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Akemetopon, a new genus containing three new species of planthoppers (Hemiptera: Fulgoroidea: Delphacidae)

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Abstract

The new delphacid genus *Akemetopon* **gen. n.** (Delphacinae: Delphacini) is described and illustrated with 3 new species from Arizona and Mexico: *Akemetopon inornatum* **sp. n.**, *A. politum* **sp. n.**, and *A. ainigma* **sp. n.** A key to species is provided. The barcoding portion of the mitochondrial gene *Cytochrome Oxidase I* (COI) was sequenced for *A. politum* **sp. n.** A maximum likelihood analysis places this genus in the basal Delphacini.

Key words: Delphacinae, Delphacini, Auchenorrhyncha, Fulgoromorpha, planthopper, maximum likelihood, *Cytochrome Oxidase I* (COI)

Introduction

Entomological collections contain a wealth of unidentified delphacid specimens, some remaining in this state because they do not fit known taxa. Here a new genus (Delphacinae: Delphacini following Asche 1985, 1990; Urban *et al.* 2010) is described in part from specimens collected initially by R. H. Beamer in the 1930s. Beamer indicated he believed these specimens were undescribed species by including pleisiotype labels. Other workers have noted the uniqueness of these specimens, particularly the sharp fastigium, and have speculated on their generic allies within the Delphacini.

The Delphacini are recognized by a well-developed suspensorium, the hind tibiae usually with 5 apical spines, a foliaceous, tectiform calcar usually with teeth along the posterior margin; and the phallobase elongate and completely fused with the aedeagus (forming a theca), without a sclerotized sperm-conducting tube. In America north of Mexico, the Delphacini contain 56 genera with 303 species.

In this paper we establish a new genus, *Akemetopon* **gen. n.** of Delphacini to accommodate three new species, namely *A. inornatum* **sp. n.**, *A. politum* **sp. n.**, and *A. ainigma* **sp. n.**, The new genus and species are described, illustrated and compared with similar taxa. A key to species is provided. The phylogenetic placement of the new genus is investigated using *Cytochrome Oxidase I* (COI) sequence data from one of the new species in a maximum likelihood analysis along with selected taxa from Urban *et al.* (2010).

Material and methods

Morphology. Morphological terminology follows Asche (1985), but for descriptive purposes the parameres will be referred to as having a proximal "basal angle" and distal "inner angle" (*sensu* Metcalf 1949). The heading 'genitalia' should be understood to refer to males and include the terminal segments.

The collections from which specimens were examined are as follows (collection abbreviations, except CMSU, following Arnett *et al.* 1993):

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CSMU	University of Central Missouri Insect Collection (in care of Stephen Wilson), Warrensburg, MO.
INHS	Illinois Natural History Survey Insect Collection, University of Illinois, Champaign, IL.
LBOB	Lois O'Brien Collection (associated with California Academy of Sciences, CASC), Green Valley, AZ.
SEMC	University of Kansas, Division of Entomology of the Biodiversity Institute, Snow Entomological Museum, Lawrence, KS.
WFBM	W. F. Barr Entomological Collection, University of Idaho, Moscow, ID.
USNM	US National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Diagnostic descriptions are provided for all included species. Features stated to be uniform among species in the generic description are not repeated in the species descriptions, except for clarity or specific detail. Measurements reported are averages in millimeters (mm), with number of specimens measured ("n") indicated and standard deviation as appropriate. Total body length was measured in dorsal view from tip of frons to tip of segment 10 (i.e., excluding the 'anal tube'); body width was measured at the tegulae.

All observed specimens are reported. Reported specimen data follows the format of the specimen label, with added notes in square brackets. Label information for primary types is quoted, with each line break indicated by "/" and each label separated by "//". All specimens are brachypterous. In the specimens examined, male "♂", and female "♀" symbols are used. Plant nomenclature, including common names, follows the USDA online PLANTS database (USDA, NRCS 2011) or ITIS (Integrated Taxonomic Information System; ITIS 2011) if not available on PLANTS.

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).

Molecular data. Nucleotide sequence data (488bp) for the mitochondrial gene COI was generated; specimens prepared for molecular work were only available for *Akemetopon politum*. Specimens for molecular work were collected (by C. H. Dietrich, INHS) and stored in 95–100% ethanol at -80°C. DNA Extractions were run on thoracic 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: 40 cycles of 1 min at 94°C, 1 min at 45°C, and 1 min at 72°C, followed by 10 minutes incubating at 72°C. Oligoneucleotide primers used were COI-RLR (Simon *et al.* 1994) and Calvin (Lin and Wood 2002) and were synthesized by Integrated DNA Technologies (Coralville, IA).

A 1–2% agarose gel electrophoresis with ethidium bromide staining was used to visualize amplified DNA. Qiagen MinElute DNA kits (Qiagen, Inc. Valencia, CA) were used to purify PCR products. Sequence was obtained using an ABI Prism 3130XL Genetic Analyzer at the University of Delaware's Delaware Biotechnology Institute. Complimentary strands were edited and inspected using 4Peaks version 1.7 (Griekspoor and Groothuis 2005) and assembled using CAP3 (Huang and 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 is provided with the species description.

Phylogenetic analysis. Phylogentic analysis using COI was conducted for 23 ingroup (Delphacini) and 3 outgroup (Stenocraninae) taxa under the optimality criteria of maximum likelihood (ML) to provide a hypothesis for the placement of *Akemetopon* with respect to the analyses of Urban and colleagues (2010). The best-fitting model for the aligned sequences (TIM2+G) was determined using JModelTest (Posada 2008) under the Akaike information criterion (AIC; Akaike 1974). The program GARLI v2.0 (Zwickl 2006) was used for the ML analysis. To remain consistent with Urban and colleagues (2010), 20 independent search replicates, each with 1,000,000 generations, were run. Bootstrap support values were obtained by running 100 bootstrap replicates for 100,000 generations in GARLI. A bootstrap consensus tree was calculated using PAUP* 4.0b10 (Swofford 2003).

Systematic account

Subfamily Delphacinae

Tribe Delphacini

Akemetopon gen. n.

Type species: *Akemetopon inornatum* **sp. n.**

Description. Color dark testaceus, legs and usually head paler; often with pale band on trailing margin of brachypterous forewings. Head narrower than pronotum. Vertex as wide as long, or slightly wider; carinae distinct, median carina weaker; sublateral carinae meeting at fastigium. In lateral view, head pointed (*A. inornatum*, *A. politum*) or rounded (*A. ainigma*). Frons with lateral margins slightly bowed laterad, widest near base of compound eyes; median carina distinct (*A. inornatum*) or weak (*A. politum*, *A. ainigma*), forked at fastigium. Antennae short, terete, first antennal segment wider than long, second over twice length of first. Pronotal carinae obscure, reaching (*A. politum*) or not reaching (*A. inornatum*, *A. ainigma*) posterior margin. Mesonotal carinae weak or obsolete.

Male pygofer broad in lateral view, longer ventrally than dorsally; in caudal view opening round, about as tall as wide; margins rounded (not keeled), ventral margin of opening with caudally projected tooth. Diaphragm well-developed, dorsal margin weakly concave leaving large oval-elliptic opening between diaphragm and segment 10; armature U-shaped, with aedeagus resting between thickened, deeply sclerotized ridges. Aedeagus curved ventrad, roughly parallel sided, narrowing in apical fourth to acute apex; with lateral serrations in rows; gonopore subapical and dorsal. Suspensorium evident, base between aedeagus and segment 10 short; arms enclosing aedeagus. Parameres flattened, forceps-like; basal angle weak, widest in apical half, distally narrowing to dorsomedially directed avicephaliform apices. Segment 10 short and wide, bearing small, short hooked processes on caudal margin; segment 11 shorter than segment 10.

Remarks. *Akemetopon* is an unusual genus. The sharp fastigium of *A. inornatum* and *A. politum* is unlike any other North American delphacine planthopper, and the bowed lateral margins of the frons is unusual among North American Delphacini. Despite substantive differences in the head, the genitalia are remarkably similar among species. Superficially it most resembles *Pissonotus*, but *Pissonotus* has a rounded fastigium, a pair of median processes on the ventral margin of the pygofer, and the median carina of the frons is forked below the fastigium (Bartlett and Deitz 2000). The midventral projection of the pygofer opening is an unusual feature among North American Delphacini. It is shared by *Kosswigianella* (*sensu* Hamilton 2002, Hamilton and Kwon 2010; *viz*. *Acanthodelphax* - *K. analis* (Crawford) and *K. wasatchi* Hamilton; but not *K. lutulenta* (Van Duzee)), which differs from *Akemetopon* in color (stramineous brown with darker abdomen in males), range (northern plus Appalachians), shape of the parameres (diverging), aedeagus (lacking rows of teeth or bearing pair of large terminal processes) and genital diaphragm form. A midventral pygofer projection is also shared with *Achorotile*, which has similar color but bears sensory pits on the adult and the median carina on the face is paired. Some members of the genera *Megamelus* Fieber (see Beamer 1955) and *Bakerella* Crawford (see Beamer 1945, 1950) have a midventral processes on some species, but these genera are quite unlike *Akemetopon.* A midventral process is also seen in the tropical Old World genus *Tarophagus* Zimmerman (see Asche and Wilson 1989), but except for this and color, *Tarophagus* bears few similarities to *Akemetopon.*

All observed specimens are brachypterous. The only long series was of *Akemetopon politum* collected by vacuum sampling the grass *Muhlenbergia*; the remaining specimens were singletons, or few in number, collected by sweeping or without collecting method provided.

Etymology. The genus name, *Akemetopon,* is formed by combining a truncation of the feminine Greek word *akoke*, meaning "a point, sharp edge", and *metopon*, the Greek noun for forehead, in reference to the angled fastigium of the type species (remarked on independently by several workers on specimen labels). The name is neuter in gender.

Key to species of *Akemetopon*

1. Median carina of frons conspicuous (Fig. 1C), forewings dark, without pale apical band (Fig. 1A), fastigium pointed in lateral view (Fig. 1B) . . . . . *A. inornatum*
- Median carina of frons weak (Figs 2C, 3C), Forewings with pale apical band (if pale, band may not be apparent) (Figs 2A, 3A); fastigium pointed (*A. politum*; Fig. 2B) or rounded (*A. ainigma*; Fig. 3B) in lateral view 2
2. Fastigium rounded in lateral view (Fig. 3B), carinae of vertex concolorous with foveae (Fig. 3A), less conspicuous; Arizona . . . . . *A. ainigma*
- Fastigium pointed in lateral view (Fig. 2B); lateral and sublateral carinae of vertex conspicuous (Fig. 2A), paler than foveae; Mexico . . . . . *A. politum*

***Akemetopon inornatum* sp. n.**
(Figs 1, 4A)

Type locality. USA: Arizona, SW of Elgin, Audubon Research Ranch.

Diagnosis. Shining deep brown with a paler head. Fastigium angulate, appearing pointed in lateral view; frons with median carina conspicuous. Forewings without apical white band.

Description. COLOR: Body mostly dark shiny brown, nearly black (Fig. 1A). Head and pronotum between lateral carinae distinctly paler (light brown). Head with carinae (including subantennal carinae and antennal sclerite) paler than intercarinal regions. Posterior compartments of vertex paler than anterior compartments. Antennae dark brown proximally, shading distally paler to yellow. Mesonotum slightly paler between lateral carinae. Legs becoming paler distally to light brown tarsi. Pygofer dark brown with paler margins.

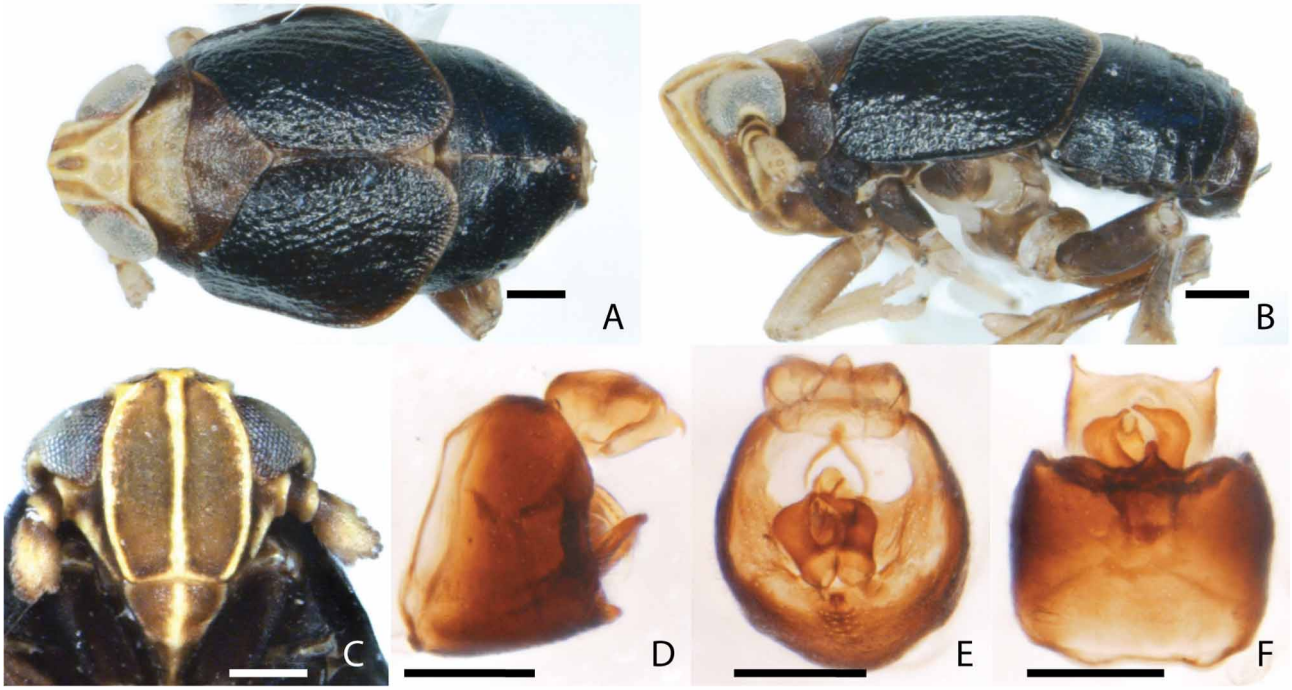

FIGURE 1. Features of *Akemetopon inornatum* **sp. n.** (paratype, scale = 0.2 mm). A. Dorsal habitus; B. Lateral habitus; C. Frons; D. Male pygofer, lateral view; E. Male pygofer, caudal view; F. Male pygofer, ventral view.

STRUCTURE: *Body.* Body length (in mm) male (♂) 1.93±0.04 (n=3); female (♀) 2.67±0.14 (n=5); width ♂ 0.77±0.03 (n=4); ♀ 0.87±0.04 (n=5). *Head:* Vertex length ♂ 0.25±0.01 (n=4); ♀ 0.28±0.01 (n=5); vertex width ♂ 0.29±0.01 (n=4); ♀ 0.33±0.02 (n=5); frons length ♂ 0.46±0.01 (n=4); ♀ 0.53±0.02 (n=5); frons width ♂ 0.35±0.01 (n=4); ♀ 0.38±0.02 (n=5). Head narrower than pronotum. Vertex approximately quadrate, wider than long (L:W ratio 0.86:1), in dorsal view apically rounded; carinae distinct, median carina of vertex weaker; submedian carinae converging anteriorly, meeting at or just past fastigium. In lateral view (Fig. 1B), head acutely pointed, fastigium sharp, carinate; projecting in front of eye about 1/4th eye length. Carinae of frons distinct (Fig. 1C), lateral carinae bowed outward, converging both ventrally and dorsally; frons widest near ventral margin of eye. Clypeus with carinae evident.

Thorax. Carinae of pronotum weak, lateral carinae obscurely reaching hind margin. Mesonotum with median carina weak, lateral carinae obsolete. Tegmina of brachypter diagonally truncate to rounded apices, leaving mid-ventral notch between tegmina apices; tegmina short, leaving about 5 terga exposed from above; venation greatly obscure and reticulate. Calcar approximately 1/2 length of basitarsus, narrow, tectiform, bearing 14–15 small teeth, the ultimate tooth largest.

Abdomen. Midventrally carinate, tapering caudad to truncate apex.

Genitalia. Pygofer (Figs 1D–F) in lateral view nearly twice as long ventrally as dorsad, ventral margin sinuate. In caudal view, slightly taller than wide, globular; margins of opening weakly carinate. Ventral margin of opening bearing a distinct, caudally projecting tooth; tooth in ventral view very slightly expanded at apex and bearing fine lateral serrulations. Diaphragm strong, armature u-shaped, flanking aedeagus in repose, caudally projected in lateral view, armature finely punctuate, serrulate on dorsal margin. Parameres simple, forceps-like, flattened, widest in apical forth, basal angle weak; basally diverging then converging, narrowed distally to avicephaliform apices, elongate inner angles mildly sinuate. Aedeagus round in cross-section with subapical dorsal gonopore; sharply curved ventrally, widest near base, gradually tapering for most of length, abruptly tapering subapically at gonopore to acuminate point; laterally bearing 12 teeth uniformly spaced, mirrored along both sides (Fig. 4A). Segment 10 longer than tall, armed with 2 widely separated, short, strongly hooked projections on caudolateral margin. Segment 11 short, mostly withdrawn into segment 10.

Recorded hosts. *Muhlenbergia rigens* (Benth.) Hitchc. (deergrass; Poaceae: Chloridoideae: Eragrostideae).

Distribution. USA: AZ.

COI barcode. Molecular material not available.

Etymology. The specific name is the Latin word '*inornatus*', meaning unadorned; in reference to the absence of a white stripe at the end of the tegmina. The specific name was emended with an '*-um*' to make it neuter in gender.

Remarks. This species is distinguished from the other *Akemetopon* species by the absence of a pale stripe on the apex of the brachypterous forewings, the angular fastigium, and the distinct median carina of the frons.

This species was originally collected in 1932 by R. H. Beamer, but only 10 specimens are available so far.

Material examined. Holotype ♂ (brachypterous) [CMSU], "AZ: Santa Cruz Co. / Audubon Research Ranch / SW of Elgin / 12 May 2004 / ex crown of / *Muhlenbergia rigens* // [red paper] HOLOTYPE / *Akemetopon inornatum* / Weglarz & Bartlett".

Paratypes: **ARIZONA:** Santa Cruz Co., Audubon Research Ranch, Kyle Canyon 13 May 2004 (1♂, CMSU); Audubon Research Ranch, SW of Elgin, 12 May 2004 (2♂, 1♀, CMSU); Sunnyside Canyon, Huachuca Mts., VII–9–[19]40, DE Hardy (1♀, UDCC); St [Santa], Rita Mts, 8–8–[19]35, ED Ball (1♀, USNM); Sycamore Cyn., T.23S. R.11E Sec., 14 4100' elev., sweep 7–8/IX–[19]87, TD Miller (1♀, WFBM); [Pima Co.,] Baboquivari Mt, AZ 7–19–[19]32, RH Beamer (1♂, 1♀, SEMC).

***Akemetopon politum* sp. n.**
(Figs 2, 4B)

Type locality. MEXICO: Durango state, rt. 40, 24 miles East El Salto.

Diagnosis. Shining chestnut brown to light brown with a white distal margin of the brachypterous forewings. Head pointed in lateral view, fastigium carinate; carinae of front concolorous with frons.

Description. COLOR: Body (Fig. 2A) glossy dark brown to brown, paler anteroposteriorly, females lighter, brown to nearly stramineous. Carinae of head paler than foveae, frons brown, darker medially, carinae concolorous; clypeus light brown, darker anteriorly. Subantennal carinae darker than subantennal sclerite; antennae brown proximally, paler to white distally. Pronotum, and mesonotum dark brown, scutellum paler. Vertex darker posteriorly, carinae white. Tegmina, glossy dark brown with a distal white stripe. Legs light brown, tarsi stramineous. Pygofer concolorous with body, darkening slightly mesolaterally. Parameres, segments 10 and 11 light brown.

STRUCTURE: *Body.* Body length (in mm) male (♂) 2.11±0.28 (n=9); female (♀) 2.57±0.3 (n=18); width ♂ 0.97±0.04 (n=5), ♀ 1.11±0.08 (n=10). *Head:* Vertex length ♂ 0.31±0.03 (n=7), ♀ 0.35±0.03 (n=14); vertex width ♂ 0.30±0.01 (n=7), ♀ 0.34±0.02 (n=14); frons length ♂ 0.48±0.02 (n=7), ♀ 0.56±0.03 (n=8); frons width ♂ 0.40±0.03 (n=7), ♀ 0.45±0.02 (n=8). Head narrower than pronotum. In dorsal view, vertex quadrate, apparently just longer than wide (L:W ratio ♂ + ♀ 1.03:1), rounded apically. Lateral and submedian carinae distinct, sub-

median carinae converging anteriorly, at or just beyond fastigium; median carinae weak. In lateral view (Fig. 2B), head distinctly wedge shaped, fastigium sharp, carinate; vertex extending beyond eye for 1/3rd length of eye. Frons (Fig. 2C) just longer than wide, lateral carinae bowed outward, reaching widest point at ventral margin of eye. Carinae of frons obscure; clypeus with carinae evident.

Thorax. Carinae of pronotum obscure, lateral carinae reaching hind margin. Median carinae of mesonotum faint. Tegmina apically rounded, diagonally truncate with a midventral notch; traces of ventation present. Calcar approximately 1/2 length of basitarsus, globular, tectiform, bearing 8–11 teeth, the ultimate tooth largest.

Abdomen. Segments of abdomen dorsomedially carinate, distal segments tapered to a truncate apex.

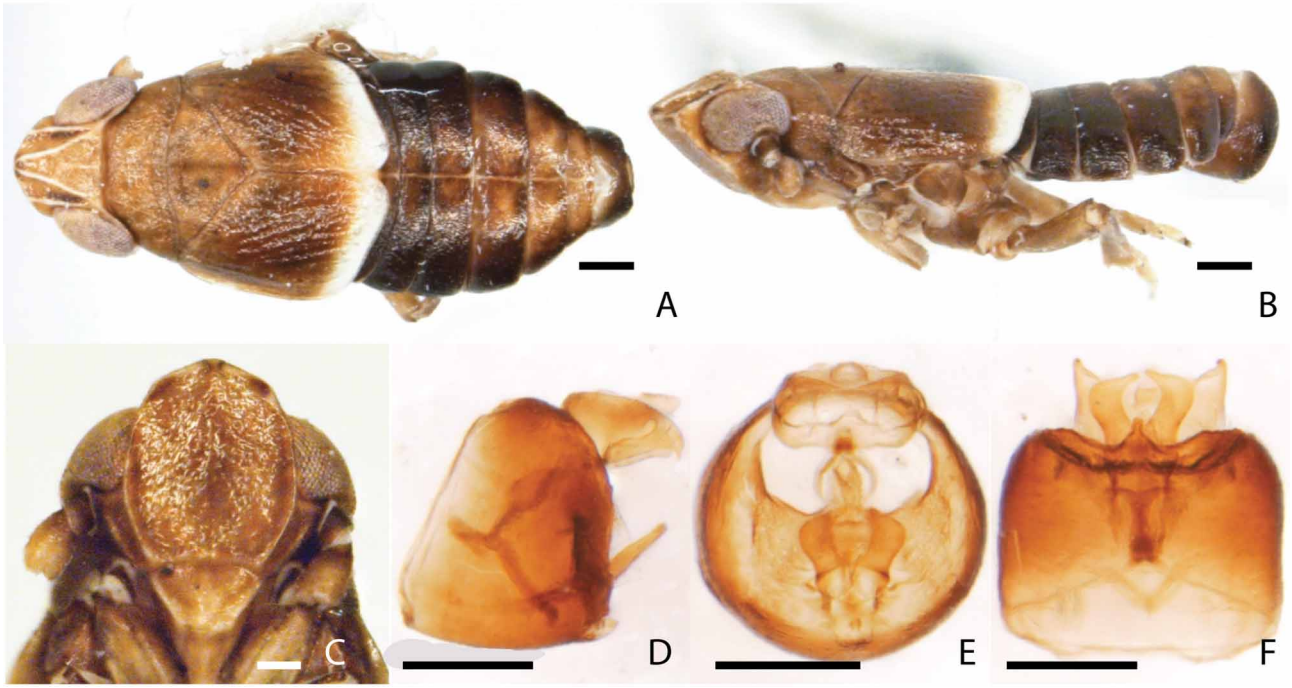

FIGURE 2. Features of *Akemetopon politum* **sp. n.** (paratype, scale = 0.2 mm). A. Dorsal habitus; B. Lateral habitus; C. Frons; D. Male pygofer, lateral view; E. Male pygofer, caudal view; F. Male pygofer, ventral view.

Genitalia. Pygofer (Figs 2D–F) in lateral view nearly 3 times as long ventrally as dorsad, ventral margin sinuate. In caudal view, opening rounded, approximately as tall as wide, slightly dorsoventrally compressed; margins of opening rounded. Ventral edge slightly sinuate; bearing a median ventral process, asperous at apex. Diaphragm sturdy, mildly excavate at confluence of parameres, opening to the inner chamber quadrate and rounded; armature weakly reinforced, slightly projecting, u-shaped to fit aedeagus, bearing few serrulations. Parameres forceps-like, flattened, widest in distal fourth, basal angle weak; diverging basally, converging apically, narrowed distally to avicephaliform apices, inner margins sinuate. Aedeagus downwardly curved, gradually tapering to a sharp point, round in cross section, bearing row of approximately 10 teeth equally spaced along either side; gonopore dorsal, subapical (Fig. 4B). Segment 10 longer than tall, armed caudally with 2 widely separated, distinctly hooked, projections. Segment 11 small, mostly held within cavity of segment 10.

Recorded hosts. *Muhlenbergia sp.* Schreb (muhly), *Muhlenbergia vaginata* Swallen (muhly).

Distribution. Mexico (Durango, Zacatecas, Mexico).

COI sequence. 5’ – GAAGTTTACATCTTAATTTTACCAGGATTTGGATTAATTTCACAT
ATTATTATACAAGAAAGAGGGAAAAAAGAAACATTTGGATCAATTGGAATAATCTACGCCATAATT
GCAATCGGAATTTTAGGGTTTATTGTTTGAGCCCACCATATATTCACAGTTGGTATAGATATCGATACAC
GAGCATACTTTACATCAGCAACTATAATTATTGCAGTACCCACTGGTATCAAAATTTTTAGATGAATAGC
TACAATTTATGGATCTAAAATTATTTATTCACCTCAAATAATTTGATCCATGGGATTCATTTTACTTTTTAC
TATTGGGGGTTTAACAGGAGTTATATTAGCAAATTCATCCATTGATATTATTTTACATGATACATATTATGT
AGTTGCACATTTCCATTATGTACTTTCTATAGGTGCAGTTTTTACTATTATTGCAAGTTTTATTCATTGAT
ACCCGTTATTTACGGGACTTTA – 3’
Genbank accession #: JN19147

Etymology. The specific name comes from the participle ("*politus*") of the Latin verb "*polio*", meaning to polish or make smooth, with the neutral ending "*-um*".

Remarks. This species can be distinguished from *A. ainigma* by the angled fastigium, and from *A. inornatum* by the presence of a pale band at the distal margin of the tegmina and the concolorous carinae of the frons. The type series was vacuumed from *Muhlenbergia vaginata*. The type locality is the same as that of *Frameus prolatus* Bartlett, 2010 (Delphacidae: Stenocraninae), which was stated as N 24° 15' 25", W 104° 25' 47" in Bartlett (2010).

Material examined. Holotype ♂ (brachypterous) [INHS], "MEXICO: Durango, rt.40 / 24mi E El Salto 2400m /26–X–1994 CH Dietrich // [red paper] HOLOTYPE / *Akemetopon politum* / Weglarz & Bartlett".

Paratypes: MEXICO: Durango, same data as holotype (9♂, 16♀, INHS); Zacatecas, Rio Frio, June 5 1983, CW & L O'Brien and Marshall (2♀, 1 imm., LBOB); Mexico, LaMirasol, 7km SW. Santiago de Tianguistengo, 2800m, XI–2–1973, CW O'Brien (1♂, 1♀, LBOB); Mexico, rt. 1500, km 64, 33 km E Ixtapaluca, 8 November 2001, CH Dietrich. vacuum (2♂, 1♀, UDCC).

***Akemetopon ainigma* sp. n.**
(Figs 3, 4C)

Type locality. USA: AZ, Cochise Co., Huachuca Mountains, Upper Garden Canyon Picnic Area seep.

Diagnosis. Shining dark brown, tegmina with a distal pale stripe. Fastigium rounded, carinae of vertex and foveae concolorous with frons.

Description. COLOR: Body (Fig. 3A) shiny chestnut to dark brown; head paler, light brown. Carinae of head concolorous with foveae, antennal sclerite paler, stramineous, subantennal carinae concolorous with antennal sclerite. Antennal segment I darkened distally, segment II paler, proximally brown, distally light brown. Pronotum, mesonotum and tegmina shining chestnut; tegmina with distal white stripe. Legs light brown (damaged in holotype). Pygofer dark brown, segment 10 paler.

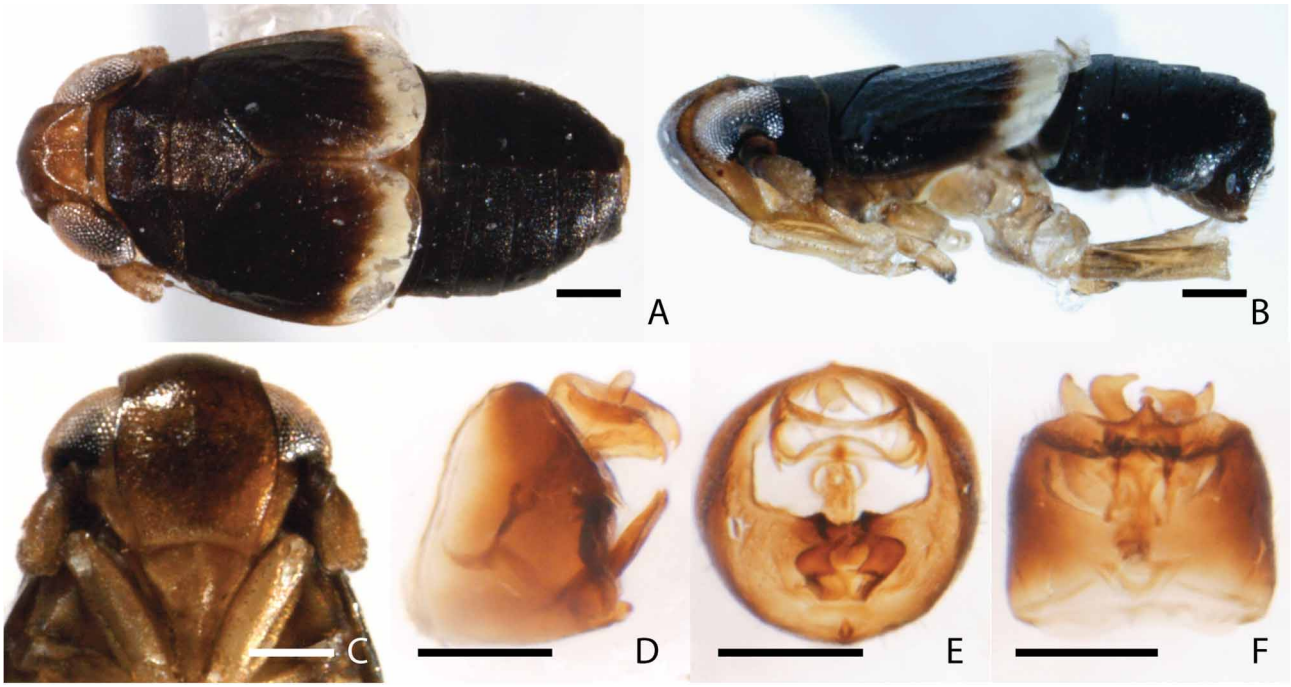

FIGURE 3. Features of *Akemetopon ainigma* **sp. n.** (holotype, scale = 0.2 mm). A. Dorsal habitus; B. Lateral habitus; C. Frons; D. Male pygofer, lateral view; E. Male pygofer, caudal view; F. Male pygofer, ventral view.

STRUCTURE. *Body.* Male (n=1; female not observed) body length 1.90, width at tegula 0.71. *Head:* Frons length 0.44, width 0.38; vertex length 0.24, width 0.32. Head in dorsal view, slightly narrower than pronotum, vertex nearly quadrate, wider than long (L:W 0.75:1), rounded at apex; carinae faint, submedian carinae apparently converging anteriorly, meeting on vertex just before fastigium. In lateral view (Fig. 3B), head wedge-shaped, fasti-

gium rounded, projecting forward 1/4th length of eye. Carinae of frons not apparent (Fig. 3C), lateral carinae converging ventrally and dorsally; frons widest just below eyes. Clypeus with distinct carinae.

Thorax. Median carinae of pronotum and mesonotum weak, lateral carinae of pronotum diverging, not quite reaching posterior margin. Lateral carinae of mesonotum obscure. Tegmina short, diagonally truncate, leaving abdominal segment 4 and beyond visible from above, apices rounded medially creating notch; venation weak, reticulate. Legs damaged in holotype, calcar not observed.

Abdomen. Segments of abdomen weakly dorsomedially carinate, gradually tapering caudally to enlarged, globular terminalia.

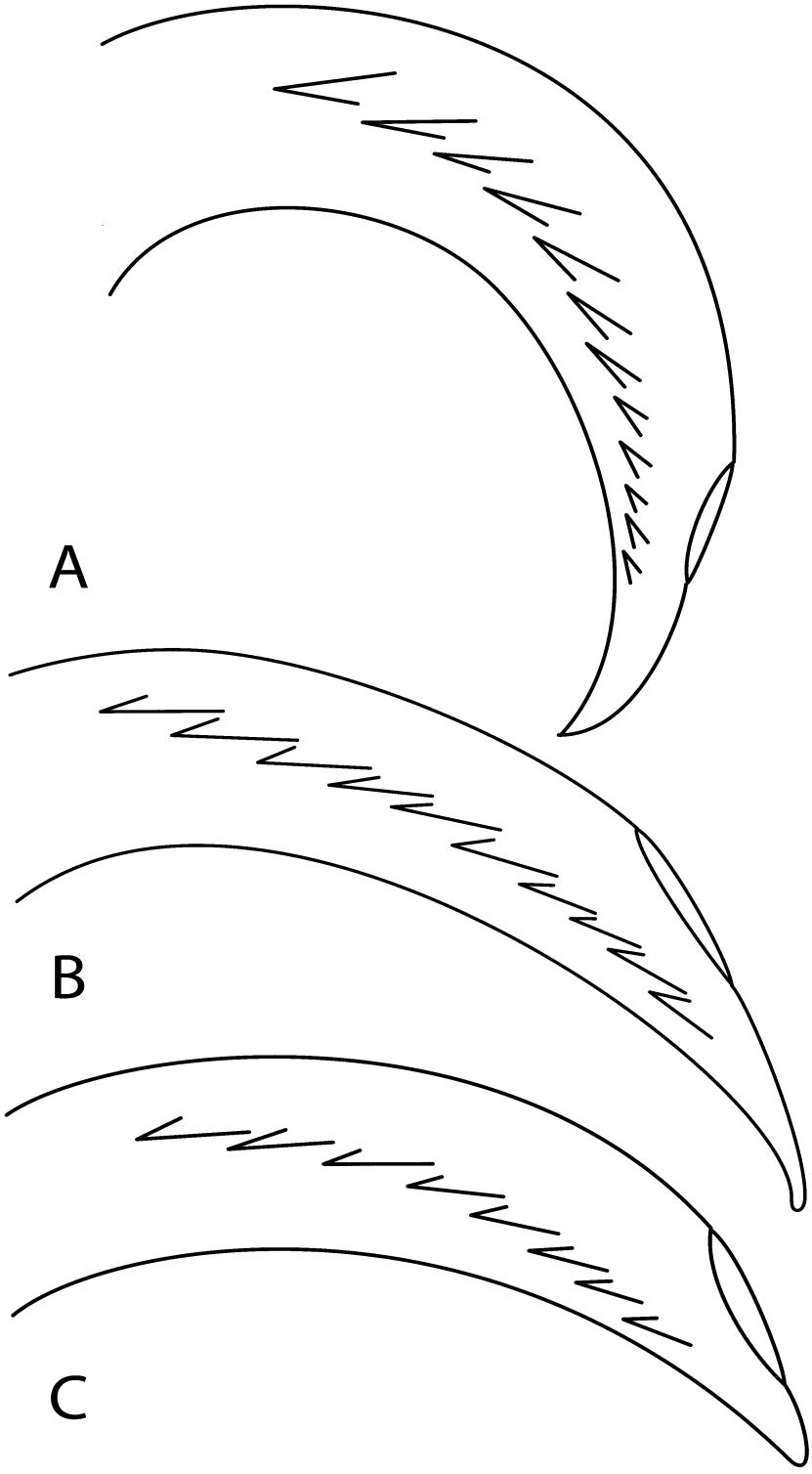

FIGURE 4. The aedeagus of *Akemetopon* species. A. *A. inornatum* **sp. n.**; B. *A. politum* **sp. n.**; C. *A. ainigma* **sp. n.**

Genitalia. Pygofer (Figs 3D–F) in lateral view ventrally approximately 3x longer than dorsally, sinuate along ventral margin. Opening rounded in caudal view, as tall as wide; margins raised, smoothly rounded; ventrally bearing a laterally projecting dorsal process, expanded at apex, slightly asperous. Diaphragm sturdy, armature u-shaped, medially mildly excavated, strongly sclerotized laterally, slightly caudally projecting; opening to the inner chamber quadrate and angulate. Parameres simple, flattened, forceps like, widest in apical fourth, basal angle weak; diverging basally, converging apically, narrowed at convergence, avicephaliform, inner angles sinuate. Aedeagus rounded in cross section with oval dorsal subapical gonopore; gradually curved ventrally, widest near base, tapering gradually over length to acutely pointed apex, laterally bearing row of approximately 8 equally spaced teeth along both sides; gonopore dorsal and subapical (Fig. 4C). Segment 10 twice as long as tall, armed with 2 widely separated, short, hooked projections on caudolateral margins. Segment 11 short, mostly hidden within segment 10.

Recorded hosts. *Muhlenbergia* sp.

Distribution. USA: AZ.

COI barcode. Molecular material not available.

Remarks. This species can be distinguished from both *A. inornatum* and *A. politum* by the rounded (not angled) fastigium. Additionally, it can be distinguished from *A. inornatum* by the presence of a pale distal band on the brachypterous forewings and the obscure median carina of the frons. The holotype is missing most of its legs.

Etymology. The specific name is the Greek neuter noun "*ainigma*" meaning "a riddle".

Material examined. Holotype ♂ (brachypterous) [LBOB], "AZ., Cochise Co., / Huachuca Mts., / Upper Garden Cyn / Picnic Area, / VII–21–2009, swept / seep. C.W. O'Brien // [red paper] HOLOTYPE / *Akemetopon ainigma* / Weglarz & Bartlett".

Phylogenetic analysis

The best scoring tree (Fig. 4, -ln score 5083.3644) placed *Akemetopon* in the basal clade of Delphacini (see Urban et al. 2010), allied with *Pissonotus* species and *Bostaera nasuta*. All 20 searches yielded trees with similar topologies, with −ln scores ranging from 5083.3644 to 5089.7556.

Discussion

The discovery of a new North American genus with 3 new species highlights the continued need for study of on the systematics of North American Delphacidae. The new genus brings the number of described delphacid genera north of Mexico to 62, including the recently described *Aethodelphax* (Bartlett and Hamilton 2011), and 338 species. There remain several genera with doubtfully or inappropriately placed species (e.g., *Liburnia*, see Bartlett 2008, ICZN 2010).

The phylogenetic analyses undertaken here were intended only to provide a hypothesis regarding the general placement of *Akemetopon* within the Delphacini. The placement of this genus in the basal Delphacini, grouped with *Pissonotus* and *Bostaera*, by ML is perhaps not surprising as it bears superficial morphological features with basal delphacine taxa, but fewer obvious similarities to derived genera (e.g., *Toya*, *Syndelphax*, *Tagosodes*, *Sogatella*). The addition of genes and additional taxon sampling would allow for more rigorous phylogenetic analyses of this large tribe. An unusual aspect of the basal placement of *Akemetopon* is that the recorded host plant, *Muhlenbergia*, is a C_4 chloridoid grass (Flora of North America Editorial Committee 2007), whereas most basal Delphacini are either C_3 grass feeders or do not feed on grasses (Urban *et al.* 2010). However, *Peregrinus maidis* is in the basal Delphacini and feeds on a C_4 grass (*Zea mays* L.), and the stenocranine genus *Frameus* also feed on *Muhlenbergia* (Bartlett 2010).

An odd feature of this genus is the great similarity of the male terminalia among species. The form of the parameres, aedeagus, midventral process of the pygofer, armature of the diaphragm, and processes of segment 10 are all very similar among species, whereas external features, in particular the shape of the head, varies greatly. The slight variation in male terminalia that we observed with the available specimens, especially in comparison to the distinctive heads, has made us reluctant to emphasize male genitalia for species diagnoses. Some taxa exhibit more

variation within a species than we have observed among the three *Akemetopon* species (e.g., *Metadelphax propinqua* Fieber, see Teson and Remes Lenicov 1983, Gonzon and Bartlett 2008). The relatively small number of specimens of *Akemetopon* known at this time at this time (45 specimens, of which 19 are male) may be insufficient to demonstrate the full species variability.

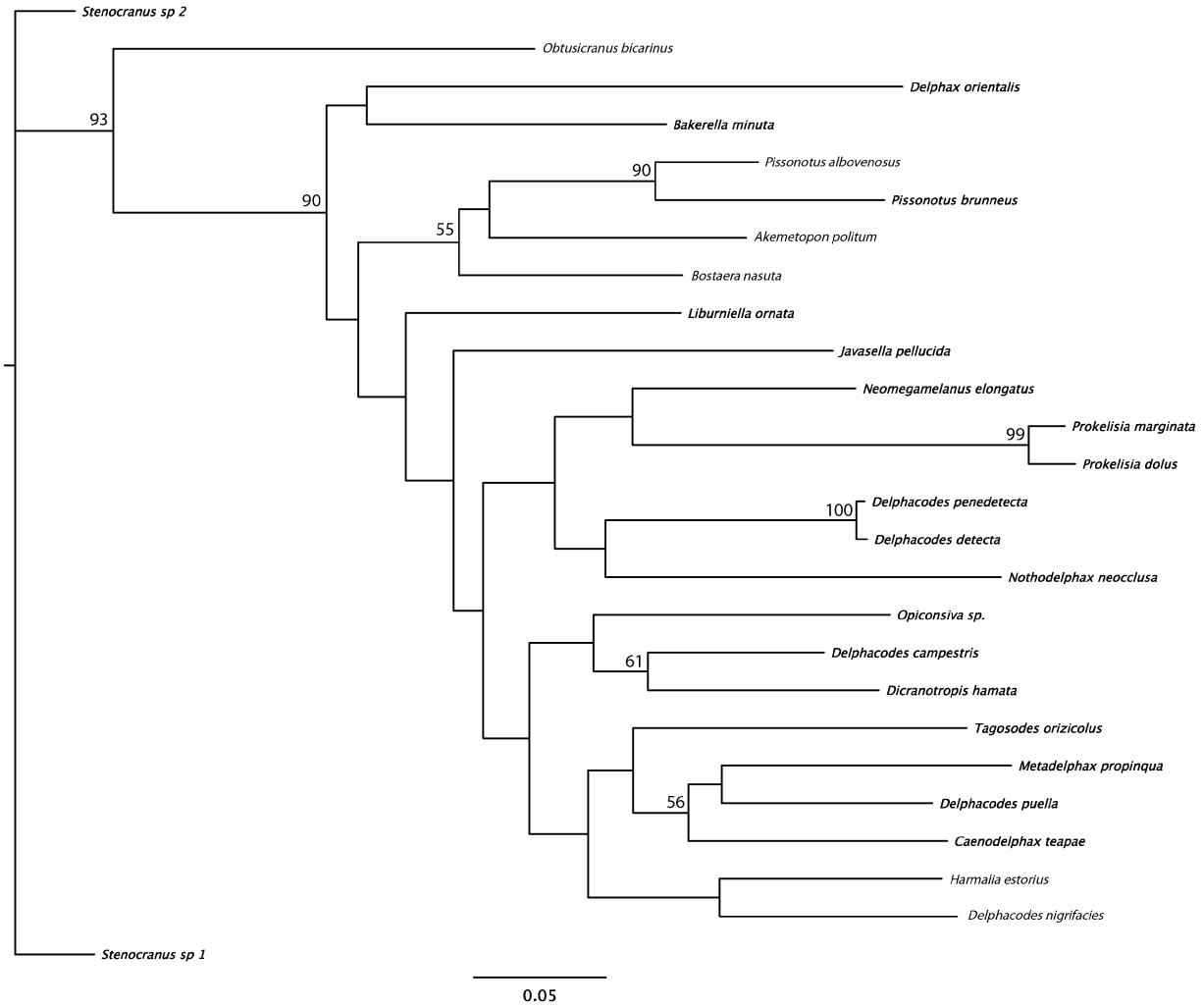

FIGURE 5. The maximum likelihood (ML) tree (likelihood, -5083.3644), showing the placement of *Akemetopon politum*. This tree resulted from 20 independent GARLI analyses of the COI data; bootstrap support values are indicated at each node and branch lengths are shown.

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