

## TWO NEW GENERA AND SPECIES OF STENOCRANINE PLANTHOPPERS (HEMIPTERA: DELPHACIDAE) FROM NORTH AMERICA<sup>1</sup>

Charles R. Bartlett<sup>2</sup>

**ABSTRACT:** Two new species and genera of stenocranine delphacid planthoppers are described and illustrated. *Kelisicranus* n. gen. has a subanal process heretofore known only from members of the subfamily Kelisiinae. *Kelisicranus arundiniphagus* n. sp. is described from specimens taken in the Great Smoky Mountains National Park. *Obtusicranus* n. gen. is unusual in having a doubled median carina of the frons. *Obtusicranus bicarinus* n. sp. is the first stenocranine planthopper described from Arizona and Colorado.

**KEY WORDS:** Homoptera, Auchenorrhyncha, Fulgoromorpha, Fulgoroidea, Stenocraninae, Stenocranini, Great Smoky Mountains National Park, ATBI

Two new genera and species of stenocranine planthoppers are here described. One of these was discovered in the collection of the Great Smoky Mountains National Park, and is described as a component of the ongoing All Taxon Biotic Inventory (ATBI) (Sharkey 2001, Bartlett & Bowman 2004). The second new genus was discovered among undetermined specimens from the Snow Entomological Museum, Lawrence, KS, from Arizona and Colorado.

The stenocranine planthoppers are advanced delphacids, treated as either a full subfamily (Stenocraninae) (Asche 1985, 1990), or a tribe (Stenocranini) within the Delphacinae (Emeljanov 1996). Preliminary combined molecular and morphological phylogenetic maximum parsimony analyses places the Stenocraninae as a sister group to the Kelisiinae (Cryan and Bartlett, unpublished data).

Worldwide, the Stenocraninae consist of 5 genera and 75 species, as follows: *Embolophora* Stål 1855 (3 species, African), *Preterkelisia* Yang 1989 (1 species, *P. magnispinosus* [Kuoh, 1981 in Ding & Kuoh, 1981], Oriental), *Stenokelisia* Ribaut, 1934 (1 species, *S. angusta* Ribaut, 1934, France & Yugoslavia, Nast, 1987), *Terauchiana* Matsumura, 1915 (5 species, Oriental & eastern Palearctic), and *Stenocranus* Fieber, 1866 (65 species, widespread, mostly Laurasian). *Stenocranus* is the largest genus, and the only genus described from the New World, however, it is apparently not monophyletic (Asche & Remane 1982, Asche 1985). New World *Stenocranus* consist of 15 species (Metcalf 1943, Beamer 1946a, b), one of which *S. luteivitta* Walker, 1851, was placed in *incertae sedis* by Beamer (1946a). *Stenocranus maculipes* (Berg, 1879) from Argentina is the only New World *Stenocranus* not from North America.

The features of the Stenocraninae are (Asche 1990): Aedeagus with a sclerotized central sperm-conducting shaft, at least partially surrounded by a mostly membranous theca. Theca with at least one curved, horn-shaped process.

<sup>1</sup> Received on June 2, 2005. Accepted on July 24, 2005.

<sup>2</sup> Department of Entomology and Wildlife Ecology, University of Delaware, 250 Townsend Hall, 531 S. College Ave., Newark, Delaware 19716, U.S.A. E-mail: 02542@udel.edu.

Females ditrysic. Second abdominal sternite of male drumming organ with small shell-like or armlike apodemes directed caudad. Calcar large, flattened, with numerous small teeth on inner margin. Kelisiinae (consisting of about 50 species in 2 genera) differ mostly in having a more solid, less concave calcar, and by the presence of a single or paired elongate, rodlike process from link between bases of aedeagus and anal segment (subanal processes), although they also differ in more subjective features such as the form of the aedeagus and chroitic features.

Terms for morphological features follow Asche (1985), except the "basal angle" of the parameres from Metcalf (1949), the carinae of the head (Fig. 1) follow Yang and Yang (1986), and "gonoplacs" (for 3rd valvulae) is used following Chapman (1998). Body length measurement is from apex of vertex to tip of wing from several specimens as specified; other measurements, ratios and angles were observed from the type specimen. The "angle of the fastigium" is determined as the convergence of the general planes of the vertex and frons in lateral view. All measurements are in millimeters (mm). The most recent revision of North American *Stenocranus* was Beamer (1946a). This work relied on features of wing venation to key species, although no interpretation of venation was provided. Wing venation here follows the conceptual scheme of Kukalová-Peck (1983) as interpreted for Auchenorrhyncha by Dworakowska (1988). Acronyms for specimen depositories are (following Arnett et al., 1993): GSNP, Great Smoky Mountain National Park collections, Sugarlands Visitor's Center, Gatlinburg, TN; SEMC, Snow Entomological Collection, University of Kansas, Lawrence, KS; USNM, United States National Museum of Natural History, Smithsonian Institution, Washington, DC; UDCC, University of Delaware Insect Reference Collection, Department of Entomology and Wildlife Ecology, Newark, DE.

The following two new species have features that differ substantially from the described New World *Stenocranus*, and are therefore placed in new genera. The North American *Stenocranus* is at present being revised, including a reconsideration of its generic limits (S. W. Wilson, pers. com.). The upcoming generic revision should clarify the relationships among these new genera and other New World stenocranines.

### *Kelisicranus* NEW GENUS

**Type species.** *Kelisicranus arundiniphagus* n. sp.

**Diagnosis.** Head produced well beyond eye, fastigium angle acute. Median carinae of frons single. Calcar thickly foliate, tectiform, with many small, black-tipped teeth on lateral margin. Gonoplacs not expanded. Male genitalia with forcepslike parameres. Diaphragm of pygofer strong, armature absent. Aedeagus long, fine; resting within phallosome caudad of articulation with segment X. Connective between segment X and phallosome bearing subanal process. Segment X with two strong, widely separated processes from dorsolateral margins.

**Remarks.** The presence of a subanal process, a feature normally associated with the Kelisiinae, separate this genus from all other Stenocraninae. The normal (unexpanded) gonoplacs also separates this species from all New World *Stenocranus* except *S. similis*. None of the North American *Stenocranus* have their head as projected or as acute in lateral view as *Kelisicranus*.

The subanal process in this genus is an unusual feature previously considered an autapomorphy of the Kelisiinae. The nature of the calcar, the theca, size, coloration, and host (Kelisiinae are sedge feeders), however, all suggest Stenocraninae. Also, none of the Kelisiinae that I am aware of (e.g., Ribaut 1934, Beamer 1945, 1951, Asche 1985, Holzinger et al., 2003) have processes on segment X. The presence of a subanal process suggests that Stenocraninae and Kelisiinae are more closely related than previously suspected (by, e.g., Asche & Remane 1982, Asche 1985, Emeljanov 1996).

**Etymology.** The generic name is a compound term formed by combining the generic name *Kelisia* with the terminus of *Stenocranus*. It is an arbitrary combination of letters to be treated as masculine.

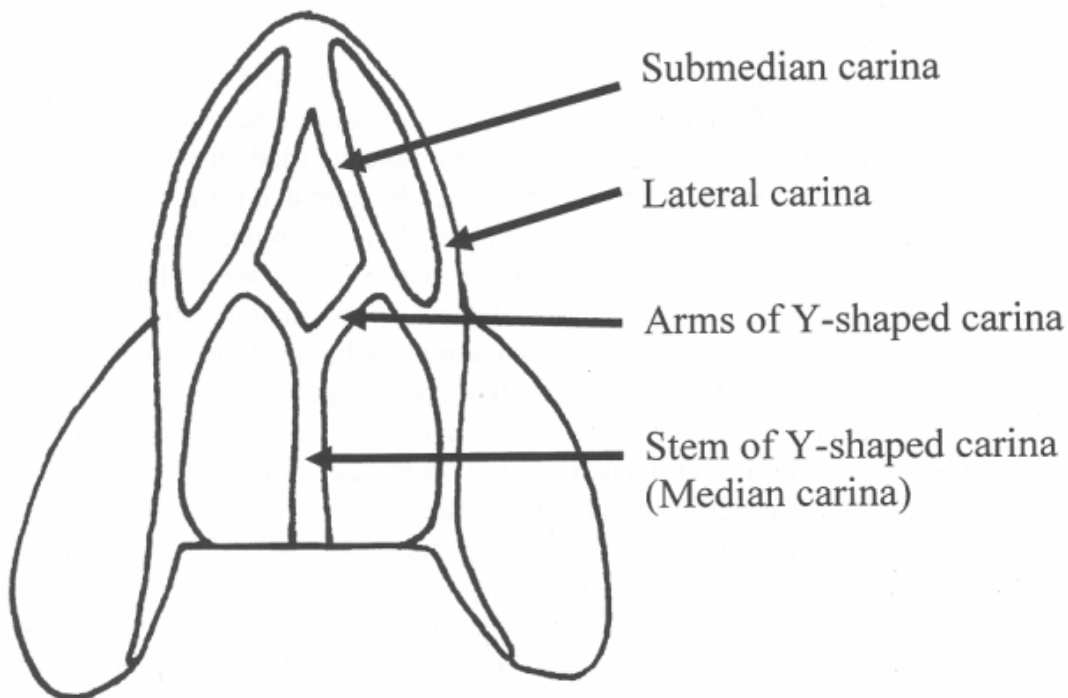


Figure 1. Head of *Obtusicranus bicarinus* n. sp. showing nomenclature of head carinae.

*Kelisicranus arundiniphagus* NEW SPECIES

(Figs. 2, 4a, b; 5, 6a)

**Type Locality.** USA, TN, Great Smoky Mountains National Park, Cades Cove.

**Diagnosis:** Color. Body tan; face (frons + clypeus + labrum), carinae of vertex and nota paler; darker on anterior lateral compartments of vertex, lateral margins of head both anterior to compound eyes and to either side of subocular suture. Thorax tan ventrally, with irregular dark spots on dorsal region of pleuron. Legs yellowish with darker foveae. Macropterous wings slightly infumed, with marginal dark spots just proximad to fused anal veins on clavus (wing coupling area), and at tip of each vein reaching wing margin except CuP (claval suture); also each longitudinal vein darkened for short length just posterior to crossveins in apical fourth of wing. Dorsum of abdomen dark brown with paler middorsum and posterior tergal margins, with highly irregular paired pale spots subdorsally and midlaterally on each tergum suggesting vittae. Venter of male abdomen with midventral and posterior sternite margins pale yellow, contrasting with dark sublateral patches, becoming paler laterally; segments IV-VI with irregular midlateral pale spots on both sides of median line. Male pygofer tan, paler ventrally and caudally. Female abdominal venter with segments III-VI similar to male except with a pair of small, dark midlateral spots on both sides of midline; gonoplasts pale yellow, gonapophyses slightly darker.

Structure: Body length: ♂ 5.5 mm (5.1-5.7, n=4), ♀ 6.0 (5.75-6.50, n=5). Head, including eyes, narrower than pronotum (0.83:1); distinctly projecting in front of eyes (Fig. 2a). Posterior margin of vertex excavated between compound eyes, posterior margins slightly sinuate, acutely concave medially. Vertex much longer (0.60 mm) than wide (0.25 mm) projected beyond eye for approximately 0.6x eye width. Lateral margins of vertex in dorsal view subparallel, converging anteriorly; in lateral view meeting lateral carinae of frons with bluntly acute angle at fastigium (Fig. 2c). Angle of fastigium approximately 40°. In dorsal view, median carinae of vertex conspicuous, arms reaching submedian carinae in anterior quarter of eyes (Fig. 1). Submedian carinae of vertex slightly raised above level of lateral carinae, forming acuminate apex, meeting approximately at or just beyond fastigium. Frons narrow (0.25 mm) and long (1.03 mm), slightly widened at eyes (Fig. 2b); lateral carinae subparallel. Postclypeus and anteclypeus with conspicuous median carinae, together 0.6x length of frons. Rostrum reaching mesocoxae. Subocular suture conspicuous ventrally, curved in dorsal quarter toward anterior margin of eye, becoming obsolete dorsally. Antennae terete, segment I subequal in length and width, II 3x length of I. Pronotum in dorsal view approximately half as long as vertex, narrowing anteriorly, both on posterolateral margins behind eyes and within head excavation between eyes; anterior apex truncate; posterior margin broadly, obtusely concave. Three conspicuous pronotal carinae, reaching hind margin. Three carinae of mesonotum conspicuous; not reaching posterior margin; lateral carinae diverging posteriorly.

Wings rounded apically, row of crossveins in apical third (Fig. 6a). Hindwings as long as forewings. Metatibia with two lateral spines. Metabasitarsus as long as tarsomeres 2 + 3 combined; spinulation of metabasitarsus 7 (2 + 5), 2nd 4. Calcar approximately 0.5x total length of basitarsus; thickly foliate, tectiform, with many (ca. 20) small, black-tipped teeth on lateral margin.

Male genitalia with pygofer subtriangular in lateral view (Fig. 4a), ventral and dorsal sides subequal, projecting slightly on either side of parameres. Pygofer posteriorly smoothly rounded into diaphragm; diaphragm sclerotized, without armature. Parameres directed caudodorsally, forcepslike, abruptly tapered in apical fifth to dorsally directed apices; basal angle obscure (Fig. 4b). Aedeagus long and fine, sclerotized; enclosed within apically bifid, weakly sclerotized phalotheca beyond base of anal segment; thecal apex with ventral process half as long as falciform dorsal projection. Segment X elongate; approximately 0.8x as tall as pygofer; bearing two long, stout, symmetrical processes from dorsolateral corners; slightly sinuate from lateral view. Segment X with a single, fine projection, 0.2 mm long, arising medially from base of ventral margin, adhering close to ventral aspect of anal segment (subanal process, Fig. 5). Anal tube elongate and conspicuous. Female with gonoplags not expanded (Fig. 2d).

**Remarks.** Of the North American species of stenocranines, only *Stenocranus similis* Crawford, 1914, shares with *K. arundiniphagus* the normal (i.e., not expanded) gonoplags, but *Kelisicranus* differs from *S. similis* and other North American *Stenocranus* in having its head strongly projecting forward. *Kelisicranus arundiniphagus* differs considerably from *S. similis* and other North American *Stenocranus* in chroitic features, particularly in having its frons uniformly pale in contrast with darker geneae. *Kelisicranus* differs from *Obtusicranus* by the gonoplags and subanal process and the shape of the head. In *Kelisicranus* the frons is longer and narrower than *Obtusicranus*, and the angle of the fastigium is more acute in *Kelisicranus*.

This species is described as a part of the All Taxon Biotic Inventory of the Great Smoky Mountains National Park (Sharkey 2001, Bartlett & Bowman 2004). The host information reported on the label ("bamboo") appears to refer to giant or river cane (*Arundinaria gigantea*), which is present in Cades Cove, with some plants reaching 4 m height. I examined giant cane in July 2003 for *Kelisicranus arundiniphagus* (or possibly *Stenocranus arundinarius*), but found only *S. similis*.

**Material Examined.** Holotype: "GRSM Blount CO/ TN Cades Cove/ Bamboo 6 IV 1995/ D. Novikov //HOLOTYPE/Kelisicranus/arundiniphagus/ Bartlett" (♂, USNM). Paratypes: 7 specimens on 5 pins, same data as holotype (6♀, 1♂, GSNP); 22 specimens on 9 pins, same data as holotype except 11 IV 1995 (19♀, 1♂ GSNP, 1♀, 1♂ UDCC).

**Etymology.** The specific name is an arbitrary combination of letters, to be treated as masculine, formed by combining "Arundin-" from *Arundinaria*, with "phag" (eat, from Greek) Latinized with the male ending "-us," connected with an "i" (see ICZN 1985, table VII p. 203).

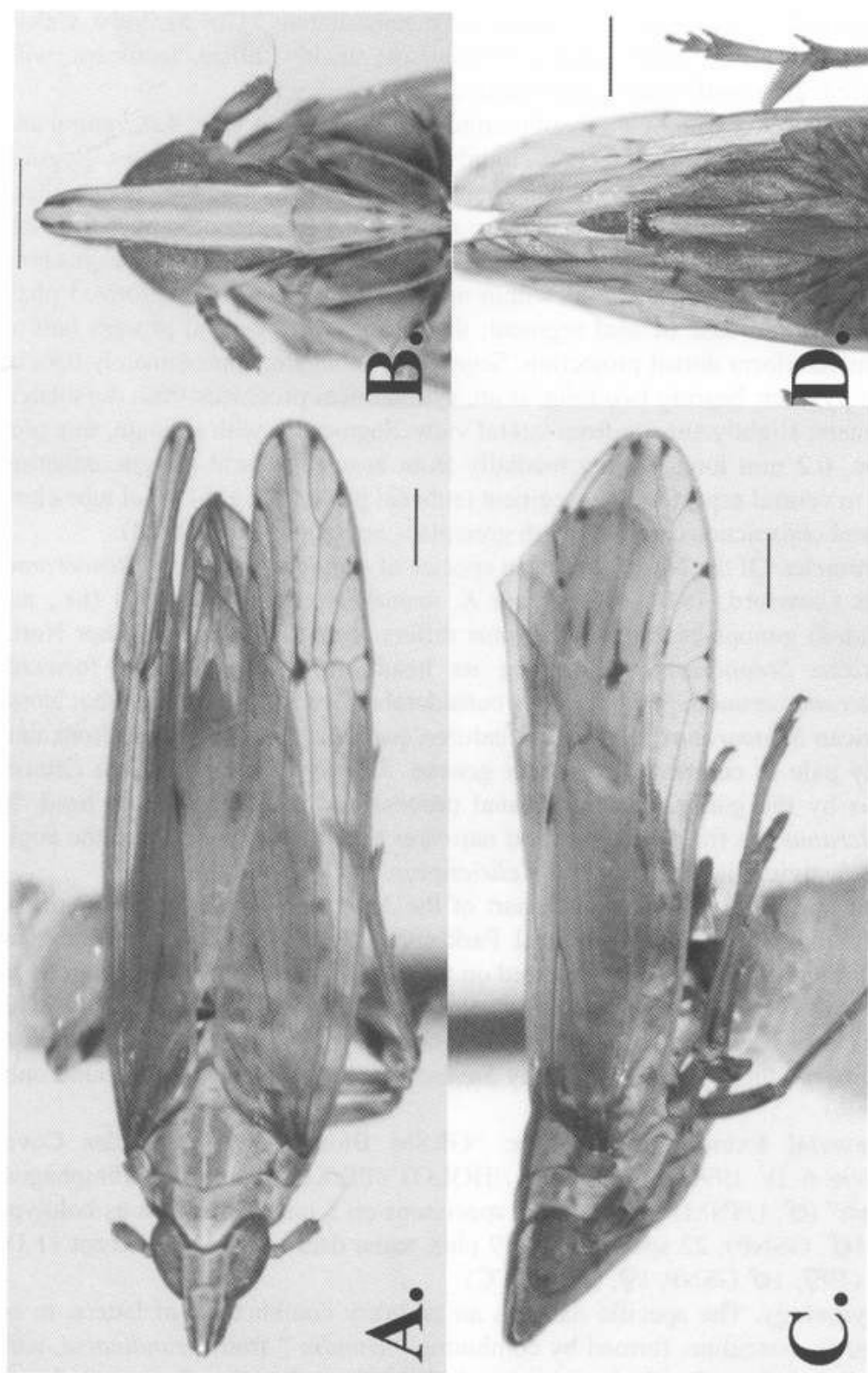


Figure 2. *Kelisicranus arundiniphagus* n. sp. A. dorsal view, B. frons, C. lateral view, D. ventral view of ovipositor. Scale bar = 0.5 mm.

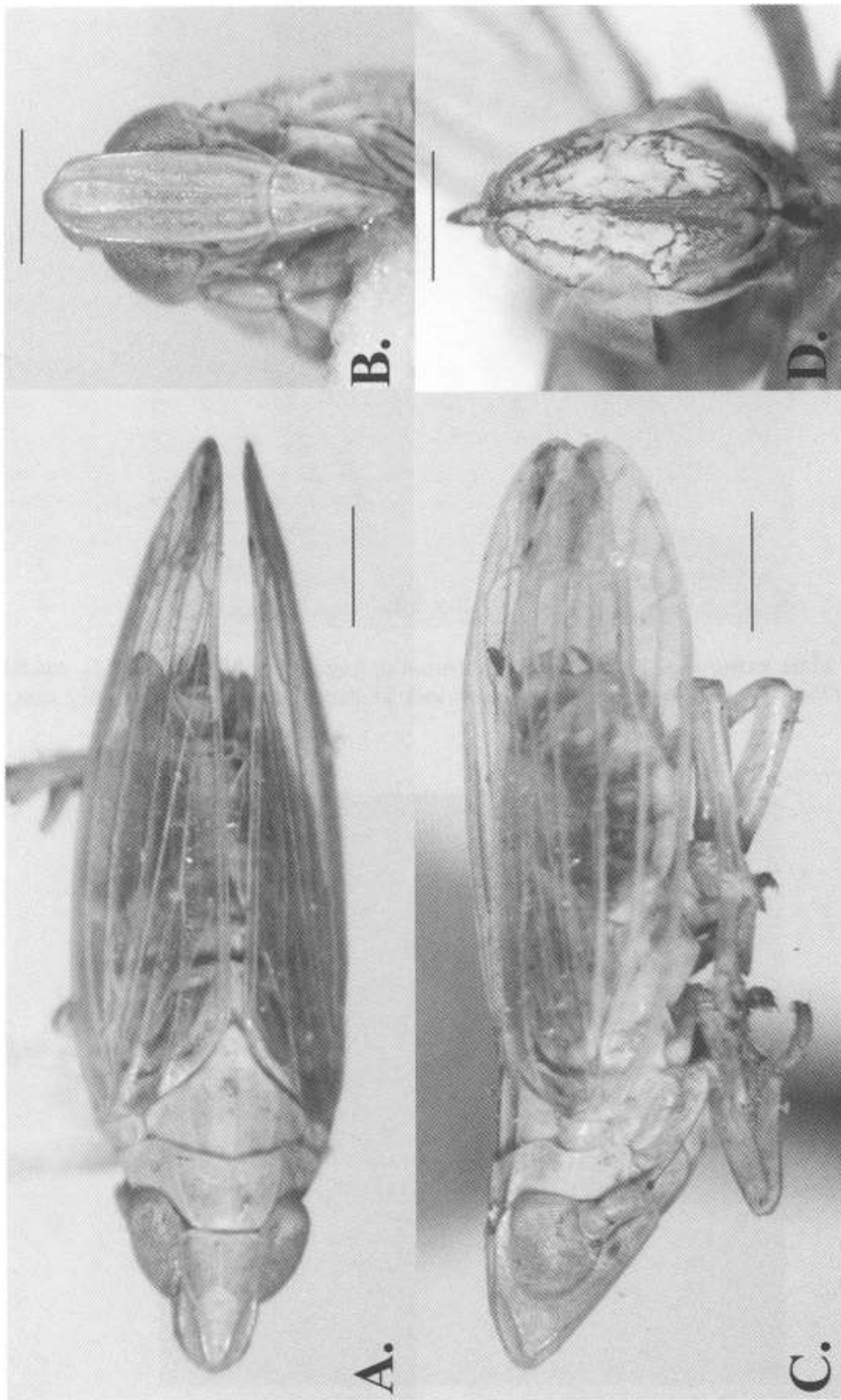


Figure 3. *Obtusicranus bicarinus* n. sp. A. dorsal view, B. frons, C. lateral view, D. ventral view of ovipositor. Scale bar = 0.5 mm.

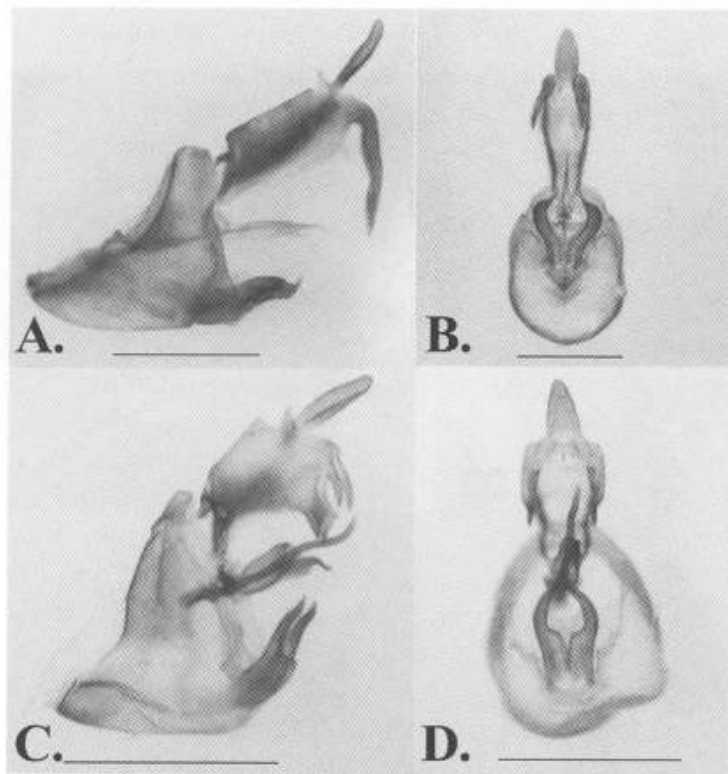


Figure 4. Male terminalia. A. *Kelisicranus arundiniphagus*, lateral view, and B. caudal view; C. *Obtusicranus bicarinus*, lateral view and D. caudal view. Scale bar = 0.5 mm.

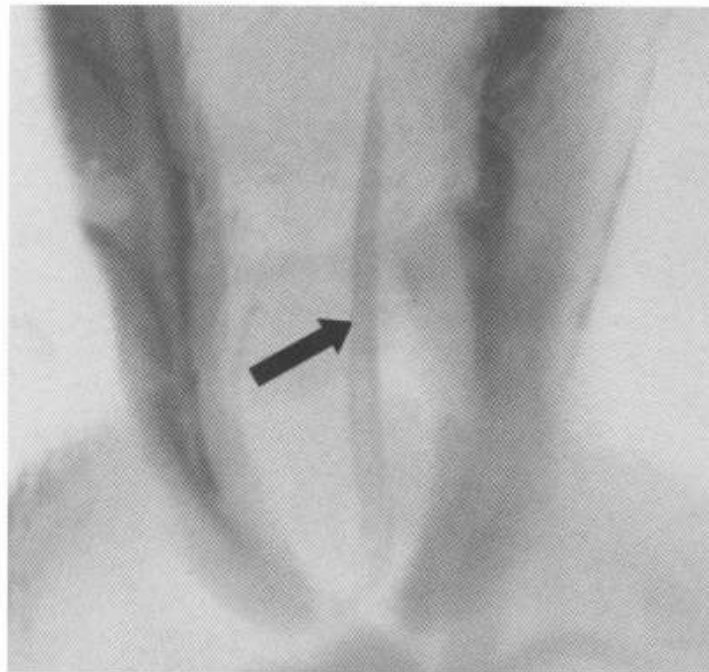


Figure 5. Subanal process of *Kelisicranus arundiniphagus* (arrow).



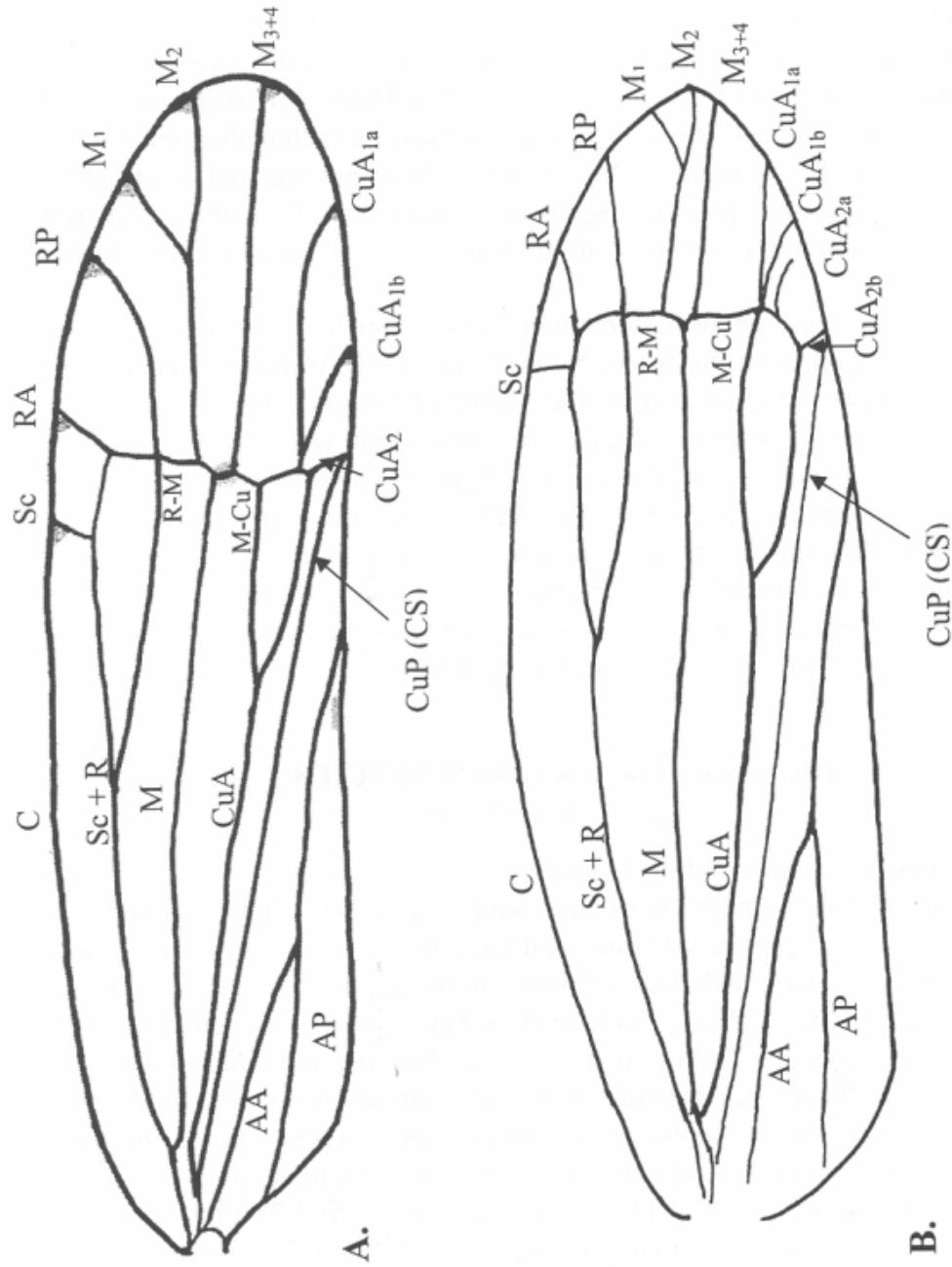


Figure 6. Wing venation following Dworakowska (1988). A. *Kelisicranus arundiniphagus*, B. *Obtusicranus bicarinus*. Abbreviations: AA = Anterior Anal, AP = Posterior Anal, C = Costa, CuA = Anterior Cubitus, CuP = Posterior Cubitus (CS = Claval Suture); M = Media (posterior), RA = Anterior Radius, RP = Posterior Radius; Sc = Subcosta.

### *Obtusicranus* NEW GENUS

**Type species.** *Obtusicranus bicarinus* n. sp.

**Diagnosis.** Head produced before eye to nearly width of eye, angle of fastigium blunt. Median carinae of frons paired, subparallel, closely approximate at frontoclypeal suture, slightly diverging nearly to apex before abruptly meeting at fastigium. Calcar thickly foliate, slightly tectiform, subcultrate, with many small, black-tipped teeth on lateral margin. Gonoplacs greatly expanded, wax bearing. Male genitalia with forcepslike parameres. Diaphragm of pygofer well developed, armature absent. Aedeagus long, fine; resting within phallosome posterior to articulation with segment X. Connective between segment X and phallosome without subanal process. Segment X symmetrical, with two paired strong, widely separated processes, one from dorsolateral margins, other directly ventrad of first.

**Remarks.** This new genus is separated from all other stenocranines by the doubled median carina on the frons. None of the North American *Stenocranus* have their head projected forward to the degree of *Obtusicranus*. The strongly flattened gonoplacs are a feature shared with most North American *Stenocranus*, except *S. similis*. The presence of two pairs of processes on segment X is shared among North America stenocranines only with *Stenocranus arundineus*.

**Etymology.** The specific name is an arbitrary combination of letters, to be treated as masculine, formed by combining "obtus" (Latin, meaning blunt), with "cranus," the termination of *Stenocranus* (referring to the head, in reference to the rounded apex of the vertex), connected with an "i."

### *Obtusicranus bicarinus* NEW SPECIES

(Figs. 1, 3, 4c,d; 6b)

**Type Locality.** Arizona, White Mountains.

**Diagnosis.** Color: General body uniformly light tan; slightly darker on clypeus, ventral most portion of frons, and laterally on nota. Carinae concolorous with body. Legs pale with darker foveae. Tegmina of brachypter clear, veins pale. Some specimens with longitudinal dark bar of varying length following  $M_{3+4}$  from wing tip (Fig. 6). Abdominal terga pale laterally and middorsally, with irregular dark midlateral band. Venter of female with segments 4-6 pale laterally, except 3-6 tiny brown spots; brown middorsally, except sclerite margins; gonapophyses light brown. Abdomen of male similar to female; pygofer pale.

Structure: Body length: ♂ 4.13 mm (4.0-4.2, n=4); ♀ 4.78 (4.4-5.0, n=5). Head, including eyes narrower than pronotum (0.82:1) (Fig. 3a). Vertex posteriorly truncate with eyes projecting posteriorly beyond vertex for 0.3 their length. Vertex much longer (0.6 mm) than wide (0.34 mm), projected in front of eye for approximately 0.5x total length. Vertex anteriorly rounded. Lateral carinae of vertex in dorsal view shallowly converging to junction with submedian carinae, slightly diverging before converging to rounded apex. In lateral view, lateral carinae of vertex meeting lateral carinae of frons with acute angle at fastigium; ver-

tex slightly declinate in apical half (Fig. 3c). Angle of fastigium approximately  $45^\circ$ . In dorsal view, median carinae of vertex meeting arms of Y-shaped carina in anterior fifth of eye (Fig. 1). Submedian carinae of vertex raised slightly above level of lateral carinae, intersecting arms of Y-shape carina just anterior to eyes, converging at approximately  $40^\circ$  angle to meet slightly posterior to fastigium. Frons narrow (0.35 mm), and long (0.90 mm); lateral carinae subparallel, widest at ventral margin of eyes (Fig. 3b). Postclypeus and anteclypeus with conspicuous median carinae, together about  $2/5$  length of frons. Rostrum short, reaching mesocoxae. Subocular suture conspicuous, slightly curved in dorsal quarter to reach eye just anterior to antennae. Antennae terete, segment I just as long as wide, II 3x length of I. Pronotum in dorsal view approximately half as long as vertex, narrowing anteriorly on posterolateral margins behind eyes, concavely arced between eyes to truncate apex; posterior margin concave between lateral carinae. Pronotal carinae conspicuous, reaching hind margin. Carinae of mesonotum conspicuous; lateral carinae diverging slightly reaching hind margin; median carina obsolete at scutellum. Wings rather pointed apically, row of crossveins in apical  $1/4$  (Fig. 6b);  $CuA_1$  and  $CuA_2$  variable in development. Hindwings 0.6x length of forewings in all available specimens. Metatibia with two lateral spines. Metabasitarsus as long as tarsomeres 2 + 3 combined; spinulation of metabasitarsus 7 (2 + 5), 2nd 4. Calcar approximately 0.5x total length of basitarsus, thickly foliate, tectiform, subcultrate, with many (ca. 11-15) small, black-tipped teeth on lateral margin.

Male genitalia with pygofer subtriangular in lateral view, dorsal and caudal sides subequal (Fig. 4c). In caudal view, with slight ridge at opening between lateral margin and diaphragm and small projections on either side of parameres. Diaphragm without armature. Parameres directed caudodorsally, forcepslike, tapering to slightly upturned, acuminate apices; basal angle obtuse (Fig. 4d). Aedeagus fine, sclerotized, somewhat serpentine; partially enclosed within weakly sclerotized phallosome, bearing elongate, caudoventrally directed apex; phallosome approximately half length of segment X. Segment X approximately 0.5x as tall as pygofer, bearing four stout, bilaterally symmetrical processes, subequal in length; two stout processes from dorso-lateral corners, and two broad, strongly flattened, acutely pointed processes ventrad of first. Segment X without subanal process. Anal tube elongate and conspicuous. Female with gonoplace greatly expanded, wax bearing, concealing ovipositor (Fig. 3d).

**Remarks.** *Stenocranus arundineus* is the only other North American stenocranine with two pairs of processes on segment X, although in that species the ventral processes are longer than the dorsal processes and are not strongly flattened. *Obtusocranus bicarinatus* is the first Stenocranine reported from the southwestern US.

**Material Examined.** Holotype: "White Mts. Ariz/ VI-19-1950/ R. H. Beamer // ♂ // SEMC //HOLOTYPE/Obtusocranus/bicarinus/Bartlett" (♂, SEMC). Paratypes: ARIZONA: 8 specimens same as holotype (2♂ [one specimen with plesiotype, R. H. Beamer, label], 4♀ SEMC; 1♂, 1♀ UDCC); 1 specimen

Flagstaff, VII-8-41, R. H. Beamer (♀, SEMC). COLORADO: 1 specimen Mesa Verde Nat. Pk., Pinyon Pine-Juniper, C4:6/29/44 (♀, SEMC).

**Etymology.** The specific name is formed from "bi-" (Latin, two, twice, double) plus "*carin*" (Latin, A keel), referring to the paired carinae of the frons, with the masculine Latin termination "-us".

#### ACKNOWLEDGMENTS

I am indebted to Kimberly Shropshire, who graciously provided the line art for Figure 1, and to William Brown who scanned the art. I thank Lewis Deitz, Matthew Wallace, and two anonymous reviewers for helpful comments on this manuscript. I especially thank Jeanie Hilton of Discover Life in America and Keith Langdon of the National Park Service for the opportunity to conduct research in the Smokies. This research was supported by Discover Life in America, The National Park Service, and the University of Delaware Department of Entomology and Wildlife Ecology.

#### LITERATURE CITED

- Arnett, R. H., Jr., G. A. Samuelson, and G. M. Nishida.** 1993. The Insect and Spider Collections of the World, 2nd ed. Sandhill Crane Press, Gainesville, Florida, U.S.A. 310 pp.
- Asche, M.** 1985. Zur Phylogenie der Delphacidae Leach, 1815 (Homoptera: Cicadina: Fulgoromorpha). Marburger Entomologische Publikationen 2(1): 1-910 (in two volumes).
- Asche, M.** 1990. Vizcayinae, a new subfamily of Delphacidae with revision of *Vizcaya* Muir (Homoptera: Fulgoroidea) - a significant phylogenetic link. Bishop Museum Occasional Papers 30: 154-187.
- Asche, M. and R. Remane.** 1982. Zur Phylogenie der Delphacidae Leach, 1815 (Homoptera Cicadina Fulgoromorpha). Vorläufige Mitteilung. Marburger Entomologische Publikationen 1(7): 155-182.
- Bartlett, C. R. and J. L. Bowman.** 2004. Preliminary inventory of the planthoppers (Fulgoroidea: Hemiptera) of the Great Smoky Mountains National Park, North Carolina and Tennessee, U.S.A. Entomological News 114(5): 246-254.
- Beamer, R. H.** 1945. The genus *Kelisia* in America North of Mexico (Homoptera: Fulgoridae: Delphacinae). Journal of the Kansas Entomological Society 18(3): 100-108.
- Beamer, R. H.** 1946a. The genus *Stenocranus* in America North of Mexico (Homoptera: Fulgoridae). Journal of the Kansas Entomological Society 19(1): 1-11.
- Beamer, R. H.** 1946b. A new species of *Stenocranus* and notes on a *Bakerella* (Homoptera-Fulgoridae-Delphacinae). Journal of the Kansas Entomological Society 19(4): 137-138.
- Beamer, R. H.** 1951. A review of the genus *Kelisia* in America North of Mexico. Journal of the Kansas Entomological Society 24(3):117-121.
- Berg, C.** 1879. Hemiptera Argentina (Continuación.). Anales de la Sociedad Científica Argentina 8: 178-192.
- Chapman, R.** 1998. The Insects: Structure and Function, 4th edition. Cambridge University Press, New York, NY, U.S.A. xvii + 770 pp.
- Crawford, D. L.** 1914. A contribution toward a monograph of the homopterous insects of the family Delphacidae of North and South America. Proceedings of the United States National Museum 46:557-640, plus 6 plates.

- Ding, J. H. and C-I. Kuoh.** 1981. New species of *Stenocranus* from China (Homoptera: Delphacidae). *Acta Zootaxonomica Sinica* 6(1): 74-84.
- Dworakowska, I.** 1988. Main veins of the wings of Auchenorrhyncha (Insecta, Rhynchota: Hemelytrata). *Entomologische Abhandlungen Staatliches Museum für Tierkunde Dresden* 52(3): 63-108.
- Emeljanov, A. F.** 1996. On the question of the classification and phylogeny of the Delphacidae (Homoptera, Cicadina), with reference to larval characters. *Entomological Review* 75(9):134-150 (translation of *Entomologicheskoye Obozreniye* 1995 74(4): 780-794 from Russian).
- Fieber, F. X.** 1866. Grundzüge zur generischen Theilung der Delphacini. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-botanischen Gesellschaft in Wien* 16: 517-534.
- Holzinger, W. E., I. Kammerlander, and H. Nickel.** 2003. The Auchenorrhyncha of Central Europe - Die Zikaden Mitteleuropas. Volume 1: Fulgoromorpha, Cicadomorpha excl. Cicadellidae. Brill Publishers, Leiden, The Netherlands. 673 pp.
- ICZN (International Commission on Zoological Nomenclature).** 1985. International Code of Zoological Nomenclature. 3rd ed. International Trust for Zoological Nomenclature. University of California Press, Berkeley, California, U.S.A. 338 pp.
- Kukalová-Peck, J.** 1983. Origin of the insect wing and wing articulation from the arthropodan leg. *Canadian Journal of Zoology* 61(7): 1618-1669.
- Matsumura, S.** 1915. Neue Cicadinen Koreas. *Transactions of the Sapporo Natural History Society* 5: 154-184.
- Metcalf, Z. P.** 1943. General Catalogue of the Hemiptera. Fascicle IV, Fulgoroidea, Part 3, Araeopidae (Delphacidae). *Smith College, Northampton, Massachusetts, U.S.A.* 552 pp.
- Metcalf, Z. P.** 1949. The redescription of twenty-one species of Araeopidae described in 1923. *Journal of the Elisha Mitchell Scientific Society* 65(1): 48-60 plus, 4 plates.
- Nast, J.** 1987. The Auchenorrhyncha (Homoptera) of Europe. *Annales Zoologici* 40 (15): 535-661.
- Ribaut, H.** 1934. Nouveaux delphacides (Homoptera-Fulgoroidea). *Bulletin de la Société d'Histoire Naturelle de Toulouse* 66: 281-301.
- Sharkey, M. J.** 2001. The All Taxa Biological Inventory of the Great Smoky Mountains National Park. *Florida Entomologist* 84: 556-564.
- Stål, C.** 1855. Hemiptera fran Kafferlandet. *Ofversigt af Kongliga Svenska Vetenskaps-Akademiens Forhandlingar* 12: 89-100.
- Walker, F.** 1851. List of the Specimens of Homopterous Insects in the Collection of the British Museum. No. 2. *British Museum, London, England.* 2: 261-636, plates 3-4.
- Yang, C. T.** 1989. Delphacidae of Taiwan (II), Homoptera: Fulgoroidea). *National Science Council Special Publications No. 6.* Taipei, Taiwan. 334 pp.
- Yang, J. T. and C. T. Yang.** 1986. Delphacidae of Taiwan (1). Asiracinae and the tribe Tropidocephalini (Homoptera: Fulgoroidea). *Taiwan Museum Special Publication Series No. 6.* 79 pp.