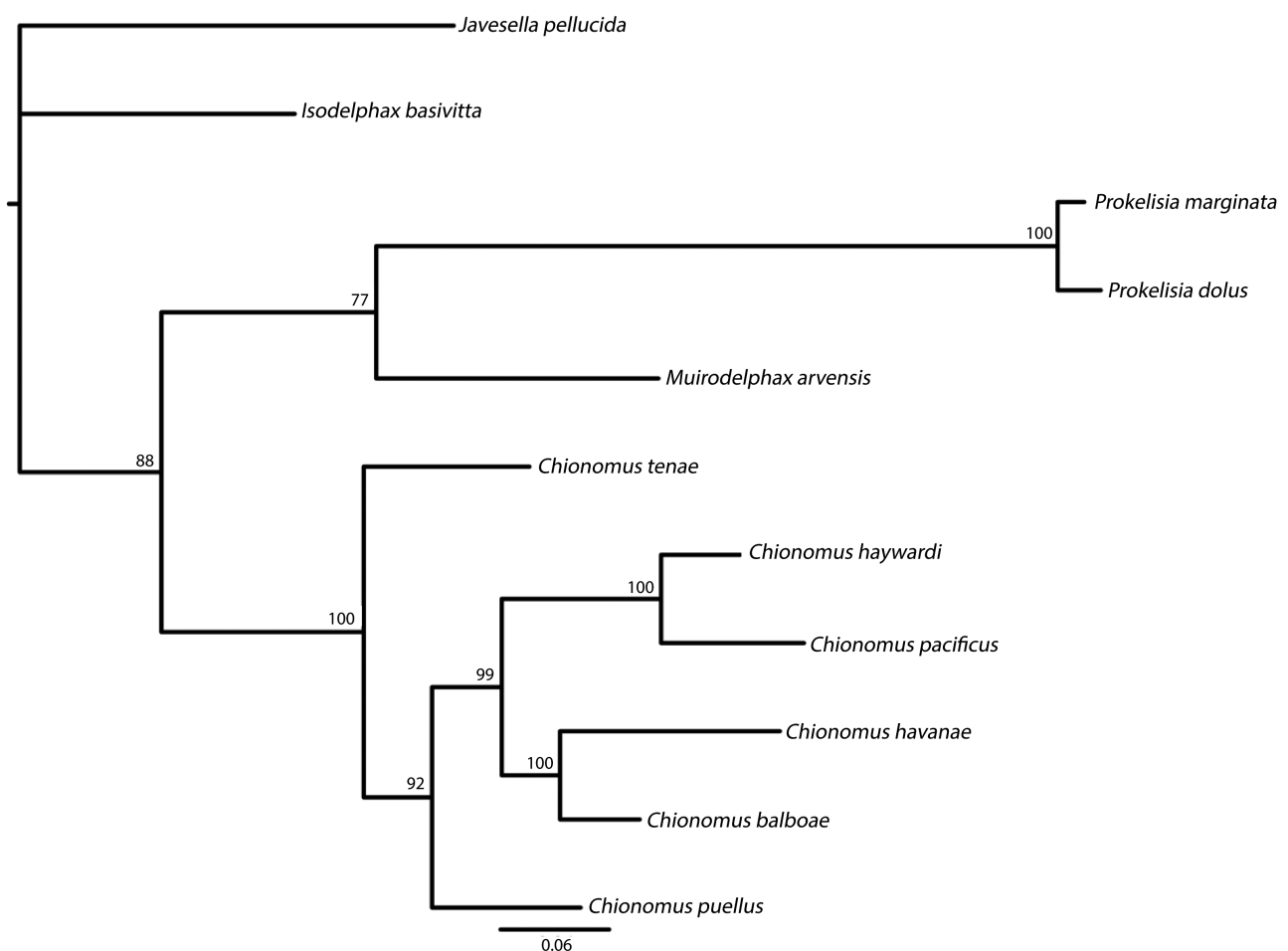


FIGURE 1. The tree topology (harmonic mean of $-\ln = 2805.42$) resultant from a mixed model Bayesian analysis of combined morphological and COI data. Posterior probabilities are indicated at the nodes; the scale bar is equivalent to 0.06 changes per site.

Systematic treatment. Of the 29 species considered, 14 species are included in the new monophyletic definition of *Chionomus*, including two new species and eight species transferred from *Delphacodes*; four species are junior synonyms and 11 are excluded from *Chionomus*.

Genus *Chionomus* Fennah, 1971

Chionomus Fennah, 1971: 323-324.

Type species. *Delphacodes havanae* Muir & Giffard, 1924, by original designation.

Description. *Color.* General body color brunneous to black, legs paler, white to stramineous or light brown; with carinae of the head, paranota, and scutellum pale. Pronotum often with characteristic wide white band along posterior margin (reduced or lacking in *C. banosensis*, *C. gluciophilus*, *C. quadrispinosus*), paranota paler along margins or more broadly, pronotal carinae contrasting in color in some species (*C. bellicosus*, *C. dissipatus*). Mesonotum dark, *C. bellicosus* and *C. pacificus* with median vitta or carinae lightened, scutellum always white except in males of *C. dolonus* **n. sp.** Wings clear with fuscous mark near apex of clavus (the 'claval spot'). *Structure.* Head narrower than pronotum, vertex quadrate, approximately as wide as long (except *C. herkos* **n. sp.**); carinae distinct, stem of Y-shaped carina weak, median carinae of vertex converging at fastigium. In lateral view, genal carinae angled anteroventrad to meet anterior margin of clypeus, fastigium rounded. Front with carinae distinctly contrasting with darkened foveae, lateral margins of frons parallel to subparallel, widest between midpoint of compound eyes to just below ventral edge; median carina distinct, forked at fastigium. Antennae short, not exceeding posterior margin of tegulae, circular in cross-section, segment I just longer than wide, II longer than I. Pronotal carinae weak, median carinae of pronotum reaching posterior margin, lateral carinae curved, diverging posteriorly, not reaching posterior margin. Mesonotum with carinae weak in macropters, median carinae never reaching scutellum, lateral carinae diverging, reaching hind margins, more pronounced in brachypters. Legs quadrate in cross-section, hind tibiae with two lateral teeth, one just distal to joint with femur and second near midpoint. Calcar foliaceous, about half length of basitarsus. Veins of macropter distinct, sparsely setaceous; R+Sc 3 branched, M 3 branched, CuA 3 branched, CuP unbranched, claval veins fusing mid-length (Figure 2). Tegmina of brachypter nearly covering abdomen, distal apices rounded. Abdomen compressed dorsoventrally, tapering caudad to truncate apex in males. Male pygofer longer ventrally than dorsally, broad in lateral view; in caudal view opening round or mildly dorsoventrally compressed; dorsolateral margins of pygofer may be produced (i.e., *C. gluciophila*, *C. herkos*) but usually truncate in lateral view, except *C. dolonus* with a caudal tooth. Diaphragm and armature strong, well-developed, dorsal margin concave producing large inverted triangular or trapezoidal opening between diaphragm and segment X; armature distinctly projecting caudad, often bilobed, indented, or caudally produced where aedeagus rests. Aedeagus tubular, parallel sided, except *C. havanae*, *C. bellicosus*, *C. herkos*; slightly to distinctly curved dorsad, gonopore subapical and dorsal. Parameres flattened apically but inner angle may be slightly curved or caudally produced (*C. banosensis*, *C. dissipatus*, *C. herkos*), basal angle strong, widest in basal third (except *C. tenae*), lateral margins concave, widened apically. Segment X quadrate, bearing zero, two, or four processes on ventrocaudal margin, ventrally directed; segment XI shorter than segment X.

Remarks. The general coloration of *Chionomus* is helpful for genus recognition but is not definitive. Also, females may be paler than males. A similar general coloration, including the dark marking at the claval apex and the pale caudal margin of the pronotum can be found in other genera (e.g., *Javesella* Fennah, 1963, *Falcotoya* Fennah, 1969, *Opiconsiva* Distant, 1917). However, these genera can be diagnosed by male genitalia. *Falcotoya* lacks the produced armature of the diaphragm and possesses a strongly decurved aedeagus. *Opiconsiva* differs in having the dorsocaudal margin of the pygofer strongly expanded and the processes on segment X closely approximated. *Opiconsiva* is restricted to the Eastern Hemisphere and Hawaii with the exception of *Opiconsiva tangira* (Matsumura, 1910), recently reported by Halbert (2016), and *Opiconsiva anacharis* (Fennah, 1969), reported as *Harmalia anacharsis* by Wooten *et al.* (1993), recorded in Florida. *Javesella* lacks the claval spot and the opening of the pygofer is very broad with widely diverging parameres and the processes on segment X always closely approximated. *Isodelphax* Fennah, 1963, also shares the same general appearance but this genus lacks the claval spot and the parameres are strongly diverging apically with a strongly projected basal angle. *Isodelphax* also tends to have a dark antennal segment I, which is usually paler (yellowish to light brown) in *Chionomus*.

Some *Chionomus* species are very common and are readily collected at lights. *Chionomus puellus* is abundant

(with more than 5,000 specimen records in the Tri-Trophic TCN database) and widely distributed in the eastern US. *Chionomus havanae* and *C. balboae* can be abundant over much of the Neotropics. Despite this, the biology of these species are poorly known.

Etymology. The original author did not indicate the gender or derivation of the name *Chionomus*. It appears to stem from the Greek noun *chionos*, meaning “snow”, possibly a reference to the whitened posterior pronotum margin, with *-[i]mus* to indicate possession. The names of three species originally placed in *Chionomus* do not indicate gender, as they are latinizations of proper nouns in the genitive. Following article 30.2.4 of the Code of Zoological Nomenclature (ICZN 1999) the name is treated as masculine (consistent with a *-us* Latin ending).

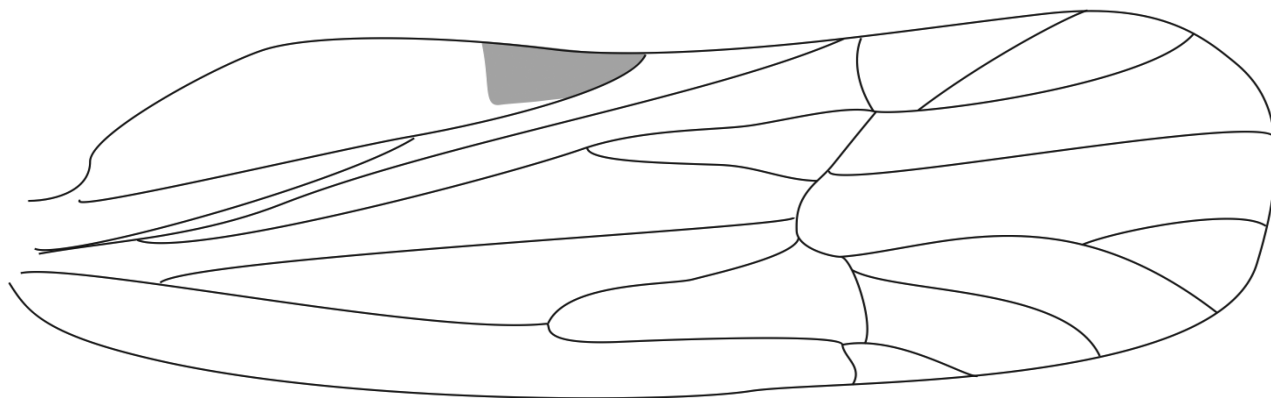


FIGURE 2. Wing venation of *Chionomus havanae*.

Key to males of the Genus *Chionomus*

1. Armature of diaphragm distinctly bilobed (Figures 6i, 28a, 29a) (2).
- Armature of diaphragm not distinctly bilobed, may be cordate, notched, or U-shaped (Figures 19a, 25a, 30a) (5).
2. Armature of diaphragm hooked, lobes parallel; processes of segment X present but not particularly strong, specimens with carinae of the mesonotum lightened frequently forming a vitta (Figures 6, 22, 13, 28) (3).
- Armature of diaphragm not hooked, lobes distinctly diverging; processes distinct and directed ventrad, carinae of mesonotum concolorous (Figures 5, 21, 14, 29) (4).
3. Armature of diaphragm hooked only in apical half, lobes only diverging in apical half; aedeagus with toothed flange on left side (Figures 6, 22) *C. bellicosus*.
- Armature of diaphragm hooked along entire length, lobes diverging from point of origin; aedeagus without flange, with two rows of scattered teeth (Figures 13, 28) *C. pacificus*.
4. Lobes of armature of diaphragm small and closely approximated; processes of segment X parallel. Posterior edge of pronotum dark, only paranota white in color (Figures 5, 21) *C. banosensis*.
- Lobes of armature of the diaphragm produced, diverging from point origin; processes of segment X diverging. Posterior edge of pronotum white, paranota also white (Figures 14, 29) *C. puellus*.
5. Pygofer with prominent quadrate, dorsolateral process. Parameres not flattened at apex. (Figures 12, 27) *C. herkos*.
- Pygofer without dorsolateral processes, if produced at dorsolateral margin, not quadrate. Parameres flattened at apex. (Figures 19, 23, 26) (6).
6. Segment X with a total of 4 processes (Figures 23b, 24b, 25b, 30b) (7).
- Segment X with only 2 processes or processes vestigial (Figures 19b, 20b, 26b, 31b) (10).
7. Secondary processes of segment X small, spine-like. Armature of diaphragm shelf-like. Ventral margin of pygofer with caudally projecting median process (Figures 9, 24) *C. dolonus*.
- Secondary processes of segment X long, sinuate. Armature of diaphragm quadrate, quadrate and notched, or U-shaped. Ventral margin of pygofer lacking median process (Figures 23, 25, 29) (8).
8. Armature of diaphragm quadrate or cordate/notched, toothed along vertical margins; aedeagus not distinctly enlarged at base (Figures 23a, c, 25a, c) (9).
- Armature of diaphragm U-shaped, lacking teeth; aedeagus with distinctly enlarged, quadrate base (Figures 29 a, b) *C. quadrispinosus*.
9. Armature of diaphragm notched along ventral margin; aedeagus with slight enlargement apically. Parameres not produced opposite of basal angle. Posterior compartments of vertex and stem of Y-shaped carina dark (Figures 10, 25) ... *C. gluciophilus*.
- Armature of diaphragm quadrate, notch along ventral margin not evident; aedeagus tapering along entire length, not enlarged apically. Parameres with rounded projection opposite of basal angle. Posterior compartment of vertex light but with fuscous markings, stem of Y-shaped carina light (Figures 8, 23) *C. dissipatus*.
10. Aedeagus nearly straight, may have slight dorsal curve (Figures 19b, 20c, 26c) (11).
- Aedeagus with distinct curve dorsad, nearly forming a right-angle apical hook on left, small teeth along length. Segment X with

- two rounded processes, lobe-like, arising from the middle of segment. Specimens frequently large for *Chionomus*, with wings infusate (Figures 17, 31) *C. tenae*.
11. Aedeagus with subapical and distinctly projecting flagellum, lacking teeth and hooks (Figure 19b) *C. havanae*.
 - Aedeagus without flagellum, with hooks and/or teeth (Figures 20c, 26c) (12).
12. Aedeagus with large hooks on right side of aedeagus; apex of parameres anvil shaped (Figures 20b,c) *C. balboae*.
 - Aedeagus with small teeth in two scattered rows, lacking any sort of hook; apex of parameres quadrate (Figures 26b,c)
 *C. haywardi*.

***Chionomus havanae* (Muir & Giffard, 1924)**

(Figures 3, 18a & d, 19)

Delphacodes havanae Muir & Giffard, 1924: 37.

Chionomus havanae (Muir & Giffard), comb. by Fennah, 1971: 324.

Type Locality. Cuba, Havana.

Diagnosis. Body light to dark brown, with white to ivory markings. Vertex quadrate; foveae of frons and vertex dark. Carinae distinct, pale; antennae light brown. Pronotum dark anteriorly, shading to white posteriorly, paranota white. Armature of diaphragm forming smooth triangular boss, apex of parameres with outer angle strongly produced, rounded. Aedeagus sinuate, bearing a caudally projected process that extends past apex.

Description. *Color.* *Macropter.* Body dark to light brown, bearing white or ivory markings. Carinae of head (including genal carinae) distinct, paler. Foveae of head fuscous. Antennae dark brown proximally, shading paler distally. Pronotum dark brown anteriorly, white posteriorly. Mesonotum dark shining brown, white posteriorly at termini of lateral carinae and scutellum. Legs yellow bearing light brown stripes on anterior face, apex of tarsi brown. Wings hyaline with dark marking near apex of clavus, some specimens fuscous on claval fold and nodal line. Abdomen brown, caudal edge of terga and sterna often paler. Pygofer brown, segment X light brown. *Brachypter.* Similar, with white at tegmina apex. *Structure. Body.* Length (in mm) macropter male (♂) 1.59±0.13 (n=22); ♂ brachypter 1.88±0.04 (n=3); width ♂ 0.74±0.08 (n=25). *Head.* Vertex length 0.18±0.03 (n=25); vertex width 0.17±0.02 (n=25); frons length 0.46±0.02 (n=25); frons width 0.21±0.02 (n=25). Vertex approximately quadrate in dorsal view, barely wider than long; carinae distinct, stem of Y-shaped carina obsolete. In lateral view (Figure 3b), fastigium rounded; projecting in front of the eye about 1/6th eye length. Carinae of frons distinct (Figure 3e), subparallel, widest at ventral margin of compound eyes. Antennae with segment I subequal in length to II; segment II sparsely setaceous; sensory pits arranged 4, 3–4, 2, 2, arranged uniformly, surrounded by small black setae.

Thorax. Macropter. Carinae of mesonotum weak, median carina ending before scutellum, lateral carinae diverging posteriorly, reaching hind margin. Tibiae carinate; sparsely setaceous, two rows of small black spines along ventral margin. Calcar bearing 22–26 small teeth (holotype with 24). *Brachypter.* Tegmina rounded apically, reaching to abdominal apex (or nearly so).

Abdomen. Slightly dorsoventrally compressed, tapering caudad to truncate apex; long, fine setae surrounding each abdominal spiracle. Male genitalia with pygofer in lateral view (Figure 3g) nearly thrice as long ventrally as dorsad, ventral margin sinuate. In caudal view (Figure 3f, 19a), as tall as wide, globular; dorsolateral margins mildly produced. Opening to inner chamber triangular, pointed ventrad. Diaphragm strong, armature distinctly produced and projecting caudad, apex triangular to bilobed, smooth. Parameres flattened distally, widest in basal third, basal angle strong, projecting, quadrate; dorsolaterally diverging to convexly curved apices, lateral margins concave, inner angles weak, acute; outer angles produced to rounded apices. Suspensorium inconspicuous. Aedeagus terete in cross-section, widest near base, irregularly tapering for most of length, abruptly tapering distally to blunt apex, weakly curved ventrad in apical quarter, keeled ventrally, gonopore apical; bearing conspicuous straight dorsal spine projecting beyond aedeagus apex. Segment X longer than tall, quadrate, not armed. Segment XI produced, about half the length of segment X, projecting caudally.

Plant associations. *Axonopus compressus* (Sw.) P. Beauv. (broadleaf carpetgrass, Poaceae) (Fennah 1959).

Distribution. USA: FL; Cuba; Cayman Islands (Cayman Brac, Grand Cayman); Puerto Rico (inc. Mona Island); Jamaica, Guadeloupe, Trinidad; Mexico (Campeche, Chiapas, Federal District, Oaxaca, Tamaulipas, Veracruz, Yucatan); Belize; Guatemala; Honduras; Nicaragua; Costa Rica; Panama; Colombia; Venezuela; Guyana; Brazil (Amazonas, Para, Rio de Janeiro, Rondonia, Sao Paulo); Peru; Ecuador, Bolivia, Argentina; also reported Cuba, Mexico (Sinaloa) (Bartlett *et al.* 2014).

GenBank accession number. MN339591



FIGURE 3. Habitus of *Chionomus havanae* (A-E holotype); A. dorsal view, habitus; B. lateral view, habitus; C-D. labels of holotype, E. frontal view, habitus; F. male terminalia, caudal view; G. male terminalia, lateral view.

Remarks. *Chionomus havanae* was initially reported in the United States by Wilson (1983). This species is common in Neotropical collections and is often collected in with *C. balboae* at lights. This species is easily differentiated by the sinuate shape of the parameres (basal angle strong, apices convexly curved) and the apical spine on the aedeagus. Males frequently can be identified without dissection if the parameres and apical spine of the aedeagus can be seen. This species may be most closely allied with *C. balboae* and *C. haywardi*, which have similarly a similarly triangular shaped armature of the diaphragm but lack the spine of the aedeagus.

Type material examined. Holotype [BPBM]: Macropterous ♂, “Havana / Cuba. Baker // Megamelus / albopalliatu / Uhl. [Handwritten] // ♂ [Handwritten] // [Blue paper] // Holotype [Red paper, vertical orientation, affixed to following label] // Delphacodes / havanae / ♂ M.G // under / puella / Crawf Col / havana [Handwritten, last line vertical orientation] // Paratype [reverse side of previous label, yellow paper] // 1075 [Handwritten]”.

Chionomus balboae (Muir & Giffard, 1924)

(Figures 4, 18b & e, 19)

Delphacodes balboae Muir & Giffard, 1924: 36.

Chionomus balboae (Muir & Giffard), comb. by Fennah, 1971: 324.

Type Locality. Mexico, Veracruz, Jalapa [Xalapa].

Diagnosis. Body dark brown and shining, with white to ivory markings. Vertex quadrate; foveae of frons and vertex dark. Carinae distinct, off-white in color; antennae light brown. Pronotum dark anteriorly with band of white along posterior edge, paranota paler at posterior edge. Armature of diaphragm forming triangular or cordate boss, apex of parameres anvil-shaped. Aedeagus tubular, right side bearing preapical hook with proximal flange on distal third opposite 2 preapical spines on the left.

Description. *Color. Macropter.* Body dark, brunneous, shining, with white or ivory markings. Carinae of head (including genal carinae) distinct, ochraceous to off-white in color, usually with a small amount brown at apex of carinae; median carinae of vertex less evident. Antennae brown to light brown proximally, shading distally paler to yellow. Pronotum dark brown to brown anteriorly, posterior edge and ventral edge of paranota white to ivory. Mesonotum dark, median and lateral carinae light brown in some specimens. Legs light brown, with hind legs lighter, occasionally yellow. Forewings hyaline, sometimes with faint fuscous markings, dark spot just before apex of clavus. Abdomen brown, caudal edge of each segment lightened to yellow or white, lateral projections of sternites yellow to white. Pygofer and segment X brown. *Brachypter.* Similar to above, tegmina infusate, white stripe along apex, darkened spot near apex of clavus. *Structure. Body.* Body length (in mm) ♂ macropter 1.67±0.13 (n=25); ♂ brachypter 1.74 (n=1); width ♂ 0.71±0.09 (n=25). *Head.* Vertex length 0.17±0.03 (n=25); vertex width 0.17±0.03 (n=25); frons length 0.45±0.03 (n=25); frons width 0.20±0.02 (n=25). *Macropter.* Carinae of vertex distinct, stem of Y-shaped carina faint. In lateral view (Figure 4b), fastigium rounded; projecting in front of the eye about 1/5th eye length. Carinae of frons and clypeus distinct (Figure 4e), frons subparallel, widest just below compound eyes. Antennal segments subequal in length, segment II wider than segment I; 2nd segment sparsely setaceous, bearing sensory pits arranged 4, 3–4, 2, 2, evenly spaced around segment. Sensory pits surrounded by small black setae. *Brachypter.* Same as above.

Thorax. Macropter. Carinae of mesonotum weak, median carina ending anterior to scutellum, lateral carinae faint, diverging posteriorly to reach hind margin. Legs with 2 rows setae on ventral margin of femora, mostly bare. Calcar bearing 22–26 small teeth (holotype with 22). *Brachypter.* Same as above but with lateral carinae mesonotum evident, diverging posteriorly; tegmina apically rounded, reaching to apex of 7th abdominal segment.

Abdomen. Macropter. Compressed dorsoventrally, tapering caudad to truncate apex; abdominal spiracles surrounded by fine setae. *Brachypter.* Same as above.

Genitalia. Pygofer in lateral view (Figure 4g) nearly 2/3rds as long dorsally as ventrad, ventral margin sinuate. In caudal view (Figure 4f, 20a), as tall as wide, rounded; margins raised, weakly carinate. Opening to inner chamber triangular, pointed ventrad. Armature of diaphragm triangular to heart shaped, smooth, distinctly projecting caudad. Parameres, widest in basal third, basal angle strong, projecting, quadrate; dorsolaterally diverging to anvil-shaped apices, lateral margins concave, inner angles weak, acute; outer angles produced to rounded apices. Aedeagus circular in cross-section, slightly curved dorsad, widest near base, slightly tapering for most of length, with slight subapical expansion before pointed apex; Aedeagus bearing 1 to 2 teeth on left and large subapical flange on right bearing 2 hooks; distal hook large, directed caudoventrally; proximal hook smaller, directed anteriorly; gonopore dorsal, subapical. Segment X quadrate, processes vestigial. Segment XI produced, about 2/3rds length of segment X.

Plant associations. None reported.

Distribution. USA: FL; Mexico (Campeche, Jalisco, Mexico City, Sinaloa, Tamaulipas, Veracruz); Cayman Islands; Belize; Guatemala; Honduras; Costa Rica; Panama; Colombia; French Guiana; Venezuela; Brazil (Amazonas, Pará, Rio de Janeiro, Rondonia, Santa Catarina); Ecuador; Bolivia; Paraguay; Uruguay; Argentina; Also reported: Guyana (as British Guiana; Muir 1926), Mexico (Chiapas, Oaxaca) Dominican Republic; Jamaica; Puerto Rico; St. Lucia (Bartlett *et al.* 2014).

GenBank accession number. MN339592



FIGURE 4. Habitus of *Chionomus balboae* (A, C, E holotype); A. dorsal view, habitus; B. lateral view, habitus; C. labels of holotype; D. apex of aedeagus, ventral view, E. frontal view, habitus; F. male terminalia, caudal view, G. male terminalia, lateral view.

Remarks. This species is very frequently collected with *C. havanae* at lights. The combination of the anvil shape of the parameres and the frequent projection of the large hook on aedeagus easily separates it from *C. havanae*. This species may be close to *C. havanae* and *C. haywardi* because of the triangular shaped armature of the diaphragm. Both of these species lack similar arming of the aedeagus, *C. havanae* bears a dorsal spine while *C. haywardi* is armed with small, scattered teeth.

Type material examined. Holotype [BPBM]: Macropterous ♂, “Jalapa / Crawford // [Blue paper] // Holotype [Red paper, vertical orientation, affixed to following label] // *Delphacodes / balboae* / ♂ M.G. [Handwritten] // ♂ gen. Slide No 8 / Series II / *Liburnia pacifica* Crawf. / det. Crawford. / Single ♂ / Jalapa, mex. / Crawf. Coll. [Handwritten] // 854 [Handwritten]”.

Chionomus banosensis (Muir, 1926), new combination
(Figures 5, 21)

Delphacodes banosensis Muir, 1926: 31.

Type Locality. Ecuador, Tungurahua Province, Banos.



FIGURE 5. Habitus of *Chionomus banosensis* (holotype; terminalia in balsam); A. dorsal view, habitus; B. frontal view, habitus; C. lateral view, habitus; D. calcar; E. anal tube, right lateral view; F. pygofer, caudal view; G. hind tarsus, ventral view; H. paramere, widest view (right paramere from underside); I. aedeagus, left lateral view.

Diagnosis. Body brunneous, dark, shining, with stramineous markings. Vertex quadrate; foveae of frons and vertex very dark. Carinae of the head distinct, yellow in color except for genal carinae and median carina of the vertex; antennae light brown. Pronotum entirely dark, paranota ivory. Armature of diaphragm posteriorly projecting, composed of two diverging but closely approximated lobes; parameres with apices Y-shaped, sinuate, with distinct secondary process on proximal edge at midpoint. Aedeagus tubular, enlarged at base, upwardly directed, with a row of scattered teeth on either side connecting at the aedeagal base; segment X with 2 processes.

Description. *Color. Macropter.* Body shining, dark, brunneous, with stramineous markings. Carinae of head (excluding genal carinae and median carinae of vertex) distinct, ochraceous to off-white in color, usually with a small amount brown at apex of carinae; median carinae of vertex and genal carinae concolorous with foveae. Antennae yellow, infusate at joint of two segments. Pronotum dark, concolorous with body, paranota distinctly ivory. Mesonotum dark, median and lateral carinae obscure. Legs yellow; forewings hyaline, dark spot at apex of clavus not evident in holotype. *Structure. Macropter.* Carinae of vertex distinct, stem of Y-shaped carina obscure. In lateral view (Figure 5c), fastigium rounded. Carinae of frons and clypeus distinct (Figure 5b), frons subparallel, widest midway below compound eyes and frontoclypeal suture. Antennae with first segment subequal in length to second, segment II wider than segment I; 2nd segment with sparse setae surrounding sensory pits.

Thorax. Macropter. Carinae of mesonotum evident, median carina ending anterior to scutellum, lateral carinae faint, diverging posteriorly and ending anterior to hind margin.

Abdomen. Macropter. Specimen has been dissected. The abdomen, excluding the pygofer, appears to have been discarded thus, the abdomen was not observed.

Genitalia. Pygofer in caudal view (Figure 5f) nearly as wide as tall, rounded; dorsal margins raised, carinate. Opening to inner chamber trapezoidal, pointed ventrad. Armature of diaphragm triangular composed of 2 lobes, smooth, projecting caudad. Parameres, widest in basal third, basal angle strong, projecting, quadrate, dorsolaterally diverging; apices with inner and outer angles distinct, diverging, Y-shaped. Exterior lateral margin of parameres concave, interior margin convex with distinct median process. Aedeagus circular in cross-section, curved dorsad in distal 1/3rd, with distinct widened base, tapering at apical 1/4th; aedeagus bearing row of scattered teeth on both sides, beginning dorsally at proximal edge of gonopore and converging ventrally at base of aedeagus. Segment X quadrate, processes distinct, directed ventrad. Segment XI produced, about 1/2 length of segment X

Plant associations. None reported.

Distribution. Ecuador.

GenBank accession number. Material for molecular work was unavailable at the time of this study.

Remarks. This species is only known from the holotype. It is distinctive in the shape of its parameres, with a median interior projection, and the closely approximated bilobed armature of the diaphragm. It appears closely allied with *C. gluciophilus*, *C. quadrispinosus*, and *C. dissipatus*, despite bearing only 2 processes on segment X, because of the similar coloration of pronotum and paranota.

Type material examined. Holotype [BPBM]: Macropterous ♂, “Type 1148 [Handwritten, white card with hole punch containing genitalia embedded in balsam] // Banos, Or. / Ecuador / XII-28-1922 [Date Handwritten] // F.X. Williams / Collector // ♂ // Holotype [Red paper, vertically oriented, affixed to following label] // *Delphacodes banosensis* / ♂ Type 1148 Muir [Handwritten, label with black border] // 855 [Handwritten]”

***Chionomus bellicosus* (Muir & Giffard, 1924), new combination** (Figures 6, 22)

Delphacodes bellicosa Muir & Giffard, 1924: 34.

Type Locality. USA, California, Tulare County, Three Rivers.

Diagnosis. Body brown to light brown, with ivory to cream markings. Vertex quadrate; foveae of frons and vertex dark, posterior compartments of vertex light with fuscous markings. Carinae distinct, off-white in color; antennae light brown. Pronotum light, white to cream in color, infusate directly behind eyes, paranota white. Mesonotum brown, lateral and median carinae cream; wing with faint fuscate mark at apex of clavus. Armature of diaphragm bifurcate, hooked at apex; parameres sinuate, outer angles enlarged. Aedeagus tubular, directed dorsoposteriorly, large flange with teeth on apical 1/2 of left side, 2 subapical teeth on right.

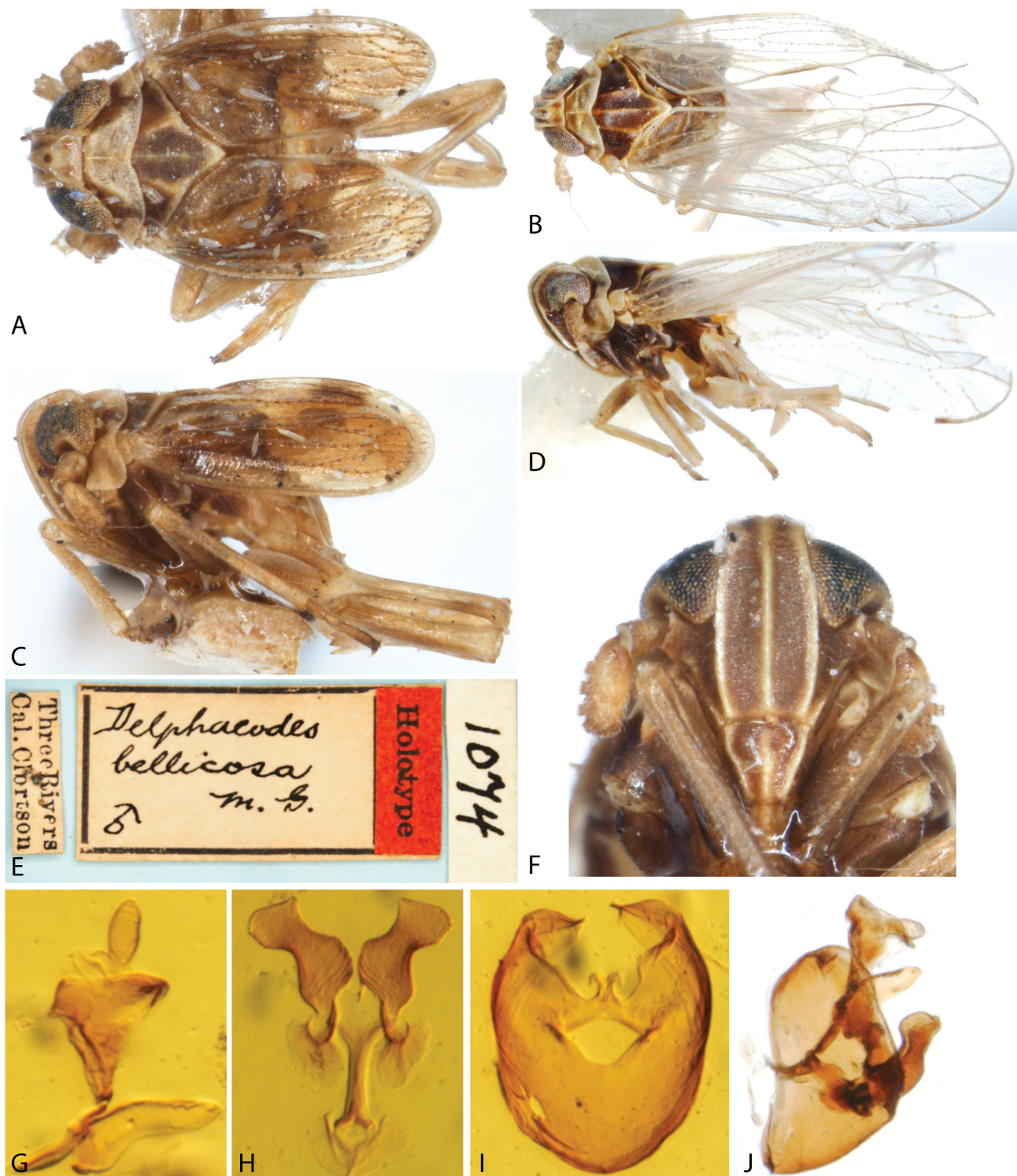


FIGURE 6. Habitus of *Chionomus bellicosus* (holotype; A, C, E-I; holotype terminalia in balsam); A. dorsal view, habitus brachypterous holotype; B. dorsal view, habitus macropter; C. lateral view, habitus brachypterous holotype; D. lateral view, habitus macropter; E. labels of holotype; F. front habitus of holotype; G. aedeagus and anal tube of holotype, left lateral view; H. parameres of holotype, caudal view; I. pygofer of holotype, caudal view, J. lateral view of male terminalia, left lateral view.

Description. *Color. Macropter.* Body brown to light brown, matte, with cream or ivory markings. Carinae of head (including genal carinae) distinct, ochraceous to off-white in color; median carinae of vertex evident. Foveae of frons and vertex brown, posterior compartments of vertex light brown. Antennae cream to stramineous. Pronotum white to cream, fuscate markings directly posterior to eyes. Mesonotum dark brown to brown, median and lateral

carinae light brown to cream. Legs stramineous to brown, with fuscous markings on anterior face of femora; apex of tarsi brown. Forewings hyaline, faint fuscous spot just before apex of clavus. Abdomen brown. *Brachypter*. Similar to above, tegmina infusate, white stripe along apex, darkened spot near apex of clavus. *Structure. Body*. Length (in mm) [All specimens previously dissected]; width ♂ macropter 0.82±0.09 (n=3); ♂ brachypter 0.75 (n=1). *Head*. Vertex length 0.19±0.02 (n=4); vertex width 0.19±0.01 (n=4); frons length 0.47±0.02 (n=4); frons width 0.26±0.02 (n=4). *Macropter*. Carinae of vertex distinct, stem of Y-shaped carina faint but evident. In lateral view (Figure 6c, d), fastigium rounded; projecting in front of the eye about 1/6th eye length. Carinae of frons and clypeus distinct (Figure 6f), frons bowed, widest just below compound eyes. Antennal segments subequal in length, segment II wider; 2nd segment sparsely setaceous, bearing sensory pits arranged 3, 4, 4, 2–1, evenly spaced around segment. Sensory pits surrounded by small setae. *Brachypter*. Same as above.

Thorax. Macropter. Carinae of mesonotum evident, median carina ending at scutellum, lateral carinae faint, diverging posteriorly to reach hind margin. Legs with 2 rows of small setae on ventral margin of femora, mostly bare. Calcar bearing 17–23 small teeth (holotype with 17). *Brachypter*. Same as above; tegmina apically rounded.

Abdomen. Brachypter. Compressed dorsoventrally, tapering caudad.

Genitalia. Pygofer in caudal view (Figures 6i, 22a), about as tall as wide, rounded; margins rounded. Opening to inner chamber triangular, pointed ventrad. Armature of diaphragm bifurcate, hooked apically, distinctly projecting caudad. Parameres, widest in basal half, basal angle strong, projecting, quadrate; dorsolaterally diverging to quadrate apices, lateral margins concave, inner angles weak, pointed; outer angles produced to rounded apices. Aedeagus circular in cross-section, slightly curved ventrad, directed dorsoposteriorly, widest near base, slightly tapering for most of length. Aedeagus bearing toothed flange on left distal half, to subapical teeth on right. Segment X quadrate; processes distinct, projected posteriorly. Segment XI produced, about 2/3rds length of segment X.

Plant associations. *Paspalum distichum* L. (knotgrass, Poaceae) (Wilson 1985).

Distribution. USA: CA.

GenBank accession number. Material for molecular work was unavailable at the time of this study.

Remarks. This species is uncommon in collections. It is closely allied with *C. pacificus* but can be distinguished by the shape of the aedeagus and the hook of the bifurcate armature of the diaphragm being only apical. This bifurcate armature is also mirrored in *C. puellus* but the processes are not hooked; additionally, the ventral edge of the parameres is distinctly S-shaped in *C. puellus* while they are nearly straight in *C. bellicosus*.

Type material examined. Holotype [BPBM]: Brachypterous ♂, “Delphacodes / bellicosa / ♂ M.G. [Handwritten, white card with hole punch containing genitalia embedded in balsam] // Three Rivers / Cal. Clortson // Holotype [Red paper, vertically oriented, affixed to following label] // Delphacodes / bellicosa / M.G. / ♂ [Handwritten, label with black border] // 1074 [Handwritten]”

***Chionomus cultus* (Van Duzee, 1907), new combination (*incertae sedis*)**

(Figure 7)

Liburnia culta Van Duzee, 1907: 47.

Megamelus cultus (Van Duzee), comb. by Crawford 1914: 628.

Delphacodes culta (Van Duzee) by Muir & Giffard 1924: 38.

Type Locality. Mandeville, Jamaica.

Distribution. Jamaica, USA: Florida, Cuba, Bermuda (Van Duzee 1907; Barber 1914; Osborn 1926 a, b; Ogilvie 1928)

Remarks. This species was described from single female specimen from Jamaica and subsequently reported from other localities. It is probable that *C. cultus* is synonymous with some other species of *Chionomus*. However, because the holotype is female (with no definitively associated males), we have found no certain method to confidently associate it with any other *Chionomus* species, and we are reluctant to speculate especially given that *C. cultus* would be the senior name. The following species of *Chionomus* are reported from Jamaica: *C. havanae*, *C. balboae*, *C. dissapatus*, *C. puellus*, *C. tenae* and *C. pacificus*. As the holotype is a female, subsequently reported localities are doubtful.

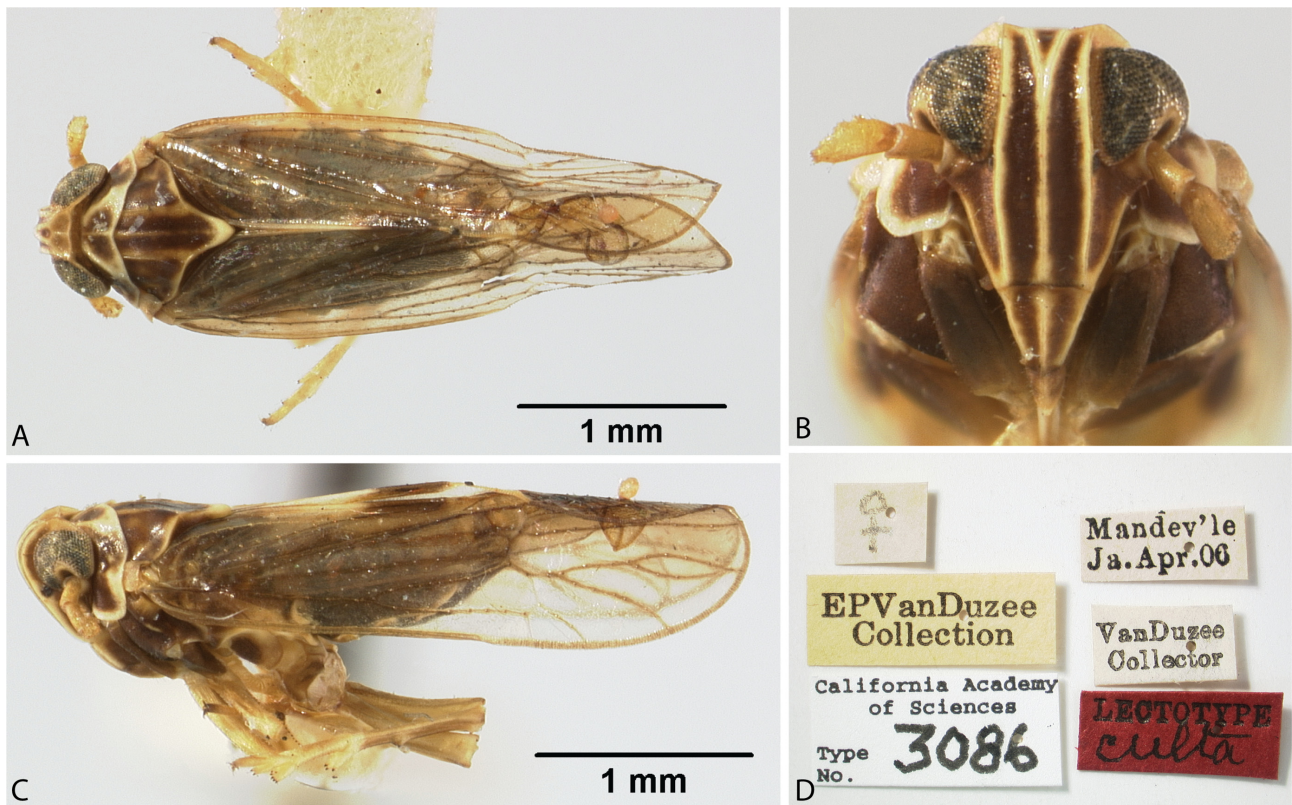


FIGURE 7. Habitus of *Chionomus cultus* (holotype), A. dorsal view, habitus; B. frontal view, habitus; C. lateral view, habitus; D. labels (images courtesy of California academy of Sciences).

***Chionomus dissipatus* (Muir, 1926), new combination**
(Figures 8, 22)

Delphacodes dissipata Muir, 1926: 33.

Syndelphax dissipatus (Muir), comb. by Fennah, 1967: 76.

Delphacodes dentis Beamer, 1948b: 102, **new synonymy**.

Delphacodes vaccina Caldwell & Martorell, 1951: 186, **new synonymy**.

Type Locality. Ecuador, Tungurahua Province, Banos.

Diagnosis. Body dark brown with white markings. Vertex quadrate; foveae of frons and vertex dark, posterior compartments of vertex light with fuscous markings. Carinae distinct, off-white in color; antennae light brown. Pronotum dark anteriorly with white band along posterior edge, paranota white with dark marks just below eyes. Carinae distinctly white or ivory. Armature of diaphragm quadrate, lined with small teeth on vertical edges; inner and outer angles of parameres diverging, basal angle produced, rounded. Aedeagus tubular, tapering apically, with linear row of teeth on either side. Segment X armed with 4 distinct processes.

Description. *Color.* *Macropter.* Body dark, brunneous, with white or ivory markings. Carinae of head (including genal carinae) distinct, stramineous to off-white in color, usually with a small amount brown at apex of carinae; stem of Y-shaped carina less evident. Antennae light brown, fuscous at joint of the two segments. Pronotum dark brown, posterior edge (including ventral edge of paranota) white to ivory, carinae distinctly white to ivory. Mesonotum dark, median and lateral carinae light brown in some specimens, frequently females. Legs light brown to stramineous, proximal half of femora infuscate. Forewings hyaline, dark spot just before apex of clavus. Abdomen dark brown, lateral projections of sternites light brown; pygofer and segment X brown. *Structure. Body.* Length (in mm) macropter ♂ 1.70 ± 0.16 (n=11); female (♀) macropter 1.95 ± 0.13 (n=3); brachypter ♂ 1.66 (n=1); width ♂ 0.70 ± 0.08 (n=19); ♀ 0.78 ± 0.01 (n=3). *Head.* Vertex length 0.13 ± 0.02 (n=25); vertex width 0.16 ± 0.03 (n=25); frons length 0.31 ± 0.05 (n=32); frons width 0.14 ± 0.03 (n=32). *Macropter.* Carinae of vertex distinct, stem of Y-shaped carina faint. In lateral view (Figure 8c, d), fastigium rounded; projecting in front of the eye about 1/5th eye length.

Carinae of frons and clypeus distinct (Figure 8f), frons subparallel, widest at ventral edge of compound eyes. Antennal segments subequal in length, segment II wider than segment I; 2nd segment sparsely setaceous, bearing sensory pits arranged 3, 3, 2, 2, evenly spaced around segment. Sensory pits surrounded by small black setae. *Brachypter*. Same as above.

Thorax. Macropter. Carinae of mesonotum obscure, median carina ending anterior to scutellum, lateral carinae faint, reaching hind margin. Legs mostly bare; calcar bearing 18–20 small teeth. *Brachypter*. Same as above; tegmina rounded at apex.

Abdomen. Macropter. Compressed dorsoventrally, tapering caudad to truncate apex. *Brachypter*. Same as above.



FIGURE 8. Habitus of *Chionomus dissipatus* (holotype; A, C, E-F); A. habitus dorsal view, brachypterous holotype; B. habitus dorsal view, macropter; C. habitus lateral view, brachypterous holotype; D. habitus lateral view, macropter; E. labels of holotype; F. habitus front of holotype; G. caudal view of male terminalia; H. left lateral view of male terminalia.

Genitalia. Pygofer in lateral view (Figure 8h) nearly half as long dorsally as ventrad, ventral margin sinuate. In caudal view (Figures 8g, 23a), 3/4ths as tall as wide, rounded; margins raised, dorsolateral margins produced, carinate. Opening to inner chamber trapezoidal, pointed ventrad. Armature of diaphragm quadrate, toothed on vertical

edges, distinctly projecting caudad. Parameres, widest in basal third, basal angle strong, projecting, rounded, mirrored on exterior edge; dorsolaterally diverging, apices nearly flat, lateral margins concave, inner and outer angles approximately equally produced. Aedeagus oval in cross-section, slightly curved dorsad, widest near base, slightly tapering for most of length; aedeagus bearing row of equally spaced teeth on both sides, along ventral edge, sometimes with 2–4 extra teeth just proximal to gonopore; gonopore dorsal, subapical. Segment X quadrate, taller than wide; with 4 processes, first pair short broadly approximated, second pair long, closely approximated. Segment XI produced, about half length of segment X.

Plant associations. None reported.

Distribution. USA: TX, LA; FL; Puerto Rico; Bahamas, Cayman Islands, Jamaica, St. Thomas; Mexico (Puebla, Veracruz); Guatemala; Honduras; Panama; Brazil (Santa Catarina), Venezuela; Also reported: Ecuador (Muir 1926); Can: NT (Wilson 1992, 1997); Galapagos Islands (Santa Cruz, San Cristóbal) (Fennah 1967, Sinclair 2011).

GenBank accession number. Molecular sequence was unable to be generated at the time of this study.

Remarks. *Chionomus dissipatus* is identical to *D. vaccina* and *D. dentis* and has priority over these names. The type of *D. dissipata* was examined and an array of at least 10 paratypes (including topotypes) were examined for *D. vaccina* and *D. dentis*. *Chionomus dissipatus* is closely allied with *C. gluciophilus* and may be easily misidentified. It can be distinguished by white or ivory carinae of the pronotum, the non-bifurcating armature of the diaphragm, and the pattern of the teeth on the aedeagus. *Chionomus dissipatus* shares the toothing along the armature of the diaphragm but bears a notch along the dorsal margin, is similar in the shape of the aedeagus but scattered rows of teeth as opposed to parallel evenly spaced rows, and lacks the expansion mirroring the basal angle found in *C. dissipatus*.

This species is also closely allied with *C. quadrispinosus* which both share 4 processes on segment X. *Chionomus quadrispinosus* has a similar tooth pattern on the aedeagus but has a quadrate expanded base and is more distinctly upwardly directed.

The single specimen reported as *D. dentis* from Northwest Territories, CAN, is likely mislabeled as indicated in Wilson (1992).

Type material examined. Holotype *Delphacodes dissipata* [BPBM]: Brachypterous ♂, “Banos, Or. / Ecuador / XII-28-1922 [Date handwritten] // F.X. Williams / Collector // ♂ // Holotype [Red paper, vertically oriented, affixed to following label] // Delphacodes / dissipata / ♂ Muir / Type No 1149. [Handwritten, label with black border]”.

Paratypes *Delphacodes dentis* [all SEMC]: Texas: *Cameron Co.*: Brownsville, 29 Dec 1945, R. H. Beamer, in palm forest (1m ♀); *Hidalgo Co.*, McAllen, 30 Dec 1945, R. H. Beamer (2m ♂, 3m ♀). *San Patricio Co.*, Sinton, 25 Dec 1945, R. H. Beamer (1m ♂).

Holotype *Delphacodes vaccina* [USNM]: Macropterous ♂, “P.R. Acc. No / Isabela, P.R. / 8-29-47 [Date Handwritten] // Delphacid [handwritten] / HOLOTYPE / vaccina [Handwritten, Pink paper] // [Microvial containing genitalia] // JS Caldwell / Collection / 1959 // Delphacodes ♂ [Handwritten] / vaccina [handwritten] / det 49 Holotype [4 is handwritten crossed out 1, Holotype is handwritten] / JS Caldwell”.

***Chionomus dolonus*, new species**

(Figures 9, 24)

Type Locality. Argentina, Santiago del Estero, Rio Dulce Road 1km west of Route 9.

Diagnosis. Body brown to dark brown, white and stramineous markings. Vertex quadrate, foveae infuscate. Carinae of frons distinct, noticeably contrasting with foveae, stramineous to cream in color. Antennae yellow. Pronotum dark brown between lateral carinae, light brown shadowing eye, thick white to cream colored band along posterior edge, paranota white. Mesonotum dark brown, shining, lacking white scutellum in males; wings with dark mark at apex of clavus, infuscate along nodal line. Armature of diaphragm shelf-like, produced caudad; apical edge of parameres sinuate. Aedeagus tubular, curved dorsad, subapical posteriorly directed spine on right; segment X with two strong ventrally directed processes, apices blunt.

Description. *Color.* Macropter. ♂. Body dark, brunneous, white and stramineous markings. Carinae of head (excluding genal carinae) distinct, yellow in color, usually with a small amount brown at apex of carinae; median carinae of vertex evident. Foveae brown, posterior compartments of vertex tan, antennae stramineous. Pronotum white, anteriorly dark brown between lateral carinae, light brown shadowing eyes; paranota white. Mesonotum dark, median and lateral carinae concolorous. Legs yellow, apex of tarsi brown. Forewings hyaline, infuscate along

nodal line, dark spot just before apex of clavus. Abdomen brown, caudal edge of each segment yellow, lateral projections of sternites yellow. Pygofer brown. ♀. Similar, mesonotum lighter, centrally light brown reminiscent of vitta, scutellum white. *Structure. Body.* Length (in mm) macropter 1.83 (n=1); female (♀) macropter 2.06±0.18 (n=3); width ♂ 0.8±0.01 (n=2); ♀ 0.87±0.03 (n=3). *Head.* Vertex length 0.20±0.03 (n=5); vertex width 0.22±0.02 (n=5); frons length 0.50±0.04 (n=5); frons width 0.24±0.01 (n=5). *Macropter.* Carinae of vertex distinct, stem of Y-shaped carina evident. In lateral view (Figure 9b), fastigium rounded; projecting in front of the eye about 1/4th eye length. Carinae of frons and clypeus distinct (Figure 9c), frons parallel ventrad of eyes, narrowing towards fastigium, widest at ventral margin of compound eyes. Antennal segments subequal in length, segment II wider than segment I; 2nd segment setaceous, bearing sensory pits arranged 4, 3, 2, 2, evenly spaced around segment. Sensory pits surrounded by small brown setae.

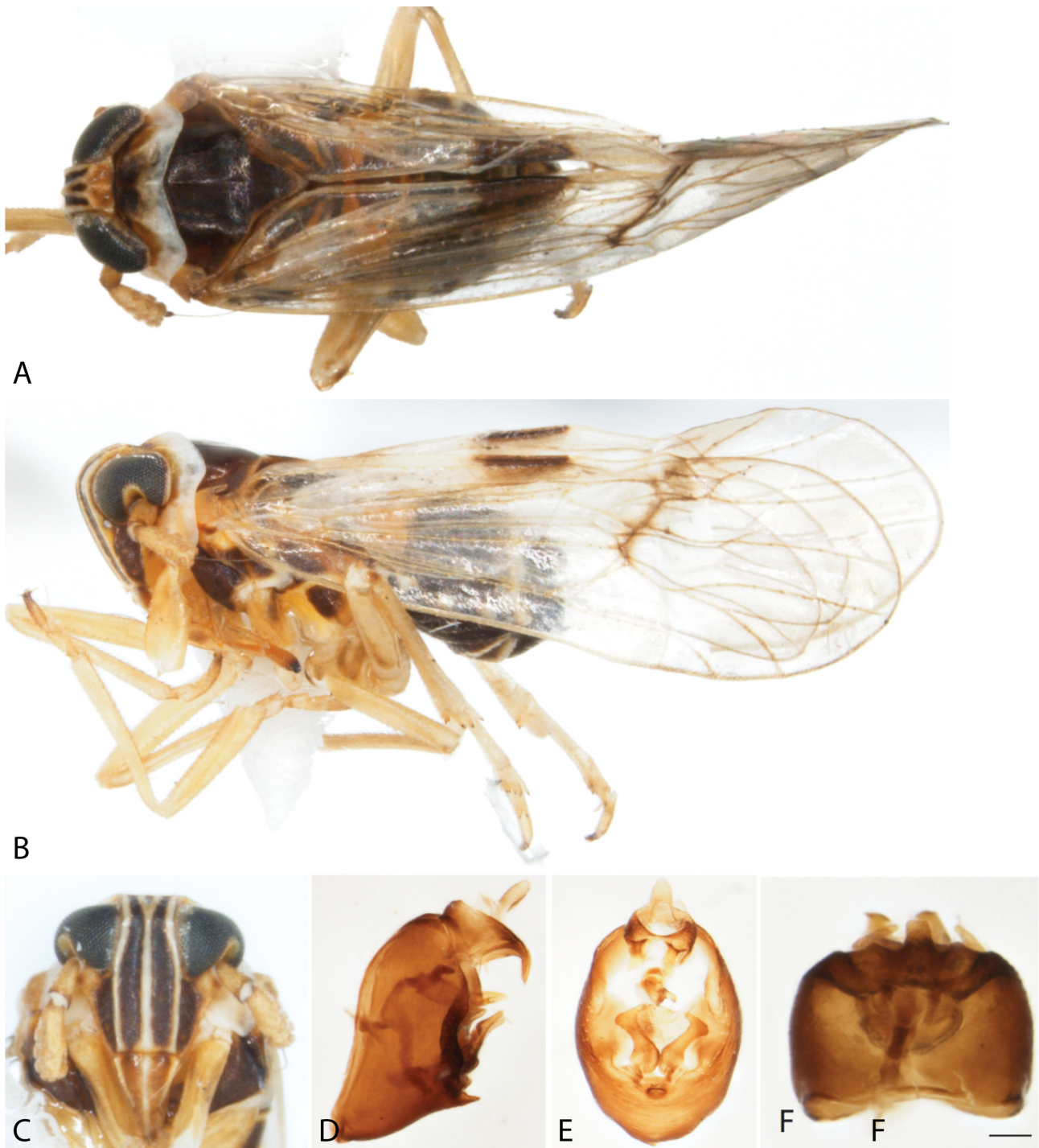


FIGURE 9. Habitus of *Chionomus dolonus* n. sp.(holotype); A. dorsal habitus; B. lateral habitus; C. frontal habitus; D. male terminalia, left lateral view, E. male terminalia, caudal view; F. male terminalia, ventral view.

Macropter. Carinae of mesonotum weak, median carina ending anterior to scutellum, lateral carinae faint, diverging posteriorly to reach hind margin. Legs with sparse rows light brown setae, mostly bare. Calcar bearing 21–25 small teeth (holotype with 24).

Abdomen. Macropter. Compressed dorsoventrally, tapering caudad to truncate apex.

Genitalia. Pygofer in lateral view nearly half as long dorsally as ventrad, ventral margin sinuate, caudally projecting ventral process. In caudal view (Figure 9e, 24a), taller than wide, rounded; lateral margins mildly raised. In ventral view (Figure 9f), caudal margin sinuate, prominent median projection, quadrate. Opening to inner chamber triangular, pointed ventrad, rounded dorsad. Armature of diaphragm shelf-like, smooth, curved dorsad to fit aedeagus. Parameres, widest in basal third, basal angle produced, rounded; dorsolaterally diverging to anvil-shaped apices, lateral margins concave, inner angles strong, acute; outer angles produced to rounded apices. Aedeagus circular in cross-section, curved dorsad, widest near base, slightly tapering for most of length, gonopore dorsal, apical. Segment X quadrate, 4 processes, 2 arising from apical margin of segment X, strong directed ventrad, hooked, secondary processes small, spine-like, arising from midsection of segment X. Segment XI produced, about 1/3rd length of segment X.

Plant associations. None reported.

Distribution. Argentina.

GenBank accession number. Material for molecular work was unavailable at the time of this study.

Etymology. The specific epithet *dolonus* stems from the Greek noun, *dolon*, meaning dagger or stiletto. This name was chosen in reference to the shape of the process of the aedeagus. The noun is neuter and in the genitive plural. The ending *-us* is an arbitrary combination of letters added to make the epithet euphonious and for gender agreement.

Remarks. *Chionomus dolonus* is unique to *Chionomus* in possessing a median ventral process of the pygofer and is thus easily distinguishable. This feature is uncommon among the higher Delphacini, it is notably shared in new world taxa with species of *Kosswigianella* Wagner, 1963 (*sensu* Hamilton 2002) formerly in *Acanthodelphax* Le Quesne, 1964. *Kosswigianella analis* (Crawford, 1914) also shares similar coloration; however, the shape of the aedeagus and parameres of *C. dolonus* do not fit the description of this genus.

The shape of the parameres and armature of the diaphragm place this species close to *C. tenae*; however, the pygofer is much more constricted in this species. It may also be allied with *C. balboae*, which shares the anvil shape of the apices of the parameres but has a triangular shaped armature of the diaphragm.

Type Material. Holotype [INHS]: Macropterous ♂, “ARGENTINA: Stgo. del Estero / Rio Dulce Rd 1 km W rt 9 / S 27°37.589’W 64°37.126’ / 450m, 21 Jan 2008 C.H.Dietrich / vacuum, AR32-1 // ♂ // INHS #2316 [Green paper] // HOLOTYPE / *Chionomus / dolonus / KMWeglarz 2012 [Red Paper]”*.

Paratypes: Argentina: Stgo. del Estero, rt 9 SE Termas del T. Hondo, km 1191, 450m, 21 Jan 2008, C.H.Dietrich, vacuum (1 ♂ m, 1 ♀ m); Stgo. del Estero, Staniago del Estero, 300m, 21 Jan 2008, C.H.Dietrich, vacuum (2 ♀ m).

***Chionomus gluciophilus* (Muir, 1926), new combination**

(Figures 10, 25)

Delphacodes gluciophila Muir, 1926: 35.

Type Locality. Ecuador, Tungurahua Province, Banos.

Diagnosis. Body brunneous, dark, shining, with stramineous markings. Vertex quadrate; foveae of frons and vertex very dark. Carinae of the head distinct, yellow in color except for median carina of the vertex; antennae stramineous. Pronotum entirely dark, paranota ivory. Armature of diaphragm forming toothed cordate or dorsally notched boss; parameres with apices slightly concave, broadest in basal third. Aedeagus tubular, sinuate, with a row of scattered teeth on either side connecting at the aedeagal base; segment X with 4 processes.

Description. *Color. Macropter.* Body dark, brunneous, shining, with white or ivory markings. Carinae of head (including genal carinae) distinct, off-white to ivory in color; median carinae of vertex concolorous. Antennae stramineous, infusate at joint of two segments. Pronotum dark brown, paranota white to ivory, fuscous marking directly below compound eyes. Mesonotum dark, median and lateral carinae obscure. Legs yellow, with fuscous striping on femora. Forewings hyaline, distinct dark spot just before apex of clavus. Abdomen dark brown, thin line

along caudal edge of each segment yellow, lateral projections of sternites yellow. Pygofer and segment X concolorous with body. *Brachypter*. Similar to above. Tegmina infusate, white stripe along apex, darkened spot near apex of clavus. *Structure*. *Body*. Length (in mm) female (♀) macropter 2.45±0.11 (n=3); width ♂ 0.73±0.06 (n=7); ♀ 0.94±0.03 (n=3). *Head*. Vertex length 0.17±0.04 (n=10); vertex width 0.18±0.02 (n=10); frons length 0.51±0.04 (n=10); frons width 0.24±0.03 (n=10). *Macropter*. Carinae of vertex distinct, stem of Y-shaped carina faint. In lateral view (Figure 10c), fastigium rounded; projecting in front of the eye about 1/4th eye length. Carinae of frons and clypeus distinct (Figure 10b), frons parallel, widest at ventral third of compound eyes. Antennal segments subequal in length, segment II wider than segment I; 2nd segment sparsely setaceous, bearing sensory pits arranged 3, 3, 2, 2, evenly spaced around segment. Sensory pits surrounded by small black setae. *Brachypter*. Same as above except stem of Y-shaped carina evident.

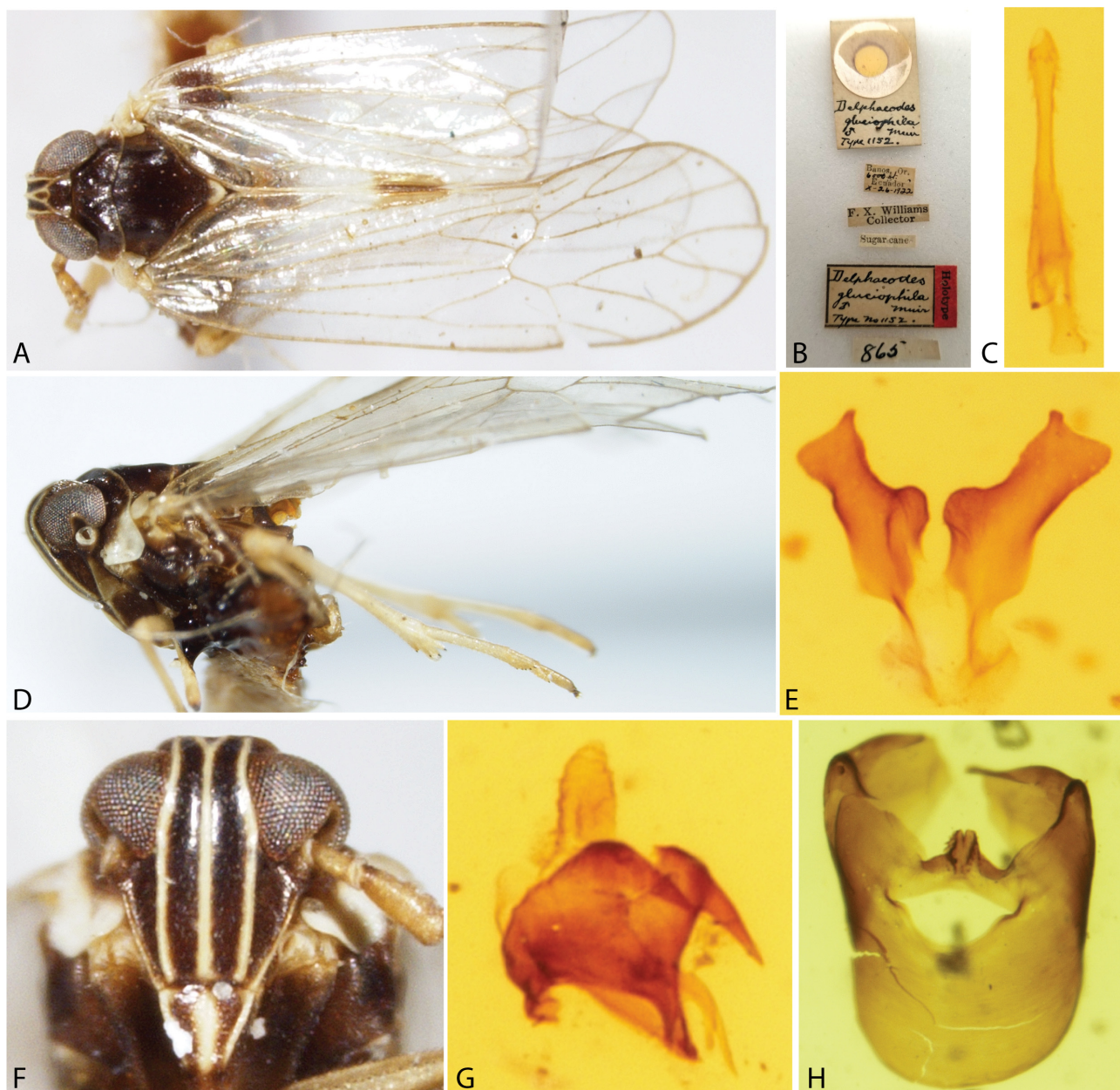


FIGURE 10. Habitus of *Chionomus gluciophilus* (holotype, C, E, G, H embedded in balsam). A. dorsal habitus; B. labels of holotype; C. aedeagus; D. lateral habitus; E. parameres, caudal view; F. frontal habitus; G. anal tube, semilateral view; H. pygofer, caudal view.

Thorax. Macropter. Carinae of mesonotum weak, median carina ending anterior to scutellum, lateral carinae faint, diverging posteriorly to reach hind margin. Legs with two rows of setae on ventral margin of femora, mostly

bare. Calcar bearing 23–26 small teeth. *Brachypter*. Same as above but with lateral carinae mesonotum evident, diverging posteriorly; tegmina apically rounded, long.

Abdomen. *Macropter*. Compressed dorsoventrally, tapering caudad to truncate apex; abdominal spiracles with one or two fine setae.

Genitalia. Pygofer in lateral view three fifths as long dorsally as ventrad, ventral margin sinuate. In caudal view (Figure 10e, 25a), four fifths as tall as wide, rounded; margins raised, dorsolateral margins produced, carinate. Opening to inner chamber trapezoidal, pointed ventrad. Armature of diaphragm cordate, notched at dorsal margin, toothed on vertical edges, distinctly projecting caudad. Parameres, widest in basal third, basal angle strong, projecting, rounded; dorsolaterally diverging, apices slightly concave, lateral margins concave, inner and outer angles approximately equally produced. Aedeagus circular in cross-section, sinuate, widest near base, slightly tapering for most of length; aedeagus bearing row of scattered teeth on both sides, along ventral edge, sometimes with 2–4 extra teeth just proximal to gonopore; gonopore large, dorsal, subapical. Segment X quadrate, taller than wide; with 4 processes, first pair distinct, broadly approximated, second pair longer than first, closely approximated. Segment XI produced, about half length of segment X.

Plant associations. *Saccharum* L. (sugarcane, Poaceae, Muir, 1926); *Phaseolus vulgaris* L., (kidney bean, Fabaceae); *Solanum tuberosum* L. (Irish potato, Solanaceae) (label information).

Distribution. Guatemala; Costa Rica; Colombia; Ecuador.

GenBank accession number. Molecular sequence was unable to be generated at the time of this study.

Remarks. *Chionomus gluciophilus* is closely allied with *C. dissipatus* and has an overlapping distribution. *Chionomus gluciophilus* can be distinguished by the dark carinae of the pronotum and posterior compartments of the vertex, the more scattered teeth on the aedeagus, the notch in the dorsal edge of the armature of the diaphragm, and the absence of a rounded projection on the basal exterior edge of the parameres. It is also similar to *C. quadrispinosus* but differs from this species in a manner similar to the ways it differs from *C. dissipatus* (see remarks for that species).

Type material examined. Holotype [BPBM]: Macropterous ♂, “Delphacodes / gluciophila / ♂ / Muir / Type 1152. [Handwritten, white card with hole punch containing genitalia embedded in balsam] // Banos, Or. / 6000 ft. / Ecuador / XII-26-1922 [Elevation and date Handwritten] // F.X. Williams / Collector // Sugarcane // Holotype [Red paper, vertically oriented, affixed to following label] // Delphacodes / gluciophila / ♂ Muir / Type No 1152. [Handwritten, label with black border] // 865 [Handwritten]”.

Chionomus haywardi (Muir, 1929)

(Figures 11, 26)

Delphacodes haywardi Muir, 1929: 83.

Chionomus haywardi (Muir), comb. by Fennah, 1971: 324.

Type Locality. Argentina, Santa Fe Province, Villa Ana.

Diagnosis. Body dark brown, with white and stramineous markings. Vertex quadrate; foveae of frons and vertex dark brown, posterior compartments of vertex brown. Carinae distinct, off-white in color; antennae stramineous with fuscous markings. Pronotum white with dark brown shadows directly posterior to eyes; paranota white. Armature of diaphragm forming inverted triangular boss, apex of parameres with inner angle mildly produced dorsally. Aedeagus tubular, 2 converging rows of scattered teeth surrounding apical half.

Description. *Color.* *Macropter*. Body dark, brunneous, with white and stramineous markings. Carinae of head (including genal carinae) distinct, off-white in color, usually with a small amount brown at apex of carinae; median carinae of vertex evident. Antennae stramineous, infusate at joint of the two segments. Pronotum white with dark brown shadows directly posterior to eyes; paranota white. Mesonotum dark to light brown, median and lateral carinae distinctly stramineous. Legs stramineous with brown striping, with hind legs lighter, tarsi brown. Forewings hyaline, distinct dark spot just before apex of clavus. Abdomen brown, some specimens with fine line of white on caudal edge of each segment, lateral projections of sternites yellow to white. Pygofer brown, segment X stramineous. *Structure.* *Body.* Length (in mm) macropter ♂ 1.94±0.09 (n=5); width 0.75±0.05 (n=15). *Head.* Vertex length 0.18±0.03 (n=15); vertex width 0.18±0.01 (n=15); frons length 0.47±0.04 (n=15); frons width 0.21±0.02 (n=15). *Macropter.* Carinae of vertex distinct, stem of Y-shaped carina evident. In lateral view (Figure 11b), fastigium

rounded; projecting in front of the eye about 1/4th eye length. Carinae of frons and clypeus distinct (Figure 11c), frons nearly parallel, widest at ventral margin of compound eyes. Antennal segments subequal in length, segment II wider than segment I; 2nd segment sparsely setaceous, bearing sensory pits arranged 4, 4, 1, 2, evenly spaced around segment. Sensory pits surrounded by small black setae.

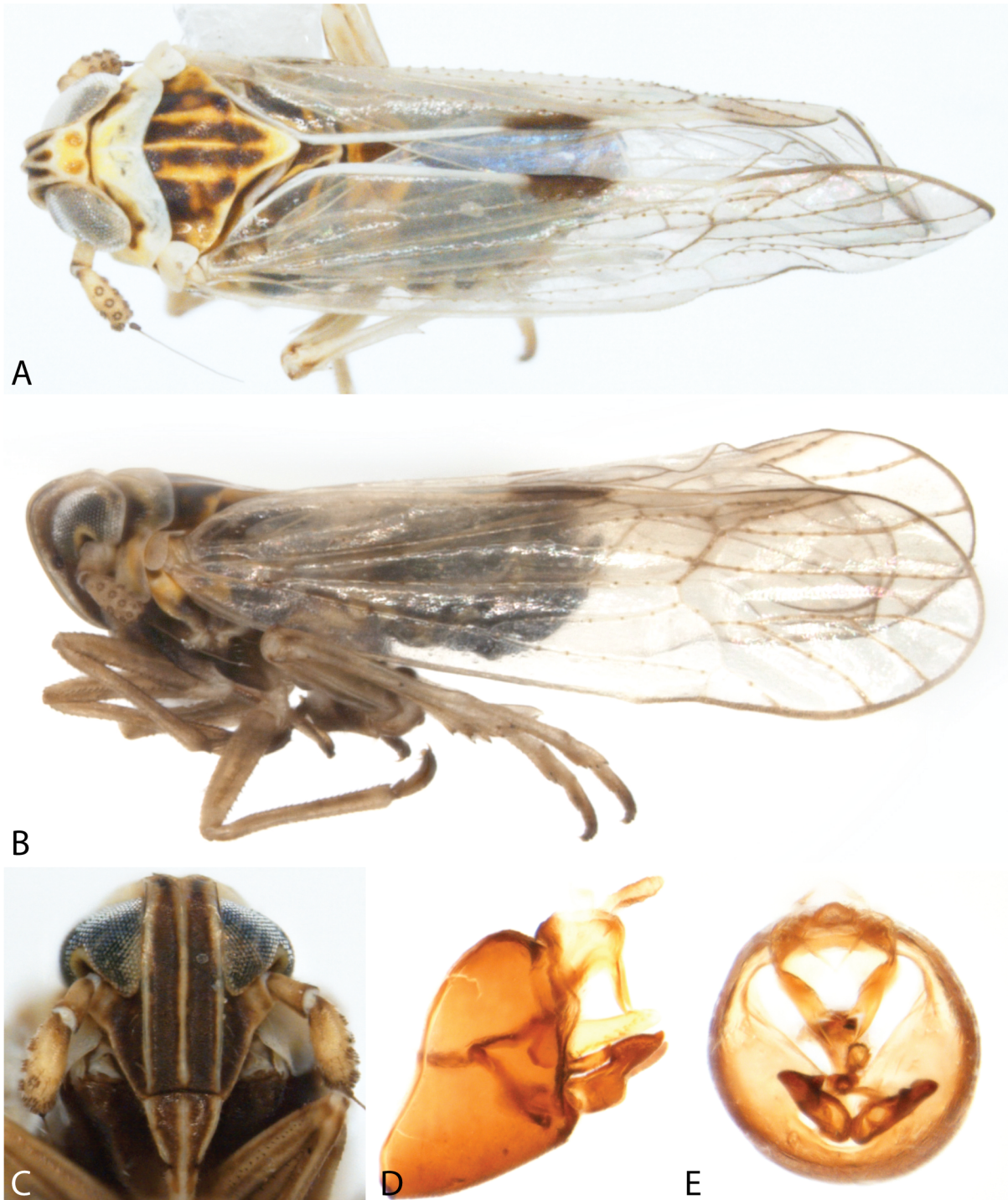


FIGURE 11. Habitus of *Chionomus haywardi*. A. dorsal habitus; B. lateral habitus; C. frontal habitus; D. male terminalia, left lateral view; E. male terminalia, caudal view.

Thorax. Macropter. Carinae of mesonotum evident, median carina ending anterior to scutellum; lateral carinae diverging posteriorly to reach hind margin. Legs with a row of setae on anterior face margin of femora, mostly bare. Calcar bearing 24–25 small teeth.

Abdomen. Macropter. Compressed dorsoventrally, tapering caudad to truncate apex.

Genitalia. Pygofer in lateral view nearly half as long dorsally as ventrad, ventral margin sinuate. In caudal view (Figure 11d, 26a), as tall as wide, globular; margins rounded, weakly raised at dorsolateral margins. Opening to inner chamber triangular, pointed ventrad. Armature of diaphragm triangular to cordate in shape, smooth or some specimens with toothing along vertical edges, distinctly projecting caudad. Parameres as wide in basal third as at apices, basal angle projecting, rounded; dorsolaterally diverging to flattened apices, lateral margins concave (inner margin more so than outer margin); inner angles acute, dorsally directed; outer angles rounded. Aedeagus circular in cross-section, slightly curved dorsad, widest near base, slightly tapering for most of length, with two rows of scattered teeth surrounding apical; gonopore dorsal, apical. Segment X quadrate, bearing 2 processes; processes well developed, directed ventrad, slightly curved inward at apices. Segment XI produced, about 2/3rds length of segment X.

Plant associations. *Oryza sativa* L., (rice, Poaceae); *Zea mays* L., (corn, Poaceae); *Triticum aestivum* L. (common wheat, Poaceae), *Avena sativa* L. (common oat, Poaceae), *Hordeum vulgare* L. (common barley, Poaceae) (Tesón & Remes Lenicov 1989, Velázquez *et al.* 2003)

Distribution. Argentina, Paraguay.

GenBank accession number. MN339589

Remarks. This species is commonly associated with agriculture, as evidenced by its plant associations. It is similar in outward appearance to *C. pacificus* but is easily distinguished by range. This species is closely allied with *C. havanae* and *C. balboae* (see remarks section on those species).

Type material examined. Holotype [BMNH]: missing (M. Webb, BMNH *pers. comm.*).

Paratype. Argentina: Santa Fe, Villa Anna F. C. S. Fe., Jan 1926, K. J. Hayward, Light Trap (BMNH, 1 female).

***Chionomus herkos*, new species**

(Figures 12, 18c & f, 27)

Type Locality. USA, Louisiana, Baton Rouge.

Diagnosis. Body brown to dark brown, white and stramineous markings. Vertex quadrate, longer than wide, foveae concolorous with body. Carinae of frons distinct, noticeably contrasting with foveae, stramineous in color. Antennae yellow. Pronotum white, fuscous markings shadowing eyes, paranota dark, broad white band along margins. Mesonotum dark brown, shining; wings with dark mark at apex of clavus. Armature of diaphragm broad, rounded; apical edge of parameres sinuate. Pygofer with dorsolateral margins distinctly produced, quadrate. Aedeagus tubular, widest in base, flange with row of small teeth distal 2/3rd of left side, one to two subapical spines on right; segment X with two long processes, sinuate, directed ventrad, following margin of segment X, hooked just dorsal to aedeagus.

Description. *Color. Macropter.* Body dark, brunneous, shining, with white or ivory markings. Carinae of head (sometimes including genal carinae) distinct, ochraceous to off-white in color, usually with a small amount brown at apex of carinae; median carinae of vertex obsolete. Foveae brown, antennae stramineous. Pronotum white, small amount of dark brown to brown anteriorly; paranota white to ivory, brown mark ventrad of eyes. Mesonotum dark, median and lateral carinae concolorous, inconspicuously lightened in some specimens. Legs yellow, apex of tarsi brown. Forewings hyaline, infusate along anterior of clavus and nodal line, dark spot just before apex of clavus. Abdomen brown, caudal edge of each segment yellow or white, lateral projections of sternites yellow. Pygofer brown, dorsolateral projections and segment X stramineous in some specimens. *Brachypter.* Similar, tegmina darkly infusate, hyaline along clavus, white stripe along apex, darkened spot near apex of clavus. *Structure. Body.* Length (in mm) macropter 1.65±0.12 (n=7); ♀ macropter 1.96±0.18 (n=6), ♂ brachypter 1.59±0.17 (n=4); ♀ brachypter 1.79±0.16 (n=10); width ♂ 0.64±0.07 (n=13); ♀ 0.71±0.10 (n=11). *Head.* Vertex length 0.21±0.04 (n=27); vertex width 0.14±0.02 (n=29); frons length 0.48±0.04 (n=23); frons width 0.21±0.02 (n=23). *Macropter.* Carinae of vertex distinct, stem of Y-shaped carinae obsolete. In lateral view (Figure 12b, d), fastigium rounded; projecting in front of the eye about 1/6th eye length. Carinae of frons and clypeus distinct (Figure 12e), frons converging apically, subparallel in basal half, widest in basal 1/4th. Antennal segments subequal in length, segment II wider than segment I; 2nd segment sparsely setaceous, bearing sensory pits arranged 3, 3, 2, 2, evenly spaced around segment. Sensory pits surrounded by small black setae. *Brachypter.* Same as above.

Thorax. Macropter. Carinae of mesonotum weak, median carina ending anterior to scutellum, lateral carinae faint, diverging posteriorly to reach hind margin. Legs with three rows of dark spines on femora (dorsal, ventral anterior face, ventral posterior face), evenly spaced. Calcar bearing 18–24 small teeth (holotype with 20). *Brachypter.* Same as above but with lateral carinae mesonotum evident, diverging posteriorly; tegmina apically rounded, reaching to apex of 7th abdominal segment.

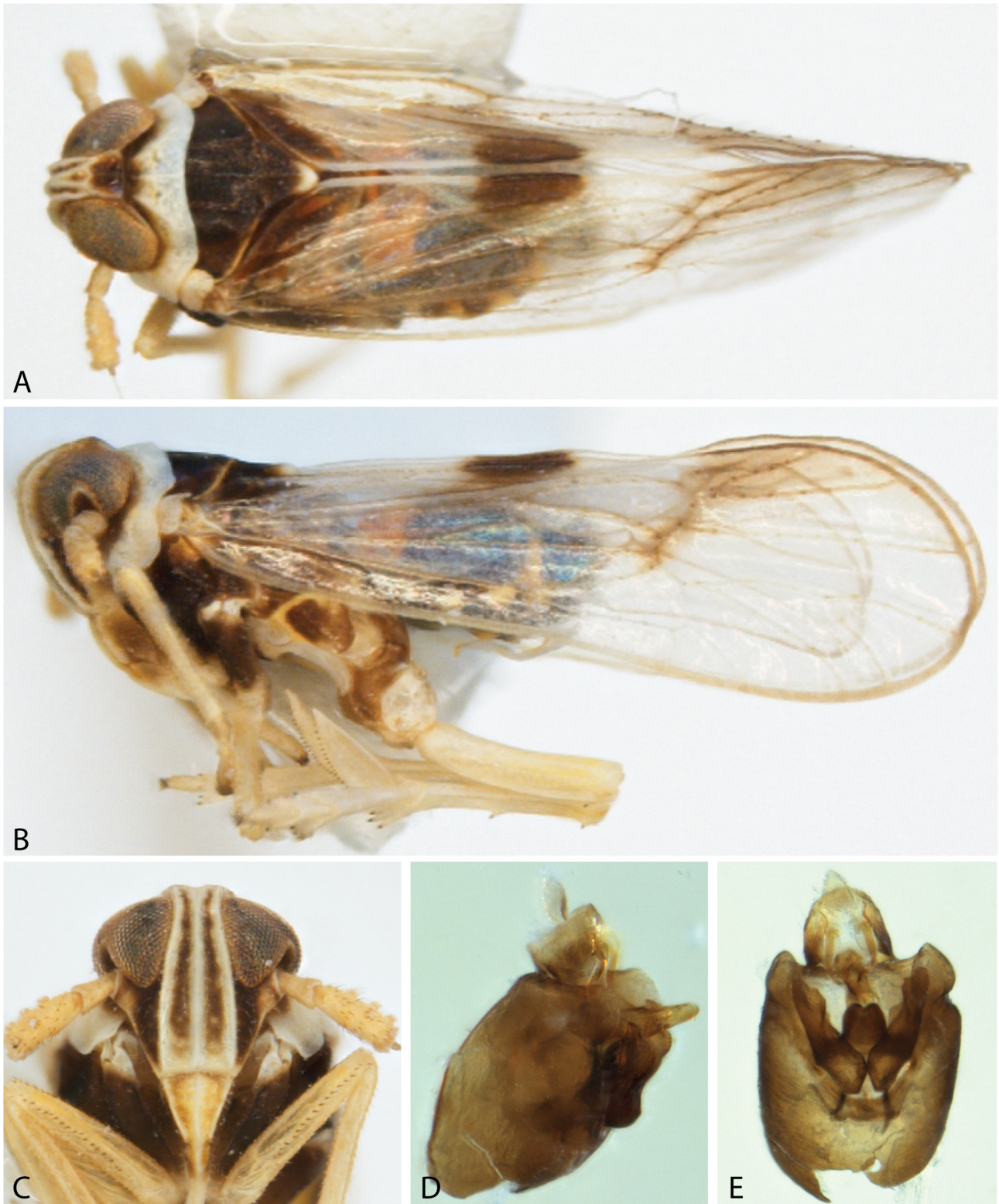


FIGURE 12. Habitus of *Chionomus herkos* n. sp. A. Dorsal view, habitus (holotype); B. lateral view, habitus (holotype); C. frontal habitus; D. pygofer, lateral view; E. pygofer, caudal view.

Abdomen. Macropter. Compressed dorsoventrally, tapering caudad to truncate apex. *Brachypter.* Same as above.

Genitalia. Pygofer in lateral view (Figure 12g) nearly as long dorsally as ventrad, ventral margin sinuate; dorsolateral processes strongly produced caudad, quadrate. In caudal view (Figure 12f, 27a), just wider than tall, rounded; margins raised, produced dorsolaterally. Opening to inner chamber triangular, pointed ventrad. Armature of diaphragm broad, rounded, smooth, distinctly projecting caudad. Parameres widest in basal third, basal angle rounded; dorsolaterally diverging, lateral margins concave, dorsal margin sinuate, inner angles weak, acute; outer angles strong, produced dorsad. Aedeagus circular in cross-section, sinuate, widest near base, slightly tapering for most of length, subapical flange on right bearing small teeth, one to two subapical spines on left. Gonopore dorsal, subapical. Segment X quadrate, taller than wide, armed with two processes; processes arising from midsection of segment, thin, directed ventrad, touching caudal face of segment X, hooked around aedeagus. Segment XI produced, about 2/3rds length of segment X.

Plant associations. None reported.

Distribution. USA: FL, LA.

GenBank accession number. Material for molecular work was unavailable at the time of this study.

Etymology. The specific epithet *herkos* is the Greek noun, meaning fence or wall. This name was chosen because the dorsolateral processes of the pygofer are reminiscent of a wall. The noun is in the genitive singular.

Remarks. This species is easily distinguished from the rest of *Chionomus* by the dorsolateral projections of the pygofer. These projections combined with point of origin of the processes on segment X indicate that this species may be allied with *C. dissipatus*, *C. gluciophilus*, and *C. quadripinosus*. All three of these species have slight dorsolateral expansions of the pygofer however none are as prominently produced. Additionally, *C. herkos* differs from these species in having a rounded armature of the diaphragm as opposed to having it toothed and quadrate (*C. dissipatus*, *C. gluciophilus*) or U-shaped (*C. quadripinosus*).

Type Material. Holotype [USNM]: Macropterous ♂, “♂ // USA: LA: E. Baton Rouge Par. / BatonRouge, BluebonnetSwamp / 22-VII-03 CRBartlett, STDash / Beech-Magnolia-Cypress / 30 22.148N 91 06.304W // HOLOTYPE / *Chionomus* / *herkos* / KMWeglarz 2012 [Red Paper]”.

Paratypes: United States: Florida. Highlands Co., Sebring: Highlands Hammock S.P., Cypress Swamp Trail, 22.IX.2007, V. Golia, Sweeping (VGC, 4 ♂ b, 4 ♀ b); Baton Rouge, La. 7-4-72 (LSAM, 1 ♂ b); Louisiana. same data as holotype (UDCC, 8 ♂ m, 2 ♂ b, 5 ♀ m, 7 ♀ b); LA, E. Baton Rouge Par., Baton Rouge, LSU Campus, Life Sciences Building, At lights, 23-May-2003, STDash (UDCC, 2 ♂ m).

***Chionomus pacificus* (Crawford, 1914), new combination**

(Figures 13, 18g & j, 28)

Megamelus pacificus Crawford, 1914: 626.

Liburnia pacifica (Crawford), comb. by Van Duzee, 1917:84.

Delphacodes pacifica (Crawford), comb. by Muir & Giffard, 1924: 34.

Type Locality. California.

Diagnosis. Body brown to light brown, with distinct median vitta and ivory to cream markings. Vertex quadrate, foveae infusate. Foveae of frons dark; carinae distinct, noticeably contrasting with foveae, stramineous to cream in color. Antennae light cream colored to yellow. Pronotum light, white to cream in color, infusate shadows directly behind eyes, paranota white. Mesonotum brown with median white vitta; wings with dark mark at apex of clavus. Armature of diaphragm bifurcate, hooked along entirety; parameres sinuate, outer angles enlarged. Aedeagus tubular, with two rows of teeth along sides on distal 2/3rds.

Description. *Color. Macropter.* Body brown to dark brown, matte, with cream or white markings. Carinae of head (including genal carinae) distinct, ochraceous to off-white in color; median carinae of vertex evident. Foveae of frons dark brown; vertex lighter than frons, foveae infusate. Antennae cream to light brown, segment I dark brown in some specimens. Pronotum white to cream, fuscate markings directly posterior to eyes and between median and lateral carinae. Mesonotum dark brown to brown, median and lateral carinae cream to white, space between carinae also lightened. Legs white to light brown; apex of tarsi brown. Forewings hyaline, faint fuscous spot just before apex of clavus. Abdomen brown, fine line of white on caudal edge of each segment, lateral projections of sternites

white. Pygofer brown. *Brachypter*. Similar to above, tegmina infusate, white stripe along apex, darkened spot near apex of clavus. *Structure. Body*. Length (in mm) macropter ♂ 1.93 ± 0.14 (n=31); ♀ macropter 2.21 ± 0.12 (n=6); ♂ brachypter 1.85 ± 0.05 (n=9); width ♂ 0.78 ± 0.06 (n=50); ♀ 0.88 ± 0.06 (n=6). *Head*. Vertex length 0.17 ± 0.03 (n=50); vertex width 0.19 ± 0.03 (n=50); frons length 0.50 ± 0.03 (n=25); frons width 0.22 ± 0.02 (n=25). *Macropter*. Carinae of vertex distinct, stem of Y-shaped carina evident. In lateral view (Figure 13b), fastigium rounded; projecting in front of the eye about 1/4th eye length. Carinae of frons and clypeus distinct (Figure 13c), frons subparallel, narrow at vertex, widest at ventral edge of compound eyes. Antennal segments subequal in length, segment II wider; 2nd segment bearing sensory pits arranged 4, 4, 2, 1, evenly spaced around segment. *Brachypter*. Same as above.

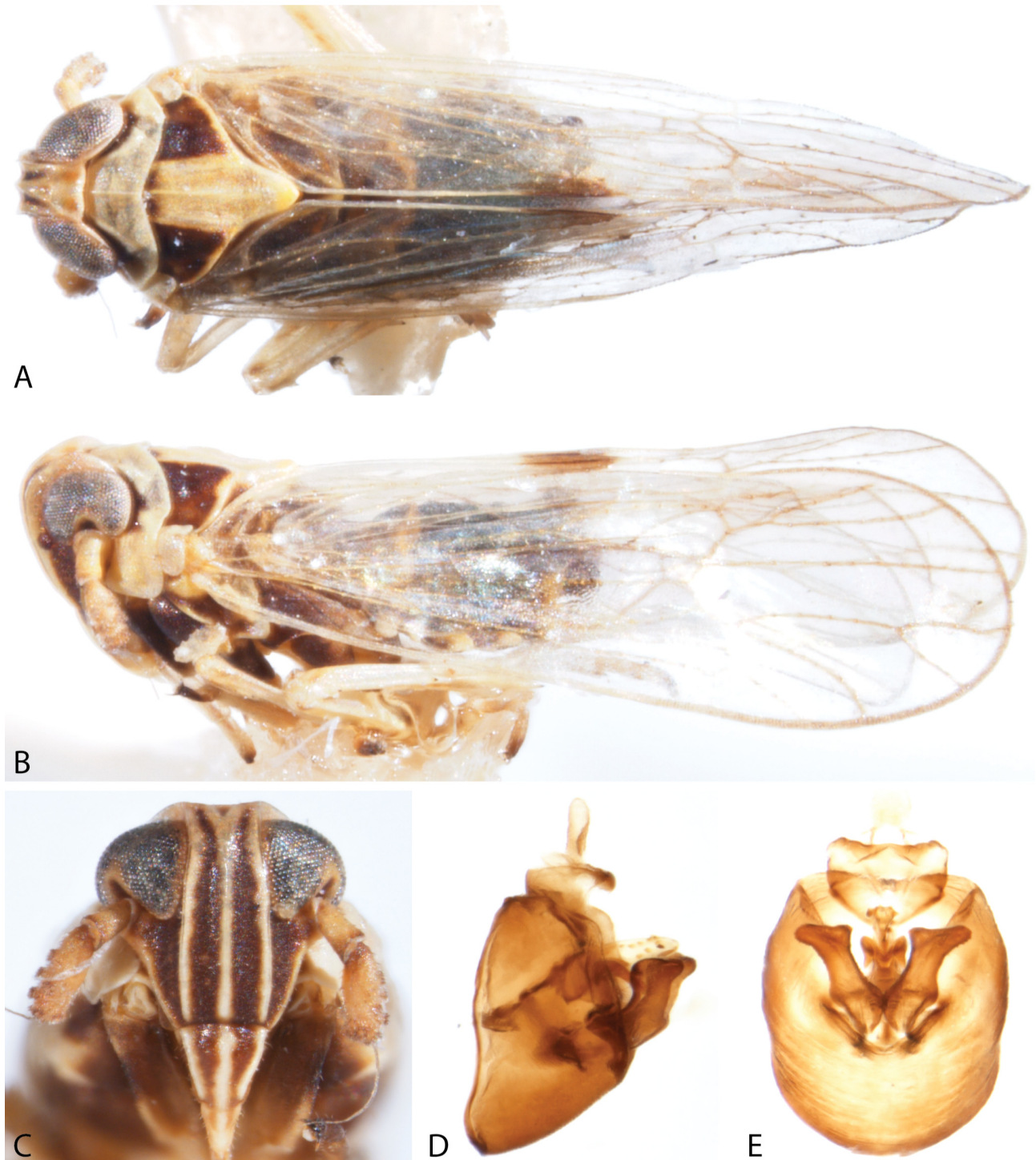


FIGURE 13. Habitus of *Chionomus pacificus*. A. dorsal habitus; B. lateral habitus; C. frontal habitus; D. male terminalia, left lateral view; E. male terminalia, caudal view.

Thorax. Macropter. Carinae of mesonotum evident, median carina ending at scutellum, lateral carinae distinct, parallel, reaching hind margin. Legs sparsely setaceous. Calcar bearing 22–25 small teeth. *Brachypter.* Same as above except lateral carinae of mesonotum diverging; tegmina apically rounded, reaching past pygofer.

Abdomen. Macropter. Compressed dorsoventrally, tapering caudad to truncate apex. *Brachypter.* Same as above.

Genitalia. Pygofer in lateral view (Figure 13d) nearly half as long dorsally as ventrad, ventral margin sinuate. Pygofer in caudal view (Figure 13e, 28a), about as tall as wide, rounded; margins rounded, slightly produced dorsolaterally. Opening to inner chamber triangular, pointed ventrad. Armature of diaphragm bifurcate, hooked along entirety, distinctly projecting caudad prior to dissection, apices of hooks pointed ventrad when fully dissected. Parameres, widest in basal half, basal angle mild, rounded; dorsolaterally diverging to expanded apices, lateral margins concave, inner angles weak, pointed; outer angles produced, rounded. Aedeagus circular in cross-section, slightly curved ventrad, directed dorsoposteriorly, widest near base, slightly tapering for most of length. Aedeagus with two rows of scattered teeth reaching from gonopore to ventral margin in apical 2/3rds; gonopore dorsally directed, apical. Segment X quadrate; bearing two weakly produced processes, projected posteriorly, hooked. Segment XI produced, about 1/2 length of segment X.

Plant associations. *Medicago sativa* L., (alfalfa, Fabaceae); *Solanum tuberosum* L. (Irish potato, Solanaceae), *Beta vulgaris* L. (common beet, reported as ‘sugar beet’, Chenopodiaceae); *Larrea tridentata* (DC.) Coville (creosote bush, Zygophyllaceae); *Lepidium thurberi* Wootton (Thurber’s pepperweed, Brassicaceae) (all label information).

Distribution. USA: AZ, AR, CA, CO, FL, GA, KS, LA, MS, NM, NV, NC, OK, SC, TX, WI; Mexico (Chiapas, Chihuahua, Durango, Hidalgo, Jalisco, Mexico, Mexico City, Morelos, Nuevo Leon, Querétaro, San Luis Potosí, Sonora, Tamaulipa), Costa Rica, Guatemala, Panama, Colombia, Venezuela; also reported IL, UT; Mexico (Michoacán, Oaxaca) (Wilson and McPherson 1980b, Bartlett *et al.* 2014).

GenBank accession number. MN339590

Remarks. There is a large amount of variation in color for *C. pacificus*, some specimens are dark with the vitta faint and marking stramineous while others are light with almost perfectly white markings and distinct vittas. This species is closely allied with *C. bellicosus* and *C. puellus* (see the remarks for *C. bellicosus*).

Type material examined. Holotype [USNM]: Macropterous ♂, under *Megamelus pacificus*, “Cala / 2351 [Handwritten]// Collection / CF Baker // Type / No. 15996 [Number handwritten] / U.S.N.M. [Red paper] // *Megamelus / pacificus / D.G.C. Crawford* [Handwritten, label with black border]”.

***Chionomus puellus* (Van Duzee, 1897), new combination**

(Figures 14, 18h & k, 29)

Liburnia puella Van Duzee, 1894: 191. [*nom. nud.*].

Liburnia puella Van Duzee, 1897: 151.

Delphax puella (Van Duzee), comb. by Kirkaldy, 1907: 161.

M[egamelus] puella (Van Duzee), comb. by Crawford, 1914: 622.

Megamelus puellis (Van Duzee), comb. and emendation by Crawford, 1914: 626.

Delphacodes puella (Van Duzee), comb. by Muir, 1917: 337; also Muir & Giffard, 1924: 32.

Delphacodes aculeata Beamer, 1948b 106, **new synonymy.**

Type Locality. USA, Mississippi [specific locality not reported].

Diagnosis. Body brown to dark brown, ivory to white markings. Vertex quadrate, foveae concolorous with body. Carinae of frons distinct, noticeably contrasting with foveae, stramineous to cream in color. Antennae shading from light brown to yellow. Pronotum dark anteriorly, thick white to cream colored band along posterior edge, paranota dark with white band. Mesonotum dark brown, shining; wings with dark mark at apex of clavus. Armature of diaphragm bifurcate, lobes diverging; apical edge of parameres sinuate. Aedeagus tubular, with scattered teeth on distal 2/3rds; segment X with two strong ventrally directed, diverging processes.

Description. *Color. Macropter.* Body dark, brunneous, shining, with white or ivory markings. Carinae of head (including genal carinae) distinct, stramineous to off-white in color, usually with a small amount of brown at apex of carinae; median carinae of vertex obscure. Antennae light brown proximally, shading distally to yellow. Pronotum

dark brown to brown anteriorly, posterior edge and ventral edge of paranota white to ivory. Mesonotum dark, median and lateral carinae obscure. Legs light stramineous, third tarsal segment infuscate. Forewings hyaline, sometimes with faint fuscous markings, dark spot just before apex of clavus. Abdomen brown, caudal edge of each segment lightened to yellow or white, lateral projections of sternites yellow. Pygofer and segment X brown, lightened at posterior margins. *Brachypter*. Similar to above, tegmina lightly infuscate, white stripe along apex, darkened spot near apex of clavus. *Structure. Body*. Length (in mm) macropter 1.63±0.13 (n=17); female (♀) macropter 1.98±0.18 (n=13), ♂ brachypter 1.50±0.07 (n=6); ♀ brachypter 1.81±0.23 (n=4); width ♂ 0.70±0.08 (n=18); ♀ 0.76±0.05 (n=11). *Head*. Vertex length 0.18±0.04 (n=23); vertex width 0.16±0.02 (n=25); frons length 0.50±0.05 (n=25); frons width 0.20±0.02 (n=25). *Macropter*. Carinae of vertex distinct, stem of Y-shaped carina not evident. In lateral view (Figure 14b), fastigium rounded; projecting in front of the eye about 1/6th eye length. Carinae of frons and clypeus distinct (Figure 14c), frons subparallel, widest at ventral margin of compound eyes. Antennal segments subequal in length, segment II wider than segment I; 2nd segment setaceous, bearing sensory pits arranged 4, 3, 2, 1, evenly spaced around segment. Sensory pits surrounded by small brown setae. *Brachypter*. Similar to above but with stem of Y-shaped carinae faint but evident.

Thorax. Macropter. Carinae of mesonotum obscure, median carina ending anterior to scutellum, lateral carinae faint, diverging posteriorly to reach hind margin. Legs with one row of setae on dorsal margin and two rows setae on ventral margin of femora. Calcar bearing 21–23 small teeth. *Brachypter*. Similar to above but carinae of mesonotum evident, median carina ending anterior of scutellum, lateral carinae diverging reaching posterior margin; tegmina apically rounded, reaching to apex of pygofer.

Abdomen. Macropter. Compressed dorsoventrally, tapering caudad to truncate apex; abdominal spiracles surrounded by several long fine setae. *Brachypter*. Same as above.

Genitalia. Pygofer in lateral view (Figure 14d) nearly half as long dorsally as ventrad, ventral margin sinuate. Pygofer in caudal view (Figure 14e, 29a), slightly wider than tall, rounded; margins rounded, slightly produced dorsolaterally. Opening to inner chamber trapezoidal, pointed ventrad. Armature of diaphragm lobed, bifurcate, lobed strongly diverging from base, distinctly projecting caudad. Parameres, widest in basal third, basally produced, rounded; dorsolaterally diverging, lateral margins concave, inner angles pointed; outer angles produced, rounded, dorsal margin distinctly S-shaped. Aedeagus circular in cross-section, curved ventrad, widest near base, slightly tapering for entirety of length. Aedeagus with scattered teeth reaching from gonopore to ventral margin in apical 2/3rds; gonopore dorsally directed, apical. Segment X quadrate; bearing two strongly produced processes, projected ventrad, mildly curved, diverging. Segment XI produced, about 2/3rds length of segment X.

Plant associations. *Abelia* sp. (*Abelia*, Caprifoliaceae), *Alnus glutinosa* (L.) Gaertn. (European alder, Betulaceae), *Amaranthus retroflexus* L. (redroot amaranth, Amaranthaceae), *Asclepias syriaca* L. (common milkweed, Apocynaceae), *Deschampsia flexuosa* (L.) Trin. (wavy hairgrass, Poaceae), *Medicago* sp. (alfalfa, Fabaceae), *Persicaria hydropiperoides* Michx. (swamp smartweed, Polygonaceae), *Quercus stellata* Wangenh. (post oak, Fagaceae), *Salix nigra* Marshall (black willow, Salicaceae), *Sorghum bicolor* (L.) Moench (sorghum, Poaceae), *Vitis* spp. (grape, Vitaceae) (label information); *Galinsoga parviflora* Cav. (Asteraceae) and *Panicum capillare* L. (witchgrass, Poaceae) (Wilson *et al.* 1994).

Distribution. USA: AR, CT, DE, DC, FL, GA, IL, KS, KY, LA, ME, MD, MA, MS, MO, NE, NH, NJ, NY, NC, OH, OK, PA, RI, SC, TN, TX, VT, VA, WV, WI; Mexico (Veracruz), Belize. Also reported USA: AL, CA, IA, IN, OR, WA; CAN: ON, NS, QC; Bermuda, Cuba; Jamaica; Puerto Rico; Venezuela (Metcalf 1943, Caldwell & Martorell 1951, Wilson & Hilburn 1991, Maw *et al.* 2000, Benton & McCreddie 2009, Bartlett *et al.* 2014, Leavengood *et al.* 2017); reported in error Australia, Brazil and Hawaii (Metcalf 1943, Bartlett *et al.* 2014).

GenBank accession number. HM017484 (Urban *et al.* 2010).

Remarks. The synonymy of *C. puellus* and *D. aculeata* is based on comparison of the primary type of *C. puellus* and 16 paratypes of *D. aculeata*, including topotypic specimens. Both the type specimen of *C. puellus* and paratype specimens of *D. aculeata* from the same collection event were examined (in addition to other paratypes). *Delphacodes aculeata* is a junior synonym of *D. puella*. *Delphacodes puella* can be identified easily by the diverging processes of segment X, the sinuate apical margins of the parameres, and the bifurcating armature of the diaphragm. This species is closely allied with *C. bellicosus* and *C. pacificus* (see the remarks section of *C. bellicosus*).

Chionomus puellus is extremely common in collections and may be one of the most commonly encountered eastern delphacid species (Gonzon *et al.* 2007, Leavengood *et al.* 2017). As such, it is very curious that the biology is almost completely unknown. Most of the plant associations reported above from label information are likely

spurious (at least those from woody plants). We associate this species with gramineous plants, especially in mesic to wet circumstances, and it is probably polyphagous.

Type material examined. Lectotype *Liburnia puella* [USNM]: Macropterous ♂ under *Liburnia puella* 1897, “ Miss. // ♂ // Type // LECTOTYPE / *Liburnia* [Handwritten]/ *puella* [Handwritten]/ Van D. [Handwritten]/ Oman 1946 [Orange paper]”.

Paratypes *Delphacodes aculeata* [SEMC, all brachypters]: USA Florida, Jefferson Co., Lamont, 7 Mar 1947, R. H. Beamer (SEMC, 2 ♂ 4 ♀); Levy Co.: Otter Creek, 9 Mar 1947, R. H. Beamer (UDCC, 4 ♂, 1 ♀); same, 9 Mar 1947, L. D. Beamer (1 ♂); Yankeetown, 9 Mar 1947, R. H. Beamer (3 ♂).

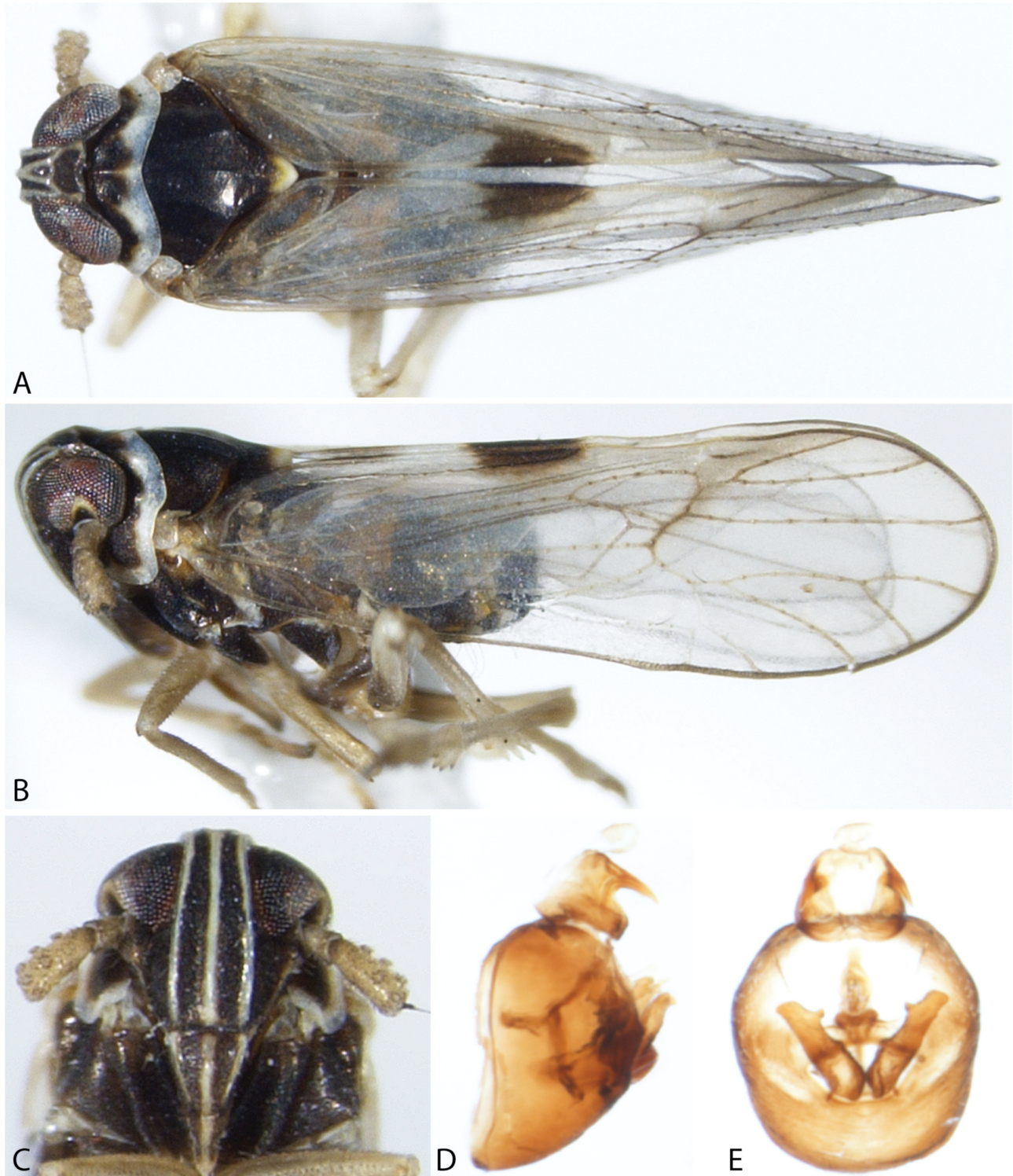


FIGURE 14. Habitus of *Chionomus puellus*. A. dorsal habitus; B. lateral habitus; C. frontal habitus D. male terminalia, left lateral view; E. male terminalia, caudal view.

***Chionomus quadrispinosus* (Muir & Giffard, 1924), new combination**

(Figures 15, 18i & l, 30)

Delphacodes quadrispinosa Muir & Giffard, 1924: 37.

Type Locality. Nicaragua, San Marcos.

Diagnosis. Body dark brown to brown, with white markings. Vertex quadrate; foveae of frons and vertex concolorous with body. Carinae distinct, off-white in color; antennae light brown. Pronotum concolorous with mesonotum, paranota white along margins. Armature of diaphragm U-shaped; inner and outer angles of parameres diverging, basal angle produced, rounded. Aedeagus tubular, with two rows of teeth along venter, curved dorsad; base enlarged, quadrate. Segment X armed with 4 distinct processes, first processes closely approximated, second processes nearly touching.

Description. *Color.* *Macropter.* Body dark, brunneous, shining, with white or ivory markings. Carinae of head (excluding genal carinae) distinct, off-white to ivory in color; median carinae of vertex concolorous with foveae. Antennae light brown, paler at apex. Pronotum concolorous with mesonotum, paranota white to ivory along margins. Mesonotum dark, median and lateral carinae obscure. Legs cream colored to yellow, apex of tarsi brown. Forewings hyaline, distinct dark spot just before apex of clavus. Abdomen dark brown, thin white line along caudal edge of each segment, lateral projections of sternites white. Pygofer and segment X brown. *Brachypter.* Similar to above. Tegmina dark, infusate, white stripe along apex, darkened spot near apex of clavus. *Structure.* *Body.* Length (in mm) macropter 1.60±0.02 (n=2); ♂ brachypter 1.46±0.12 (n=5); ♀ brachypter 1.69±0.09 (n=4); width ♂ 0.62±0.07 (n=16); ♀ 0.64±0.04 (n=4). *Head.* Vertex length 0.14±0.03 (n=16); vertex width 0.16±0.02 (n=13); frons length 0.41±0.06 (n=16); frons width 0.19±0.03 (n=16). *Macropter.* Carinae of vertex distinct, stem of Y-shaped obscure. In lateral view (Figure 15b), fastigium rounded; projecting in front of the eye about half the length of eye. Carinae of frons and clypeus distinct (Figure 15c), frons subparallel, widest just below ventral edge of compound eyes. Antennal segments subequal in length, segment II wider than segment I; 2nd segment sparsely setaceous, bearing sensory pits arranged 3, 3, 2, 2, evenly spaced around segment. Sensory pits surrounded by small black setae. *Brachypter.* Same as above.

Thorax. *Macropter.* Carinae of mesonotum weak, median carina ending anterior to scutellum, lateral carinae faint, diverging posteriorly, reaching hind margin. Forelegs with 2 rows setae on ventral margin of femora; legs mostly bare. Calcar bearing 18–22 small teeth. *Brachypter.* Same as above but with lateral carinae mesonotum evident; tegmina apically rounded, reaching the midsection of the pygofer.

Abdomen. *Macropter.* Compressed dorsoventrally, tapering caudad to truncate apex; abdominal spiracles surrounded with one or two long, fine setae.

Genitalia. Pygofer in lateral view (Figure 15d) about as long dorsally as ventrad, ventral margin sinuate. In caudal view (Figure 15e, 30a), 5/6ths as tall as wide, rounded; margins raised, dorsolateral margins produced, carinate. Opening to inner chamber trapezoidal, pointed ventrad. Armature of diaphragm U-shaped, fitting aedeagus, smooth, distinctly projecting caudad. Parameres, widest in basal third, basal angle projecting, rounded; dorsolaterally diverging, apices concave, lateral margins concave, inner produced, quadrate, outer angles produced, rounded. Aedeagus oval in cross-section, curved ventrad, consistent in width excluding base, two rows of evenly spaced teeth along ventral margin; base wide, quadrate. Gonopore ventral, subapical. Segment X quadrate, wider than tall; with 4 processes, first pair distinct, closely approximated, second pair longer than first, more closely approximated, nearly touching. Segment XI produced, about 1/3rd length of segment X.

Plant associations. *Phaseolus vulgaris* L. (kidney bean, Fabaceae); *Galactia elliottii* Nutt. (Elliot's milkpea, Fabaceae) (Label information).

Distribution. USA: FL, LA; Dominican Republic; Guatemala; Honduras; Nicaragua; Costa Rica. Also reported Cuba (Muir & Giffard 1924).

GenBank accession number. Molecular sequence was unable to be generated at the time of this study.

Remarks. *Chionomus quadrispinosus* is closely allied with *C. dissipatus* and *C. gluciophilus* and has an overlapping distribution (see Remarks of *C. dissipatus*). *Chionomus quadrispinosus* tends to be darker and can be distinguished by the armature of the diaphragm and shape of the aedeagus. This species is most frequently collected in brachypterous form.

The primary type material of this species appears to be lost. According to Muir and Giffard (1924: 37), the types

of this species “...were standing under the name of *culta* Van Duzee in the Pomona [College] and Crawford collections.” The Pomona College (Claremont, CA) collection was reportedly transferred to the California Academy of Science; however, the Crawford types are not listed in the California Academy of Science’s type specimen database, and a trip to the collection failed to find it. BPBM was also checked because many of Muir’s type specimens are housed there.

Type material examined. Holotype [Pomona Collection, transferred to CASC]: missing.

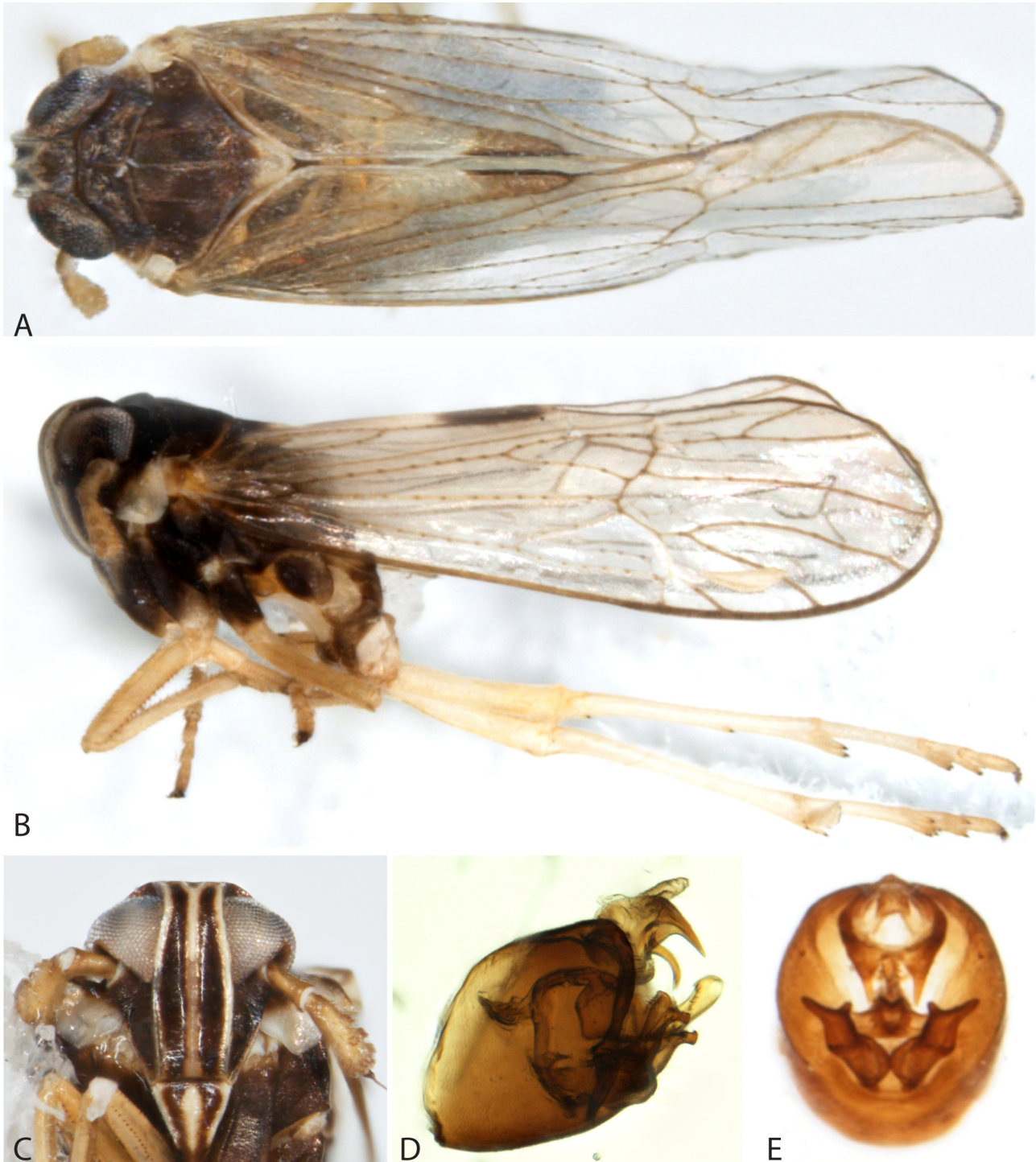


FIGURE 15. Habitus of *Chionomus quadrispinosus*. A. dorsal habitus; B. lateral habitus; C. frontal habitus; D. male terminalia, left lateral view; E. male terminalia, caudal view.

***Chionomus tenae* (Muir, 1926), new combination**

(Figures 16, 17, 31)

Delphacodes albinotata Muir & Giffard, 1924: 36 [nec. Crawford, 1914].

Delphacodes tenae Muir, 1926: 34.

Delphacodes arcuata Beamer, 1948b: 105–106; replacement name for preoccupied *Delphacodes albinotata* Muir & Giffard [nec. Crawford, 1914], **new synonymy**.

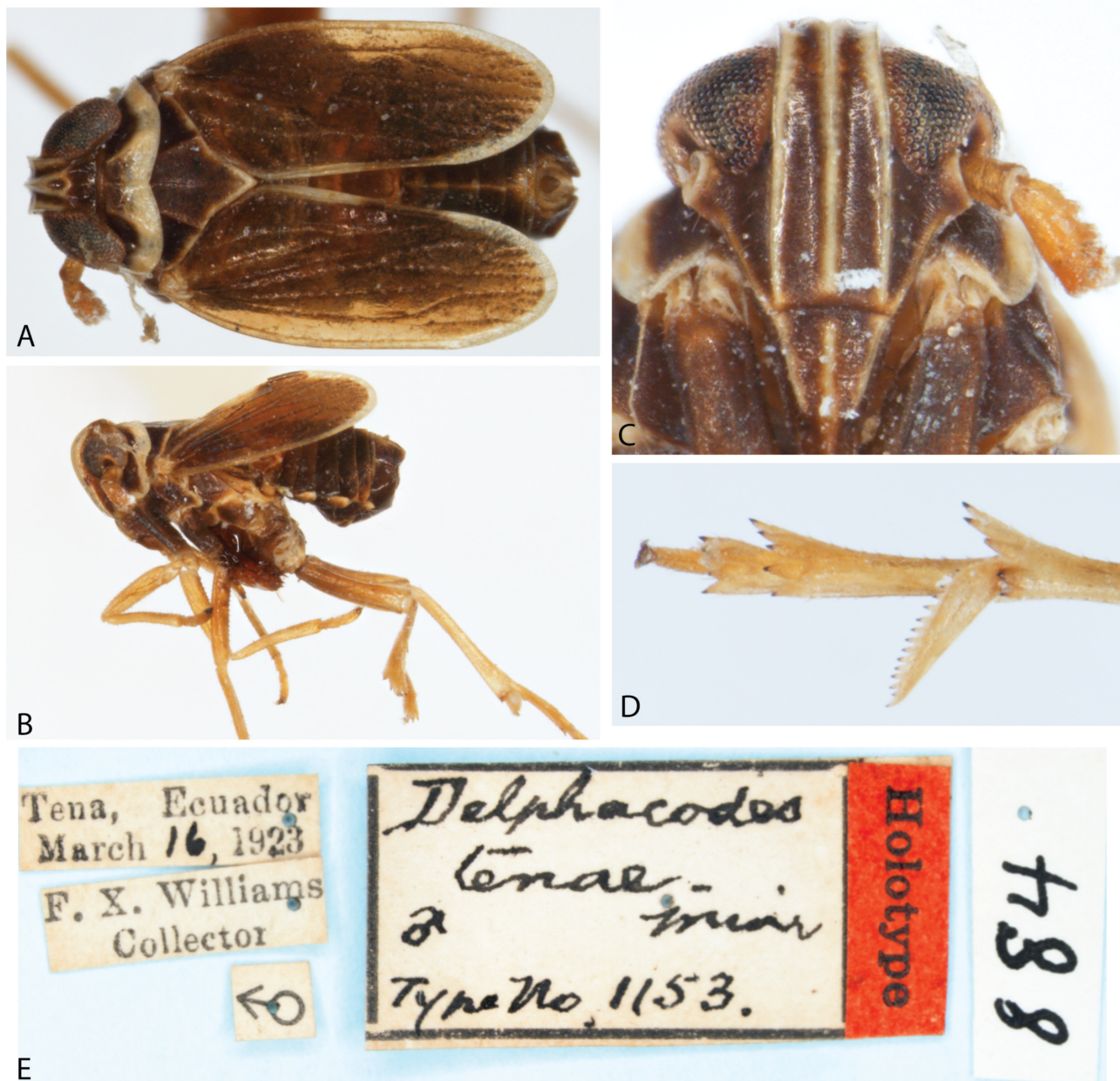


FIGURE 16. Habitus of *Chionomus tenae*, holotype, A. dorsal habitus; B. lateral habitus; C. frontal habitus; D. hind tarsus, ventral view; E. labels.

Type Locality. Ecuador, Napo, Tena.

Diagnosis. Body dark brown, with white to cream colored markings. Vertex quadrate; foveae of frons and vertex dark. Carinae distinct, off-white in color; antennae light brown. Pronotum dark anteriorly with band of white along posterior edge, paranota pale along margins. Armature of diaphragm forming a triangular fold, apex of parameres avicephaliform. Aedeagus tubular, left side bearing preapical spine, posteriorly projected; segment X with processes produced as lobes.

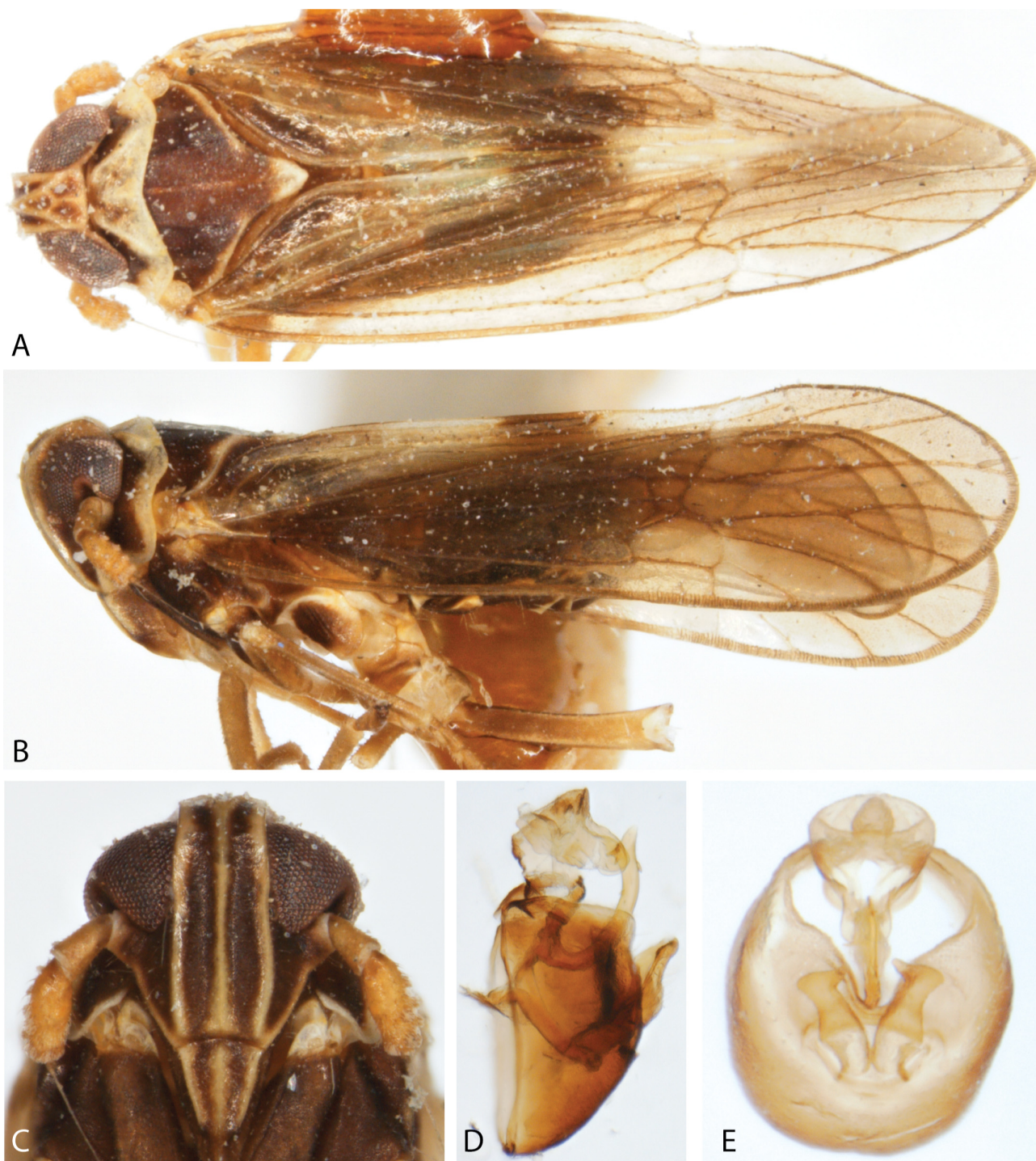


FIGURE 17. Habitus of *Chionomus tenae* (A-C paratype of *Delphacodes arcuata* Beamer, Lower Matecumbe Key, Florida). A. dorsal habitus; B. lateral habitus; C. frontal habitus, D. male terminalia, left lateral view, E. male terminalia, caudal view.

Description. *Color.* Body dark, brunneous, with white and stramineous markings. Carinae of head (including genal carinae) distinct, ochraceous in color, usually with a small amount of brown at apex of carinae; median carinae of vertex evident. Antennae light brown, darkened at joint of the two segments. Pronotum white, dark brown shadows directly posterior to eyes, fuscous markings between lateral and median carinae; paranota dark with white border. Mesonotum dark, median and lateral carinae obscure. Legs light brown; forewings hyaline, infusate, distinct dark spot just before apex of clavus. Abdomen dark brown, some specimens with fine line of white on caudal edge of each segment, lateral projections of sternites yellow to white. Pygofer brown. *Brachypter.*

Similar to above, lighter; tegmina infusate, white stripe along apex, darkened spot near apex of clavus. *Structure*. *Body*. Length (in mm) macropter 1.88±0.14 (n=12); female (♀) macropter 2.2±0.2 (n=12), ♂ brachypter 1.72 (n=1); width ♂ 0.78±0.06 (n=24); ♀ 0.88±0.07 (n=14). *Head*. Vertex length 0.18±0.04 (n=38); vertex width 0.19±0.03 (n=38); frons length 0.50±0.05 (n=38); frons width 0.22±0.02 (n=38). *Macropter*. Carinae of vertex distinct, stem of Y-shaped carina faint. In lateral view (Figure 16b, 17b), fastigium rounded; projecting in front of the eye about 1/5th eye length. Carinae of frons and clypeus distinct (Figure 16c, 17c), frons subparallel, widest ventral 1/3rd of compound eyes. Antennal segments subequal in length, segment II wider than segment I; 2nd segment sparsely setaceous, bearing sensory pits arranged 3, 4, 2, 1, evenly spaced around segment. Sensory pits surrounded by small black setae. *Brachypter*. Same as above.

Thorax. *Macropter*. Carinae of mesonotum weak, median carina ending anterior to scutellum, lateral carinae faint, parallel posteriorly, reaching hind margin. Legs mostly bare. Calcar bearing 15–17 small teeth (holotype with 15). *Brachypter*. Same as above but with lateral carinae mesonotum evident, diverging posteriorly; tegmina apically rounded, reaching midsection of pygofer.



FIGURE 18. Dorsal and lateral habitus of brachypters of select *Chionomus* species, A,D. *Chionomus havanae*, B,E. *Chionomus balboae*, C,F. *Chionomus herkos*, G,J. *Chionomus pacificus*, H,K. *Chionomus puellus*, I,L. *Chionomus quadrispinosus*.

Abdomen. *Macropter*. Compressed dorsoventrally, tapering caudad to truncate apex; abdominal spiracles surrounded by long fine setae. *Brachypter*. Same as above.

Genitalia. Pygofer in lateral view (Figure 17d) nearly half as long dorsally as ventrad, ventral margin sinuate. In caudal view (Figure 17e, 31a), as tall as wide, globular; margins rounded, mildly produced dorsolaterally. Opening to inner chamber triangular, pointed ventrad. Armature of diaphragm produced as a U-shaped fold, some specimens with center of fold dorsally produced, triangular, smooth, projecting caudad. Parameres, widest in basal third, basal angle weak; dorsolaterally diverging to avicephaliform apices, lateral margins concave, inner angles strong, acute; outer angles produced to rounded apices. Aedeagus circular in cross-section, strongly curved dorsad, wider near base, with slight subapical expansion before pointed apex; Aedeagus bearing 1 to 2 subapical spines on

left, sometimes hooked, directed posteriorly; row of small teeth along either side in midsection; gonopore dorsal, subapical. Segment X quadrate, taller than long; processes produced from midsection, rounded, lobe like, surrounding aedeagus. Segment XI produced, about half length of segment X.

Plant associations. None reported.

Distribution. USA: AZ, FL; Mexico (Tamaulipas, Veracruz); Puerto Rico, Cuba; Jamaica; Montserrat; Belize; Guatemala; Honduras; El Salvador, Costa Rica; Panama, Colombia; Brazil (São Paulo); French Guiana; Venezuela; Bolivia; Paraguay; Ecuador; Argentina.

GenBank accession number. MN339593

Remarks. This species may be allied with *C. dolonus* because of the folded shape of the armature of the diaphragm, although it is not nearly as posteriorly produced here. The pygofer is also not as laterally compressed in this species. It may also be allied with *C. balboae* because of the subapical spines of the aedeagus; however, this species has the aedeagus distinctly upturned (straight in *C. balboae*) and lacks the triangular boss on the armature of the diaphragm.

Type material examined. Holotype *Delphacodes tenae* [BPBM]: Brachypterous ♂, “Tena, Ecuador / March 16, 1923 [Day handwritten] // F.X. Williams / Collector // ♂ // Holotype [Red paper, vertical orientation, affixed to following label] // Delphacodes / tenae / ♂ Muir / Type No.1153. [Handwritten]”.

Paratypes *Delphacodes arcuata* [all SEMC], Florida, Monroe Co., Lower Matecumbe Key, 14 Mar 1947, R. H. Beamer (8 ♂, 8 ♀); Florida, St. Lucie Co., Fort Pierce, 07 Aug 1930, P. W. Oman (2 ♂); same, 07 Aug 1930, R. H. Beamer (1 ♀).

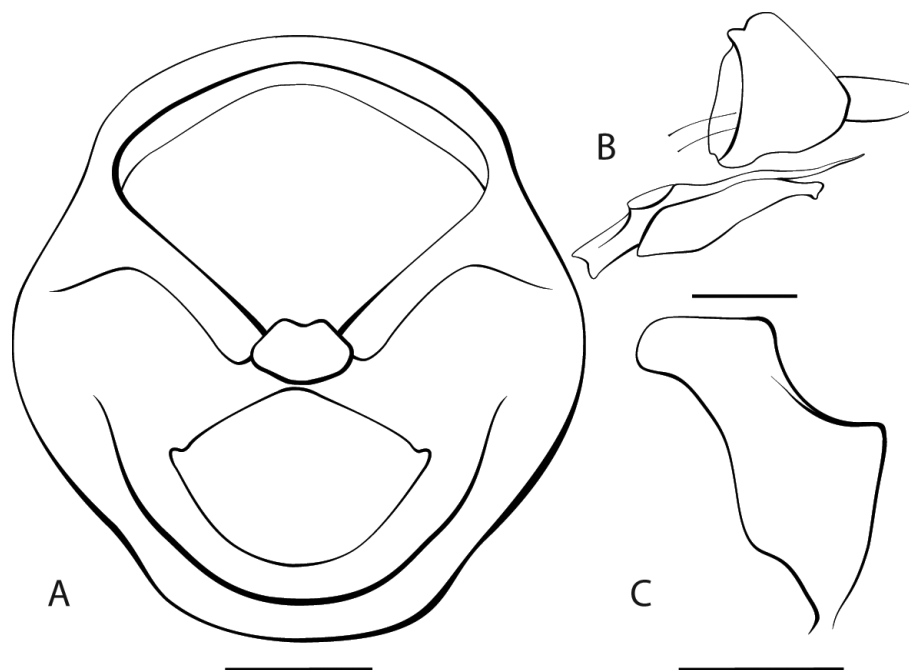


FIGURE 19. Line art of *Chionomus havanae* terminalia, A. pygofer, caudal view, B. aedeagus and anal tube, left lateral view, C. left paramere, widest view.

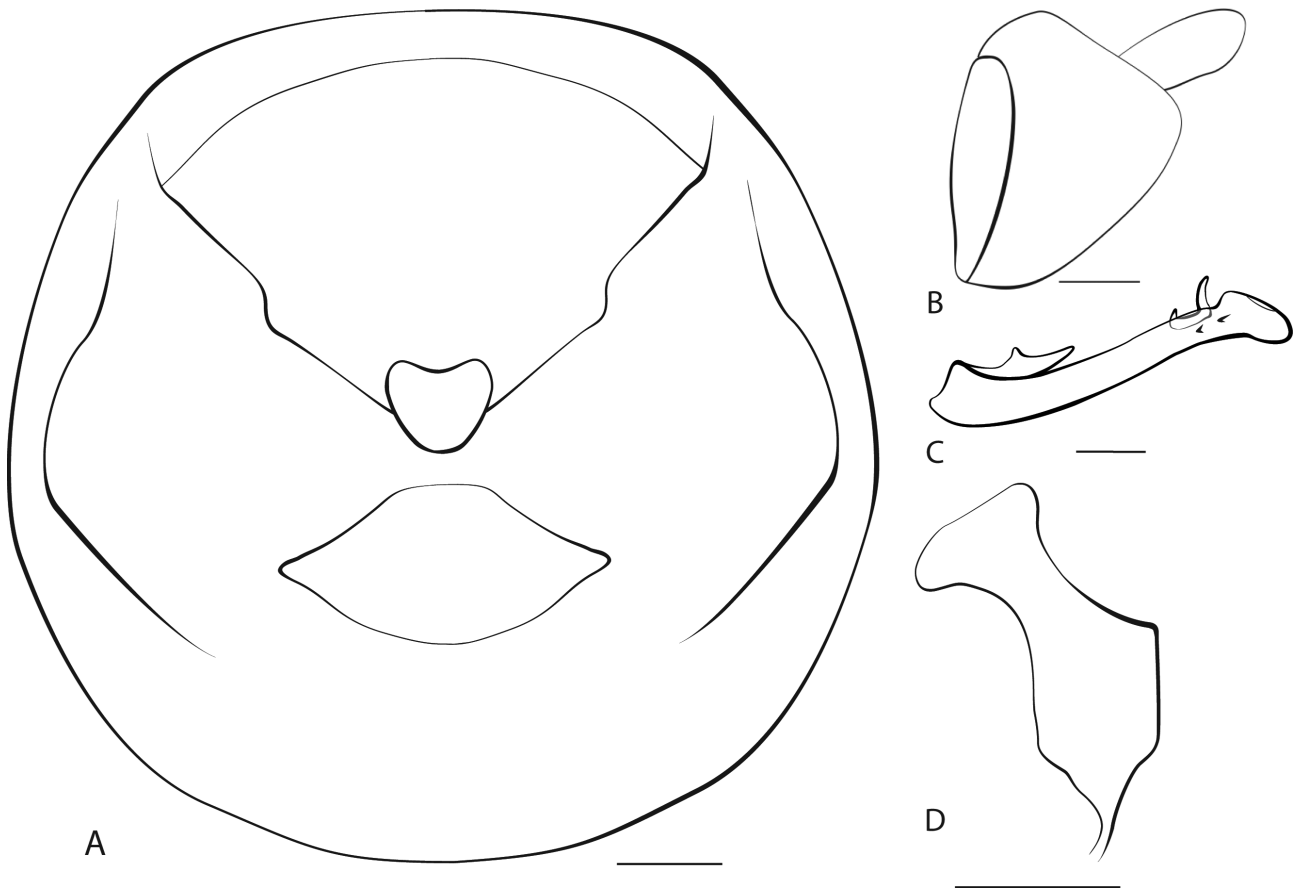


FIGURE 20. Line art of *Chionomus balboae* terminalia, A. pygofer, caudal view, B. anal tube, left lateral view, C. aedeagus, left lateral view; D. left paramere, widest view.

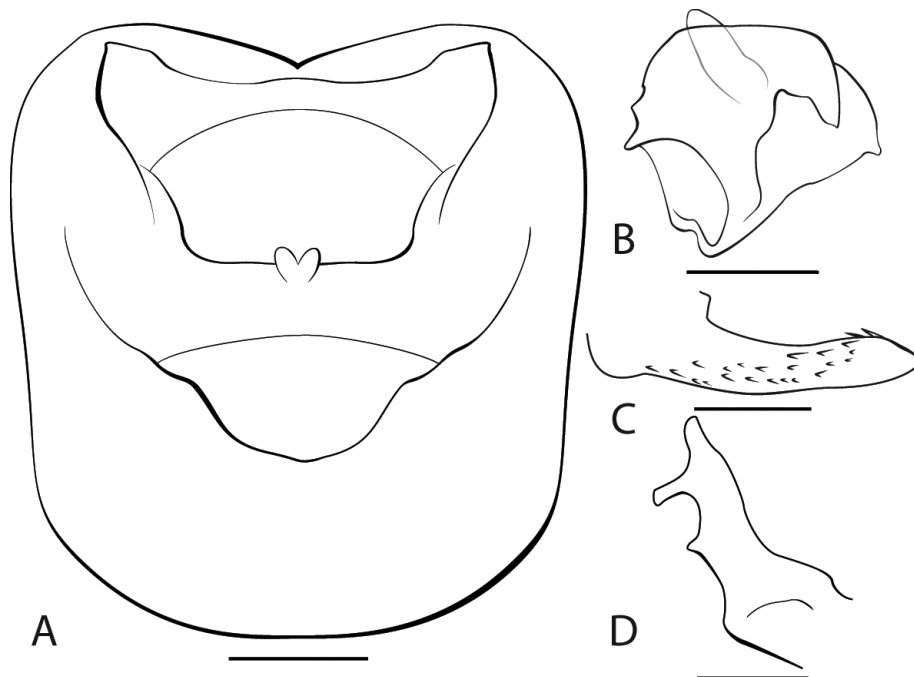


FIGURE 21. Line art of *Chionomus banosensis* terminalia, A. pygofer, caudal view, B. anal tube, left lateral view, C. aedeagus, left lateral view; D. left paramere, widest view.

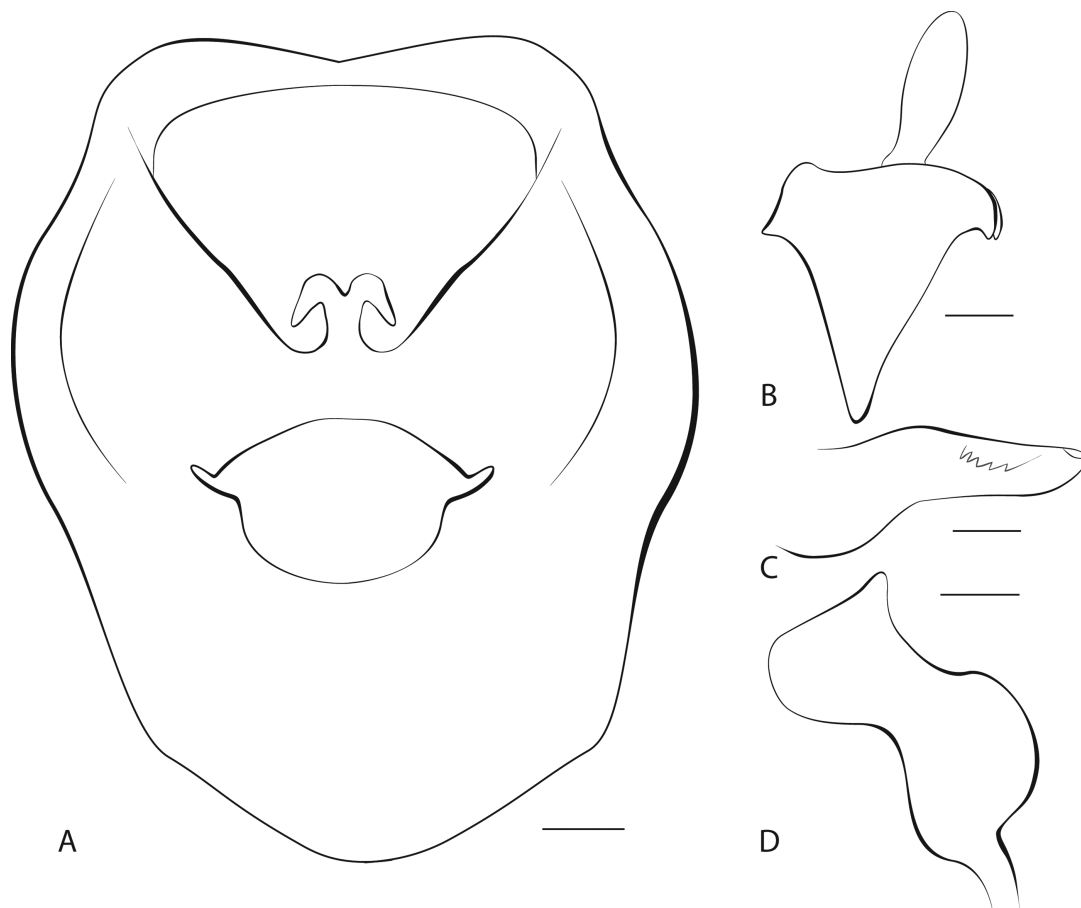


FIGURE 22. Line art of *Chionomus bellicosus*, terminalia, A. pygofer, caudal view, B. anal tube, left lateral view, C. aedeagus, left lateral view; D. left paramere, widest view.

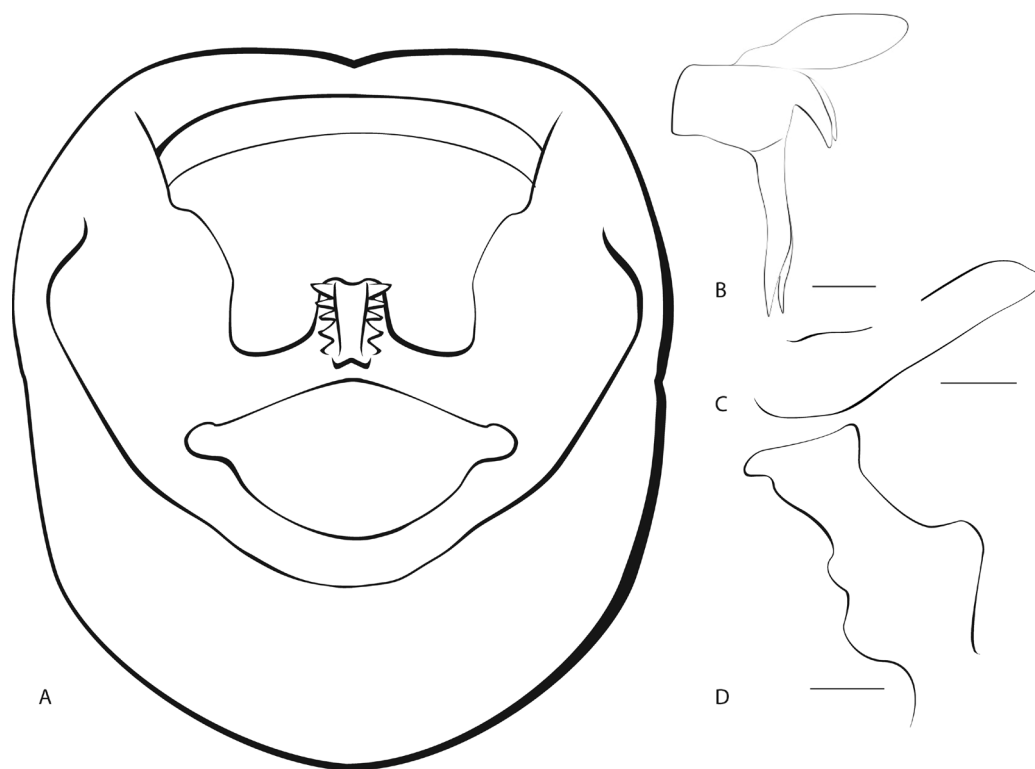


FIGURE 23. Line art of *Chionomus dissapatus*, terminalia, A. pygofer, caudal view, B. anal tube, left lateral view, C. aedeagus, left lateral view; D. left paramere, widest view.

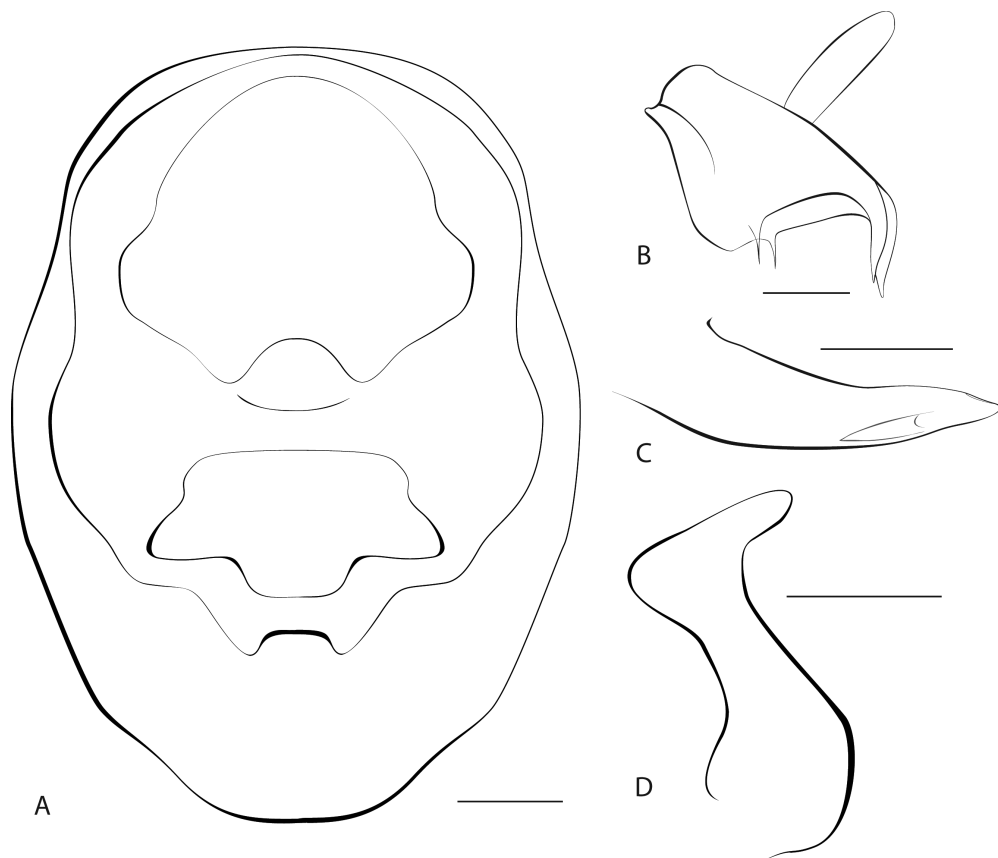


FIGURE 24. Line art of *Chionomus dolonus* n. sp., terminalia, A. pygofer, caudal view, B. anal tube, left lateral view, C. aedeagus, left lateral view; D. left paramere, widest view.

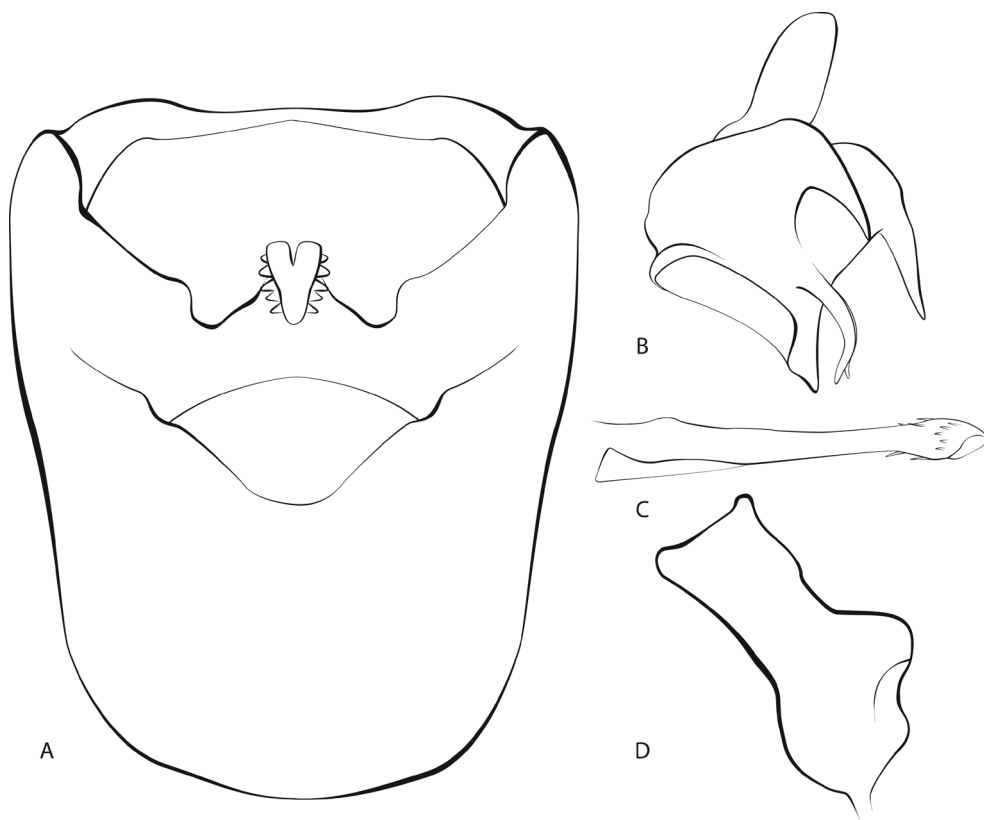


FIGURE 25. Line art of *Chionomus gluciophilus*, terminalia, A. pygofer, caudal view, B. anal tube, left lateral view, C. aedeagus, left lateral view; D. left paramere, widest view.

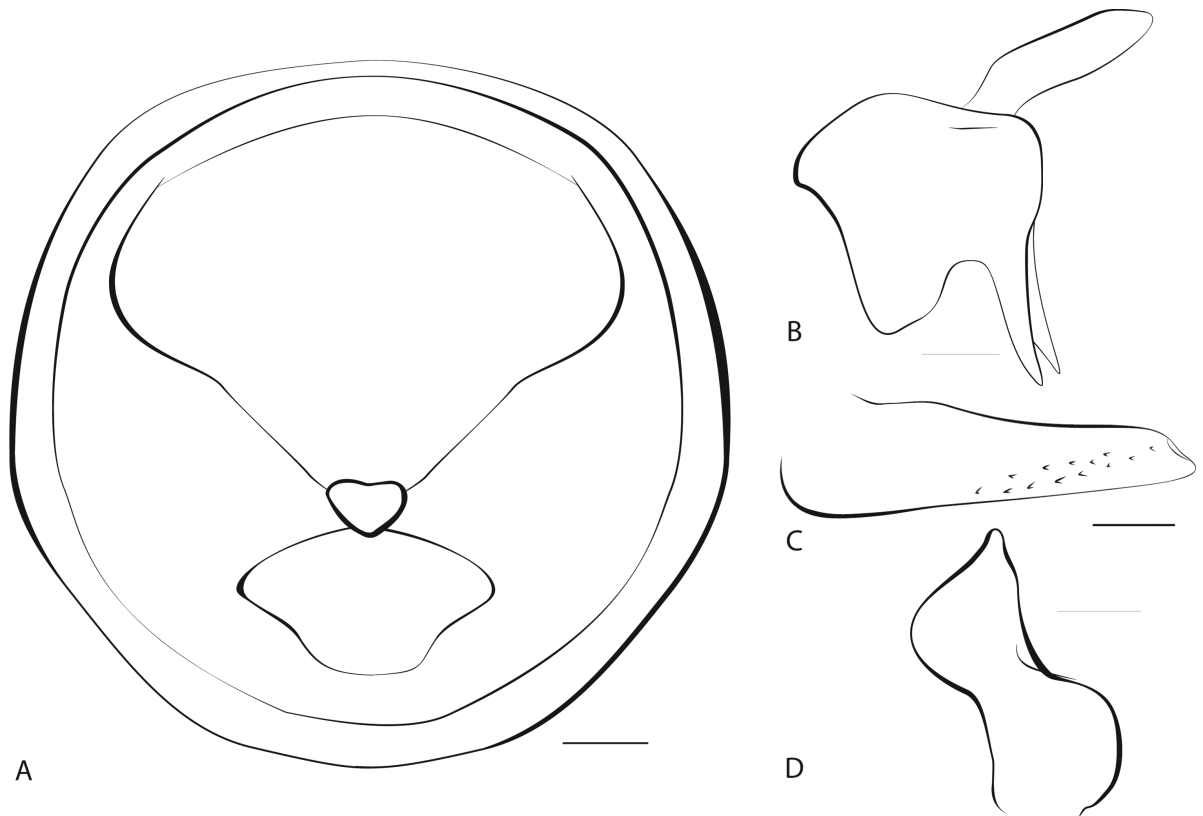


FIGURE 26. Line art of *Chionomus haywardi*, terminalia, A. pygofer, caudal view, B. anal tube, left lateral view, C. aedeagus, left lateral view; D. left paramere, widest view.

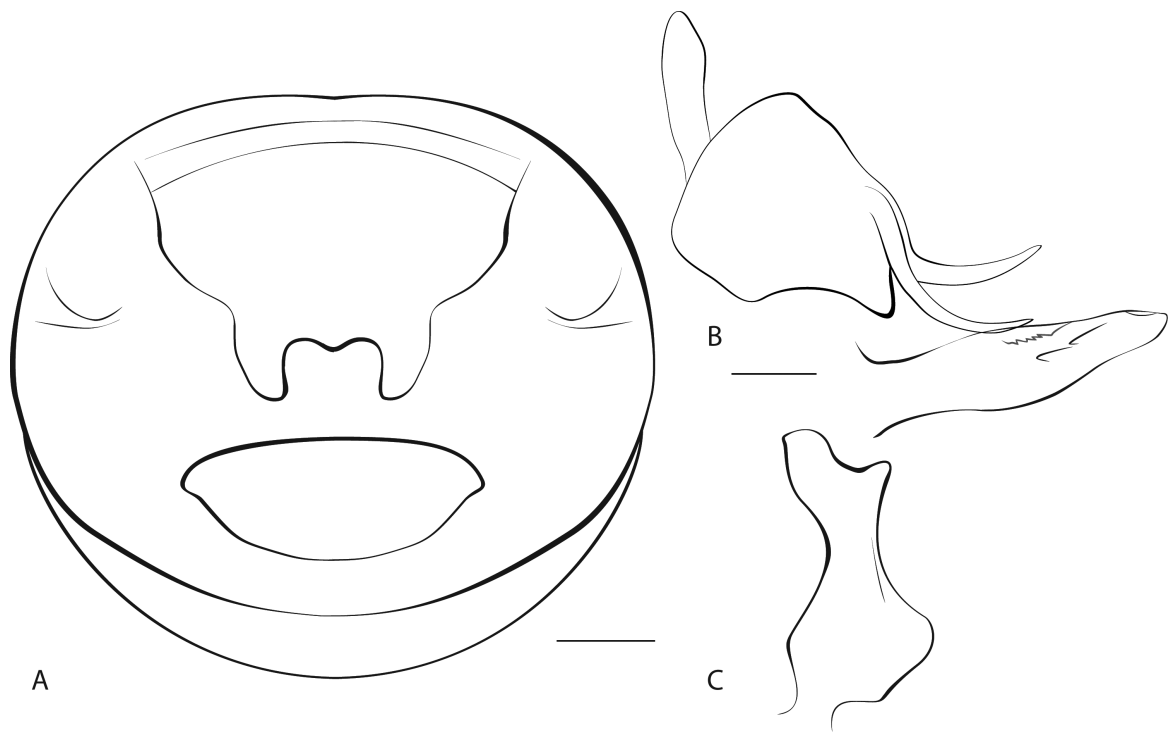


FIGURE 27. Line art of *Chionomus herkos* n. sp. terminalia, A. pygofer, caudal view, B. anal tube and aedeagus, left lateral view, C. left paramere, widest view.

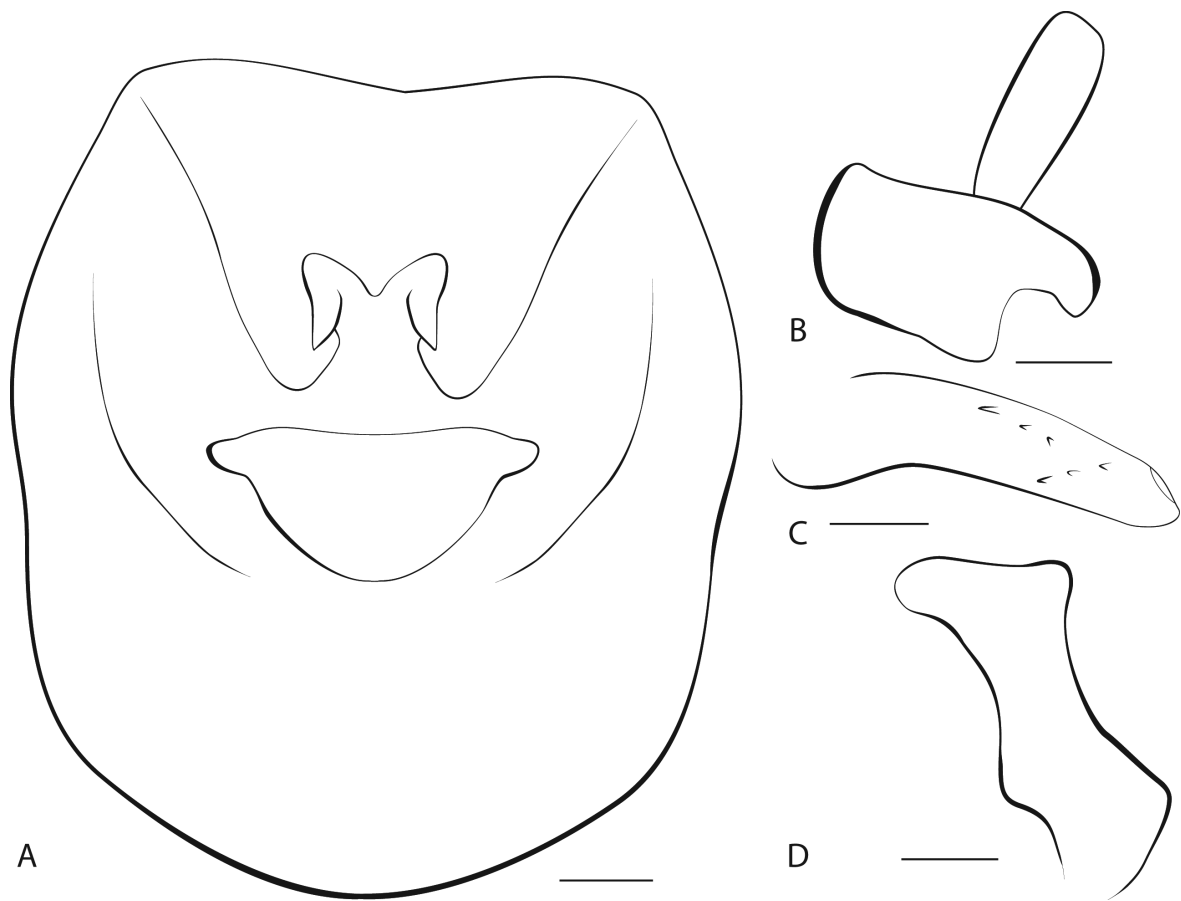


FIGURE 28. Line art of *Chionomus pacificus* terminalia, A. pygofer, caudal view, B. anal tube, left lateral view, C. aedeagus, left lateral view, D. left paramere, widest view.

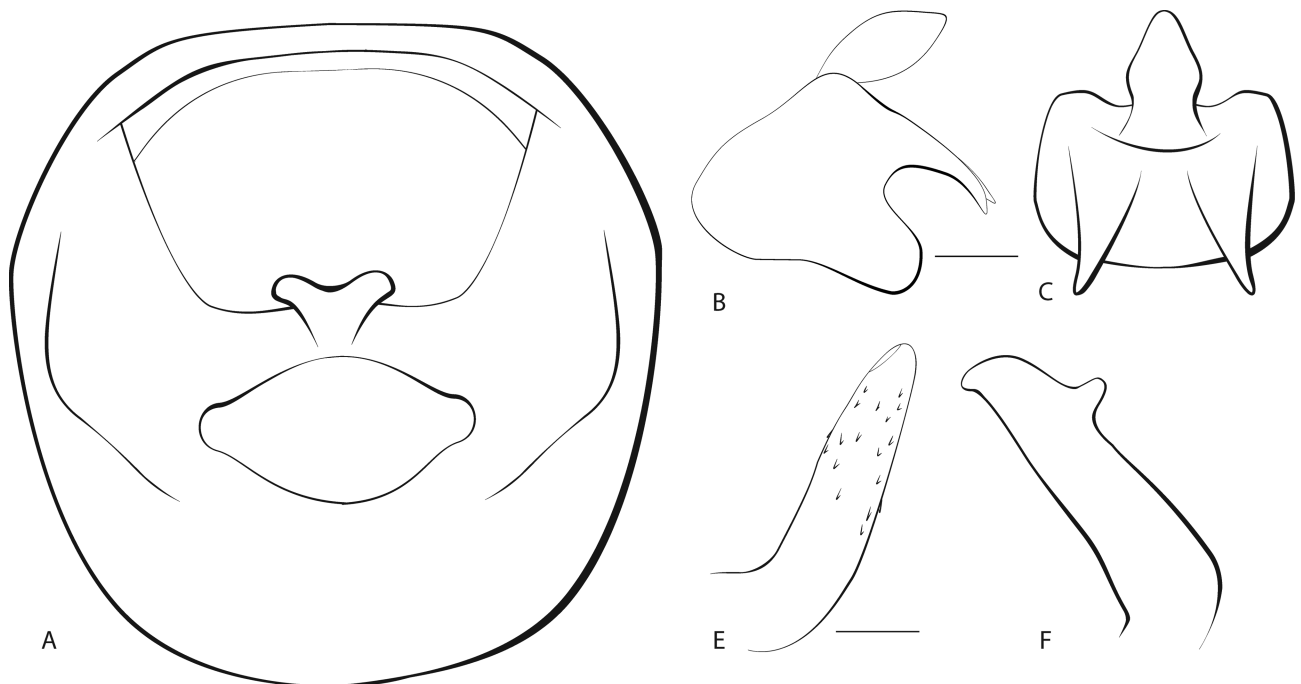


FIGURE 29. Line art of *Chionomus puellus* terminalia, A. pygofer, caudal view, B. anal tube, left lateral view, C. anal tube, caudal view, D. aedeagus, left lateral view, E. left paramere, widest view.

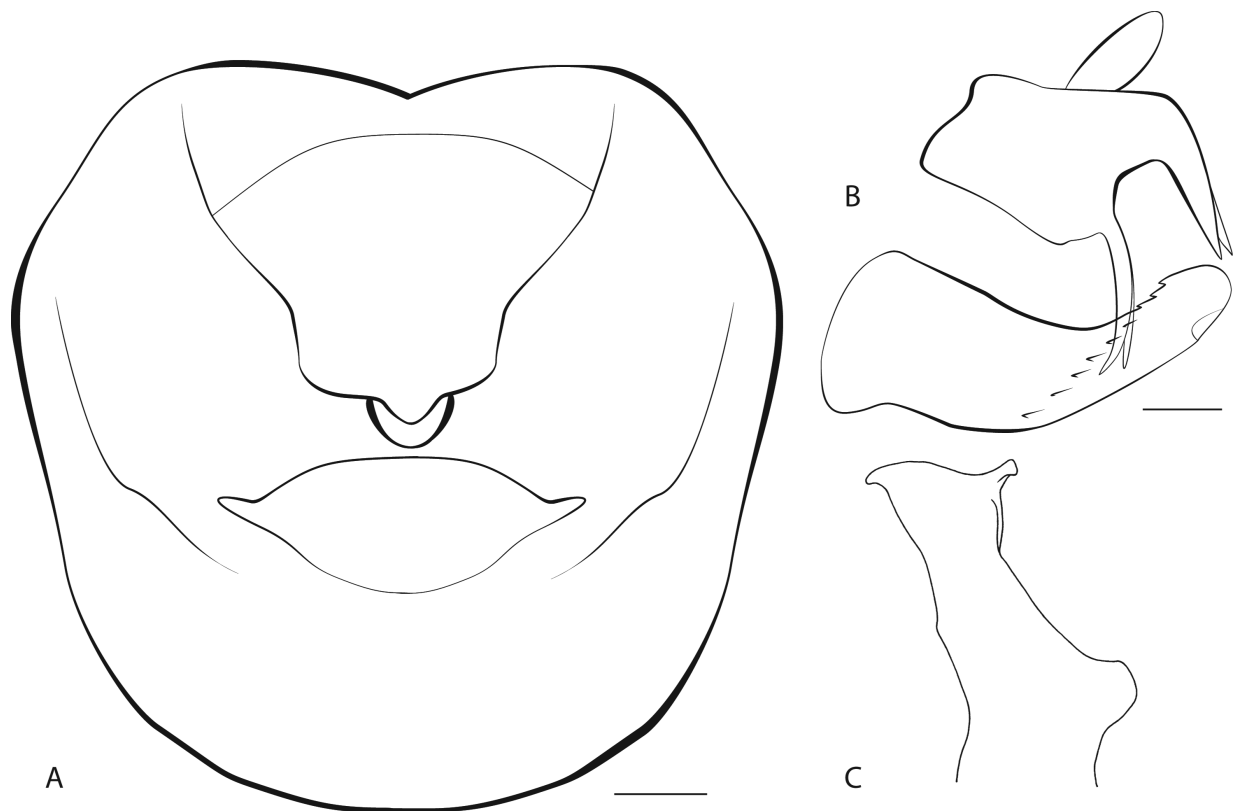


FIGURE 30. Line art of *Chionomus quadrispinosus* terminalia, A. pygofer, caudal view, B. anal tube and aedeagus, left lateral view, C. left paramere, widest view.

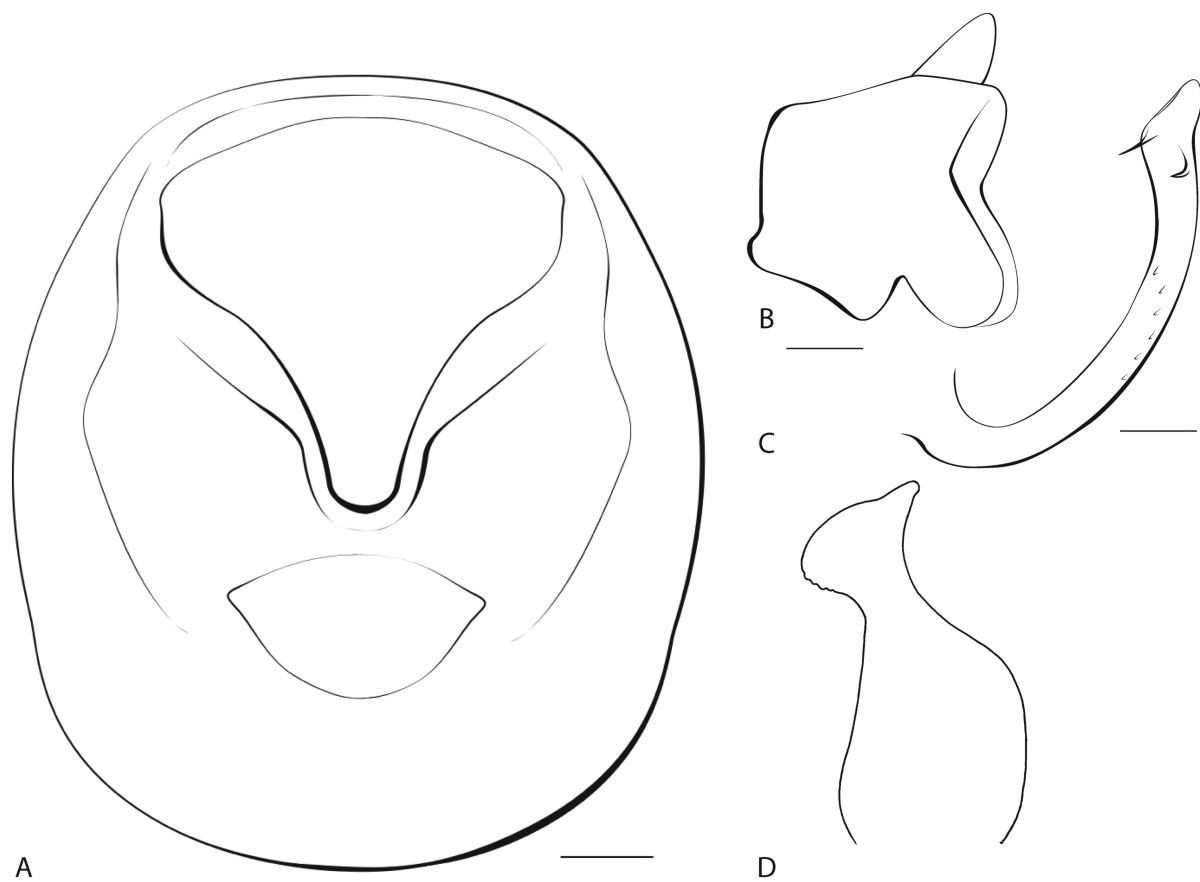


FIGURE 31. Line art of *Chionomus tenae* terminalia, A. pygofer, caudal view, B. anal tube and aedeagus, left lateral view, C. left paramere, widest view.

TABLE 5. Summary of recorded plant associations for species of *Chionomus* the source of the association.

Species	Host	Literature	Label
<i>C. havanae</i>	<i>Axonopus compressus</i> (Sw.) P. Beauv.	X	
<i>C. bellicosus</i>	<i>Paspalum distichum</i> L.	X	
<i>C. gluciophilus</i>	<i>Saccharum</i> L.	X	
	<i>Solanum tuberosum</i> L.		X
	<i>Phaseolus vulgaris</i> L.		X
<i>C. haywardi</i>	<i>Oryza sativa</i> L.	X	
	<i>Zea mays</i> L.	X	
	<i>Triticum aestivum</i> L.	X	
	<i>Avena sativa</i> L.	X	
	<i>Hordeum vulgare</i> L.	X	
<i>C. pacificus</i>	<i>Medicago sativa</i> L.		X
	<i>Solanum tuberosum</i> L.		X
	<i>Beta vulgaris</i> L.		X
	<i>Larrea tridentata</i> (DC.) Coville		X
	<i>Lepidium thurberi</i> Wooton		X
<i>C. puellus</i>	<i>Abelia</i> sp.		X
	<i>Alnus glutinosa</i> (L.) Gaertn.		X
	<i>Amaranthus retroflexus</i> L.		X
	<i>Asclepias syriaca</i> L.		X
	<i>Deschampsia flexuosa</i> (L.) Trin.		X
	<i>Galinsoga parviflora</i> Cav.	X	
	<i>Medicago</i> sp.		X
	<i>Panicum capillare</i> L.	X	
	<i>Persicaria hydropiperoides</i> Michx.		X
	<i>Quercus stellata</i> Wangenh.		X
	<i>Salix nigra</i> Marshall		X
	<i>Sorghum bicolor</i> (L.) Moench		X
<i>Vitis</i> spp.		X	
<i>C. quadrispinosus</i>	<i>Phaseolus vulgaris</i> L.		X
	<i>Galactia elliottii</i> Nutt.		X

Species excluded from *Chionomus*

We considered eleven additional species for inclusion in *Chionomus*. *Delphacodes penepuella* Beamer is most likely closely allied with *Ribautodelphax* because of the crossed processes on segment X, although its coloration and shape of the parameres does not appear to match. *Delphacodes sagae* Beamer lacks key features of *Chionomus* such as the light mark at the scutellum apex and a dark spot at the apex of the clavus; it does have the strongly downward curve of the aedeagus and coloration consistent with *Falcotoya*. Similarly, *D. saxicola* Muir probably belongs in *Falcotoya*, although the bifurcating parameres may not be consistent with this genus. *Delphacodes concava* was placed in *Aethodelphax* by Bartlett & Hamilton (2011); the authors agree with this placement. *Delphacodes serrata* (Beamer) was recently moved to *Nothodelphax* (Bartlett *et al.* 2014). The placement of *Delphacodes silvae* Beamer is not clear, it has some general features similar to *Toya* (e.g., color, shape of the armature of the diaphragm), but it may also be allied with *Delphacodes acuministyla* Dozier (see Kennedy & Bartlett 2014). *Delphacodes quadridentis* Beamer is a pale species (as Beamer 1948b noted) resembling *Delphacodes acuministyla*, and lacking all the *Chionomus* coloration characteristics; while its genitalia bear similarities to *Chionomus*, it probably also belongs in a new genus allied with *D. acuministyla*. *Delphacodes ardentis* Beamer was recently synonymized with *Tagosodes*

wallacei (Muir and Giffard) (Bartlett *et al.* 2014). *Delphacodes securigera* Muir may be allied with *Tagosodes*, but probably belongs in a new genus. *Delphacodes mesada* Caldwell and *D. scolochloa* Cronin and Wilson were considered as part of this revision however, they are not *Chionomus* nor do they appear to fit into any other described New World genus.

Discussion

Eleven species are moved into the genus *Chionomus* for a total of 14 valid species. Three of the total species were placed in this taxon when it was originally described. Two species are newly described and nine are moved into *Chionomus* from *Delphacodes*. Additionally, four species are placed as junior synonyms—*D. dentis* Beamer and *D. vaccina* Caldwell are synonymized with *C. dissipatus* (Muir); *D. aculeata* Beamer with *C. puellus* (Van Duzee); and *D. arcuata* Beamer with *C. tenae* (Muir).

Members of *Chionomus* are most diverse in South America, with 10 of 14 species found in this area. Eight of the 14 species are known from more than one New World region. This work has greatly expanded the ranges for the majority of *Chionomus* species. It is now evident that most members of this taxon are widespread and seem to be well adapted for dispersal.

Plant associations for *Chionomus* species are summarized in Table 5. However, most of these records require verification. While only seven species of *Chionomus* have reported plant associations, members of this genus appear to be polyphagous, found predominantly on grasses or associated with crops. While adult specimens of *Chionomus* are abundant in collections, immatures are only reported for *C. bellicosus* (Wilson 1985).

The resultant Bayesian phylogenetic tree supports the monophyly of *Chionomus* as defined here. This tree provides insight into the relationships among members of *Chionomus*, as the topology shows the original three species in *Chionomus* (*C. havanae*, *C. balboae*, *C. haywardi*) are in fact paraphyletic. This tree recovers *C. havanae* and *C. balboae* as sisters, however, this branch is not as well supported as the *C. haywardi* + *C. pacificus* branch. The support for the *C. haywardi* + *C. pacificus* branch may indicate that the pale median vitta that these species possess is a homoplasy. This trait seems to be diagnostic within *Chionomus*, however it arises sporadically throughout the Delphacini. The presence of this feature among many Stenocraninae and Kelisiinae suggests that it may be a plesiomorphic trait or an adaptation in response to similar environments and/or selective pressures. *Chionomus tenae* is placed as basal in the group. Morphological features of the species further support this placement, specifically consistent coloration and a posteriorly projecting but poorly produced armature of the diaphragm. Further work is necessary to resolve the relationships among species of *Chionomus*. Specifically, taxon sampling needs to be more extensive, ideally all members of *Chionomus* will be sampled. However, the results of this work validate the proposed broader definition of *Chionomus*, supporting the morphological interpretations used to define the genus.

While *Chionomus* is not large, it is frequently collected when delphacids are targeted. The genus lacks a key to females. Additionally, while distributions can be inferred, more collecting is needed to confirm them. The work presented here lays the foundation for further investigations of the ecology and evolution of *Chionomus*.

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APPENDIX 1. Other Material Examined. (all non-type specimens)

Chionomus balboae

United States: Florida: Putnam Co., 3mi E Melrose, K. Ordway Preserve, 16-VII-1998, C.W. O'Brien & P. Kovarik, (LBOB, 3m ♂). **Cayman Islands:** Cayman Brac: The Creek, 27 Dec 1995, C. R. Dilbert (NCSU, 1 ♂). Grand Cayman: Grand Cayman, 17 Dec 1980, MEC Giglioli (UCDC, 1 ♂). **Mexico:** Campeche: 9-VIII-1974, L.B. O'Brien (LBOB, 23m ♂; UDCC, 4 ♂); 4-VIII-1974, L.B. O'Brien (LBOB, 2m ♂). Jalisco: 20 mi W of Tecolotian, 15-IX-1938, L.J. Lipovsky (SEMC 3b ♂). Mexico City: Mexico City area, 1940s, D.M. DeLong (UKYC, 3 ♂). Sinaloa: Los Mochis, 20-VII-1922, CT Dodds (CASC, 3m ♂). Tamaulipas: 25 mi N Ciudad Mante, nacimiento del Rio Fro, 31 Jul 1970, C. W. O'Brien, Light Trap (UDCC, 1 ♂). Veracruz: 3 mi W Coatzacoalcos, 26-VI-1971, Ward & Brothers (LBOB, 9m ♂); Coatepec 4100ft. K-342, 14 Oct 1945, D. M. DeLong (UKYC, 9 ♂); Cumbres, 12 Oct 1945, D. M. DeLong (UKYC, 1 ♂); Fortin de las Flores nr. microondas sta., 31 Oct 1982, J. Huber (UDCC, 1 ♂). **Belize:** Cayo District: nr. Teakettle Bank, Pooks Hill, 5-VII-2003, CR Bartlett (UDCC, 1m ♂); Western Highway Mile 66, 15-VI-1968, C. & D. Hasse (LBOB, 1m ♂); same, 07-VII-1969, W. and D. Hasse, Light Trap (LBOB, 1 ♂). Orange Walk: Rio Bravo Res. Sta., 10-13-VI-1991, P.H. Freytag (LBOB, 5 ♂); Rio Bravo Cons. Area, Mahogany Trail, 10-VII-1996, C.W. & L.B. O'Brien (LBOB, 1m ♂); Rio Bravo Cons. Area, Hdqrtrs, 11-VII-1996, L.B. O'Brien (LBOB, 1m ♂); Orange Walk Town, 16-VII-1968, W.L. Hasse (LBOB, 1m ♂). Stann Creek: Cockscomb Basin, 12-VI-1991, Tom Myers (LBOB, 4 ♂). Toledo: Rio Temash[h], Sep 1937, A. J. White (NCSU, 2 ♂); Rio Temash, Aug 1937, A. J. White (UDCC, 1 ♂). **Guatemala:** Quetzaltenango: Fuentes Georginas, Volcan Zunil, 8km SE Zunil, 16-II-2007, AT Gonzon & R Donovall (UDCC, 1b ♂). Sacatepequez: Finca Salinas, 29 Jun 1980, J. Schuster (FSCA, 1 ♂). **Honduras:** Comayagua: Comayagua, 1-VIII-1966, J.M. Matta (LBOB, 1m ♂); Siguatepeque, 22 Sep 1966, J.M. Matta, Light Trap (FSCA, 1 ♂). Francisco Morazan: Zamorano, 27 Oct 1966, F. S. Blanton, Light Trap (FSCA, 1 ♂). **Costa Rica:** Cartago: Tapanti National Park, Kirilodge Trail, 13-20 Jul 2011, K. Weglarz (UDCC, 1 ♂). Heredia: Puerto Viejo Dist.; La Selva Biological Station, 10.431°N 84.00349°W, 27 Jan 2012, A.M. Deczynski (UDCC, 1 ♀). Puntarenas: Res. For. Golfo Dulce, 3 km SW Rincon, Dec 1989–Mar 1990, Hanson (LBOB, 1 ♂). **Panama:** Canal Zone: Coco Solo Hosp[ital]., 29-V-1975, D. Engleman, Light trap (LBOB, 1m ♂). Panama: Tocumen, 06-10 Jul 1970,

D. Navas (FSCA, 1 ♂); La Jolla, 26 Apr 1951, F. S. Blanton (USNM, 1m ♂). **Panamá Oeste:** Nueva Gorgano, 16-IX-1952, FS Blanton (USNM, 1m ♂); El Espino, 18 Sep 1952, F. S. Blanton (USNM, 1m ♂); Palm Beach nr San Carlos, 07 Oct 1952, F. S. Blanton (USNM, 1m ♂). **Colombia:** Meta: Puerto Lopez, 09 Mar 1971, S.S. Roback (USNM, 2 ♂). **French Guiana:** Guyane: 8 km W. Risquetout, 10-11-VI-2005, J. E. Eger (LBOB, 5m ♂; UDCC 1 ♂); 14km E of N2 on rd to Dégrad Corrèze, 6-XII-2002, J.E. Eger (LBOB, 2m ♂); Amazon Nature Lodge, 30 km SE of Roura on Kew Road, 02-08 Jun 2005, J. E. Eger & M. T. Messenger (UDCC, 1 ♂). **Venezuela:** Amazonas: Aqua Linda R., 18-20 Jun 2000, P. Freytag, 1;m (UDCC, 1 ♂); Apure: Hato El Frio, 26 km W El Saman de Apure, 104 m, 24 Jul 1988, C. W. and L. O'Brien and G. Wibmer (LBOB, 1m ♂). Aragua: *Girardot Co.*, Rancho Grande, 14 Jul 1979, R. W. Brooks, A. A. Grigarick, J. McLaughlin, and R. O. Schuster (CSAC, 1m ♂). Guanare: Estado Portuguesa, 10 Sep 1957–13 Sep 1957, Borys Malkin (CASC, 2m ♂). **Ecuador:** Napo: Limoncocha, on Tio Napo, 14-I-1974, Boyce A. Drummond, III (LBOB, 1m ♂). Tungurahua: Runtun Val., 22-XI-1938, F.M. & H. H. Brown (SEMC, 6b ♂). **Brazil:** Amazonas: Lac Redondo, 07 Oct 1963, G. Marlier (ISNB, 3 ♂); Manaus, 20 Oct 1963, G. Marlier (ISNB, 1 ♂). Pará: Belem, VII-1954, NLH Krauss (USNM, 1m ♂). Rio de Janeiro: Iguabinha, 14 Feb 1989, N. Ferreira (UFRRJ, 1 ♂); Restinga de Maricá, 19 Jul 1985, R. Iglesias (UFRRJ, 1 ♂); 16 Aug 1985, R. Monteiro (UFRRJ, 2 ♂); 14 Sep 1985, J. Miranda (UFRRJ, 2 ♂); 25 Oct 1987, L. BoaNova (UFRRJ, 2 ♂). Rondonia: 62 km SW Ariquemes, Fzda Rancho Grande, 5-17-X-1993, J.E. Eger (LBOB, 2m ♂); same, 8-24-IX-1994, J.E. Eger (LBOB, 1m ♂); same, 3-15-XII-1996, J.E. Eger [light trap] (LBOB, 4m ♂, 1b ♂; UDCC, 2 ♂); same, 04-16 Nov 1997, J.E. Eger (LBOB, 5 ♂). Santa Catarina: Nova Tenonia, 13-XII-1949, F. Plaumann (SEMC, 1m ♂). **Bolivia:** Cochabamba: Pto. S. Francisco, 19mi NW Villa Tunari, 1-IV-1978, C.W. & L.B. O'Brien & G.B. Marshall (LBOB, 1m ♂); Villa Tunari, Chapare, 19 Oct 1959, R. B. Cumming (FSCA, 1 ♂). Santa Cruz: 38 km S. Santa Cruz de la Sierra, Ingenio La Delgica, 19-I-1980, L.A. Stange (LBOB, 2m ♂); 10 mi W Portachuelo, 11-IV-1978, GB Marshall (LBOB, 1m ♂); 10 mi W Portachuelo, 27 Mar 1978, G.B. Marshall, Light Trap (LBOB, 1 ♂); S.C., Saavedra Res. Sta., 23-III-1978, CW & LB O'Brien (LBOB, 1m ♂); Santa Cruz Est. Exp. Saavedra, 9-VIII-1980, D. Foster (UDCC, 1m ♂); Santa Cruz., 5 km SSE Buena Vista Hotel Flora & Fauna, 17-II-2007, C.W. & L.B. O'Brien (LBOB, 1m ♂); 1 km S Montero, Muyurina, 22 Sep 1959, R. B. Cumming (FSCA, 1 ♂); Potrerillos del Guenda Prs. Natural, 370 m, 01-04 Oct 2007, Wappes & Morris (UDCC, 2 ♂); same, 12-13 Oct 2007, Cline & Wappes (UDCC, 2 ♂); same, 17-22 Oct 2007, J. & F. Romero (UDCC, 20 ♂); Refugia los Volcanes, 06 Oct 2007, J. E. Wappes (UDCC, 7 ♂); San Esteban, Muyurina, 49 km. N. of Santa Cruz, 341 m, 09 Nov 1959, R. B. Cumming (FSCA, 2 ♂); Santa Cruz, 19 Aug 1980, D. Foster, Light Trap (UDCC, 2 ♂). **Paraguay:** Central: 3km E Ypacarai, 7-X-1968, C.W. & L. O'Brien (LBOB, 2m ♂) San Lorenzo, 6-VII-1968, C. & C.W. O'Brien (LBOB, 1m ♂). Cordillera: 7 km W Caacupé, 6-VII-1968, L. & C.W. O'Brien (LBOB, 1m ♂). Guaira: Col. Independencia Villarrica, X-1951, F.H. Shade (SEMC, 1m ♂). Presidente Hayes: B. Acerval, 12-X-1968, C.W. & L. O'Brien (LBOB, 1m ♂). **Uruguay:** Colonia: Rte. 21, km 184, Piedra de los Indios, 07 Feb 2014, G. J. Wibmer (UDCC, 1 ♂). **Argentina:** Chaco: P[arque] N[acional] Chaco, 10-I-2008, C.H. Dietrich (INHS, 2m ♂). Corrientes: P.N. Mburucuyá, 0.5 km N campgd, 8-I-2008, C.H. Dietrich (INHS, 3m ♂); same, 9-I-2008, C.H. Dietrich (INHS, 1m ♂); P.N. Mburucuyá, 1.3 km N campgd, 8-10-I-2008, Dietrich *et al* (INHS, 1m ♂); P.N. Mburucuya, 2.4 km W campground, 08.i.2008, L. Barbosa (INHS, 1 ♂). Misiones: Pto.[Puerto] Iguazú Viejo Amer. Campgd., 7-I-2008, C.H. Dietrich (INHS, 1m ♂). Santa Fe: Villa Guillermina, II-1946, Willink & Hayward (SEMC, 1m ♂).

Chionomus bellicosus

United States: California: *Butte Co.*, Chico, 20-V-1981, SW Wilson (UDCC, CMSU, USNM; 3m ♂); 27 May 1981, S. W. Wilson (BMNH, 1 ♂); *Humboldt Co.*, Eureka, 14 Jun 1978, N.L.H. Krauss (AMNH, 1 ♂).

Chionomus dissipatus

United States: Florida: *Monroe, Co.*, Middle keys, US Rt 1, Marathon Holiday Inn, 10-Jan-2006, AT Gonzon (UDCC, CMSU, 7m ♂). Louisiana: *East Baton Rouge*, 3 mi N of Baton Rouge on Hwy 61, 30.50412°N 91.14252°W, 17 May 1993, J. W. Tesmer (LSCU, 1 ♂); Baton Rouge, 11 Oct 1975, (LSCU, 3 ♂); same, 01 Oct 1979 (LSCU, 1 ♂). **Bahamas:** Long Island: Deadmans Cay, 11 Mar 1953, E.B. Hayden (UDCC, 1 ♂). **Puerto Rico:** Lajas: Lajas, Sep-Nov 1960, M. Beauchamp (USNM, 3m ♂, 1m ♀). **Cayman Islands:** Cayman Brac: The Creek, 8-XII-1995, CR Dilbert (LBOB, 4m ♂). Grand Cayman: Grand Cayman, 30 Nov 1982, MEC Giglioli (CSCA, 1 ♂); 02 Dec 1982, MEC Giglioli (CSCA, 1 ♂). **Jamaica:** Portland Parish: Caenwood, 01 Mar 1981 (BMNH, 1 ♂). **Mexico:** “Br. Tex.”, II-20-5 (USNM, 1m ♂). Puebla: Necaxa Co., 26 Oct 1945, D.M. DeLong (UKCY, 1 ♂). Veracruz: Coatepec, 1250 m, 14 Oct 1945, D. M. DeLong (UKCY, 1 ♂). **Honduras:** Atlántida: [Jardín botánico] Lancetilla, Aug (NCSU, 2m ♂). **Panama:** Canal Zone: Fort Clayton, Sept 8-15, 1978, H.J. Harlan (LBOB, 2m ♂); Mojinga Sw[am]p, 30 Jun 1952, F. S. Blanton (USNM, 1 ♂). Darién: Patino, 19-VII-52, FS Blanton (USNM, 1m ♂). **Venezuela:** Amazonas: [?] Aqua Linda R., 18-20.vi.2000, P. Freytag (UDCC, 1m ♂). Aragua: Cagua, 25-XI-1975, CK and GF Smith (NCSU, 1m ♂). Mérida: Merida Libertador VII 3 1979, R.W. Brooks, A.A. Grigarick, J. McLaughlin, R.O. Schuster (CSAC, 1m ♂). **Brazil:** Santa Catarina: Nova Tentonia, 8 Catarina, May, 18, 1945, Remett Piaomann (NCSU, 1m ♂).

Chionomus gluciophilus

Guatemala: Quetzaltenango: Fuentes Geoginas, Volcan Zunil, AT Gonzon R Donovall, 16.ii.2007 (UDCC, 1m ♂). Suchitepequez: Reserve Los Tarrales Volcan Atitlan, 14.52389°N 91.13528°W, 709 m, 11 Feb 2007, J. R. Cryan & J. Richards, Light Trap (UDCC, 1 ♂). **Costa Rica:** San José: San Pedro de Montes de Oca, 4-XII-1936, CH Ballou (USNM, 2m ♂, 3m ♀); 26 km N Sanluisidro, III-V-1992, P. Hansons & C. Godoy (LBOB, 1m ♂, 1b ♂). **Colombia:** Antioquia: Sonson, 16-XI-1955, L. Pesada (USNM, 2m ♂). **Ecuador:** Azuay: Gualaceo, VII-30-1954, H.R. Yurist (USNM, 1m ♂).

Chionomus havanae

United States: Florida: Baker Co., near Sanderson, 25 Jul 2000, C. R. Bartlett (UDCC, 1 ♂). Broward Co., Ft. Lauderdale, 14 Mar. 1975, NL Woodiel (UDCC, 1m ♂). Collier Co., Fatahachee Strand St. Res., 18 May 1998, C.W. O'Brien (LBOB, 1m ♂). Highlands Co., Archbold Biological Station, Lake Placid, 27.18833°N 81.33778°W, 21 Jan 2002, C. R. Bartlett (UDCC, 2 ♂). Miami-Dade Co., Airport Fumigation Site, 25.79966°N 80.30733°W, 10 Sep 2009, T. Dobbs, Light Trap (UDCC, 1 ♂). **Puerto Rico:** Añasco: Añasco, Julio 1961, J. Maldonado C. (USNM, 1 ♂). Bayamon: Bayamon, Jan 1899, Aug Busck (USNM, 2 ♂). Guayanilla, Guavanilla, IX-XI-1969, E. Murphy (USNM, 1m ♂). Humacao: Rio Piedras, 20 Nov 1947, J. S. Caldwell (USNM, 1 ♂); same, 23 Nov 1947 (USNM, 1 ♂). Maricao: fish hatchery, 08-11 Aug 1961 (USNM, 1 ♂). Mayagüez: Mayagüez, 3-4-VIII-1955, J.A. Ramos (LBOB, 2m ♂). Ponce: Ponce, 14 Nov 1947 (USNM, 1 ♂). **Mona Island**: Mona Island, 17-28 Apr 1954, J. Maldonado (USNM, 1 ♂). **Cayman Islands:** Cayman Brac: The Creek, 6-XII-1995, C.R. Dilbert (UDCC, 1m ♂); The Creek, 27-XII-1995, C.R. Dilbert (UDCC, 2m ♂); The Creek, 28-XII-1995, C.R. Dilbert (LBOB, 1m ♂). **Guadeloupe**: Duclos, 25 Jun 1971, J.A. Slater, R.M. Baranowski, J.E. Harrington (UCMS, 1 ♂). **Mexico:** Campeche: Campeche, 4-VIII-1974, L.B. O'Brien (LBOB, 2m ♂); same, 09 Aug 1974, L. B. O'Brien, Light Trap (LBOB, 2b ♂). Chiapas: 3 km S Palenque on Hwy 199, 21-22 May 1987, D. A Rider, E.G. & T. J. Riley (LBOB, UDCC, 3 ♂). Mexico City: Mexico City area, 1940s, D.M. DeLong (UKYC, 2 ♂). Oaxaca: 1.5 mi E Zopilote, near Pan-American Highway, 05 Jun 1987, W.B. Warner (LBOB, 1 ♂); Juchitan, 17 mi E Oaxaca, 08 Jul 1953, University of Kansas Mexico Expedition (SEMC, 1m ♂). Tamaulipas: ca. 25mi N. C. Monte. Nacimiento del Rio Frio Tam, 31-VII-1970, C.W. O'Brien, light trap (LBOB, 1m ♂). Veracruz: 3 mi W Coatzacoalcos, 26-VI-1971, Ward & Brothers (LBOB, UDCC, 11m ♂); 250' Los Tuxtlas, Biological Station UNAM, 20-V-1983, C&L O'Brien & G Marshall, light trap (LBOB, 3m ♂); same, 21 May 1983, C. W. & L. B. O'Brien & G. B. Marshall, Light Trap (LBOB, 1 ♂); same, 17 May 1983, C. W. & L. B. O'Brien & G. B. Marshall, Light Trap (LBOB, 1 ♂); Cotaxtla Exp. Sta., 23 Jun 1962, D. H. Janzen (UDCC, 2 ♂); Fortin de las Flores-sumidero, Planta de la cerveceria, Ing. Daniel Rabago res., 27-28 Apr 1965, H. V. Weems, Jr. (FSCA, 1 ♂). Yucatan: 15 mi E Chichenltza, 7-VIII-1974, C.W.&L. O'Brien & Marshall (LBOB, 1m ♂). **Belize:** Belize: Mile 15, Western Highway, 08 Jun 1968, W.L. Hasse, Light Trap (1 ♂, UDCC). Orange Walk: Rio Bravo Cons. Area, Research Station, 13 Oct 1991, P. H. Freytag (7m ♂, LBOB, 2 ♂ UDCC); Rio Bravo Conservation Area Headquarters, 08 Jul 1996, L. B. O'Brien (1m ♂, LBOB); same, 13 Jul 1996, L. B. O'Brien (1m ♂ LBOB); Rio Bravo Conservation Area Mahogany Trail, 19 Jul 1996, L. B. & C. W. O'Brien (1m ♂ LBOB). Stann Creek: Cockscombe Basin, 12 Jun 1991, T. Myers, Light Trap (17 ♂, LBOB, 1 ♂ UDCC); near Armenia at River, Hummingbird Highway, 07 Jan 2003, C. R. Bartlett, Light Trap (1 ♂, UDCC). Toledo: Blue Creek Village, 35 m, 26 May 1999, J. Shuey (1m ♂, LBOB); Rio Temas[h], July 1937, A. J. White (1m ♂, NCSU). **Honduras:** Atlantida: Tela, 15-III-1936, John Deal (SEMC, 1m ♂); Lancetilla, nr. Tela, 19-VI-1979, J.A. Chemsak, A.&M. Michelbacher, W.W. Middlekauff (UDCC, 1m ♂, 2m ♀). Choluteca: 14 mi NW Choluteca, 16-VI-1974, L.B. O'Brien (LBOB, 2m ♂). Comayagua: Comayagua, 10 Oct 1966, J.M. Matta, Light Trap (FSCA, 3 ♂). Cortes: La Lima United Fruit Co., 3-VI-1964, F.S. Blanton, A.B. Broce, R.E. Woodruff (LBOB, 1m ♂). Francisco Morazan: Zomorano, 3-IX-1964, G.A. Axtell (CSAC, 2m ♂). **Nicaragua:** Granada: 2 mi. W. Nandaime, 13 Jul 1974, L. B. O'Brien (UDCC, 1 ♂). **Costa Rica:** Cartago: Turrialba, 20-VI-1974, L.B. O'Brien (LBOB, 1m ♂); Turrialba, 17-20-VIII-1969, R.E. Woodruff (LBOB, 1m ♂). Guanacaste: Est. Exp. Enrique Jimenez Munez, 15 Jun 1992, F. Parker (UDCC, 2 ♂); Nicoya Pen. Nandayure nr. Carmona, Crocodile Lake, 10.05861°N 85.24028°W, 34 m, 15 Jan 2003, W Porras, A Short, RE Roughley (UDCC, 1 ♂). Heredia: nr Puerto Viejo, La Selva Biological Station, 19-VIII-2003, CR Bartlett (UDCC, 17m ♂); same, 15 Aug 2003, C.R Bartlett, J. Cryan and J. Urban (UDCC, 74 ♂, 11 ♀); same, 16 Aug 2003, C.R Bartlett, J. Cryan and J. Urban (UDCC, 29 ♂, 1 ♀); same, 17 Aug 2003, C.R Bartlett, J. Cryan and J. Urban (UDCC, 36 ♂); same, 18-19 Aug 2003, C.R Bartlett, J. Cryan and J. Urban (UDCC, ANSP, 56 ♂, 3 ♀); same, 20 Aug 2003, C.R Bartlett, J. Cryan and J. Urban (UDCC, 9 ♂); same, 23 Feb 2004–02 Mar 2004, C.R Bartlett, J. Cryan and J. Urban (UDCC, ANSP, 20 ♂, 2 ♀); same, 14 Feb 2005, A. E. Z. Short (UDCC, 18 ♂). Limon: Guayabo, 19km NE Turrialba, 11-IX-1998, C.W.&L.B. O'Brien (LBOB, UDCC, 3m ♂). **Panama:** Canal Zone: Barro Colorado Is[land], 7-VIII-1967, C.W. & L. O'Brien (LBOB, 1m ♂); Coco Solo Hosp[ital], 29-V-1975, D. Engleman (LBOB, 1m ♂). Colon: Gamboa Chagas R., 30-VI-1974, L.B. O'Brien (LBOB, 1m ♂). Panama: Fort Clayton, 8-15-IX-1978, H.J. Harlan (LBOB, 2m ♂); Las Cumbres, 4-VII-1974, C.W.&L.B. O'Brien & Marshall (LBOB, 1m ♂); Las Cumbres, 16-VII-1971, M Daykin (CSAC, 2m ♂);

Las Cumbres, 28-VII-1971, M Daykin (CSAC, 1m ♂); Tocumen, 06-10 Jul 1970, D. Navas (FSCA, 2 ♂); Cardenas Village, 10 May 1969, F. G. Thompson (FSCA, 1 ♂). **Colombia:** Valle: Mun. Candelaria Finca San Luis, 3-5.III.1975, R. C. Wilkerson (LBOB, 2m ♂). **Trinidad:** Saint George Co.: Curepe, Santa Margarita Circular Rd, 5-VII-1972, F.D. Bennett (LBOB, 1m ♂); not specified, A. Busck (USNM, 1 ♂). **Venezuela:** Apure: Apure, near San Fernando de Apure, 20-VI-2000, P.M. Freytag, M.A. Gaiani, Q. Arias (UDCC, 1m ♂). **Brazil:** Amazonas: Manaus, 24 Jun 1964, G. Marlier, Light Trap (ISNB, 1 ♂). Para: Obidos [a bord, Croisierre du Mercator], 13 Jan 1936, Light Trap (ISNB, 5 ♂). Rio de Janeiro: Restinga de Maricá, 13 Sep 1985, R. Iglesias (UFRRJ, 1 ♂). Rondonia: 62 km SW Ariquemes, Fzda Rancho Grande, 3-15-XII-1996, JE Eger (LBOB, 4m ♂); same, 4-16-XI-1997, JE Eger (LBOB, 10m ♂); same, 19-21-XI-1997, U. Schmitz (LBOB, 1m ♂); 28 Nov 1992, U. Schmitz (UDCC, 2 ♂); same, 8-20-XI-1994, JE Eger (LBOB, 1m ♂). Sao Paulo: Piracocaba, 20-I-1966, CA Triplehorn, Light Trap (UDCC, 1m ♂). **Ecuador:** Orellana: Yasuni National Park, 0.66799°S 76.38573°W, 26 Apr 2005, C. R. Bartlett, N. Nazdrowicz, and D. Chang (UDCC, 2 ♂); same, 27 Apr 2005, C. R. Bartlett, N. Nazdrowicz, and D. Chang (UDCC, 1 ♂); same, 25 May 2005, C. R. Bartlett, N. Nazdrowicz, and D. Chang (UDCC, 1 ♂). **Peru:** Huanuco: Leoncio Prado Co.: Tingo Maria, 11 Aug 1985–12 Aug 1985, J. F. Cornell, Light Trap (UDCC, 2 ♂). Loreto: Maynas, Iquitos, km. 5 marine road, 24 Nov 1972, H. Wolda (LBOB, 2 ♂). Pasco: Villa Rica, 21-X-2002, C.J. Dietrich (INHS, 3b ♂); 3 km Tournavista Rd., 34 km W Pucallpa, XII-1971, R.T. & J.C. Schuh (UDCC, 2m ♂, 1m ♀). Ucayali: Km 3 Tournavista Rd., 34 km W Pucallpa, Dec 1971, R. T. & J. C. Schuh (UDCC, 2 ♂, 1 ♀). **Bolivia:** Santa Cruz: 3.7km SSE Buena Vista, Hotel Flora y Fauna, (14-28) Oct 2000, MC Thomas (UDCC, 1m ♂); 10mi W Portachuelo, 27 Mar. 1978, C.W. O'Brien (LBOB, 1m ♂); Saavedra Res. Sta, 25 Mar 1978, C. Ward & CW. O'Brien (LBOB, 1m ♂). **Argentina:** Santa Fe: Rio de la Plata (a 50 km de Rosario), (04-05) Nov 1928, Ch. Michel, Light Trap (2 ♂, ISNB).

Chionomus haywardi

Argentina: Buenos Aires: ca. Reserva Otamendi, 23-I-2008, CH Dietrich (INHS, 4m ♂); same, 24-I-2008, CH Dietrich (INHS, 1m ♂); 2 km N La Plata, 23-I-2008 (INHS, 1m ♂); 3 km N La Plata 27-I-2008, CH Dietrich (INHS, 2m ♂). Chaco: P.N. Chaco, 10-I-2008, CH Dietrich (INHS, 2m ♂). Corrientes: 3km W San Cosme, 18-I-1989, C&L O'Brien & G. Wibmer (LBOB, 1m ♂). Entre Ríos: Federación, Siriri Campgd, 4-I-2008, CH Dietrich (INHS, 3m ♂); rt 14 km 43, 24-I-2008, CH Dietrich (INHS, 2m ♂). **Paraguay:** Cordillera: 7 km W. Caacupe, 06 Jul 1968, C. W. and L. B. O'Brien (LBOB, 1 ♂).

Chionomus pacificus

United States: Arizona: Cochise Co.: Huachuca Mts., Upper Garden Cyn Picnic Area, 21-VII-2009, C.W. O'Brien (UDCC, 1m ♂); Garden Canyon, upper picnic area, 31.41967°N 110.31667°W, 08 May 2008, C. W. O'Brien (UDCC, 8 ♂, 1 ♀); Rustler Park, Chiricahua Mountains, 05 Sep 2007, C. W. and L. B. O'Brien (UDCC, 1 ♂); Ash Creek, 28-VII-2003, AL Park (UDCC, 10m ♂, 13m ♀); Bagby Rd. 0.2 mi W. Central Hwy., 25 Feb–10 Apr 2012, W.B. Warner (UDCC, 1 ♂); Bisbee; 1429 Franklin St., 08-15 Jul 2012, A.S. Menke (UDCC, 1 ♂); San Bernardino National Wildlife Refuge, North Pond, 28 Apr 2011, C. W. O'Brien (UDCC, 1 ♂, 1 ♀); San Bernardino National Wildlife Refuge, old trailer parking, 28 Apr 2011, C. W. O'Brien (UDCC, 1 ♂). Graham Co.: Graham Mts, 15-VI-1914, E.G. Holt (USNM, 1m ♂); Graham Mts, 25-VI-1914, E.G. Holt (USNM, 1m ♂). Maricopa Co.: Higley, 23-XI-2000, S.N. Johnson (BYUC, 1m ♂); Higley, 25-XI-2000, S.N. Johnson (BYUC, 2m ♂); Mesa, 12-19.VI.1959, M.W. Nielson, alfalfa (BYUC, 1m ♂); East end of Apache Lake, 01 Apr 1959, M. Wible (CMNH, 1 ♂); Phoenix, 25 May 1902 (USNM, 1 ♂); Wickenburg, 05 Jul 1950, R. H. Beamer (SEMC, 1 ♂). Pima Co.: Tucson, 17-VII-1967, M.W. Nielson (BYUC, 1m ♂, 2m ♀); Green Valley, 25 Aug 2007, J. Brambila (UDCC, 1 ♂); same, 25 Aug 2007, C. W. O'Brien & W. Tang (UDCC, 1 ♂); same, 30 Aug 2007, C. W. O'Brien & W. Tang (UDCC, 1 ♂); Santa Catalina Mts., Htek Hwy, MP 8, 03 May 1995, Olson, Singer, Mathison (UDCC, 1 ♂); Tucson, Rillito River Basin, Bet Campbell Avenue & River Road, 10 Sep 2004, M. Huang (UAIC, 1 ♂). Santa Cruz Co.: Patagonia, 7-IX-1929, E.D. Ball (USNM, 1m ♂, 1m ♀); 2 mi S of Canelo Pass, 31, 14 Sep 2007, C. W. O'Brien (UDCC, 1 ♂); Little Outfit Ranch, 26 Sep 2008, C. W. O'Brien (UDCC, 4 ♂, 3 ♀); same, 27 Sep 2008, C. W. O'Brien (UDCC, 2 ♂). Little Outfit Ranch, shore around pond, 27 Sep 2008 (UDCC, 1 ♀); Peña Blanca Lake, Boat Ramp Area, 05 Jun 2005, L. B. & C. W. O'Brien (UDCC, 2 ♂). Yavapai Co.: Granite Dells, 10 Aug 1967, D. A. Young (NCSU, 1 ♂). Arkansas: Garland Co.: Hot Springs Nat'l Park, 6-X-1963, BC Marshall (USNM, 1m ♂); Hot Springs Nat'l Park, 11-X-1963, BC Marshall (USNM, 1m ♀). California: Los Angeles Co.: Whittier, 13 Aug 1920, Timberlake, grass (UCRC, 1u). Riverside Co.: University of California at Riverside, 14 Jul 1965, Timberlake (UCRC, 1 ♀). San Diego Co.: Wild Cat Canyon, 16 Nov 1906, J. C. Bradley (NCSU, 1 ♂). Santa Cruz Co.: Canelo Hills Cienego Res., Hwy 83 mi. 16, 16 Jul 2007, C. W. O'Brien (UDCC, 1 ♂). County not specified, "Cala", CF Baker (USNM, 1m ♂). Colorado: Jackson Co.: Gould, 10 Aug 1965, J. T. Medler (WIRC, 1 ♀). Larimer Co.: Virginia Dale, 26 May 2005, S. M. Clark (BYUC, 1 ♂). Florida: Jefferson Co.: 2 mi S Wacissa, 27-VII-2000, C.R. Bartlett (UDCC, 1m ♂); 4 mi S Wacissa, 27-VII-2000, C.W. O'Brien (LBOB, 1m ♂). Lee Co.: Fort Myers, 18 Sep 1957, J. P. Kramer (USNM, 1 ♀). Georgia: Peach Co.: Ft. Valley, 9-VI-1945, Turner (USNM, 1m ♂). Kansas:

Meade Co., Meade County, 14 Aug 1945, R. H. Beamer (SEMC, 1 ♂). *Riley Co.*, Manhattan, 16-IV-1929, D.A. Wilbur (USNM, 1m ♂). **Louisiana**: *Sabine Par.*, Many, 17 Aug 2000, A. J. Ames (BYUC, 1 ♂). *St. Martin Par.*, JCT I-10 & PR 352, 1-X-1992, J.T. McBride (LSAM, 1m ♂). **Mississippi**: *Bolivar Co.*, 02 Aug 1960 (MEMU, 1 ♂). *Oktibbeha Co.*, Mississippi State University (Agr. Col.), Nov 1895, H. E. Weed (MEMU, 1 ♂). *Sunflower Co.*, 29 Jul 1960 (MEMU, 1 ♂). *Washington Co.*, 18 Aug 1960 (MEMU, 1 ♂). **New Mexico**: *Catron Co.*: Gila R. Cliff, 25 Jun 1954, W. W. Wirth (USNM, 2 ♂). *Dona Ana Co.*, I-10W Welcome Center, 01 May 2010, M. J. Rothschild, *Larrea tridentata* (UDCC, 1 ♂, 1 ♀); Las Cruces, 12-VI-1950, B.H. Beamer (SEMC, 1m ♂). *Hidalgo Co.*: Skeleton Canyon, 16 Aug 1968, J. B. Heppner, *Lepidium thurberi* (FSCA, 1 ♀); *Sierra Co.*, Truth or Consequences Park, off S. Cedar Street, 33.12916°N 107.24944°W, 21 Jun 2009, C. R. Bartlett, *Larrea tridentata* (UDCC, 1 ♂). **Nevada**: *Nye Co.*, Mercury, Brigham Young University AEC Nevada Test Site, 22 Jul 1965 (USNM, 1 ♀). **North Carolina**: *Haywood Co.*, GSMNP Cataloochee ATBI Plot, 35.58611°N 80.08167°W, (20-VIII)-(11-IX)-2001, I. C. Stocks (UDCC, 1m ♂). *Swain Co.*, GSMNP Clingman's Dome Rd. Site #2, 35.5675°N 83.47388°W, 1807 m, 30-VII-2003, CR Bartlett, D Nonne, A Gonzon (UDCC, 2m ♂). *Wake Co.*, Raleigh Marcom St., 35.77936°N 78.68764°W 19-VII-2000, CR Bartlett (UDCC, 1m ♂). **Oklahoma**: *Cleveland Co.*, Norman, 10-15 Nov 1976, William D. Shepard (OSEC, 1u). *Payne Co.*, Stillwater, 14 Aug 1976, J. W. Johnson (OSEC, 1 ♂). **South Carolina**: *Clemson*, 14-X-1955, David Dunacan (USNM, 1m ♂). **Texas**: *Brooks Co.*, 10 mi S of Falfurrias on Highway 281 26 Oct 2010, C. Grinter & D. Wikle (CASC, 1 ♀). *Brown Co.*, Brownwood, R.H. Painter (USNM, 1m ♂); Del Rio, 25-V-1912, JD Mitchell (USNM, 1m ♂). *Cameron Co.*, Cameron County, 13 Apr 1989, R. L. Meagher (BMNH, 1 ♂); Harlingen, 12-III-1945, D.E. Hardy (USNM, 1m ♂); Harlingen, 15-III-1945, D.E. Hardy (USNM, 1m ♂). *El Paso Co.*, Franklin Mountains, along Loop 375 near Wilderness Park Museum, 04 Oct 1997, R. Worthington (UDCC, 1 ♂); Hueco Mountains, Hueco Tanks State Historic Park, 17 Oct 1996, R. Worthington (UDCC, 1 ♂, 1u). *Hudspeth Co.*, Indio Mountains, Double Tank Corral, 12 Oct 1996, R. Worthington (UDCC, 1 ♂). *Jeff Davis Co.*, Ft. Davis, 16 Jul 1988, R. Morris (LBOB, 1 ♂). *Kendall Co.*, Boerne City Park, 30 Oct 2010, A. Vasquez, M. Leyva, D. Campos, and A. Aguina (UDCC, 1 ♂). *Maverick Co.*, Quemado, 14 Apr 1949, Michener and Beamer (SEMC, 1 ♂). *Nueces Co.*, Robstown (LSAM, 4m ♂, 2m ♀). *Val Verde Co.*, Del Rio, 25 May 1912, J. D. Mitchell (USNM, 1 ♂). **Utah**: *Washington Co.*, Hurricane, 18-VI-1935, G.F. Knowlton (USNM, 1m ♂). **Wisconsin**: *Dane Co.*, Mazomanie, 23 Aug 1989 (WIRC, 2 ♂). **Jamaica**: Black River, 24 Feb 1937, Chapin and Blackwelder (USNM, 1 ♂). **Mexico**: **Chiapas**: Sanches Ranch, Las Rosas, 12 Mar 1953, R. F. Smith and E. I. Schlinger, *Medicago saliva* (FSCA, 1 ♂). **Chihuahua**: 55mi SW Ciudad. Juarez, 25-XIII-1986, M.W. Nielson (BYUC, 8m ♂, 6m ♀); Cuiteco, 1-VIII-1969, TA Sears, RC Gardiner, CS Glaser (CDAE, 1m ♂); Chihuahua, 12 Jul 1938, L.J. Lipovsky, 1; (NCSU, 1 ♂). **Durango**: Rt. 45 31mi N Durango, 28-X, 1995, C.H. Dietrich (UDCC, 1m ♂). **Hidalgo**: Hwy. 45, 10 mi. W. Huichapan, 2423 m, 26 Jul 1982, C. W. and L. O'Brien and G. Wibmer (UDCC, 1 ♂). **Jalisco**: 20mi W of Tecolotlan, 15-IX-1938, L.J. Lipovsky (SEMC, 23m ♂, 10b ♂); Guadalajara, 17 Sep 1938, L. J. Lipovsky (NCSU, 5 ♂); Manantlan, 8-X-1980, D.M. DeLong (UKYC, 2m ♂). **Mexico**: 15 mi W Toluca, Hwy 15, 2804 m, 06 Aug 1982, C. W. and L. O'Brien and G. Wibmer (LBOB, 1 ♂). **Mexico City**: 22-X-1945, D.M. DeLong, city park (UKYC, 1m ♂); Deserto de Leones, 17 Oct 1945, D. M. DeLong (UKYC, 1 ♂); Mexico City area, 1920s, Dr. A. Dampf (UKYC, 1 ♂); 1940s, D.M. DeLong (UKYC, 2 ♂). **Michoacán**: Morelia, 4-IX-1938, L.J. Lipovsky (SEMC, 1m ♂); Rio Tuxpan K-185, 29-IX-1945, D.M. DeLong (UKYC, 1m ♂). **Morelos**: *Cuernavaca Co.*, Cuernavaca, 10 Dec 1963, N. L. H. Krauss (USNM, 1 ♂); Yautepec, Nov 1917 (USNM, 1 ♂). **Nuevo Leon**: Bustamente, 13 Jul 1983, A. Gonzalez (CSCA, 1 ♂). **Querétaro**: 19 mi SW Bernal, 27-VII-1982, C.W. & L. O'Brien & G. Wibmer (LBOB, 1m ♂). **San Luis Potosí**: Hwy 70, 13 mi SW El Ebano, 30 m, 06 May 1983, C. W. & L. B. O'Brien & G. B. Marshall (LBOB, 2 ♂). **Sonora**: Hermosillo, 14-IV-1982, Vasquez (SEMC, UDCC, 2m ♂). **Tamaulipas**: Tampico, 29 Dec 1908 (NCSU, 3 ♂, 1 ♀). **Costa Rica**: **Limón**: La Lola, 12 Jun 1958, Milton Stelzer, Light Trap (WIRC, 1 ♀). **Guatemala**: **Quetzaltenango**: Fuentes Georginas, Volcan Zunil 8km SE Zunil, 14.74944°N 91.47972°W, 2313 m, 14-15-II-2007, AT Gonzon, R Donovall (UDCC, 2m ♂). **Sacatepequez**: Antigua, 28-VIII-1952, R.H. Painter, sugar beet (USNM, 1m ♂). **Panama**: **Canal Zone**: Paraiso, X-1948, G.B. Fairchild (SEMC, 1m ♂). **Colombia**: **Boyacá**: Duitama, 2590 m, 12 Apr 1956, L. Posada, *Solanum tuberosum* L. (USNM, 2 ♂). **Cundinamarca**: Funza, 12-X-1955, L. Pesada (USNM, 1m ♂); Duitama, Boy., 12-IV-1956, L. Pesada (USNM, 1m ♂). **Venezuela**: **Merida**: Libertador Merida, 3-VII-1979, R.W. Brooks, A.A. Grigarick, J. McLaughlin, R.O. Schuster (CDAE, 1m ♂).

Chionomus puellus

Canada: Nova Scotia: At sea, 3-VII-1987, Uhler (USNM, 1m ♂). **USA**: **Alabama**: *Mobile Co.*, Gulf Crest, 30.99555°N 88.23777°W, 04 Nov 1916, Unknown (AMNH, 1 u). **Arkansas**: *Lincoln Co.*, Newark, 35.69844°N 91.44253°W, 79 m, N. Cai, (UDCC, 2 ♂, 5 ♀). *Logan Co.*, Paris, 35.29166°N 93.72611°W, 11 Sep 1977, Unknown, (LSU, 1 ♂). *Polk Co.*, Queen Wilhelmina State Park, near Mena, 34.68566°N 94.36994°W, 04 Jun 1987, G. F. and J. F. Hevel (USNM, 1 ♂, 1 ♀). **Connecticut**: *Fairfield Co.*, New Canaan, 41.14667°N 73.49528°W, 03 Sep 1920, B. H. Walden (NCSU, 1 ♂). *New Haven Co.*, Orange, 41.27975°N 73.02959°W, 55 m, 22 Jun 1920, B. H. Walden (NCSU, 1 mxd). **Delaware**: *Kent Co.* (UDCC, 10 ♂, 7 ♀, 3 u, 1

mxd). *New Castle Co.* (UDCC, NCSU, LBOB, USNM, ISUI, Unknown, ANSP, FSCA, PSUC, 322 ♂, 212 ♀, 166 u, 2 mxd), 12 Sep 2005, L. R. Donovall, (Cyperaceae), (LBOB, 1 ♂, UDCC, 2 u), Newark, UD CANR farm, 39.66444°N 75.74°W, 31 Jul 2013, O. Cass, *Medicago sp.* (Fabaceae), (LBOB, 1 ♀), 06 Sep 1996, C.R. Bartlett, goldenrod, (UDCC, 1 ♂). *Sussex Co.*, (UDCC, LBOB, NCSU, 23 ♂, 23 ♀, 9 u), Milford, 38.91512°N 75.42108°W, 2 m, 16 Jul 1964, Unknown, alfalfa, (UDCC, 1 u); 13 Jul 1966, Unknown, alfalfa, (UDCC, 1 u). Milton, 38.77928°N 75.30968°W, 1 m, 23 Jun 1965, Unknown, alfalfa (UDCC, 2 u). **District of Columbia:** Washington, 38.89025°N 77.0263°W, 8 m, 12 Sep 1907, Unknown (USNM, 1 u). **Florida:** *Alachua Co.* (UDCC, NCSU, 23 ♂, 32 ♀, 10 u) *Baker Co.* near Sanderson, 30.25194°N 82.27306°W, 28 Aug 1999, C. R. Bartlett (UDCC, 1 ♂). *Broward Co.:* Broward County, 15 Oct 1976–18 Oct 1976, H. Katz (PSUC, 1 ♂). Fort Lauderdale, Sunrise, 26.13361°N 80.11333°W, 08 Jul 2000, C. R. Bartlett (UDCC, 1 ♂, 1 ♀). Ft. Lauderdale, Hugh Birch Rec Area, 26.14321°N 80.10516°W, 26 Dec 1999, C. R. Bartlett (UDCC, 15 ♂, 6 ♀, 10 u). Ft. Lauderdale, Hugh Taylor Birch State Park, Rec Area, 26.14525°N 80.10483°W, 26 Jul 1999, C. R. Bartlett (UDCC, 1 ♂). Ft. Lauderdale, Invarry, 26.1729°N 80.23367°W, 24 Dec 1999, C. R. Bartlett (ANSP, UDCC, 4 ♂, 7 u). Ft. Lauderdale, Lauderdale Invarry, 26.1729°N 80.23367°W, 05 Jul 2000, C. R. Bartlett, sedge (UDCC, 1 ♂, 1 ♀). near Sweetwater, SR41 rest area, 25.76043°N 80.3847°W, 02 Jan 1996, C. Bartlett (UDCC, 1 u). *Citrus Co.*, Homosassa, 28.721°N 82.522°W, 21 m, 22 Dec 2015–29 Dec 2015, T. Fox (USCB, 1 ♂). *Collier Co.*, Naples, 26.14167°N 81.795°W, 22 Dec 1960, Leon W Hepner (MEMU, 2 u). *Columbia Co.*, Osceola National Forest; Forest Road 26318, 30.2683°N 82.52975°W, 23 Sep 2016, A. M. Deczynski (AMDC, 1 ♀). *Glades Co.*, Palmdale, 26.945°N 81.31639°W, 20 Dec 1960, L. W. Hepner (MEMU, 5 u). *Hardee Co.*, Ona, 27.48167°N 81.91917°W, July 1967, E. F. Fagen (NCSU, 1 ♂). *Hendry Co.*, LaBelle, 26.76055°N 81.43916°W, 16 Jul 1939, Oman (USNM, 1 u). *Highlands Co.*, Lake Placid, Archbold Bio. Res. Stat., 27.1829°N 81.35179°W, 21 Jan 2002, C. R. Bartlett (UDCC, 1 ♂). Archbold Biol. Sta. Lake Placid, 27.18805°N 81.35083°W, 21 Jan 2002, C. R. Bartlett (UDCC, 1 ♀); 21 Jan 2002, C. R. Bartlett (UDCC, 2 ♀). Archbold Biological Station, 27.18833°N 81.33778°W, 21 Jan 2002, C. R. Bartlett (UDCC, 1 ♂, 1 ♀). Lake Placid, Archbold Biological Station, 27.188°N 81.337°W, 20 Jan 2002, Vince Golia (UDCC, 1 u); 21 Jan 2002, C. R. Bartlett (UDCC, 1 ♂). Sebring, 27.49559°N 81.44091°W, 19 Dec 1960, L. W. Hepner (MEMU, 1 u). *Indian River Co.*, Vero Beach, 27.64606°N 80.41342°W, 11 Oct 1999, C. W. O'Brien, Light Trap (UDCC, 1 ♂); 11 Oct 1999, C. O'Brien (UDCC, 1 u). *Jefferson Co.*, 3 mi. S Wacissa, 30.34648°N 83.99031°W, 27 Jul 2000, C. W. O'Brien (LBOB, 1 ♂). Monticello, 30.545°N 83.87°W, 04 Oct 1914–08 Oct 1914, Unknown (AMNH, 1 ♂). Rt 59, 2.4mi S of Wacissa, 30.34022°N 84.01516°W, 27 Jul 2000, C. R. Bartlett (UDCC, 1 ♀). Wacissa at Jet SR259 & 60, 30.35833°N 83.98722°W, 27 Jul 2000, C. R. Bartlett, Light Trap (UDCC, 1 ♂). *Leon Co.*, Tallahassee, 30.4383°N 84.2807°W, 06 Aug 2002, C. W. O'Brien (UDCC, 3 ♂); 16 Aug 2002, G. J. Wibmer (UDCC, 1 ♀); 23 Aug 2002, G. J. Wibmer (UDCC, 1 ♂, 3 ♀). *Miami-Dade Co* (UDCC, AMNH, NCSU, 11 ♂, 13 ♀, 6 u). *Monroe Co.*, Middle Keys; US Rt 1, MM 53.5; Marathon Holiday Inn, 24.73222°N 81.01916°W, 10 Jan 2006, A. Gonzon (UDCC, 2 ♂, 1 ♀); 12 Jan 2006, A. Gonzon (UDCC, 1 u). Marathon, 24.71375°N 81.09035°W, Dec 1967, A. R. Jeffery (PDA, 1 u). Middle Keys; US Rt. 1, mm 16 at bridge, 13 Jan 2007, A. Gonzon (UDCC, 1 u). *Okaloosa Co.*, Niceville, 30.51299°N 86.42021°W, 12 m, 22 Jun 1972, S. Southern, Light Trap (NCSU, 1 ♂, 1 ♀); 28 Jul 1972, S. Southern (NCSU, 1 ♂). *Osceola Co.*, 2 mi W of Intercession City, 28.26206°N 81.54356°W, 20 Aug 1968, G.F. Hevel (USNM, 1 ♀). *Palm Beach Co.*, Lake Worth, Geneva Lakes court, 26.57048°N 80.16625°W, 28 Jul 2004, Vince Golia, Light Trap (FSCA, 1 ♀). near Boca Raton, Loxahatchee Road, 26.34143°N 80.25123°W, 22 Jan 2002, C. R. Bartlett (UDCC, 1 ♀). *Pasco Co.*, I-75 N of St. Petersburg, 28.21345°N 82.37445°W, 24 Jan 2009, C. R. Bartlett (UDCC, 1 ♀, 2 ♂). *Seminole Co.*, Sanford, 28.80028°N 81.27333°W, 29 May 1926, E. D. Ball (FSCA, 1 ♂). *Suwannee Co.*, Live Oak, 30.28333°N 82.98333°W, no date provided, A.R. Cline & S.T. Dash, Light Trap (UDCC, 1 ♀). **Georgia:** *Charlton Co.*, Folkston, Traders Hill Rec. Area, 30.779°N 82.02683°W, 11 Jul 2005, N. H. Nazdrowiez (UDCC, 1 ♂). Okefenokee Swamp, Billy's Island, 30.80001°N 82.3426°W, 40 m, Jul 1912, Unknown (USNM, 1 ♀). *Murray Co.* Chatsworth, 34.76555°N 84.77°W, 28 Aug 1965, F. W. Mead, Light Trap (FSCA, 1 ♂). *Not sure Co.*, Ft. Gordon (could be in more than one county), 09 Sep 1975, H.J. Harlan (UDCC, 2 ♂, 4 ♀). Ft Gordon, 33.35848°N 82.23485°W, 09 Sep 1973, H.J. Harlan (UK, 1 u); 09 Sep 1975, H. Harlan (UK, 1 ♂, 2 ♀). **Illinois:** *Union Co.*, Dongola, 37.36116°N 89.16591°W, 120 m, 25 Aug 1916, Unknown (NCSU, 1 m). **Kansas:** *Bourbon Co.*, Bourbon County, 37.85°N 94.85°W, 244 m, 13 Jul 1966, J. and W. Ivie (AMNH, 2 ♂, 1 ♀). *Douglas Co.*, Lawrence, 38.97167°N 95.235°W, 06 Oct 1895, H. Kahl (CMNH, 4 ♂, 1 ♀); Sep 1915, Sydney Prentice (CMNH, 1 ♂). **Kentucky:** *Bourbon Co.* Bourbon County, no specific locality, 38.2°N 84.21°W, 01 Oct 1974–08 Oct 1974, Unknown (UDCC, 1 ♂). *Breathitt Co.* Robinson Forest, 37.45274°N 83.15976°W, 13 Jul 1972, P. H. Freytag (UDCC, 1 ♀); 16 Sep 1972–30 Sep 1972, P. H. Freytag (UDCC, 1 ♂, 2 ♀). *Fayette Co.*, Fayette County, 38.04233°N 84.45873°W, 23 Jul 1979–29 Jul 1979, C. Sperka (UDCC, 1 ♀). Kentucky Experiment Station, 38.05758°N 84.50078°W, 15 Jul 1892, H. Garman (UK, 1 ♂, 1 u). Lexington, 38.04003°N 84.50347°W, 22 Oct 1920, H. H. Jewett (UDCC, 1 ♂); 17 Aug 1922, H. H. Jewett (UDCC, 1 ♂); 20 Jul 1973–23 Jul 1973, Unknown (UDCC, 1 ♂). Lexington, 37.98869°N 84.47772°W, 294 m, 16 June 1970, Victor Johnson (UK, 2 ♀); summer 1981, Mahendra Giri (UK, 2 ♂); 26 Jul 1906, H. Garman, *Medicago sp.* (Fabaceae) (UK, 2 ♂); 20 Jun 1910, Unknown, Light Trap

(UK, 3 ♂, 2 ♀); 12 Jul 1910, Unknown, Light Trap (UK, 1 ♀); 05 Sep 1912, H. Garman, *Vitis* sp. (Vitaceae) (UK, 6 ♂, 2 ♀). *Fulton Co.*, Fulton Co., no specific locality, 36.55408°N 89.18761°W, 22 Sep 1971, D Barnett (UK, 1 ♀). *Graves Co.*, Graves County, no specific locality, 36.72°N 88.65°W, 16 Jul 1971, D Barnett (UDCC, 1 ♂). *Hardin Co.*, Glendale, 37.60166°N 85.90555°W, 22 Aug 1975–03 Sep 1975, Unknown (UDCC, 1 ♂). *Jefferson Co.*, Louisville, 38.21537°N 85.76345°W, 139 m, 15 Jun 1955–22 Jul 1955, P. J. Christian (UK, 1 ♀); 22 Jul 1955–22 Aug 1955, P. J. Christian (UK, 1 ♂). Louisville, 38.25417°N 85.75944°W, Summer 1953, P. J. Christian (UK, 1 ♂); 11 Aug 1954–31 Aug 1954, P. J. Christian (UDCC, 3 ♂, 2 ♀); 15 Jun 1955–22 Jul 1955, P. J. Christian (UK, 1 ♀); 23 Sep 1958, J.A. Loring (UK, 1 ♀). Louisville, 38.25417°N 85.75944°W, 30 Jul 1940, D. A. Young (USNM, 2 ♀). *Madison Co.*, Valley View, 37.84615°N 84.43046°W, 26 Aug 1969, P.H. Freytag and W.P. Morrison (UDCC, 1 ♂). *Mercer Co.*, Mercer County, no specific locality, 37.81103°N 84.87443°W, 14 Jun 1976–18 Jun 1976, F Harold (UK, 1 ♀). *Perry Co.*, Perry County, no specific locality, 37.24°N 83.23°W, 03 Aug 1971, D Barnett (UDCC, 1 ♂). Louisiana: *Cameron Co.*, Cameron Parish, 29.83808°N 93.2304°W, 14 Apr 1974, Unknown (LSU, 1 ♂). *East Baton Rouge Co.* Baton Rouge, 30.46121°N 91.13041°W, 31 Dec 1974, Unknown (LSU, 2 u); 11 Oct 1975, Unknown (LSU, 1 ♂). Baton Rouge, 30.45056°N 91.15444°W, no date provided, Unknown (LSU, 1 ♂); 15 Nov 1971, Unknown (LSU, 1 u); 21 Aug 1975, Unknown, Light Trap (LSU, 1 ♀); 01 Nov 1975–30 Nov 1975, Unknown (LSU, 1 ♂); 10 Nov 1975, Unknown (LSU, 1 ♂); 24 Sep 1992, A. L. Johnson (LSU, 1 u); 08 Oct 1992, A. L. Johnson (LSU, 1 u). Baton Rouge, LSU Campus, Life Science Building, 30.41083°N 91.17722°W, no date provided, C.R. Bartlett (UDCC, 1 ♂); 05 Sep 2003, S. T. Dash (UDCC, 1 ♀). Baton Rouge Hooper Road, BREC Hooper Park, 30.53229°N 91.11919°W, 03 Apr 2003, S. T. Dash (UDCC, 1 ♂). Baton Rouge near LSU, River Road, Mississippi R., 30.41232°N 91.1969°W, 20 Jul 2003, Unknown (UDCC, 1 u). Baton Rouge near LSU, River Road Miss. River levee, 30.37304°N 91.174°W, 20 Jul 2003, Unknown (UDCC, 4 ♀). E of LA 3035, 1.2 mi S of Central, 27 Apr 1985, C. B. Barr (LSU, 1 ♂). Louisiana State University Campus, 30.40583°N 91.18583°W, 31 Aug 1985, D. A. Rider (LSU, 1 ♂); 13 May 1986, D. A. Rider (LSU, 1 ♂). *Iberville Co.*, Bayou Pall, off River Road, Levee Mississippi; Riparian Forest, 30.30971°N 91.15123°W, 21 Jul 2003, C. R. Bartlett (UDCC, 2 ♀). Bayou Paul, Off River Road, Levee Mississippi River Riparian Forest, 30.30971°N 91.15123°W, 21 Jul 2003, C. R. Bartlett (UDCC, 2 ♂). Saint Gabriel Research Station, 30.26819°N 91.10445°W, 5 m, 23 Jul 1986, E. G. Riley (LSU, 1 ♂, 1 ♀). *Jefferson Co.*, Harahan, 29.94891°N 90.20272°W, 28 Jul 1944, H. Dybas (FMNH, 1 ♂). *Natchitoches Co.*, Kisatchie National Forest, Red Dirt Wildlife Management Area, 31.5063°N 93.00322°W, 12 Jul 1985, E. G. Riley (LSU, 1 ♂). Kisatchie Ranger District, Custis Campground, 31.36666°N 93.01666°W, 03 Aug 2004, A. R. Cline (UDCC, 4 ♀). Maine: *York Co.*, Somersworth, 05 Sep 1999, C. R. Bartlett (UDCC, 1 ♂). Maryland: *Allegany Co.* (UDCC, NCSU, LBOB, 11 ♂, 13 ♀). *Anne Arundel Co.*, 6 km S Edgewater SERO, 38.88333°N 76.55°W, 27 Jul 1976, J. H. Falk (USNM, 2 ♂, 1 ♀); 07 Sep 1976, J. H. Falk (USNM, 6 ♂, 1 ♀); 12 Nov 1976, J. H. Falk (UDCC, USNM, 7 ♂, 1 ♀). *Calvert Co.*, Chesapeake Beach, 38.68611°N 76.535°W, 27 Jul 1913, R. C. Shannon (FMNH, 1 ♂). *Cecil Co.*, (UDCC, NCSU, LBOB, CUAC, ISUI, FSCA, ANSP, 195 ♂, 121 ♀, 113 u, 17 mx), Fair Hill NRA, 39.695°N 75.85694°W, 24 Sep 2004, R. Plank, (Cyperaceae), (LBOB, 4 ♂, 1 ♀). *Dorchester Co.*, Eldorado, 38.57883°N 75.792°W, 18 Aug 2007, N. H. Nazdrowicz (NCSU, 1 ♀). *Harford Co.*, 2mi NW of Havre de Grace; I-95, Park & Ride, 39.59673°N 76.13335°W, 08 Sep 2006, K. Styer (UDCC, 1 ♀). 195 Park & Ride Drive, Havre de Grace, 39.54928°N 76.09162°W, 08 Sep 2006, C. R. Bartlett (UDCC, 4 ♂, 3 ♀). Edgewood, 39.43028°N 76.30556°W, 11 Aug 1946, D. A. Young (USNM, 1 ♀). Fallston, 39.51434°N 76.41119°W, 142 m, 05 Sep 1970, L. L. Deitz (NCSU, 1 ♂). Havre de Grace, Park and Ride, 39.57055°N 76.13555°W, 129 m, 09 Sep 2005, C. E. Stragar (UDCC, 1 ♂) 07 Sep 2007, E. Lake (UDCC, 1 ♀). Susquehanna Park'n Ride, 39.59673°N 76.13335°W, 07 Sep 2007, T. Cooper (NCSU, UDCC, 1 ♂, 1 ♀, 1 u). Susquehanna State Park, 39.61166°N 76.14333°W, 07 Sep 2007, A. Villiard (UDCC, 1 u). near Havre de Grace, Susquehanna River, 39.54825°N 76.08669°W, 2 m, 08 Sep 2000, JM Faedtke (UDCC, 1 ♂). *Howard Co.* Clarksville, 39.2064°N 76.9433°W, 16 Aug 2006, K. Shropshire (UDCC, 1 ♂, 1 ♀). *Kent Co.*, Langford, Chesapeake Farms, 39.17972°N 76.18111°W, 7 m, 02 Jun 1997–16 Jun 1997, D. Hulburt (NCSU, 1 ♀); 16 Jun 1997–30 Jun 1997, D. Hulburt, (NCSU, 1 ♂, 1 ♀); 30 Jun 1997–14 Jul 1997, D. Hulburt (NCSU, 2 ♀); 11 Aug 1997–25 Aug 1997, D. Hulburt (NCSU, 1 ♀). Worton, Andelot Farms MV 3-1, 39.31393°N 76.18338°W, ix.viii.2015, A. Mitchell (UDCC, 1 ♂). near Langford, Chesapeake Farms, 39.17926°N 76.18222°W, 11 Aug 1997, C. R. Bartlett (UDCC, 2 ♂, 3 ♀). nr Fairlee, Chesapeake Farms, 39.17191°N 76.17625°W, 2 m, 30 Jun 1997, C. R. Bartlett (NCSU, 2 ♂); 30 Jun 1997, C. R. Bartlett (NCSU, UDCC, 3 ♂, 3 ♀, 1 u); 30 Jun 1997, C. R. Bartlett (UDCC, 6 ♀); 30 Jun 1997, C. R. Bartlett (UDCC, 1 ♂); 14 Jul 1997, C. R. Bartlett (NCSU, 1 ♀). nr Millington, Millington WMA, 39.2785°N 75.78544°W, 19 Sep 2012, A. Keruly (NCSU, 1 ♀). *Montgomery Co.*, Burtonsville, 39.11111°N 76.93278°W, 24 Aug 1980–03 Sep 1980, A. S. Menke (UCD, 1 ♂). Rockville, 39.084°N 77.15276°W, 24 Sep 1970, M.J. Blymyer (GWMP, 1 ♀). *Prince George's Co.*, Beltsville, 39.03472°N 76.90778°W, 31 Oct 1931, P. W. Oman (UCR, 2 u); 17 Aug 2006, K. Shropshire (UDCC, 4 ♂). College Park, 38.98067°N 76.93692°W, 18 May 1948, B. K. Dozier (FSCA, 1 u). Forestville, Penn Crossing, 38.85742°N 76.91091°W, 03 Aug 2003–07 Aug 2003, I. Johnson (NCSU, UDCC, 4 ♂, 4 ♀). Mitchellville, 15909 Pointer Ridge, 39.04576°N 76.64127°W, 21 Aug 1999, J. Caci (NCSU, 1 ♀). Upper Marlboro, 38.85699°N

76.781°W, 17 Aug 2006, K. Shropshire (LBOB, 1 ♂); 14 Aug 2007, K. Shropshire (UDCC, 1 ♂, 2 ♀). Upper Marlboro, UMD Farm, 38.857°N 76.781°W, 17 Aug 2008, K. Shropshire (UDCC, 1 ♂). *Talbot Co.*, Easton Woodland Pond, 38.77258°N 76.07683°W, 05 Jul 1971, R. Gordon (NCSU, 2 ♂, 1 ♀). *unknown Co.* “Maryland”, 12 Jul 1918, E. Shoemaker (AMNH, 1 ♂). Massachusetts: *Hampshire Co.*, Amherst, 42.3803°N 72.5236°W, 07 Jun 1934, S.D. Edmond (UMAM, 2 u); 17 Aug 1978, AJ Ritchie, *Amaranthus retroflexus* L. (Amaranthaceae) (UMAM, 1 u). Michigan: *Berrien Co.*, Saint Joseph, 42.09698°N 86.48309°W, 02 Sep 1973, D. D. Wilder (PSUC, 1 ♀). *Washtenaw Co.*, Ypsilanti TWP, 42.182°N 83.618°W, 19 Sep 2017, T. Fox (USCB, 1 ♂). Minnesota: *Anoka Co.*, Cedar Creek Natural History Area, 45.39298°N 93.18598°W, unknown Date, Unknown (UMSP, 1 ♂, 1 ♀). *Freeborn Co.*, Freeborn county, Minnesota, USA, 43.51885°N 93.16922°W, 21 Jun 2001, Unknown, soybean (UMSP, 1 ♀). *Olmsted Co.*, Olmsted county, Minnesota, USA, 44.02148°N 92.22906°W, 20 Jun 2001, Unknown, alfalfa (UMSP, 1 ♂). *Ramsey Co.*, Near Gray Cloud Island, Ramsey County, Minnesota, USA, 46.98605°N 93.01354°W, 12 Jul 1921, Wm. E. Hoffmann (UMSP, 1 ♂). *Wabasha Co.*, Wabasha County, Minnesota, USA, 44.20352°N 92.31073°W, 22 Jun 2001, Unknown, oats (UMSP, 1 ♀). Mississippi: *Alcorn Co.*, Corinth, 34.93417°N 88.52222°W, 28 May 1959, L. W. Hepner (MEMU, 2 u). *Bolivar Co.*, (MEMU, 14 ♂, 8 ♀, 55 u). *Claiborne Co.*, Port Gibson, 31.96083°N 90.98389°W, 04 Sep 1961, Unknown (MEMU, 1 ♂, 2 ♀). *Coahoma Co.*, (MEMU, 1 ♂, 2 ♀, 37 u). *George Co.*, 11 mi S of Lucedale, 30.76533°N 88.59°W, 01 Sep 2002, C. W. O’Brien & M. Haseeb (UDCC, 1 ♀). *Grenada Co.*, Grenada, 33.76889°N 89.80833°W, 15 Sep 1961, Unknown (MEMU, 1 ♀). *Harrison Co.*, Kressler AFB Biloxi, 30.40656°N 88.91695°W, 07 Aug 1972, J. B. Heppner (FSCA, 1 u). *Humphreys Co.*, Belzoni, 33.18417°N 90.48917°W, 04 Aug 1960, Unknown (MEMU, 1 ♀). Unknown, 32.08043°N 90.84094°W, 15 Aug 1960, Unknown (MEMU, 5 u); 24 Aug 1960, Unknown (MEMU, 7 u). *Kemper Co.*, 3.9 mi E of Preston, 32.87916°N 88.76233°W, 18 Jul 2006, N. H. Nazdrowicz (UDCC, 3 ♂). 4.9mi W of Scooba, 32.804°N 88.55566°W, 17 Jul 2006, N. H. Nazdrowicz (UDCC, 3 ♀, 1 ♂). *Leflore Co.*, (MEMU, 11 ♂, 19 ♀, 49 u). *Marshall Co.*, Holly Springs, 34.76759°N 89.44869°W, 187 m, 20 Aug 1960, L. W. Hepner (MEMU, 1 u). *Noxubee Co.*, Unknown, 33.16063°N 88.55649°W, 14 Sep 1961, Unknown (MEMU, 1 ♀); 26 Sep 1961, Unknown (MEMU, 2 ♂, 4 ♀). *Oktibbeha Co.*: (MEMU, 16 ♂, 21 ♀, 740 u), 21 Jul 1961, L. W. Hepner, *Quercus stellata* Wangenh. (Fagaceae), (MEMU, 1 u). *Quitman Co.*, Unknown, 32.04015°N 88.7281°W, 05 Aug 1960, Unknown (MEMU, 1 ♀); 16 Aug 1960, Unknown (MEMU, 2 ♀, 11 u). *Scott Co.*, Forest, 32.36444°N 89.47417°W, 22 Jul 1961, C. R. Andress (MEMU, 1 u). *Sharkey Co.*, Unknown, 33.90511°N 90.26481°W, 03 Aug 1960, Unknown (MEMU, 11 u); 08 Aug 1960, Unknown (MEMU, 1 u); 18 Aug 1960, Unknown (MEMU, 2 u). *Sunflower Co.*, (MEMU, 2 ♂, 3 ♀, 31 u). *Tallahatchie Co.*, Charleston, 34.00667°N 90.05667°W, 15 Sep 1961, Unknown (MEMU, 4 ♂, 1 ♀). Unknown, 33.95048°N 90.17326°W, 16 Aug 1960, Unknown (MEMU, 4 u). Webb, 33.94722°N 90.34417°W, 15 Sep 1961, Unknown (MEMU, 1 ♀). *Tishomingo Co.*, (MEMU, 3 ♂, 1 ♀, 46 u). *Washington Co.*, (MEMU, 44 u). Missouri: *St. Louis Co.*, Howard Bend, 38.68422°N 90.53957°W, 07 Aug 1937, R. C. Froeschner (NCSU, 1 ♂, 1 ♀). Nebraska: *Douglas Co.*, Omaha, 41.25139°N 95.93056°W, 17 Dec 1923, Owen Bryant (NCSU, 1 ♂). *Richardson Co.*, Falls City, 40.0625°N 95.60111°W, 13 Aug 1919, Unknown (NCSU, 2 ♀). New Hampshire: *Coos Co.* Mount Washington, 44.2846°N 71.28039°W, no dated provided, Unknown (AMNH, 1 ♂). Mt. Washington, 44.2725°N 71.30055°W, 1740 m, 06 Aug 1939, David L. Arenberg (UMAM, 2 u). *Hillsborough Co.*, Rosaly Bass Farm, 2 km SE Peterborough, 42.86114°N 71.93358°W, 20 Aug 2012, D. S. Chandler (UNHP, 1 ♀). *Strafford Co.*, Burley-Demeritt Farm, 3 km SE of Lee, 43.10031°N 70.99117°W, 11 Aug 2011, M. C. Dube, alfalfa (UNHP, 1 ♂). Butternut Farm, 8 km NW of Rochester, Meaderboro Road, 43.31531°N 71.05658°W, 07 Jul 2011, M. C. Dube (UNHP, 1 ♀). Durham, 43.13389°N 70.92694°W, 07 Sep 1922, Unknown (NCSU, 1 ♂). Flag Hill Winery, 4.7 km S of Lee, 43.08259°N 71.02748°W, 22 Jul 2011, M. C. Dube (UNHP, 3 ♂). Ramsbotham Farm, Nute Road, 4 km NW of Madbury, 43.1899°N 70.97795°W, 22 Jul 2011–04 Aug 2011, M. C. Dube (UNHP, 1 ♂). Shagbark Farm, 5 km E of Rochester, Bernard Road, 43.30734°N 70.91976°W, 27 Jun 2011, M. C. Dube (UNHP, 1 ♀). New Jersey: *Bergen Co.*, Closter, 40.97306°N 73.96194°W, 26 Jun 1962, Rozen, Statham, Woods, and Hessel (AMNH, 1 ♂). Rutherford, 40.82639°N 74.10722°W, IX 3, Unknown (AMNH, 2 ♂); 24 Oct, Unknown (AMNH, 2 ♂); Oct 1924, E. L. Dickerson (AMNH, 1 ♀). *Burlington Co.*, (NCSU, UDCC, UK, 34 ♂, 28 ♀, 1 u). *Camden Co.*, Collingswood, 108E Narberth, 39.9149°N 75.07613°W, 03 Sep 2005, R. D. Anderson (UDCC, 1 ♂); 04 Oct 2005, R. D. Anderson (UDCC, 1 ♀). *Cape May Co.*, Avalon, 39.08912°N 74.7287°W, 11 Aug 1998–14 Aug 1998, C. R. Bartlett (UDCC, 3 ♂). Avalon, 39.09338°N 74.74381°W, 11 Aug 1998–14 Aug 1998, C. R. Bartlett (NCSU, 2 ♀). *Essex Co.*, Newark, 40.73555°N 74.1725°W, 9 m, no date provided, E. L. Dickerson (AMNH, 1 u). Nutley, 40.82222°N 74.16028°W, 22 m, IX, Unknown (AMNH, 1 u). South Orange, 40.7489°N 74.2617°W, 07 Oct 1926, F. M. Schott (AMNH, 1 ♀). *Middlesex Co.*, South Amboy, 40.4778°N 74.2911°W, IX 5, Unknown (AMNH, 3 u). *Ocean Co.*, Whitesville, 40.06805°N 74.27194°W, 27 m, Aug 24, Unknown (AMNH, 2 ♂). *Salem Co.*, (LBOB, NCSU, UDCC, 109 ♂, 110 ♀, 1 mxd). *Union Co.*, Cranford Twp; “7 Fifth Avenue”, 40.65748°N 74.32262°W, 19 Jul 2013, A. M. Deczynski (AMDC, 1 ♀); 18 Jun 2014, A. M. Deczynski (AMDC, 2 ♂). New York: *New York Co.*, Central Park, Manhattan, 40.78222°N 73.9658°W, 26 Aug 1961, P. H. Arnaud Jr. (AMNH, 1 ♂). Long Island, 40.81667°N 73.06667°W, 27 Aug 1928, A. Ball (ISNB, 1 ♂). *Rockland Co.*, West Nyack, 41.09649°N 73.97292°W, 13 Oct 1919, Chris. E.

Olsen (AMNH, 1 ♀); 30 May 1921, C.E.Olsen (KBIN, 1 ♂). *The Bronx Co.*, Mosholu, 40.9032°N 73.8594°W, 30 Aug 1919, Unknown (AMNH, 1 u). *Tompkins Co.*, Cornell University, 42.44851°N 76.47862°W, no date provided, Heidemann (NCSU, 1 ♂). Ithaca, 42.44056°N 76.49694°W, 122 m, 14 Aug 1928, A. Ball (KBIN, 2 ♂). Miller Farm (23), Jul 1997, R.A. Byers (PSUC, 1 ♂); Sep 1997, R.A. Byers (PSUC, 2 ♀). *Westchester Co.*, Crugers, 41.23333°N 73.92306°W, 03 Jul 1912, Unknown (AMNH, 1 u). North Carolina: *Avery Co.*, Grandfather Mountain, 36.09617°N 81.83186°W, Sep 1908, F. Sherman (NCSU, 2 ♂); 25 Sep 1960, T. Daggy (NCSU, 2 ♀). *Beaufort Co.*, 1 km W of Bath, 35.47694°N 76.823°W, 29 Aug 1992, W.E. Klingeman (NCSU, 1 ♂). *Bertie Co.*, Lewiston, Basemore Farm, 36.12577°N 77.17913°W, 20 m, 28 Sep 1971, V. B. Dixon, soybean (NCSU, 1 ♂). Windsor, 35.99833°N 76.94639°W, 26 Oct 1949, P. O. Ritcher (NCSU, 1 ♀). *Bladen Co.*, (NCSU, UDCC, 24 ♂, 26 ♀, 31 u). *Brunswick Co.*, (UDCC, NCSU, 18 ♂, 22 ♀, 30 u) E. Bridges & E. Powell, soybean, (NCSU, 1 ♀); 14 Aug 1979, E. Bridges & E. Powell, soybean, (NCSU, 1 ♂); 15 Aug 1979, E. Bridges & E. Powell, soybean, (NCSU, 1 ♂, 1 ♀); 16 Aug 1979, E. Bridges & E. Powell, soybean, (NCSU, 1 ♂); 29 Aug 1979, E. Bridges & E. Powell, soybean, (NCSU, 1 ♂). *Buncombe Co.*, (AMNH, NCSU, 12 ♂, 13 ♀). *Burke Co.*, Linville Falls, 35.95295°N 81.92774°W, 975 m, no date provided, Z. P. Metcalf (NCSU, 6 ♂, 7 ♀). *Cabarrus Co.*, (NCSU, UDCC, 17 ♂, 12 ♀, 4 u). *Caldwell Co.*, Edgemount, 35.9637°N 81.57778°W, 18 Sep 1965, B. G. Hill (NCSU, 1 ♀). *Carteret Co.*, New Drum Inlet, 34.84835°N 76.32937°W, 29 Sep 1973, N. Newton (UDCC, 1 u). *Chatham Co.*, Rt. 1 X Deep River, 35.61923°N 79.09444°W, 25 May 1993, C. R. Bartlett (UDCC, 1 u). US RTE 1 x Deep Rvr, 35.61971°N 79.09392°W, 25 May 1993, C. Bartlett *Persicaria hydropiperoides* (Polygonaceae) (NCSU, 5 ♂, 1 ♀). *Cherokee Co.*, Andrews, 35.20166°N 83.79083°W, 612 m, Mid May 1908, F. Sherman (NCSU, 2 ♀); 25 Jul 1958, D. A. Young (NCSU, 2 ♂, 1 ♀). *Columbus Co.*, Whiteville, 34.34916°N 78.69902°W, 25 m, 17 Jul 1971, B. Pleasants (NCSU, 1 ♂, 7 ♀); 27 Jul 1971, W.S. Brooks, soybean (NCSU, 1 ♂). *Cumberland Co.*, Fayetteville, 35.06035°N 78.86611°W, 26 m, 13 Sep 1956, D. H. Habeck (NCSU, 2 ♀). Fort Bragg, 35.14264°N 78.98687°W, 81 m, 15 Oct 1968, D.B. Palmer (NCSU, 1 ♂, 1 ♀); 17 Oct 1968, D.B. Palmer (NCSU, 5 ♂). *Dare Co.*, Cape Hatteras Island, 35.25019°N 75.57412°W, 21 Aug 1958, D. A. Young (NCSU, 1 ♂, 1 ♀). *Davidson Co.*, Davidson Co., 35.77224°N 80.1878°W, 04 Jul 1959, T. Daggy (NCSU, 1 ♀); 21 May 1960, T. Daggy (NCSU, 1 ♀); 19 Jul 1962, H. D Blocker (NCSU, 1 ♀); 06 Oct 1969, T. Daggy (NCSU, 2 ♂); 14 Jul 1994, T. Daggy (NCSU, 5 ♂); 16 Oct 1994, T. Daggy (NCSU, 1 ♀). *Duplin Co.*, Faison, 35.1161°N 78.1364°W, 32 m, 31 May 1955, Unknown, Light Trap (NCSU, 1 ♀); 11 Jul 1958, W. P. Dubose, Light Trap (NCSU, 2 ♂). Magnolia, 34.89589°N 78.05408°W, 26 May 1964, J. F. Cornell (NCSU, 2 ♀). unknown, 34.95787°N 77.8607°W, 25 Jun 1964, H. D Blocker (NCSU, 3 ♂). *Durham Co.*, Unknown, 36.036°N 78.87632°W, 13 Jul 1969, Unknown (UDCC, 1 u). *Gaston Co.*, Moss Farm, Gated Meadow, 35.18889°N 81.21667°W, 02 Aug 2003, Unknown, *Asclepias syriaca* (Apocynaceae) (SNHM, 1 ♂). *Gates Co.*, Nr. Cornapeake, E. Dismal S. P., 36.51282°N 76.45802°W, 22 Jun 1994, C. R. Bartlett (UDCC, 2 ♀). *Graham Co.*, (NCSU, 28 ♂, 24 ♀). *Harnett Co.*, Harnett County, no specific locality, 35.39358°N 78.82557°W, 74 m, 28 Oct 1934, Z. P. Metcalf (NCSU, 8 ♂, 7 ♀). *Haywood Co.*, (UDCC, NCSU, ANSP, FSCA, 181 ♂, 132 ♀, 152 u), Black Balsam Knob, 35.32778°N 82.87444°W, 1890 m, 29 Sep 2002, A. G. Wheeler, Jr., *Deschampsia flexuosa* (Poaceae), (UDCC, 1 ♀). *Henderson Co.*, Henderson county, no specific locality, 35.3193°N 82.475°W, 679 m, 16 Sep 1972, T. Hunt (NCSU, 1 ♂). Hendersonville, 35.31861°N 82.46111°W, Jul 1907, F. Sherman (NCSU, 4 ♂). *Hyde Co.*, Hyde County, no specific locality, 35.5°N 76.26667°W, 17 Jun 1959, D. A. Young (NCSU, 1 ♀); 26 Aug 1959, D. A. Young (NCSU, 1 ♂, 2 ♀). *Jackson Co.*, Cullowhee, 35.31286°N 83.17678°W, Early May 1936, Z. P. Metcalf (NCSU, 7 ♂, 5 ♀). near Balsam, Blue Ridge Parkway, Wesner Bald View, 35.4464°N 83.1155°W, 31 Jul 2003, C. R. Bartlett, D. Nonne, A. Gonzon (UDCC, 1 ♂); 31 Jul 2003, C. R. Bartlett, D. Nonne, A. Gonzon (UDCC, 2 ♂). *Johnston Co.*, Clayton, 35.6636°N 78.4581°W, 82 m, 03 Jul 1958, W. P. Dubose, Light Trap (NCSU, 4 ♀); 18 Jul 1958, W. P. Dubose, Light Trap (NCSU, 9 ♂, 21 ♀). Johnston County, no specific locality, 35.52°N 78.37°W, 07 Oct 1959, Sam Turnipseed (NCSU, 1 ♂). NE of Brogden, SR-2523, 35.4405°N 78.21991°W, 41 m, 22 Sep 1981, W. C. Warrick, soybean (NCSU, 1 ♂). NE of Cox Mill, rt. 1212 field J-11, 34.75906°N 77.51448°W, 24 Aug 1978, R. K. Sprenkel & W. C. Warrick, soybean (NCSU, 3 ♂, 1 ♀). SE of Brogden, road 1007 x 2523, field J-33, 35.43072°N 78.24805°W, 13 Aug 1979, E. K. Rawls, soybean (NCSU, 1 ♂). *Macon Co.*, Highlands, 35.0525°N 83.19694°W, 1158 m, 05 Jun 1957, D. A. Young (NCSU, 1 ♂, 1 ♀). *Mecklenburg Co.*, (NCSU, UDCC, SNHM, 11 ♂, 3 ♀, 13 u). *Mitchell Co.*, Roan Mountain, 36.10456°N 82.12207°W, 1-8 Sep 1927, Z. P. Metcalf (NCSU, 8 ♂, 6 ♀). *Moore Co.*, Lakeview, 35.24332°N 79.30878°W, 12 Sep 1959, F.W. Mead (NCSU, 1 ♂). Southern Pines, 35.17389°N 79.3925°W, 159 m, 1917, A. H. Manee (NCSU, 1 ♂). *New Hanover Co.*, Carolina Beach, 34.035°N 77.89389°W, June 20, Unknown (NCSU, 1 ♀); 04 Jul 1927, Unknown (NCSU, 1 ♀). Near Wilmington, 34.20534°N 77.89395°W, 17 May 1995, C. R. Bartlett (UDCC, 1 u). Wilmington, Greenfield Park, 34.21796°N 77.92732°W, Mid May 1934, Z. P. Metcalf (NCSU, 2 ♀). Wilmington, Open Woods, 34.20477°N 77.89173°W, 09 Oct 1925, Unknown (NCSU, 1 ♂). unknown, 34.18141°N 77.86561°W, 09 Jul 1957, D. A. Young (NCSU, 2 ♂, 1 ♀). *Northampton Co.*, Lasker, 36.34981°N 77.3055°W, 21 Jun 1970, W. Martin (NCSU, 1 ♂). *Onslow Co.*, (NCSU, 27 ♂, 28 ♀, 2 u). *Pasquotank Co.*, Elizabeth City, 36.29414°N 76.25097°W, 25 Oct 1949, P. O. Ritcher, potato (NCSU, 1 ♂). *Randolph Co.*, Crabtree Meadows Park, 35.60616°N 82.9677°W, 29 Jul 1958, D. A. Young (NCSU, 1 ♂). *Richmond Co.*:

unknown, 35.00594°N 79.74783°W, 18 Jun 1958, W. P. Dubose (NCSU, 1 ♀). *Sampson Co.*, Sampson County, unspecified locality, 34.92349°N 78.39°W, 24 May 1957, D. A. Young (NCSU, 2 ♂). S of Benson, NC242, 35.34722°N 78.52966°W, 11 Sep 1994, C. R. Bartlett (NCSU, 5 ♂, 4 ♀). *Scotland Co.*, Laurinburg road 1321, 34.80851°N 79.4901°W, 15 Aug 1979, E. K. Rawls, soybean (NCSU, 1 ♀). Unknown, 34.8409°N 79.48043°W, 03 Jul 1958, W. P. Dubose (NCSU, 1 ♂, 2 ♀). *Stanly Co.*, Morrow Mountain State Park, 35.35222°N 80.09306°W, 276 m, 20 Jun 1958, D. A. Young (NCSU, 1 ♀); 23 Jun 1958, D. A. Young (NCSU, 3 ♂, 3 ♀); 20 Jul 1959, F.W. Mead (NCSU, 1 ♂); 22 Jul 1959, D. M. Weisman (NCSU, 1 ♀); 24 Jul 1991, R. L. Blinn (NCSU, 1 ♀). *Stokes Co.*, Hanging Rock State Park, 36.39989°N 80.28668°W, 588 m, 28 May 1959, D. A. Young (NCSU, 1 ♂). *Surry Co.*, Cumberland Knob, 36.55013°N 80.90869°W, 29 May 1959, D. A. Young (NCSU, 1 ♀). *Swain Co.*, (BYU, UDCC, CUAC, ANSP, NCSU, UMAM, 104 ♂, 120 ♀, 34 u). *Transylvania Co.*, unknown, 35.20325°N 82.79886°W, 14 Aug 1957, D. A. Young, (NCSU, 2 ♀). *Tyrrell Co.*, Columbia, West Vaco Area, 35.9146°N 76.2546°W, 09 Aug 1972, V. B. Dixon, soybean, (NCSU, 6 ♂ 1 ♀). SW of Columbia, SR-1122 x SR-1105, field T-10, 35.84592°N 76.32137°W, 30 Aug 1979, E. K. Rawls, soybean, (NCSU, 1 ♂). S of Columbia road 1108, 35.86979°N 76.26936°W, 24 Aug 1979, E. K. Rawls, soybean, (NCSU, 1 ♂). *Wake Co.*, (NCSU, UDCC, 57 ♂, 33 ♀, 10 u), 05 Sep 1994, C. R. Bartlett, *Abelia (typo for Abelia)* sp. (Unknown), (NCSU, 2 ♂, 1 ♀); 11 Sep 1994, C. R. Bartlett, *Abelia (typo for Abelia)* sp. (Unknown), (NCSU 1 ♂, 1 ♀), 12 Aug 1978, K. B. Corrette, grape, 2;m *Vitis rotundifolia* (Vitaceae), (NCSU, 6 ♂, 8 ♀, 1 u), Raleigh, Lake Wheeler Road, Unit II Research Farm, 35.72418°N 78.67396°W, 105 m, 05 Jun 1990, R. L. Blinn, *Salix nigra* Marshall (Salicaceae), (NCSU, 1 ♀). *Warren Co.*, County Line State Park, 36.44117°N 78.36815°W, 19 Jul 2000, C. R. Bartlett, (NCSU, 3 ♀, UDCC, 1 u). E. of Vicksboro rt. 1133, field W-41, 36.30111°N 78.25763°W, 10 Aug 1978, R. K. Sprenkel & W. C. Warrick, soybean, (NCSU, 2 ♂). S. of Vicksboro rt. 1134, 36.29536°N 78.26934°W, 31 Jul 1978, R. K. Sprenkel & W. C. Warrick, soybean, (NCSU, 1 ♂). *Washington Co.*, Sexton Farm II, rt 99 Wenona, 35.71822°N 76.64127°W, 14 Aug 1973, W. Byrum, soybean, (NCSU, 2 ♂, 1 ♀). *Yadkin Co.*, NW of Yadkinville, road 1331 x 1373, field Y-5, 36.13458°N 80.65951°W, 21 Aug 1979, L. A. Freeman, soybean, (NCSU, 1 ♀). Newell, 35.27959°N 80.73563°W, 16 Jul 2012, E.F. Menhinick, Light Trap, (SNHM, 1 ♂); 11 Oct 2012, E.F. Menhinick, (SNHM, 1 u); 15 Sep 2013, E.F. Menhinick, Light Trap, (SNHM, 1 ♀, 1 #u). *unknown Co.*, Mountains, 35.59716°N 82.98265°W, 1937–1938, Z. P. Metcalf, (NCSU, 9 ♂, 6 ♀). Western NC, no date provided, Unknown, (NCSU, 1 ♂). *Ohio: Franklin Co.*, Columbus, 39.96111°N 82.99889°W, 17 Oct 1917, Unknown, (FSCA, 1 u); 04 Jul 1921, A. E. Miller, (FSCA, 1 u). *Gallia Co.*, Gallipolis, 38.8098°N 82.20237°W, 01 Jun 1962, F. W. Mead, (FSCA, 1 u). *Muskingum Co.*, Duncan falls, 39.87201°N 81.9093°W, 17 Aug 1922, Unknown, (NCSU, 2 ♂, 1 ♀). *Ottawa Co.*, Catawba Is., 41.55086°N 82.84787°W, 14 Aug 1998, C. R. Bartlett, (NCSU, 1 ♂). *Pickaway Co.*, Pickaway County, no specific locality, 39.64°N 83.03°W, 19 Jun 1938, D. M. DeLong, (UDCC, 3 ♀). *Scioto Co.*, Friendship, 38.69777°N 83.09388°W, 25 May 1964, P. H. Freytag, (UK, 1 ♀); 04 Jun 1964, P. H. Freytag, (UDCC, 1 ♂); 06 Aug 1964, P. H. Freytag, (UDCC, 1 ♂). Scioto County, no specific locality, 38.81°N 82.99°W, 15 Jun 1964, P. H. Freytag, (UK, 1 ♂); 06 Aug 1964, Unknown, (UDCC, 2 ♂, UK, 1 ♂, 1 ♀). Shawnee State Forest, Shawnee State Park, 38.75972°N 83.17694°W, 01 Jun 2014, M.D. Sheaffer, (UDCC, 1 ♀). *Warren Co.*, Monroe, 39.44611°N 84.33475°W, 22 Nov 1979, E. J. West, (FSCA, 1 u). *Oklahoma: Alfalfa Co.*, unknown, 35.21895°N 98.60729°W, 23 Oct 1948, S. Coppock Jr., (NCSU, 1 ♂); 21 Jul 1949, S. Coppock Jr., (NCSU, 1 ♂); 10 Sep 1949, S. Coppock Jr., (NCSU, 1 ♀). *Comanche Co.*, Fort Sill, 34.6659°N 98.38199°W, 344 m, 19 May 1978, H. J. Harlan, Light Trap, (UK 1 ♀). Fort Sill, by Building 294, 34.5937°N 98.41849°W, 01 Aug 1977–02 Aug 1977, H. J. Harlan & G. V. Henson, Light Trap, (UDCC, 2 ♂). *Ottawa Co.*, Fairland, Twin Bridges State Park, 36.80138°N 94.75611°W, 28 Jul 1965, J. T. Medler, (WIRC, 4 ♀). *Pennsylvania: Adams Co.*, Beechcreek, Adams County, PA, USA, 39.96131°N 77.2511°W, 24 Jul 2014, C. Witmer, (UDCC, 1 ♂). Weiser—SF2, 40.01938°N 77.0934°W, 27 Oct 2015, Terryll Ayler, (NCSU, 1 ♂). *Allegheny Co.*, Little Sewickley Creek, 40.2642°N 79.68102°W, 06 Aug 1921, H. Kahl, (CMNH, 2 ♂). Panther Hollow, Pittsburgh, 40.43667°N 79.94972°W, 12 Aug 1916, H. Kahl, (CMNH, 6 ♂, 1 ♀). Pittsburgh, 40.43429°N 79.981°W, 01 Aug 1919–07 Aug 1919, H. Kahl, (CMNH 1 ♂). *Bucks Co.*, 3849 Hunter Rd, Kintnersville, 40.5375°N 75.22655°W, 02 Jul 2017, T. J. Hagerty, Light Trap, (UDCC, 2 ♂). *Centre Co.*, DMTR FRT BKT 3, 40.80021°N 77.61882°W, 01 Oct 2015, Jody Rauch, (UDCC, 1 ♀). Potters Mills, Penn Nursery, 40.77778°N 77.61333°W, 13 Oct 1971, A. G. Wheeler, *Alnus glutinosa* (Betulaceae), (PDA, 1 u). Rock Springs, Ferguson Twp, 40.7059°N 77.96778°W, 07 Sep 1984, D. L. Bierlein, (PSUC, 1 ♀). Rock Springs Farm, PSU Pennsylvania, 40.7059°N 77.96778°W, 13 Sep 1979, Jae Chun Choe, (Poaceae), (PSUC, 1 ♂). TF CARD 4, 40.77941°N 77.74043°W, 15 Oct 2015, Jody Rauch, (UDCC, 1 ♂, 1 ♀). *Chester Co.*, (ANSP, UDCC, NCSU, 65 ♂, 60 ♀, 16 u). *Cumberland Co.*, Carlisle, 2262 Walnut Bottom Road, back of house, 40.13426°N 77.27912°W, 07 Jul 2012–08 Jul 2012, M.D. Sheaffer, (UDCC, 3 ♂). *Dauphin Co.*, Fort Hunter Conservancy [40.3693 N - 76.9003 W], 40.3693°N 76.9003°W, 10 Jun 2011, L. Barringer, (UDCC, 1 ♀). Fort Indiantown Gap, site B12-2, 40.45°N 76.63333°W, 08 Oct 2003, K.C. Kim, R.A. Byers, R.P. Withington, T.J. Tomon, K.C. Kahler, J.E. Heindel, D., (PSUC, 4 ♂, 1 ♀). Fort Indiantown Gap, site B12-3, 40.45°N 76.6°W, 21 Jul 2004, K.C. Kim, R.A. Byers, R.P. Withington, T.J. Tomon, K.C. Kahler, J.E. Heindel, D., (PSUC, 1 ♂, 1 ♀). Fort Indiantown Gap, site F1-10, 40.44333°N 76.64333°W, 15 Oct 2003, K.C. Kim,

R.A. Byers, R.P. Withington, T.J. Tomon, K.C. Kahler, J.E. Heindel, D., (PSUC, 2 ♂). Hershey, 40.28583°N 76.65056°W, 25 Jun 1975, W. H. Yackley, (CMNH, 1 ♂); 10 Oct 1990, W. H. Yackley, (CMNH, 1 ♀). Hummelstown, 40.26528°N 76.70861°W, 30 Jul 1967, W. Yount, (PDA, 1 u). *Delaware Co.*, Broomall, 2709 North Kent, 39.99278°N 75.35833°W, 04 Aug 2015, C. R. Bartlett, (LBO, 1 ♂). Media, Middleton Memorial Park, 39.91859°N 75.40625°W, 09 Oct 2011, H.L. Johnson, (LBOB, 5 ♂, UDCC, 4 ♂, 2 ♀, 3 u, USNM, 1 ♂). *Fayette Co.*, Ohiopyle, 39.87022°N 79.49137°W, 370 m, Aug 1907, Unknown, (CMNH, 3 ♂). *Franklin Co.*, Letterkenney Army Depot, Chambersburg, 40.01861°N 77.69722°W, 11 Jun 1973, Robert R. Kline, (PSUC, 1 ♂). Scotland, 39.96611°N 77.59555°W, 06 Aug 1930, J. O. Pepper, (PSUC, 1 ♀). *Lancaster Co.*, 2369 Old Phila Pike, 40.07239°N 76.3541°W, 22 Jun 2012, C. Parson, (UDCC, 1 u). *Lebanon Co.*, Fort Indiantown Gap, site B12-1, 40.45°N 76.63333°W, 31 Jul 2003, K.C. Kim, R.A. Byers, R.P. Withington, T.J. Tomon, K.C. Kahler, J.E. Heindel, D., (PSUC, 1 ♀); 06 Oct 2003, K.C. Kim, R.A. Byers, R.P. Withington, T.J. Tomon, K.C. Kahler, J.E. Heindel, D., (PSUC, 1 ♀); 08 Oct 2003, K.C. Kim, R.A. Byers, R.P. Withington, T.J. Tomon, K.C. Kahler, J.E. Heindel, D., (Poaceae), (PSUC, 17 ♂, 14 ♀, 1 u). *Monroe Co.*, Austin T. Blakeslee Natural Area, 41.0844°N 75.58809°W, 14 Aug 2017, T. J. Hagerty, (UDCC, 1 u). Delaware Water Gap, 40.9675°N 75.1225°W, no date provided, Unknown, (AMNH, 2 m, 1 u). *Montgomery Co.*, Mountain Mulch #8, Montgomery County, PA, USA, 40.32345°N 75.60164°W, 31 Oct 2014, J. Shannon, (UDCC, 2 m). *Northampton Co.*, Easton, 40.68833°N 75.22111°W, Sep 1957, Unknown, (UDCC, 1 ♂). *Perry Co.*, Duncannon, 40.37627°N 77.1136°W, 19 Oct 2013, S. Nacko, (LBOB, 1 ♂, UDCC, 3 ♂, USNM 1 ♂). Sherman's Creek, near Dellville, 40.36389°N 77.11611°W, 17 Aug 1999, R. L. Snyder, (UDCC, 1 ♂). *Venango Co.*, Beary Farm (15), Cranberry, 41.35°N 79.75806°W, Sep 1996, R. A. Byers and S. F. LaMar, (PSUC, 1 ♂). *Washington Co.*, Vestaburg, 556 Vine Street, 40.01817°N 79.9964°W, 01 Jul 1997–30 Jul 1997, R. Westich, (UDCC, 1 u). *Wayne Co.*, near Mount Pocono, 41.19742°N 75.36775°W, 09 Oct 1999, J. E. Witmer, (UDCC, 1 ♂). *Westmoreland Co.*, Powdermill Preserve, Rt. 381, 3 mi S Rector, 40.16004°N 79.272°W, 07 Aug 1982, G. Ekis, (CMNH, 1 ♂). Rhode Island: *Washington Co.*, Kingston, 41.48028°N 71.52306°W, 08 Oct 1931, Unknown, (URI, 1 ♂). South Carolina: *Aiken Co.*, Unknown, 33.60274°N 81.59887°W, 15 Jun 1958, E.F. Menhinick, (SNHM, 1 ♀); 15 Aug 1959, E.F. Menhinick, (SNHM, 1 ♀); 22 Jun 1975, E.F. Menhinick, Light Trap, (SNHM, 1 ♀). *Charleston Co.*, Francis Marion St. For. nr. Thompson Center, 33.12694°N 79.58472°W, 06 Jun 2005, N. H. Nazdrowicz, (UDCC, 1 u). McClellanville, 33.0882°N 79.4612°W, 27 Jun 1970, L. L. Deitz, (NCSU, 1 ♂). Thompson Corner, Francis Marion National Forest, 33.104°N 79.59466°W, 06 Jun 2005, N. H. Nazdrowicz, (UDCC, 1 ♂, 5 ♀). *Colleton Co.*, Walterboro, 32.90174°N 80.67283°W, 9 m, 13 Jul 1963, H. D Blocker, Light Trap, (NCSU, 1 ♂). *Darlington Co.*, Darlington, 34.29972°N 79.87639°W, 05 Jul 1958, W. P. Dubose, (NCSU, 6 ♂, 5 ♀). *Florence Co.*, Florence, 34.19543°N 79.76256°W, 01 Sep 1930, O. L. Cartwright, (PDA, 1 u); 20 Sep 1930, O. L. Cartwright, (PDA, 1 u); 29 Sep 1930, O. L. Cartwright, (PDA, 1 u). *Georgetown Co.*, Baruch/Debidue Island, Georgetown County, South Carolina, USA, 33.3539°N 79.1571°W, 14 May 2015, M. Caterino, S. Myers, A. Deczynski, (UDCC, 2 ♂). *Pickens Co.*, Clemson Twp; “E of Bridge on Old Central Road”, 34.69642°N 82.82811°W, 24 Aug 2014, A. M. Deczynski, (AMDC, 7 ♂, 4 ♀). Clemson Twp; Clemson Experimental Forest; “Railroad Tracks”, 34.69385°N 82.8164°W, 30 Aug 2014, A. M. Deczynski, (AMDC, 1 ♂, 2 ♀). Clemson Twp; Creekside Drive, 34.69615°N 82.82649°W, 21 Sep 2014, A. M. Deczynski, (AMDC, 1 ♀). Easley, 34.82972°N 82.60167°W, 20 Aug 1925, J. O. Pepper, (PSUC, 1 ♀); 15 Oct 1927, J. O. Pepper, *Sorghum bicolor* (L.) Moench (Poaceae), (PSUC, 1 ♀). Tennessee: *Blount Co.*, (UDCC, 43 ♂, 53 ♀, 1 u). *Carter Co.*, Carter County, 36.29272°N 82.12743°W, 21 Jul 1969–07 Aug 1969, T. Helseth, (UDCC, 1 ♀). *Cocke Co.*, GSMNP, Albright Grove ATBI Plot, 35.73333°N 83.28055°W, 16 Oct 2000–14 Nov 2000, Parker, Stocks, Petersen, (UDCC, 1 ♂, 1 ♀); 06 Nov 2001–19 Nov 2001, I. C. Stocks, (ANSP, 1 ♀); 06 Nov 2001–19 Nov 2001, I. C. Stocks, (UDCC, 1 ♀); 19 Nov 2001–04 Dec 2001, I. C. Stocks & L.Collins, (UDCC, 1 ♀). GSMNP, Snakeden Ridge ATBI Plot, 35.74333°N 83.22°W, 27 Sep 2001–16 Oct 2001, I. C. Stocks, (UDCC, 2 ♀); 16 Oct 2001–06 Nov 2001, I. C. Stocks, (UDCC, 1 ♀); 19 Nov 2001–04 Dec 2001, I. C. Stocks & L.Collins, (UDCC, 2 ♀). *Henderson Co.*, Wildersville, Parker's Crossroads, 35.79194°N 88.38°W, 29 Jul 2013, K. Handley, (NCSU, 1 ♀). *Montgomery Co.*, Clarksville, 36.52972°N 87.35944°W, 25 Aug 1917, D. M. DeLong, (FSCA, 1 u). *Sevier Co.*, (ANSP, FSCA, UDCC, 39 ♂, 46 ♀, 1 u). *Weakley Co.*, Martin, 36.33902°N 88.85271°W, Jul 1935, H. R. Horton, (NCSU, 6 ♂, 2 ♀). Great Smoky Mountains, 35.58333°N 83.5°W, 06 Jun 1939, C. P. Alexander, (UMAM, 7 u); 09 Jun 1939, C. P. Alexander, (UMAM, 2 u). *unknown Co.*, Great Smoky Mountains National Park, 35.60056°N 83.50852°W, 14 Sep 1953, H. Dybas, (FMNH, 1 ♂, 1 ♀). Texas: *Brazos Co.*, (VEBC, 17 ♂, 24 ♀, 1 u). *El Paso Co.*, El Paso, 6021 Isabella Dr., 31.8253°N 106.5363°W, 01 Jul 2014–12 Jul 2014, S.T. Dash, (UDCC, 1 ♀). *Hidalgo Co.*, Pharr Import Lot near [Pharr-Reynosa] international bridge, 26.09003°N 98.20223°W, 25 Sep 2016–05 Oct 2016, JM Leavengood jr., D. McCoy, A. Cisneros, A. Garza, (UDCC, 1 u). *Hockley Co.*, 2.4 mi S of Levelana, 33.58731°N 102.3779°W, 04 Oct 2004, R. Turnbow, (UDCC, 1 ♀). *Kenedy Co.*, Sarita, 27.22338°N 97.79123°W, 11 m, 27 Nov 1911, Unknown, (NCSU, 1 ♂). Unknown: unknown Co., Delaware Water Gap (PA or NJ), 40.9717°N 75.13442°W, no date provided, Unknown, (AMNH, 1 ♂). Unknown, 29 Jul 1960, Hinds, (MEMU, 1 u). Vermont: *Chittenden Co.*, Jericho, 22 Sunnyview Drive, 44.50361°N 72.99306°W, 23 Aug 1998, C. R. Bartlett, (NCSU, 2 ♂, 1 ♀). Jericho, 43 Sunnyview Drive, 44.50348°N 72.99306°W,

22 Aug 1997–25 Aug 1997, C. R. Bartlett, (NCSU, 1 ♂). Lamoille Co., Stowe, 44.46533°N 72.68456°W, 221 m, 22 Jun 1927, C. P. Alexander, (USNM, 2 u). Virginia: Arlington Co., Arlington, 38.89027°N 77.08416°W, 15 Jul 1932, JW Serivener, (USNM, 1 u). Chesapeake Co., NW River Park campground, 36.59444°N 76.11944°W, 04 Oct 2013, A. M. Deczynski, (UDCC, 1 ♀). Northwest River Park, 36.58472°N 76.15694°W, 16 Oct 2015, Kaitlin Rim, (UDCC, 1 ♂); 17 Oct 2015, Kaitlin Rim, (UDCC, 1 ♂, 1 ♀). Fairfax Co., (GWMP, UDCC, UCR, 11 ♂, 2 ♀, 4 u). Giles Co., Mount Lake Biological Station, 37.37476°N 80.52273°W, 25 Jun 1962, T. Daggy, (NCSU, 1 ♂, 1 ♀). Norfolk Co., Northwest River Park, Chesapeake, 36.58459°N 76.1569°W, 16 Oct 2015, Sara Westhafer, (UDCC, 1 ♂, 1 ♀). Northwest River Park, Chesapeake, 36.58436°N 76.15576°W, 16 Oct 2015, Sara Westhafer, (UDCC, 3 ♂, 3 ♀). Prince George Co., Gunston Hall, S of Springfield, 38.66401°N 77.15998°W, 28 Aug 1999, C. R. Bartlett, (UDCC, 7 ♂, 5 ♀). Suffolk Co., Great Dismal Swamp, 36.64088°N 76.4518°W, 9/10/1933, H. G. Walker, (UCR, 1 u). West Virginia: Barbour Co., Philippi, 39.15222°N 80.04056°W, 25 Sep 1938–30 Sep 1938, G. E. Wallace, (CMNH, 2 ♂, 2 ♀). Clay Co., Clay, 38.46068°N 81.08494°W, 06 Sep 1938–12 Sep 1938, G. E. Wallace, (CMNH, 2 ♂, 2 ♀). Morgan Co., nr Great Cacapon, 39.62°N 78.2925°W, 01 Sep 1984, G. F. and J. F. Hevel, (USNM, 1 ♂). Pendleton Co., Spruce Knob, 38.70069°N 79.53079°W, 1481 m, 05 Aug 1960, Milliron & Wallace, (CMNH, 1 ♂). Tucker Co., 6 mi S Parsons, Shavers Fork, 39.0226°N 79.71013°W, 01 Oct 1938–06 Oct 1938, G. Wallace, (CMNH, 2 ♂). Shaver's Fork, 39.07779°N 79.68919°W, 01 Oct 1938–06 Oct 1938, G. E. Wallace, (CMNH, 3 ♂). Wisconsin: Dane Co., Cross Plains, 43.11444°N 89.65556°W, 01 Sep 1987, B. J. Harrington, (WIRC, 1 ♂). Madison, 43.0454°N 89.42727°W, 279 m, 14 Oct 1983, J. K. Castle, (WIRC, 1 ♂). Picnic Point T7N R9E Sec 15, 43.08915°N 89.41598°W, 24 Sep 1983, K. Racke, (WIRC, 1 ♂). Juneau Co., Mather, 44.14278°N 90.30861°W, 13 Sep 1930, Unknown, (WIRC, 1 ♂, 1 ♀). Sauk Co., Baraboo, 43.47111°N 89.74417°W, 26 Sep 1987, B. J. Harrington, (WIRC, 1 ♂). Beaver Creek, 43.57543°N 89.88623°W, 20 Oct 1989, B. Anderson, (WIRC, 1 ♂, UCR, 2 u). **Mexico**: Veracruz: Coatzacoalcos Co., 3 mi W Coatzacoalcos, 18.14057°N 94.5261°W, 26 Jul 1971, Ward and Brothers, (LBOB, 1 ♂). **Puerto Rico**: Aibonito: Aibonito, 18.1419°N 66.2664°W, 14 Jul 1914–17 Jul 1914, Unknown, (AMNH, 1 u). Mayaguez: Mayaguez, 18.19329°N 67.14324°W, 04 Jul 1917, Harold Morrison, (USNM, 1 ♂). Arecibo, 18.4744°N 66.7161°W, 01 Mar 1914–04 Mar 1914, Unknown, (AMNH, 1 u). Manati, 18.429°N 66.492°W, 53 m, 27 Jun 1915–29 Jun 1915, Unknown, (AMNH, 2 u). **Belize**: Stann Creek: Cockscombe Basin, 16.75972°N 88.46111°W, 12 Jun 1991, Tom Myers, (UDCC, 1 u). **Unknown**: unknown: unknown Co., Delaware, 12 Sep 1916, Unknown, (NCSU, 1 ♂ 1 ♀). Unknown, Sep 1909, Z. P. Metcalf, (NCSU, 3 ♂, 3 ♀).

Chionomus quadrispinosus

United States: Florida: Broward Co., Fort Lauderdale, 14 May 1975, N. L. Woodiel (LBOB, 1 ♂). Hendry Co., LaBelle, 16-VII-1939, [P.W.] Oman (FSCA, 3b ♂). Highlands Co., Archbold Biological Station, 27.18833°N 81.33778°W, 15 Mar 2012, M. A. Deyrup, Galactia elliottii (ABSC, 1 ♀). Miami-Dade Co., Coral Gables, Matheson Hammock, 25.66914°N 80.26655°W, 03 May 2010, Vince Golia (ABSC, 1 ♂). Seminole Co., Sanford, 29-V-1926, E.D. Ball (FSCA, 2b ♂, 2b ♀); Sanford, 11-III-1947, R.H. Beamer (FSCA, 1b ♂, 1b ♀). Louisiana: Baton Rouge Par., Baton Rouge, 10-XI-1975, (LSAM, 3b ♂). **Dominican Republic**: La Vega: La Guardarraya, Mons. Nouel-Constanza Rd, J. Maldonado-Capriles (USNM, 1m ♂). **Guatemala**: Quetzaltenango: Fuentes Georginas, Volcan Zunil, 8km SE Zunil, 14-15-II-2007, AT Gonzon & R Donovall (UDCC, 1m ♂). Suchitepequez: reserva Los Tarrales, Volcan Atitlan, 12km NW Patulul, 14.54822°N 91.16106°W, 1450 m, 11 Feb 2007, J. R. Cryan & J. Richards (UDCC, 1 ♂). **Honduras**: Francisco Morazan: Zamorano, 23-IX-1961, J.M. Matta (LBOB, 1m ♂). **Nicaragua**: Rio San Juan: Refugio Bartola, nr. Indio Maíz Biological Reserve, ~6Km E of El Castillo, 10.97252°N 84.33916°W, 50 m, 01-06 Nov 2010, J. Cryan, J. Urban, G. Svenson (UDCC, 1 ♂). **Costa Rica**: San José: San Pedro de Montes de Oca, 4-XII-1936, CH Ballou (USNM, 1m ♂); 2 km W. Empalme, I-1995, C. Godoy & P. Hanson (UDCC, 1m ♂); Moravia Co.: Zurqui de Moravia, Mar 1994, Hanson and Godoy (LBOB, 1 ♂); 26 km N Sanisidro, 2100 m, Mar–May 1992, P. Hanson & C. Godoy (LBOB, UDCC, 3 ♂). Puntarenas: S. Voco, Est. Biol. Las Alturas, X-1991, Hanson & Godoy (LBOB, 1m ♂); S. Voco, Est. Biol. Las Alturas, II-1992, Hanson & Godoy (LBOB, 2m ♂); Res. For. Golfo Dulce, 3 km SW Rincon, 10 m, Dec 1989–Mar 1990, Hanson (UDCC, 1 ♂). Heredia: nr Puerto Vieja La Selva Bio. Sta. , 24-II-2004, CR Bartlett, *et al* (UDCC, 1m ♂, 1b ♂); same, (23-II)-(2-III)-2004, CR Bartlett, J Cryan, J Urban (UDCC, 1m ♂); Estacion Biologica, La Selva, 12-I-1995, S.M. Clark (BYUC, 1m ♂).

Chionomus tenae

USA: Florida: Broward Co., Ft. Lauderdale, Lauderdale Invarry, 26.1729°N 80.23367°W, 05 Jul 2000, C. R. Bartlett (UDCC, 1 ♂, 2 ♀). Miami-Dade Co., Everglades National Park, Flamingo Prairie, 27 Mar 1973, O'Briens & Kaplan (UDCC, 1 ♂). Palm Beach Co., Boynton Beach, Jog Rd., 26.52383°N 80.14739°W, 26 Feb 2001, Vince Golia (UDCC, 1 ♂); Delray Beach, Country Lake, 13 May 1995, Vince Golla (UDCC, 1 ♂); Lake Worth, Geneva Lakes court, 16 Jun 2004, Vince Golia, Light

Trap (FSCA, 1 ♀). **Mexico:** Tamaulipas: Cielito, near Encino, 28 Aug 1985–30 Aug 1985, E. G. & T. J. Riley (LSUC, 1 ♂). Veracruz: 3 mi W Gutierrez Zamora, 25-VI-1953, University of Kansas (SEMC, 1m ♂); Fortin de Las Flores, Hydroelectric Plant, Cervecería Moctezuma, 17 Jun 1964, Daniel Rabago (FSCA, 1 ♂); Fortin de las Flores-sumidero, Planta de la cervecería, Ing. Daniel Rabago res., 14 Jul 1968, H. V. Weems, Jr. (FSCA, 1 ♀); Los Tuxtlas, Biological Station, UNAM, 23 Aug 1982, C. W. and L. O'Brien and G. Wibmer (LBOB, 1 ♂). **Puerto Rico:** Arecibo: Cambalache State Forest, 01 Aug 1999, C. W. O'Brien & P. Kovarik (UDCC, 1 ♂). Bayamon: Bayamon, Jan 1899, Aug Busck (USNM, 3 ♂). Maricao: Maricao State Forest, 03 Jul 1953, J. A. Ramos, Light Trap (LBOB, 1 ♂); fish hatchery, 08-11 Aug 1961 (USNM, 3 ♂). **Cuba:** Las Tunas: Jobabo, 19-I-1925, CF Stahl (UDCC, 1m ♂). **Jamaica:** Clarendon: 2 km S of Rocky Point, nr Jackson Bay Cave, 10 Dec 1975, G. F. Hevel, light trap (USNM, 1 ♂). Saint James Parish: 5-7 mi W Montego Bay, 4-VIII-1967, L&CW O'Brien (LBOB, 1b ♂); ca 6 km S Montego Bay near Mocho Cave, 300 m, 12 Dec 1975, G. F. Hevel (USNM, 1 ♀). **Montserrat:** Plymouth, Sep 1967, N. L. H. Krauss (USNM, 1 ♂). **Belize:** Cayo: nr Teakettle Bank, Pooks Hill, 8-VII-2003, CR Bartlett (UDCC, 1m ♀); same 7-VII-2003 (UDCC, 1 ♂); ~5 mi S of Teakettle Village off Western Highway, 02-09 Jul 2003, C.R Bartlett, J. Cryan and J. Urban (UDCC, 2 ♂, 1 ♀); near Teakettle Bank, near Pooks Hill by river, 17.153°N 88.846°W, 08 Jan 2003, C. R. Bartlett, 1;f, 1;f (UDCC, 2 ♀). Orange Walk: Rio Bravo Cons. Area, Mahogany Trail, 11-VII-1996, C.W. & L.B. O'Brien (LBOB, 1m ♂); Rio Bravo Cons. Area, Research Station, 13 Oct 1991, P. H. Freytag (LBOB, 1 ♂). Stann Creek: near Armenia at River, Hummingbird Highway, 07 Jan 2003, C. R. Bartlett (UDCC, 1 ♂). Toledo: Rio Temas[h], VII-1937, A.J. White (NCSU, 2m ♂, 1m ♀); same, VIII-1937, A. J. White (UDCC, 5m ♂, 4m ♀); same, IX-1937 (UDCC, 3 ♂, 6 ♀); Rio Grande, VI-1932, J.J. White (NCSU, 4m ♂, 11m ♀). **Guatemala:** Peten: Reserva Natural Ixpanpajul, 16-20 Oct 2005, G. B. Edwards (FSCA, 2 ♂, 2 ♀). Suchitepequez: reserva Los Tarrales, Volcan Atitlan, 12 km NW Patulul, 14.54822°N 91.16106°W, 1450 m, 11 Feb 2007, J. R. Cryan & J. Richards (UDCC, 1 ♂). **Honduras:** Cortes: La Lima, United Fruit Co, 3-VI-1964, F.S. Blanton, A.B. Broce, R.E. Woodruff (LBOB, 1m ♂). **El Salvador:** La Libertad: La Libertad, 29 Oct 1965, N. L. H. Krauss (USNM, 1 ♂). **Costa Rica:** Heredia: nr Puerto Vieja La Selva Biol. Sta., 18-19-VIII-2003 CR Bartlett, J Cryan, J Urban (UDCC, LBOB, 1m ♂, 1 ♀); Heredia nr Puerto Vieja La Selva Biol. Sta., 15-VIII-2003 CR Bartlett, J Cryan, J Urban (UDCC, 1m ♂); Heredia nr Puerto Vieja La Selva Biol. Sta., 16-VIII-2003 CR Bartlett, J Cryan, JUrban (UDCC, 2m ♂, 1 ♀); Heredia nr Puerto Vieja La Selva Biol. Sta., 17-VIII-2003 CR Bartlett, J Cryan, JUrban (UDCC, 3m ♂); same 01 Mar 2004 (LBOB, 1 ♂). Puntarenas: Osa Co. Co., nr. Playa Tortuga; Hotel Villas Gaia, 14 Jan 2012, A.M. Deczynski (UDCC, 1 ♂); Golfito Hotel Balneario, 06 Aug 1964, R. E. Woodruff (FSCA, 1 ♂). San Jose: Cerro Muerte, 26 km. N. San Isidro, 2100 m, Sep 1992–Oct 1992, Hanson and Godoy (UDCC, 1 ♂). **Panama:** Panama: Panama, 10 Nov 1952, F. S. Blanton (USNM, 1 ♂). **Colombia:** Cauca: PNN Gorgona El Saman, 7-25-V-2001, R. Duque (UDCC, 1m ♂). Valle: Mun. Candelaria, Finca San Luis, 1010 m, 14 Apr 1975–16 Apr 1975, R. Wilkerson, light trap (UDCC, 1 ♂). **French Guiana:** Cayenne: 5 km E Tonnegrande, 4.80293°N 52.42542°W, 45 m, 12 Jun 2005, J. E. Eger (UDCC, 1 ♂); Entomotech Lodge 30 km SE Roura on Kaw Rd, 1-12.XII.2002, J.E. Eger (LBOB, 1m ♂). Guyane: 8 km W of Risquetout, 4.91828°N 52.55201°W, 45 m, 10-11 Jun 2005, J. E. Eger (UDCC, 2 ♂, 2 ♀). **Brazil:** São Paulo: Piracicaba, 24-II-1966, C.A. Triplehorn (UDCC, 1m ♂, 2m ♀). **Venezuela:** Caracas: *Distrito Federal*, El Valle, 28 Sep 1938, *Medicago sativa*, lot no. 39-10379 (USNM, 1m ♂ + 1m ♀ [on same pin]). **Ecuador:** Manabi: Cojimies, Aug 1949, W. Clark-Macintyre (USNM, 1 ♂). **Bolivia:** Santa Cruz: 3.7 km SSE Buena Vista, Hotel Flora & Fauna, 17.49915°S 63.55253°W, 430 m, 14-28 Oct 2000, M. C. Thomas, light trap (LBOB, 1 ♂); Potrerillos del Guenda Prs. Natural, 17.66667°S 63.45°W, 370 m, 12-13 Oct 2007, Cline & Wappes (UDCC, 1 ♂). **Paraguay:** Central: 3 km E Ypacarai, 7-X-1968, C.W. & L. O'Brien (LBOB, 1m ♂). **Argentina:** Chaco: P.N. Chaco, 11-13-I-2008, Dietrich *et al* (INHS, 1m ♂); ~5 km W Capitan Solari, in Park Nacional Chaco, 26.80875°S 59.60561°W, 48 m, 10-13 Jan 2008, J. R. Cryan (UDCC, 3 ♂, 5 ♀). Corrientes: P.N. Mburucuyá, 1.8km W campgd., 8-I-2008, C.H. Dietrich (INHS, 1m ♂).