

Diversity in New World Stenocranine Planthoppers (Hemiptera: Delphacidae)

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ABSTRACT.

The diversity of stenocranine planthoppers and their reported host plants is reviewed and discussed with particular reference to the New World fauna. A new species of *Obtusocranus* and two new genera (*Frameus* n. g. with 5 new species, *Tanycranus* n. g. with 1 new species) are described and illustrated. These taxa are the first stenocranine planthoppers known from Mexico and South America. Members of *Frameus* and *Tanycranus* are remarkable for having a greatly elongated head. A key to New World genera of stenocranine planthoppers and keys to species for the genera *Obtusocranus* and *Frameus* are provided. *Stenocranus maculipes* (Berg) described from Argentina is not a stenocranine, but is in the Delphacini and is here referred to *incertae sedis*. *Stenocranus luteivitta* (Walker) is not a *Stenocranus*, and is here referred to *Delphacodes*. The specimen reported by Hamilton (2006) from Illinois as the Asian genus *Terauchiana* is here found to be *Kelisicranus arundiniphagus*.

Key Words. Delphacidae, Auchenorrhyncha, Fulgoroidea, Fulgoromorpha, Planthopper, Stenocraninae, Stenocranini, New Genus, New Species.

The New World stenocranine planthoppers (Hemiptera: Fulgoroidea: Delphacidae: Stenocraninae) consisted of only 15 species placed in the mostly Holarctic genus *Stenocranus* Fieber, 1866 (Beamer 1946a, b) until Bartlett (2006) described the monobasic genera *Kelisicranus* (from Tennessee) and *Obtusocranus* (from Arizona and Colorado), and Hamilton (2006) reported a female specimen of the Asian genus *Terauchiana* Matsumura, 1915 from Illinois, and an undescribed stenocranine from Brazil similar to the African genus *Embolophora* Stal, 1853. Hamilton (2006) also synonymized *Stenocranus pallidus* Beamer, 1946 with *Stenocranus dorsalis* (Fitch, 1851) (nec. Beamer, 1946), bringing the total reported fauna of New World stenocranines to 16 species in 3 genera, plus *Terauchiana* and an undescribed Neotropical taxon. The Neotropical Stenocranine fauna consists of 3 *Stenocranus* (*S. lautus* Van Duzee, 1897, *S. dorsalis* (Fitch, 1851), and *S. angustus* Crawford, 1914) reported from the northern Neotropics and southern U.S. states, and *Stenocranus maculipes* (Berg, 1879) from Argentina (Metcalf 1943).

Bartlett (2006) provided a brief overview of the composition of stenocranine genera. Since that time *Terauchiana yasumatsui* (Esaki and Ishihara, 1950) has been transferred to *Preterkelisia* Yang, 1989, by Ding (2006:79). The Palearctic region plus adjacent tropical Asia has 61 species in 4 genera of Stenocraninae: *Preterkelisia* Yang 1989 (2 species), *Stenokelisia* Ribaut, 1934 (1 species),

Terauchiana Matsumura, 1915 (4 species), and 52 species assigned to *Stenocranus* (Metcalf 1943, Joseph 1964, Nast 1972, 1982; Fennah 1975, Asche and Hoch 1983, Yang 1989, Ding 2006). The stenocranine fauna of Asia is diverse and has some elements found both in the temperate (Palearctic) and tropical (Indo-Malayan) regions. In contrast, the described stenocranine fauna of other regions is depauperate. Africa has only 3 species of *Embolophora* (Asche 1983), the Pacific islands have two species of *Stenocranus* (the widespread *S. agamopsyche* Kirkaldy, 1906; and *S. pacificus* Kirkaldy, 1907, from Fiji, Palau, Caroline Islands, Viet Nam and recently invasive into the Philippines; Metcalf 1943, Fennah 1978, FAO 2007), and Australia has only *Stenocranus agamopsyche*. The predominately north temperate distribution of stenocranines suggests a northern origin and diversification, with limited subsequent southern dispersal.

The Stenocraninae are usually treated as a subfamily following the cladistic treatment of Asche (1985, 1990). However, Emeljanov (1996) treated them as a tribe within the Delphacinae based on a phenetic investigation of larval features. Hamilton (2006) followed Emeljanov's (1996) treatment, but reduced Asche's (1985, 1990) Kelisiinae to a subtribe within the Stenocranini. Bartlett (2006) found that *Kelisicranus arundiniphagus* specimens possess a subanal process, a feature previously found only in the Kelisiinae, and suggested that the two subfamilies may be more closely related than previously suspected. Clear resolution of the relationships between the kelisiine and stenocranine planthoppers awaits a detailed phylogenetic investigation. The current study will treat the Stenocraninae in the strict sense (i.e., excluding the Kelisiinae). Features of the subfamilies of Delphacidae are discussed by Asche (1985, 1990), and those of Stenocraninae specifically by Bartlett (2006) and Hamilton (2006).

A variety of host plants have been reported for stenocranine delphacids. Most records are grasses and sedges, with two ferns and *Equisetum* also reported (Table 1). North American stenocranines are reported predominately from sedges and *Arundinaria* (Poaceae: Bambusoideae). Old World stenocranines are primarily reported from sedges, grasses in the Poaceae, and *Phragmites* (Arundinoideae). Most reported grass hosts have the C₃ photosynthetic pathway, except *Imperata*, *Miscanthus*, *Zea* (Panicoideae; Andropogoneae) and *Neyraudia* (Chloridoideae: Cynodonteae) have a C₄ photosynthetic pathway. Hosts for the new taxa reported here consists both of grass taxa with C₃ (*Festuca*, *Bromus*) and C₄ (*Muhlenbergia*) photosynthetic pathways.

Here 7 new stenocranines are described from the Neotropics; 6 of these from Mexico, including 5 in the new genus *Frameus* and 1 new species of *Obtusocranus*; plus 1 new species in the new genus *Tanycranus* from South America. These taxa represent the first species of stenocranine delphacid recorded from Mexico (*S. angustus* is recorded from Belize, Crawford 1914), and the first confirmed stenocranines from South America. A key to New World Stenocraninae genera is presented.

MATERIALS AND METHODS

The morphological terminology follows Asche (1985), but for descriptive purposes the parameres will be referred to as having a proximal “basal angle”; the pygofer a “ventral angle” and an “anal angle” (*sensu* Metcalf 1949); “segment X” will be used instead of “anal tube” (= “analrohr”), and “segment XI” instead of “anal style”. For simplicity, the “male genitalia” within the descriptions should be understood to include the postgenital segments. Wing venation is interpreted following Dworakowska’s (1988) elucidation of Kukalová-Peck’s (1983) general scheme. Features that appear invariant at the generic level are not reiterated in the species descriptions. A total of 220 specimens were examined and reported here (Table 2), including all observed specimens of new taxa, plus new records *Obtusocranus* and *Kelisicranus*, and Old World taxa examined by way of comparison. Label information for primary types is quoted, with each line break indicated by “/” and each label separated by “//”. Reported data for other specimens follows the format of the specimen label, with added notes in square brackets, and information edited for style and consistency. All specimens are macropterous unless otherwise noted. The collections from which specimens were examined are abbreviated as follows (collection abbreviations according to Arnett et al. 1993, except UCMC):

- CASC – California Academy of Sciences, Golden Gate Park, San Francisco, CA.
CNCI – Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Canada.
NYSM – New York State Museum, Biological Survey, Cultural Education Center, Albany, NY.
INHS – Illinois Natural History Survey at the University of Illinois, Urbana-Champaign, IL.
LBOB – Lois O’Brien Collection (Associated with California Academy of Sciences, CASC), Green Valley, AZ.
NCSU – North Carolina State University, Department of Entomology, Insect Collection, Raleigh, NC.
NYSM – New York State Museum, Biological Survey, Cultural Education Center, Albany, NY.
UDCC – University of Delaware, Department of Entomology and Wildlife Ecology, Insect Reference Collection, Newark, DE.
UCMC – University of Central Missouri Collection, Agriculture Program, Warrensburg, MO; c/o Stephen†W. Wilson.
UIAC – Department of Entomology Collection, University of Arizona, Tucson, AZ.
UNAM – Coleccion Entomologica, Instituto de Biología, Universidad Nacional Autónoma de México, D. F., México.
USNM – US National Museum of Natural History, Smithsonian Institution, Washington, DC.

Lengths reported are averages \pm standard deviation in millimeters (mm), with n (number measured) reported, and males and females reported separately. Body length is reported both by measuring from tip of vertex to tip of wings and tip of vertex to tip of “anal style” (segment XI). Some specimens mounted out of alcohol were concavely curved in lateral view, in these specimens body lengths were taken by using the sum on the measurement from tip of vertex to tegula, plus tegula to tip of segment XI in lateral view to compensate for the curve. Body

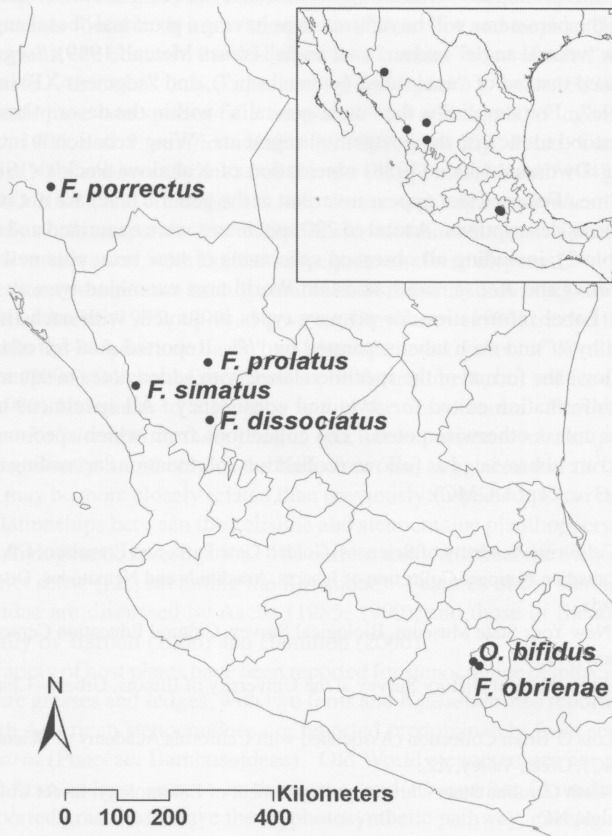


Figure 1. Type localities of *Frameus* and *Obtusicranus* species in Mexico.

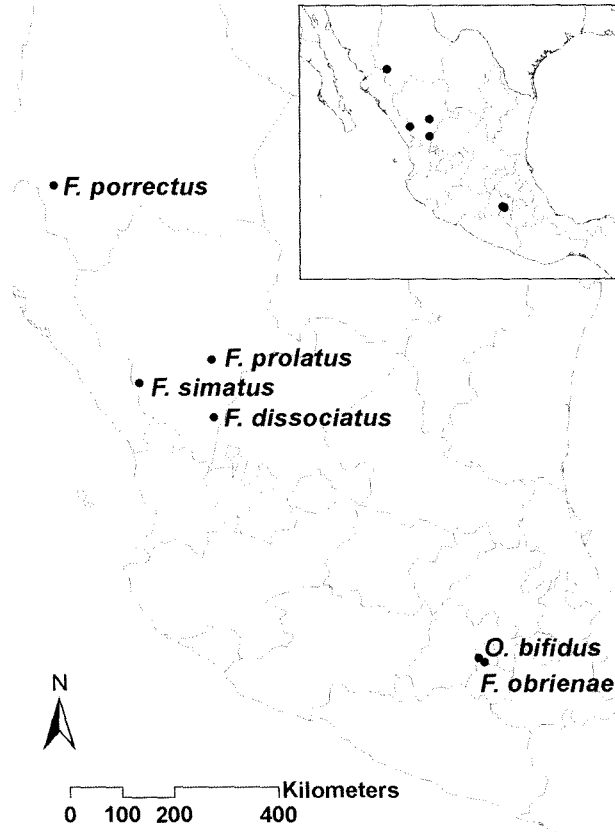


Figure 1. Type localities of *Frameus* and *Obtusicranus* species in Mexico.

width was measured at the tegulae, length of vertex was measured at vertex midline, width of the vertex and frons were taken at the widest part, and the vertex length was taken at midline between frontoclypeal suture and the fastigium. Length to width (L:W) ratios are determined using the average of the ratio of each specimen. Photographs and measurements were taken using a Nikon SMZ-1500 Digital Imaging Workstation with Nikon DS-U1 digital Camera and NIS-Elements imaging software (Ver. 3.0). Scale bar in all figures represents 0.5 mm, unless otherwise indicated.

Plant names and authorship follow the USDA PLANTS database (USDA, NRCS 2009; <http://plants.usda.gov>), except when taxa not present, in which case the Germplasm Resources Information Network online database was consulted (USDA, ARS, National Genetic Resources Program 2009; <http://www.ars->

grin.gov/). Abbreviated citation of author names for plants follow Brummett and Powell (1992). The higher classification of grasses, and information on photo-synthetic pathways, follows Flora of North America Editorial Committee (2003, 2007).

RESULTS

The new taxa described here bring the Nearctic fauna up to 5 genera and 23 species of stenocranine planthoppers. These new taxa are the first stenocranine planthoppers known from Mexico and South America. The collecting localities of the *Frameus* n. g. species are distributed through northern Mexico from middle to higher elevations (Fig. 1). *Tanycranus elongatus* n. sp. is confirmed from lower elevations in Uruguay and southern Brazil. Females tentatively referred to this species are from lower elevations in French Guiana and Bolivia.

Hamilton's *Terauchiana* specimen was *Kelisicranus arundiniphagus* Bartlett, 2006. Additional specimens of *Kelisicranus arundiniphagus* from Illinois and Missouri are also reported here. Most *Terauchiana* (e.g., *Terauchiana singularis* Matsumura, 1915, Fig. 2B), have a long vertex and would key here to *Frameus*, but would differ in that the gonoplasts are not enlarged (Fig. 3) and the median carina of the frons is bicarinate only near the fastigium. *Terauchiana sagitta* (Kusnezov, 1929; Fig. 2C) has a shorter vertex (although it extends in front of the eye for a distance about equal to the eye length, whereas *Kelisicranus* is much shorter), but *Terauchiana* has asymmetrical processes on segment X and rather cupped parameres with elongate basal angles. With the addition of two new genera, and the deletion of *Terauchiana*, there are presently 5 stenocranine genera in the New World stenocranine fauna which can be recognized as follows.

KEY TO NEW WORLD GENERA OF STENOCRANINAE

1. Vertex greatly elongate (e.g., Figs. 4A, 12A) and strongly projecting; distance from eye to tip of head at least as long as length of eye in dorsal view (usually much longer); vertex L:W ratio greater than 4:1; in lateral view, lateral carinae of frons and vertex meeting prior to fastigium (e.g., Fig. 4B), forming a combined carina **2**
- 1' Vertex less elongate, head weakly projecting (Figs. 9A, 10A, 11A) distance from eye to tip of head less than length of eye in dorsal view (usually much shorter); vertex L:W ratio less than 3:1; in lateral view, lateral carinae of frons and vertex meeting near fastigium (Figs. 9C, 10C) ... **3**
2. Fastigium in lateral view distinctly truncate (Fig. 12B); carinae of frons single near frontoclypeal suture (may be weak), forked from between eyes to fastigium (Fig. 12C); legs pale; male genitalia with single pair of processes on segment X (Fig. 13J); phallobase short with long sclerotized projection (Fig. 16C); South America ***Tanycranus*** n. g.
- 2' Fastigium in lateral view blunt or rounded (e.g., Fig. 6A), narrowed at apex; carinae of frons usually paired to frontoclypeal suture; legs usually with dark foveae; male genitalia usually with two pair of processes on segment X (Figs. 12E-H); phallobase elongate, surrounding aedeagus to near apex with straight or hooked terminal projections (e.g., Fig. 15A); Mexico ***Frameus*** n. g.

3. Frons medially bicarinate (Figs 9B, 10B); male with segment X bearing 2 pairs of ventral processes (Figs 13A, B); SW USA and Mexico *Obtusocranus*
- 3' Frons with a single median carina (Fig. 11B); male with segment X usually bearing a single pair of ventral processes (Figs 13C, 13I) **3**
4. Fastigium angle of head acute in lateral view (Fig. 2D); gonoplags of female not greatly enlarged (Fig. 3B); male genitalia bearing subanal process; processes on segment X symmetrical; USA: TN, IL, MO *Keliscranus*
- 4' Fastigium angle of head rounded in lateral view (Fig. 11C); gonoplags of female greatly expanded (Fig. 3A; except *S. similis*); male genitalia lacking subanal process; processes on segment X may be strongly asymmetrical; widespread *Stenocranus*

FRAMEUS new genus

Type species.— *Frameus simatus* n. sp., here designated.

Diagnosis.— Head narrow, greatly elongate, projecting in front of eye at least 2x length of eye, angle of fastigium blunt to acute. Carinae of head distinct and often keeled. Head in lateral view with lateral carinae of vertex and frons meeting well prior to fastigium, forming combined carina. Vertex narrow, ratio L:W exceeding 4:1, submedian carinae not joining, reaching fastigium as paired carinae. Median carinae of frons paired, closely approximated at frontoclypeal suture, diverging to fastigium. Calcar tectiform, subcultrate, with many small, black-tipped teeth on lateral margin. Gonoplags greatly expanded, hiding gonapophyses. Male genitalia with forceps-like parameres, dorsocaudally directed. Diaphragm of pygofer developed, armature absent. Aedeagus long, fine; mobile and mostly enclosed within phallosheca. Connective between segment X and phallosheca without subanal process. Segment X with one or (usually) two pair strong, symmetrical, widely separated processes, first from dorsolateral margins, second near midlength of ventral margin of segment X in lateral view.

Description.— *Color.* Body stramineous, darker in foveae of legs; paler middorsally on vertex, prothorax and mesothorax. Wings clear, usually with diffuse fuscous markings along trailing margin of forewing, veins pale.

Structure. Head, including eyes, narrower than pronotum with long anterior projection (vertex 5-9x longer than wide); head narrowing anteriorly. In dorsal view, vertex shallowly incised posteriorly; eyes projecting posteriorly beyond vertex. Median carina of vertex broadly forked near anterior margin of eyes to submedian carinae. Submedian carinae of vertex distinct, keeled, converging anteriorly, not meeting before fastigium. In lateral view, lateral carinae of vertex merging with lateral carinae of frons well prior (~0.5 mm) to fastigium, forming combined carina. In ventral view, frons narrow and very long, lateral carinae subparallel. Median carina of frons paired, closely approximated near frontoclypeal suture, diverging anteriorly. Postclypeus and anteclypeus with conspicuous single median carina. Rostrum short, usually exceeding mesocoxae. Subocular suture conspicuous, curved, extending from below eye, anterior to antenna, to subgenal suture near lateral carinae of frons. Antennae terete, segment

I about as wide as long; II approximately 3x length of I, bearing irregularly placed rhinaria (sensory structures), especially anterodorsally.

Pronotum in dorsal view trapezoidal between lateral carinae; subequal in length to scutum of mesonotum, anterior margin truncate, posterior margin broadly and shallowly concave. Carinae of pro- and mesonotum distinct. Carinae of pronotum attaining posterior margin, lateral carinae diverging slightly. Lateral carinae of mesonotum diverging slightly, reaching hind margin; median carina obsolete near scutellum.

Wings exceeding body; forewings exceeding hindwings. Forewings narrow, distinctly narrowing in distal 1/4 to rounded apex, row of crossveins in apical 1/3. Fork of R proximad of Cu fork (outer subapical cell longer than inner subapical cell), anal veins fused near midlength of clavus. Metatibiae with two lateral spines. Metabasisar longer than tarsal segments 2 + 3 combined; spinulation 6 (3+3) (tarsus), 7 (2 + 5) (basitarsus), 4 (2nd tarsomere). Calcar tectiform, subcultrate, bearing 10+ fine teeth including larger apical tooth. Abdomen with group of 4-6 pits on each lateral margin of ventral side of segments 4-6.

Male genitalia with pygofer subtriangular in lateral view, concave proximally, much longer ventrally than dorsally. In caudal view, opening about as tall as wide, lateral margins rounded, ventral margin concave at parameres, ventral angle projecting. Diaphragm developed, without armature. Parameres directed caudodorsally in lateral view, forceps-like, curved to dorsomedially directed apices, basal angle weak. Aedeagus fine, sclerotized, sinuate; mostly enclosed within weakly sclerotized phallosheath. Phallosheath broad, sinuate, terminating in one or more (usually 2) processes. Segment X elongate, in lateral view bearing 2 or 4 (usually 4) symmetrical processes; one pair at caudoventral margin, second (absent in *F. dissociatus*) near midlength of ventral margin of segment X; processes widely separated at base in caudal view. Anal tube elongate and conspicuous. Female with gonoplares greatly expanded, concealing gonapophyses (Fig. 3A), sometimes bearing wax.

Etymology.— The genus is formed from the Latin word “*framed*” (spear, javelin), given the masculine termination “-us”.

Remarks.— Members of this genus are easily separated from *Stenocranus*, *Obtusocranus*, and *Kelisicranus* by the greatly elongate head. *Frameus* differs from *Tanyocranus* in that *Frameus* does not have an abruptly truncate fastigium, the median carina of the frons is usually paired to the frontoclypeal suture, male segment X usually having 2 pair of processes, and the aedeagus mostly enclosed within the phallosheath (*Tanyocranus* has a truncate fastigium, median carina of the frons forked between the eyes, male segment X with one pair of processes, and the aedeagal phallosheath short with a projection subequal to the aedeagus in length).

Species within *Frameus* are fairly similar to each other externally, but are most easily separated by features of male genitalia, especially the number and form of the processes on segment X and features of the phallosheath. The length of the head projection also varies among species. The wing venation of this genus is variable among individuals of the same species, and sometimes between left and right forewings of the same individual, making wing venation unreliable for identification. In particular, the ScP + RP, MP, and CuA veins varies in the number of branches and the details of their arrangements. So far, only macropterous individuals of this genus have been observed. Most species have been collected from *Muhlenbergia* (Poaceae: Chloridoideae: Cynodonteae) (host infor-

mation from Dietrich field notes), although a long series of *Frameus obriena* was collected from *Festuca amplissima* Rupr. These host are unusual since most New World taxa with known hosts feed on either sedges or bambusoid grasses (Table 2).

An additional species of *Frameus* was examined based on a single male specimen (collected Mexico, Durango, 20 mi. SE Mezquital, 2450m, C. H. Dietrich, vacuum, 95-101, *Muhlenbergia* sp.) but the type material was judged to be not adequate to describe at this time. Also examined was a female from Hidalgo, 13 mi SW Jacala, 6600', V-27-1974 (LBOB) that could not be placed at this time.

KEY TO SPECIES FOR THE GENUS *FRAMEUS* (MALES)

1. Anal segment with one pair of processes on segment X on caudoventral margin in lateral view (Fig. 13D) *F. dissociatus*
- 1' Anal segment bearing two pairs of processes on segment X (e.g., Fig. 13E), in lateral view, one pair on caudoventral margin, the second pair approximately at midlength of ventral margin **2**
2. Proximal pair of processes on segment X distinctly broader than distal processes (Fig. 13H); phallobase terminating with a strongly ventrally hooked acuminate process, subtended by a short, broad acute process (Fig. 15I) *F. simatus*
- 2' Proximal pair of processes on segment X subequal in width to distal processes (e.g., Fig. 15E); aedeagus not as above (Figs. 15C, E, G) **3**
3. Processes on segment X converging (Fig. 13G), distal processes directed retrosely, proximal directed caudally; phallobase terminating in pair of ventrally curved processes (Fig. 15G); L:W ratio of vertex ~6.2:1 (Fig. 6A) *F. prolatus*
- 3' Processes on segment X both retrosely directed (Figs. 13E, F); apical phallobase processes not ventrally curved (Fig. 15E, or if similar (Fig. 15C); L:W ratio of vertex ~4.7:1 (Fig. 5A) **4**
4. L:W ratio of vertex ~4.7:1; phallobase with short dorsal projection strongly laterally projecting in ventral view (Fig. 15D); processes on segment X widely separated in lateral view (Fig. 13E) *F. obriena*
- 4' L:W ratio of vertex ~6:1; phallobase with short dorsal projection directed caudally in ventral view, longer ventral process apically notched (Fig. 15E); processes on segment X more closely approximated (Fig. 13F) *F. porrectus*

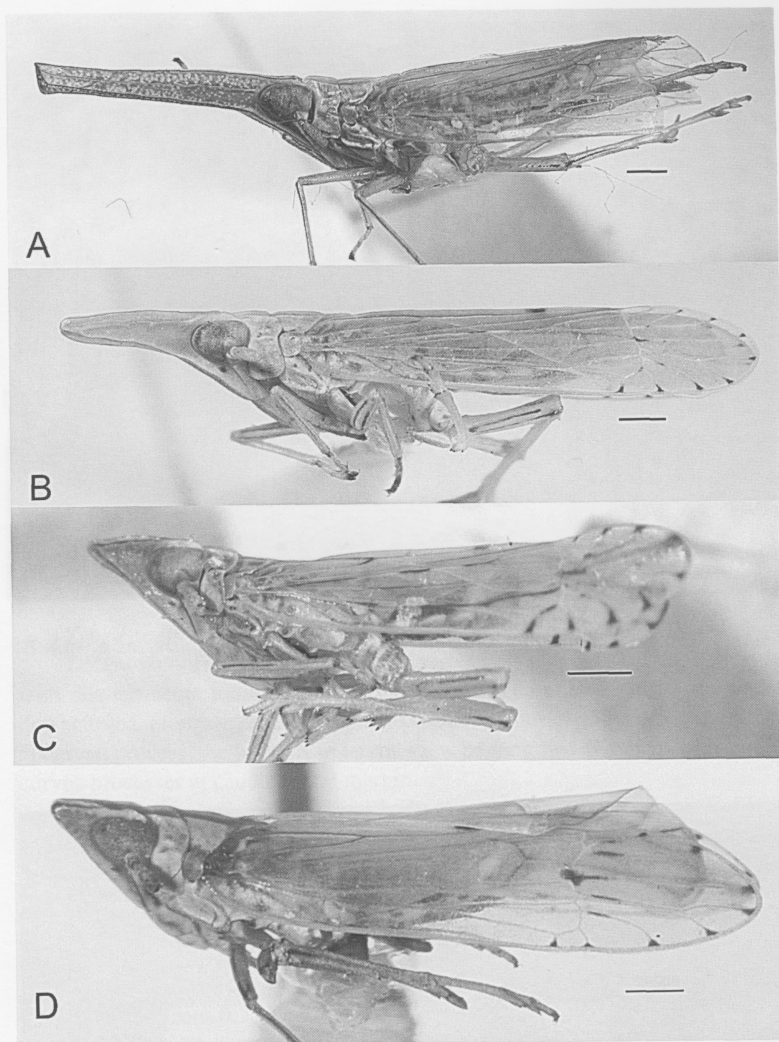


Figure 2. Various stenocranines. A. *Embolophora monoceros* from South Africa, B. *Terauchiana singularis* from Japan, C. *Terauchiana sagitta* from Kazakhstan, D. *Kelisicranus arundiniphagus* from Tennessee.

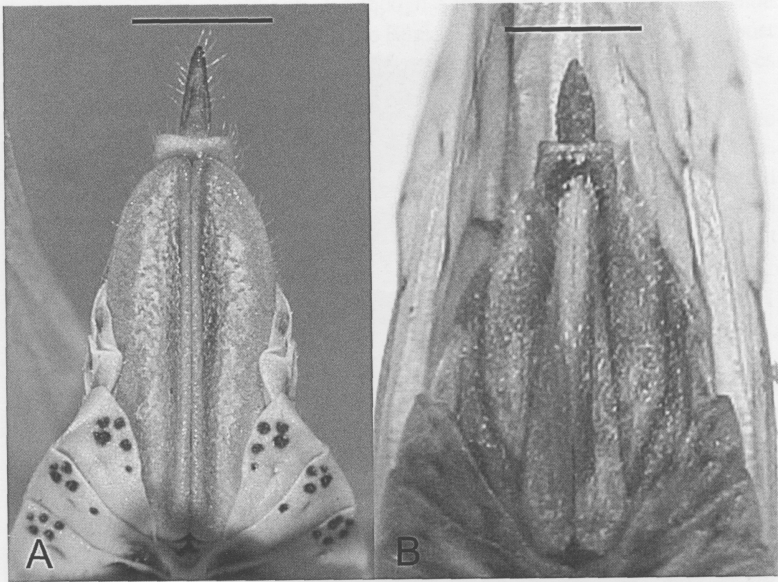


Figure 3. Female genitalia. A. Gonoplasts expanded (*Frameus porrectus* n. sp.), B. Gonoplasts normal (*Kelisicranus arundiniphagus* Bartlett).

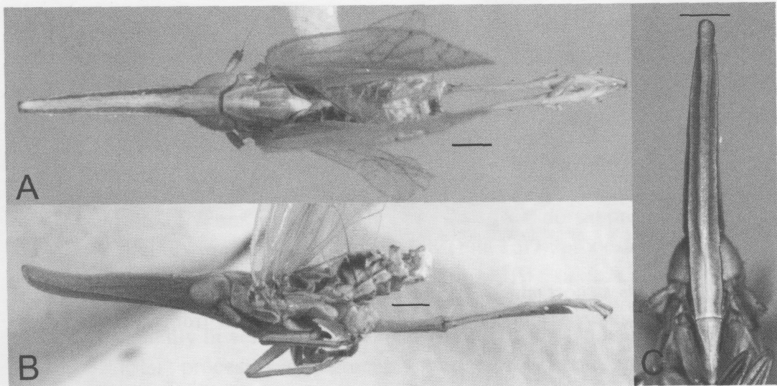


Figure 4. *Frameus dissociatus* n. sp. (holotype). A. Dorsal view. B. Frons. C. Lateral view.

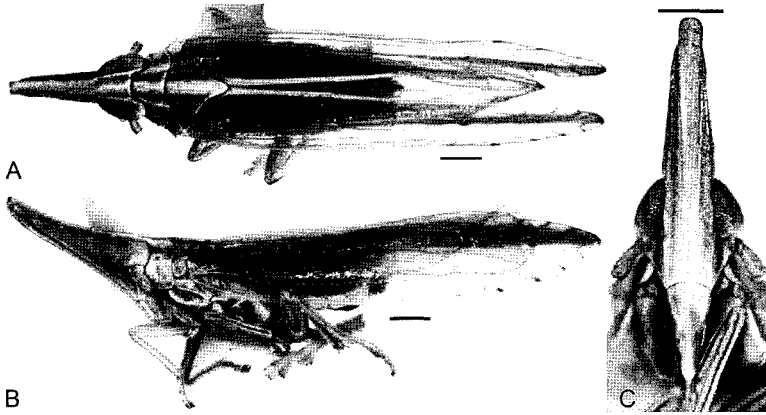


Figure 5. *Frameus obrienae* n. sp. (paratype). A. Dorsal view. B. Frons. C. Lateral view.

Frameus dissociatus new species

Figs. 4, 13D, 13B, 14B, 15A-B, 17A

Type Locality.— MEXICO: Durango, 17 mi. SE Mesquital.

Diagnosis.— Head very long, ratio of vertex L:W approximately 7:1. Pygofer with distinct acute tooth at lateral angles. Phallosome with a long, slender, downcurved, elongate acuminate process above a shorter and a heavier, slightly upcurved process. Segment X in lateral view bearing two symmetrical retrose curved processes at caudoventral margin.

Description.— *Color*: General body stramineous, darker in foveae of legs, genae, metanotum, and abdomen dorsum and midventral. Middorsal portion of vertex, prothorax and mesothorax paler, suggesting median vitta. Wings clear, forewings faintly marked with dark along trailing margin.

Structure: All measurements from holotype male (in mm). Body length (including wings): 7.90; body length (without wings) (not determined before dissection); width 0.91; length of vertex 2.48; width of vertex 0.35; length of frons 2.89; width of frons 0.31.

Head. Head in lateral view slightly deflexed upward (Fig. 4B); vertex slightly sinuate, reflexed slightly upward near apex, frons sinuate, curved upward near apex, fastigium rounded. Vertex much longer than wide (L:W ratio ~7:1), strongly forward projecting. In dorsal view vertex truncate anteriorly, lateral carinae of vertex keeled, slightly converging (with head). Median carina of vertex distinct (carinae beyond fork weaker), broadly forked just anterior to eyes to submedian carinae. Submedian carinae of vertex distinct, keeled, converging over length to fastigium. In lateral view, lateral carinae of vertex merging with lateral carinae of frons well prior (ca. 0.6 mm) to fastigium, combined carina obsolete just prior to fastigium.

In ventral view, frons narrow and very long (L:W ratio ~9.3:1); widest near eyes, lateral margin subparallel, converging slightly dorsally and ventrally (Fig. 4C). Median carina of frons paired, closely approximated near frontoclypeal suture to eyes, diverging anteriorly and becoming more strongly keeled to fas-

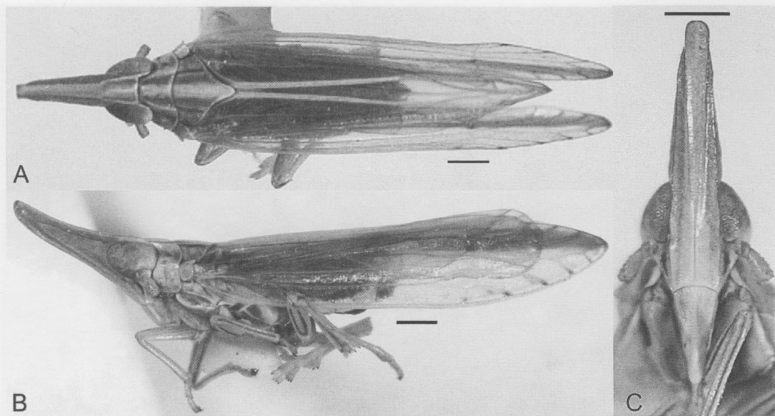


Figure 5. *Frameus obriena* n. sp. (paratype). A. Dorsal view. B. Frons. C. Lateral view.

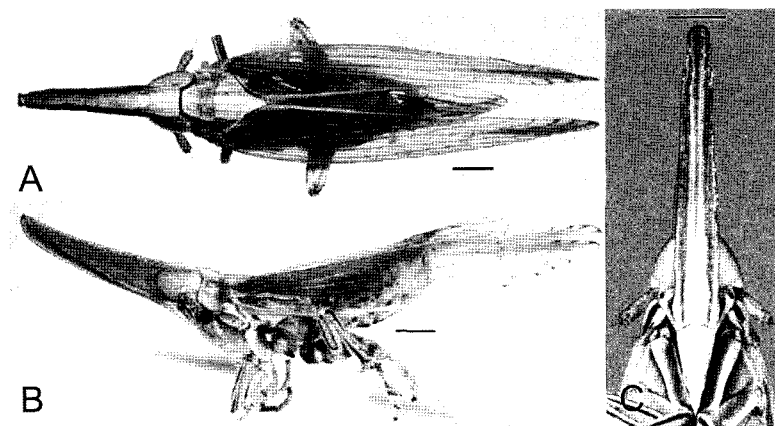


Figure 6. *Frameus porrectus* n. sp. (paratype). A. Dorsal view. B. Frons. C. Lateral view.

tigium. Rostrum short, exceeding mesocoxae. Subocular suture conspicuous (type specimen with three conspicuous pale spots anterior to carinae), curved, extending from below eye just in front of antennae to subgenal suture near lateral carinae of frons. Antennae terete, segment I short, just longer than long; II 3.5x length of I, bearing irregularly placed sensory structures (mostly on anterodorsal surface).

Thorax. Carinae of pro- and mesonotum distinct. Pronotum in dorsal view about $\frac{1}{2}$ length of scutum of mesonotum. Forewings narrow, distally narrowed to rounded apex, row of crossveins in apical $\frac{1}{3}$ (Fig. 14B), R forked well proximad of CuA fork (outer subapical cell twice length of inner subapical cell); ScP + R 3-branched; MP 4- or 5-branched (type 5-branched on right wing, 4-branched left), embracing wing tip) and CuA 4-branched; anal veins fused prior to midlength of clavus. Calcar just over $\frac{2}{3}$ length of basitarsus, tectiform, subcultrate, bearing approximately 12 fine teeth (apical tooth distinctly larger).

Genitalia. Male genitalia with pygofer subtriangular in lateral view, with distinct acute tooth at lateral angles (Fig. 13D). In caudal view, lateral margins rounded with distinct lateral angles. Parameres in caudal view forceps-like, curved and tapering to dorsomedially directed apices; basal angle with a distinct, rounded tooth (Fig. 17A). Phallosome of aedeagus broad, in lateral view medially humped, terminating in a pair of processes (Figs. 15A, B), a long, slender, downcurved, elongate acuminate process originating just to the right and slightly below the aedeagus, subtended by a slightly shorter and stouter process, slightly upcurved originating subapically on the ventral margin of the phallobase. Segment X elongate, taller than wide in lateral view, bearing two symmetrical processes at caudoventral margin; processes elongate, retrosely curved, uniformly tapering to pointed apices. Anal tube elongate and conspicuous, subequal in length to segment X.

Etymology.— The specific name “*dissociatus*” is a Latin term meaning “separate from fellowship”, referring to the single pair of processes on segment X, understood to be masculine.

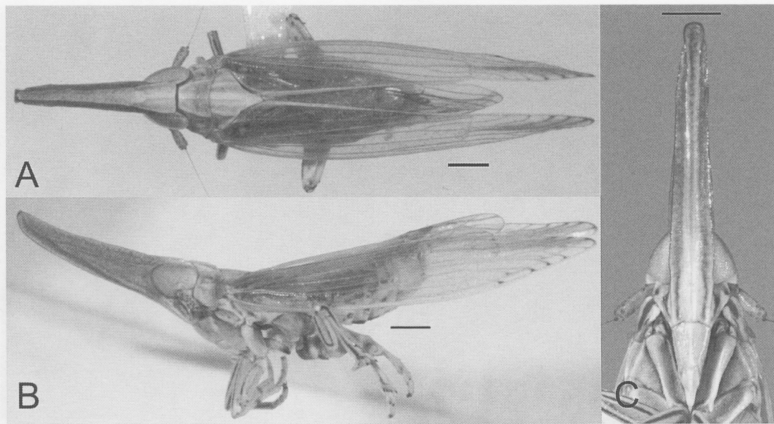


Figure 6. *Frameus porrectus* n. sp. (paratype). A. Dorsal view. B. Frons. C. Lateral view.

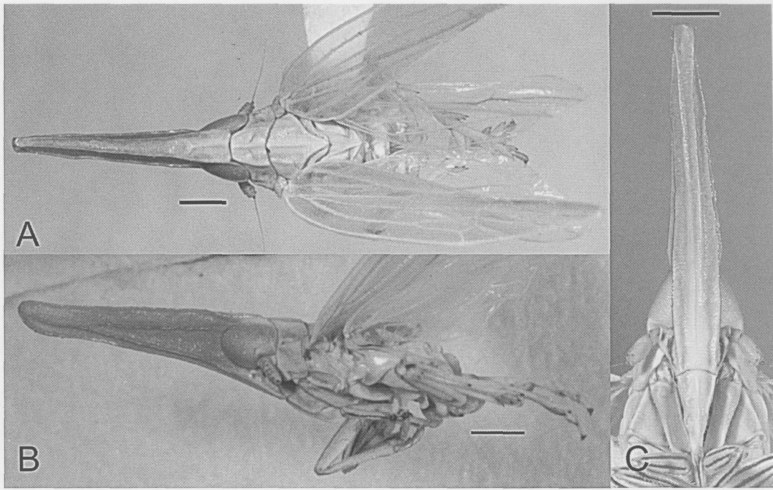


Figure 7. *Frameus prolatus* n. sp. (holotype). A. Dorsal view. B. Frons. C. Lateral view.

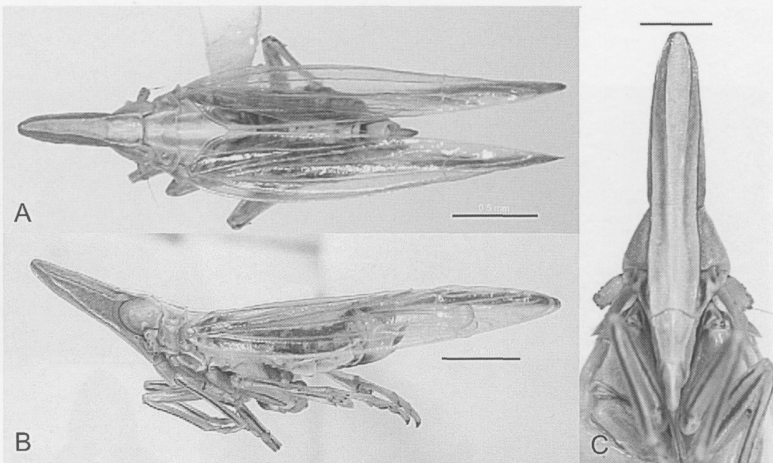


Figure 8. *Frameus simatus* n. sp. (paratype). A. Dorsal view. B. Frons. C. Lateral view.

Host.— This specimen was collected from *Muhlenbergia curvula* Swallen (Poaceae: Chloridoideae: Cynodonteae), on a cliff face

Material Examined.— Holotype: "MEXICO: Durango / 17 mi. SE Mesquital/ 2320m. 7 Nov 1995 / C.H.Dietrich/ sweeping. 95-098 // HOLOTYPE / *Frameus / dissociatus* / Bartlett [red paper]" (male, INHS). Also examined: Mexico, Durango, 7 mi. S La Escondida, 2670m, 7 Nov 1995, C.H. Dietrich, sweeping, 95-102) (1 male, INHS, badly damaged).

Remarks.— This species is unique among *Frameus* in having only a single pair of ventral processes on segment X. The type locality is approximately N 23°

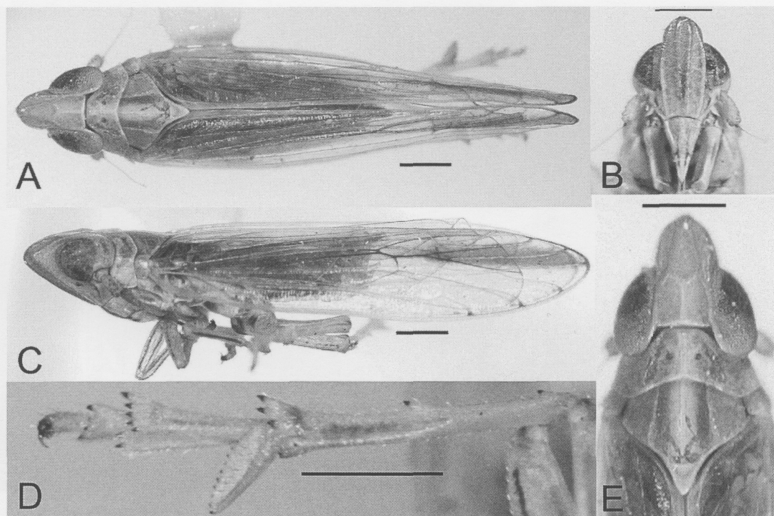


Figure 9. *Obtusicranus bifidus* n. sp. (paratype). A. Dorsal view. B. Frons. C. Lateral view. D. Left hind leg and calcar, ventral view, E. Head and thorax, dorsal view.

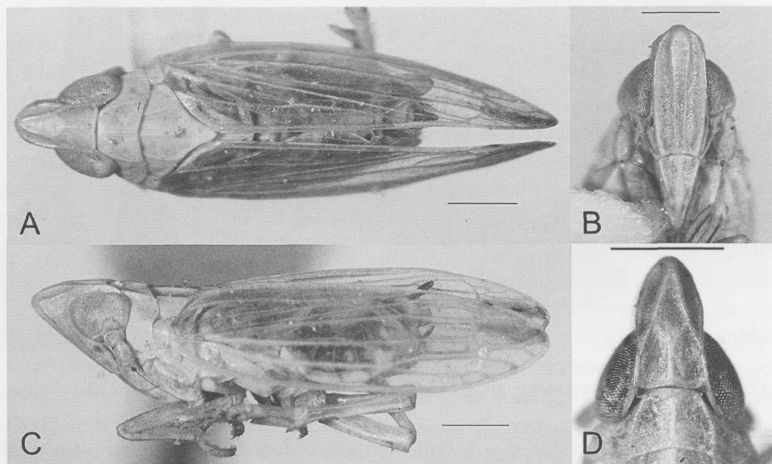


Figure 10. *Obtusicranus bicarinus* Bartlett, 2006. A. Dorsal view. B. Frons. C. Lateral view. D. Head and pronotum, dorsal view. (Modified from Bartlett 2006.)

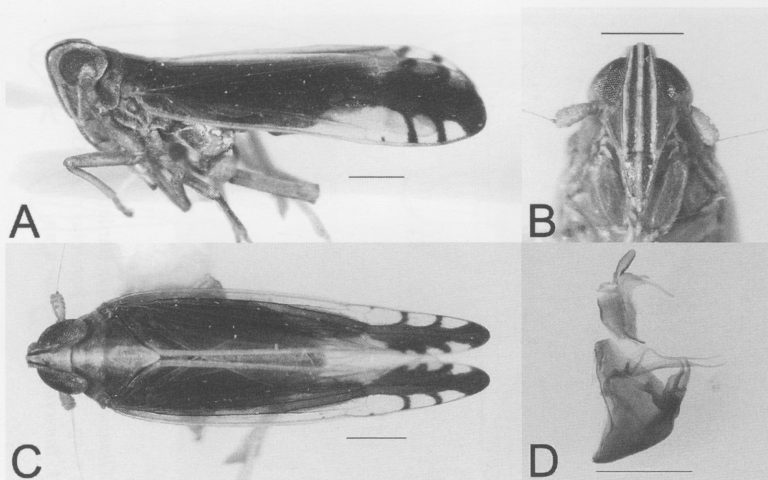


Figure 11. *Stenocranus brunneus* Beamer, 1946a. A. Dorsal view. B. Frons. C. Lateral view. D. Male pygofer, Lateral view. (Modified from Bartlett and Wheeler, 2007.)

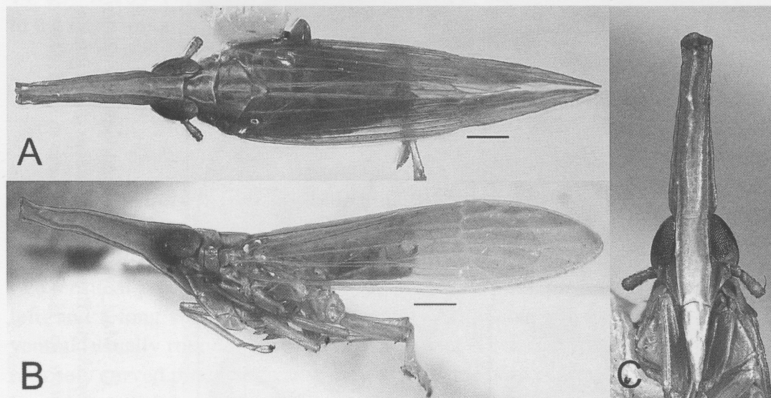


Figure 12. *Tanycranus elongatus* n. sp. A. Dorsal view. B. Frons. C. Lateral view.

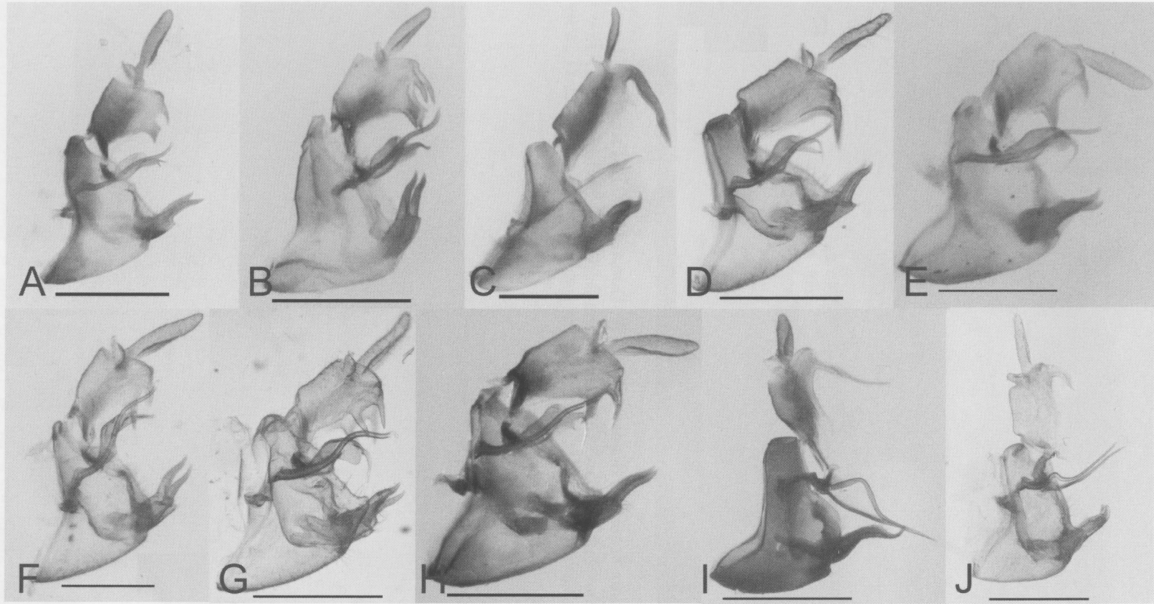


Figure 13. Male pygofers, lateral view. A. *Obtusicranus bifidus* n. sp., B. *Obtusicranus bicarinus* Bartlett, C. *Kelisicranus arundiniphagus* Bartlett, D. *Frameus dissociatus* n. sp., E. *Frameus obrienaе* n. sp., F. *Frameus porrectus* n. sp., G. *Frameus prolatus* n. sp., H. *Frameus simatus* n. sp., I. *Stenocranus lautus* Van Duzee, J. *Tancranus elongatus* n. sp.

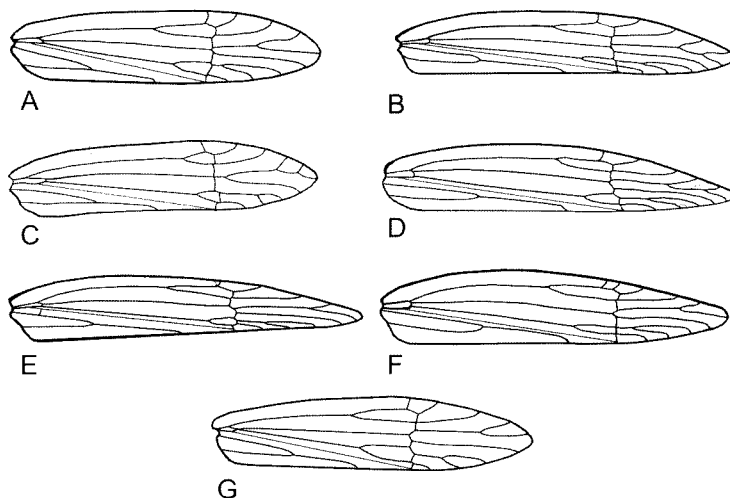


Figure 14. Wing venation. A. *Obtusocranus bifidus* n. sp., B. *Frameus dissociatus* n. sp., C. *Frameus obrienae* n. sp., D. *Frameus porrectus* n. sp., E. *Frameus prolatus* n. sp., F. *Frameus simatus* n. sp., G. *Tanycranus elongatus* n. sp.

14° 03' W 104° 17' 49". The type specimen of *F. dissociatus* was dissected prior to the description; the other available specimen is headless.

***Frameus obrienae* new species**

Figs. 5, 13E, 14C, 15C-D, 17B

Type Locality.— Mexico, Federal District, 21 km S. Mexico City.

Diagnosis.— Head elongate, ratio of vertex L:W approximately 4.7:1. Pygofer with lateral angles developed as flattened flanges. Phallosome bearing two terminal processes, a short, dorsal, slightly curved process projecting to the left, and a long sharply hooked elongately acuminate process; subtended by a ventral (usually rounded) projection. Segment X bearing four widely separated retrose curved processes, uniformly tapered to sharp point; proximal processes longer than distal.

Description.— *Color*: General body stramineous, darker in foveae of legs and abdomen. Middorsal portion of vertex, prothorax and mesothorax pale, forming median vitta, bordered by dark tan on posterior portion of vertex, pro-, and mesonotum. Wings clear over leading 2/3; except variable, diffuse, longitudinal fuscous marking on portions of trailing third, veins clear except pale on commissural margin and dark spots on veins near apical wing margin. Male pygofer dark.

Structure: (all measurements for males, in mm) Body length (including wings): 7.33 ± 0.47 (n=3), body length (without wings) 4.92 (n=1); width 0.99 ± 0.02 (n=3); length of vertex 1.60 ± 0.24 (n=3); width of vertex 0.35 ± 0.03 (n=3); length of frons 2.00 ± 0.13 (n=3); width of frons 0.35 ± 0.03 (n=3).

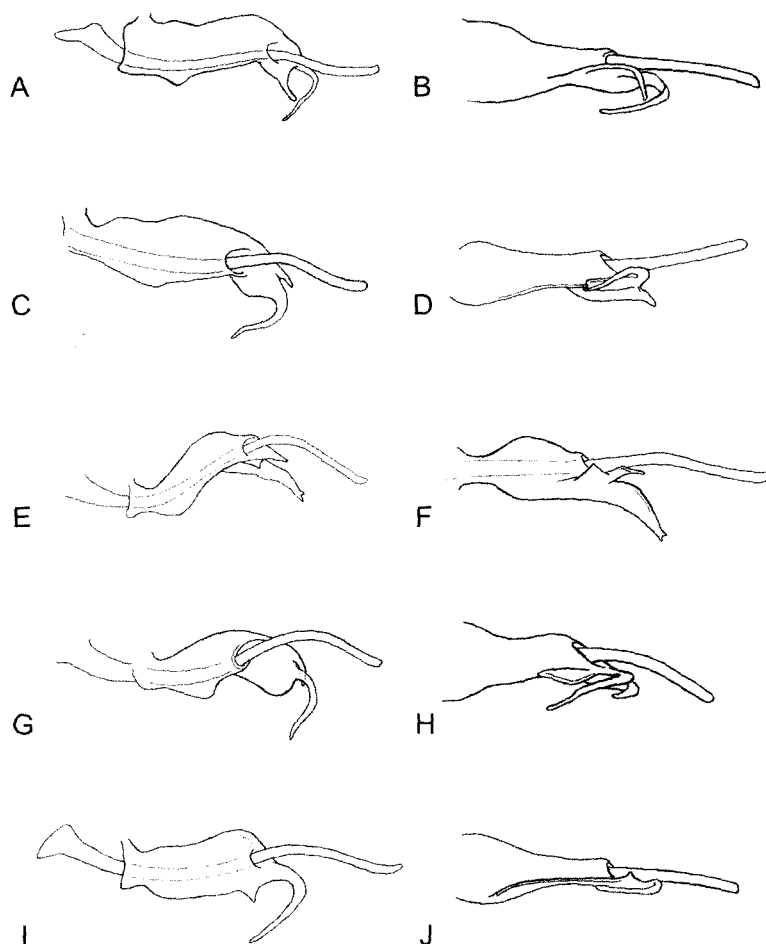


Figure 15. Phallus of *Frameus* species, lateral view (A, C, E, G, I) and ventral view (B, D, F, H, J). A, B. *dissociatus* n. sp., C, D. *obriena* n. sp., E, F. *porrectus* n. sp., G, H. *prolatus* n. sp., I, J. *simatus* n. sp.

Head. In lateral view, head (Fig. 5B) straight to slightly upcurved; frons sinuate, fastigium rounded. In dorsal view, vertex shallowly incised posteriorly. Vertex much longer than wide (L:W ratio ~4.7:1), anteriorly truncate in dorsal view. In dorsal view lateral carinae of vertex distinct, keeled, slightly converging distally. Median carina of vertex distinct, broadly forked just anterior to eyes to submedian carinae (branches weak). Submedian carinae of vertex distinct, keeled, slightly converging, then subparallel to fastigium. In lateral view, lateral carinae of vertex merging with lateral carinae of frons well prior (~0.4 mm) to fastigium, combined carina slightly upturned apically, obsolete just prior to fastigium.

In ventral view, frons narrow and very long (L:W ratio ~5.06:1); lateral cari-

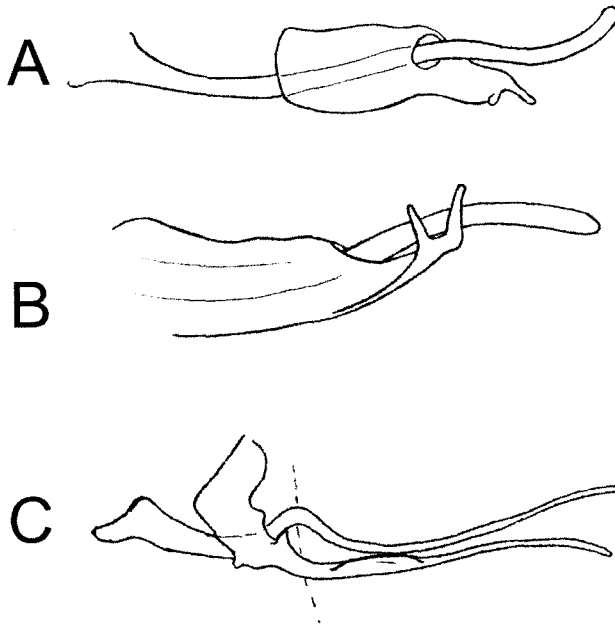


Figure 16. Phallus, lateral view (A, C) and ventral view (B). A, B. *Obtusicranus bifidus* n. sp., C. *Tanycranus elongatus* n. sp.

nae sinuate, converging slightly toward apex (Fig. 5C). Median carina of frons paired, closely approximated and subparallel near frontoclypeal suture, diverging and becoming more strongly keeled anteriorly. Rostrum short, just exceeding mesocoxae. Subocular suture conspicuous, curved, extending from below eye just anterior to antenna to subgenal suture at junction with lateral carinae of frons. Antennae terete, segment I short, wider than long; II 3x length of I, bearing irregularly placed rhinaria on dorsal aspects.

Thorax. Carinae of pronotum reaching hind margin; lateral slightly diverging posteriorly. Lateral carinae of mesonotum slightly diverging, reaching hind margin. Wings exceeding body by nearly 1/2 length of forewing. Forewings narrow, distally narrowed to rounded apex, row of crossveins in apical 1/4 (Fig. 14C); R forked proximad of Cu fork; ScP + R, MP, and CuA 3 or 4-branched. Calcar over 3/4 length basitarsus, tectiform, subcultrate, rather foliaceous, bearing approximately 15 fine teeth.

Genitalia. Male genitalia with pygofer subtriangular in lateral view (Fig. 13E), with lateral angles caudally projecting as flattened flange. In caudal view, lateral angles projecting as acute teeth. Diaphragm developed, projecting somewhat caudad, without armature. Parameres in caudal view rather broad, tapering to dorsomedially directed acute apices (apices cross in some specimens); basal angle obscure (Fig. 17B). Aedeagal phallosome in lateral view broad, humped, bearing two terminal processes (Figs 15C-D), a short weakly hooked process originating

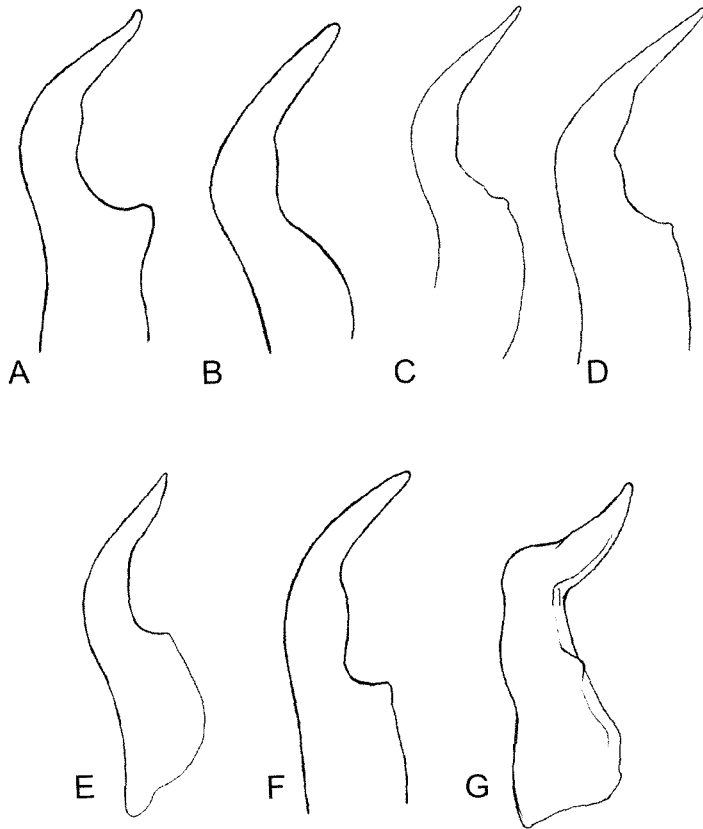


Figure 17. Left parameres, widest view. A. *Frameus dissociatus* n. sp., B. *Frameus obriena*e n. sp., C. *Frameus porrectus* n. sp., D. *Frameus prolatus* n. sp., E. *Frameus simatus* n. sp., F. *Obtusicranus bifidus* n. sp., G. *Tanycranus elongatus* n. sp.

to the left of the aedeagus, and a long sharply hooked elongately acuminate process; phallobase with ventral (usually rounded) projection. Segment X elongate, in lateral view taller than wide, bearing four symmetrical processes; proximal and distal pair widely separated; distal pair at caudoventral margin, proximal processes posterior to midlength of ventral margin, both retroseely curved, uniformly tapering to sharp points, proximal processes longer than distal (length of proximal processes about half width of segment X in lateral view). Segment XI elongate, subequal in length to segment X.

Etymology.— The specific name “*obriena*e” is a Latinized honorific for Lois O’Brien, who collected and loaned the type series to the author.

Host.— *Festuca amplissima* Rupr. (Poaceae: Pooideae: Poeae).

Material Examined.— Holotype: “MEXICO, D.F., Hwy95 / 21

km.S.MexicoCity / 5 Sept.1982 C.W. & L.O'Brien&G. Wibmer// on *Festuca / amplissima* // HOLOTYPE / *Frameus / obrienae* / Bartlett [red paper]". Paratypes: MEXICO: *Federal District*: Same data as holotype: 41 males, 35 females; LBOB, UDCC); Parres, Hwy. 95, X-30-1973, C. W. O'Brien (6 male, 12 female; LBOC); Mexico: *Michoacán*: Hwy 37, 13 mi SE Carapan, 7600', 13 Aug. 1982, CW & L. O'Brien & G. Wibmer (1 male, LBOB); *Morelos*, Laguna de Zemprala [sic, Zempoala], Oct. 21, 1945, 9500ft., Pine + lake meadow, D. M. DeLong (2 male, UKUY). Excluded from paratype series: MEXICO: *Morelos*, Laguna de Zemprala [sic], Oct. 21, 1945, 9500ft., Pine + lake meadow, D. M. DeLong (male, UDCC [genitalia slightly different]); *Federal District*: La Guarda, X-26-41. K.40, DeLong, Good, Caldwell & Plummer; JSCaldwell Collection, 1959 (1 female, USNM, cannot confirm specific identification).

Remarks.— This species is distinguished from its congeners by segment X bearing retrosely curved, uniformly tapered, processes, proximal processes exceeding distal; and the phallobase bearing two processes, a dorsal, short slightly curved process projecting from the left side of the phallobase in ventral view, and a long sharply hooked elongately acuminate process; subtended by a ventral rounded projection. There is some variation in the phallobase, particularly in the shape of the ventral lobe and in the form of the dorsal process. The head also varies between the vertex being flat to slightly upcurved. This species is most similar to *Frameus prolatius* n. sp. Which has a much longer vertex, and the distal pair of projections on segment X is directed caudad (instead of retrose), and the short, dorsal projection of the phallobase is not laterally projected. The type locality of *F. obrienae* is approximately N 19° 07' 40" W 99° 10' 30".

***Frameus porrectus* new species**

Figs. 3A, 6, 13F, 14D, 15E-F, 17C

Type Locality.— Mexico, Chihuahua, Barranca del Cobre (Copper Canyon), near Batopilas.

Diagnosis.— Head very long, ratio of vertex L:W approximately 6:1. Pygofer slightly keeled at lateral angles. Phallosome bearing in a pair of terminal processes; a short, broad, acute dorsal process arising just below the aedeagus and an elongate, flattened, ventral process, tapering to a forked apex. Segment X in lateral view bearing four symmetrical processes; proximal pair just posterior to midlength of segment X, 1.3x length of distal processes, both pair retrosely curved, uniformly tapering to sharp apices.

Description.— *Color:* General body stramineous, darker in foveae frons, genae, and legs, midventral and laterodorsal portions of abdomen. Middorsal portion of vertex, prothorax and mesothorax pale, suggesting median vitta, with darker border on pro- and mesonotum. Wings clear except diffuse, longitudinal fuscous marking approximately from nodal line to wing apex, between MP and CuA and spots on veins near apical wing margin. Male pygofer pale; female gonopods tan, female pygofer pale.

Structure: Body length (including wings) (all in mm): male = 7.62±0.26 (n=4), female = 8.21±0.19 (n=6); body length (without wings) male = 5.25±0.19 (n=3), female = 5.37±0.34 (n=6); width male = 0.95±0.02 (n=4); female = 0.99±0.02 (n=6); length of vertex male = 2.24±0.14 (n=4), female = 2.39±0.08 (n=6); width of vertex male = 0.37±0.02 (n=4), female = 0.39±0.01 (n=6); length

of frons male = 2.68 ± 0.14 (n=4), female = 2.81 ± 0.10 (n=6); width of frons male = 0.35 ± 0.01 (n=4), female = 0.37 ± 0.01 (n=6).

Head. In lateral view, head deflexed upward; vertex slightly sinuate, re-flexed near apex, frons nearly flat, fastigium rounded. In dorsal view, vertex shallowly incised posteriorly; eyes projecting posteriorly beyond vertex for approximately half their length. Vertex much longer than wide (L:W ratio ~6:1), strongly forward projecting, anteriorly truncate in dorsal view. Lateral carinae of vertex distinct, slightly converging in dorsal view. Median carina of vertex distinct, broadly forked at anterior margin of eyes to submedian carinae (arms of fork rather obscure). Submedian carinae of vertex distinct, keeled, slightly converging over length of vertex to blunt apex at fastigium. In lateral view, lateral carinae merging with lateral carinae of frons well prior (0.4 mm) to fastigium, combined carina slightly upturned apically, obsolete just prior to fastigium.

In ventral view, frons narrow and very long (L:W ratio ~7.6:1); lateral carinae converging slightly to apex (Fig. 6C). Median carina of frons paired, approximated near frontoclypeal suture, diverging anteriorly and becoming more strongly keeled to fastigium. Rostrum short, exceeding mesocoxae. Subocular suture conspicuous, curved, extending from below eye just anterior to antenna to subgenal suture just posterior to lateral carinae of frons. Antennae terete, segment I short, just wider than long; II 3x length of I, bearing group (~20) of irregularly placed sensory structures over dorsal surface.

Thorax. Carinae of pronotum conspicuous, lateral carinae diverging slightly. Lateral carinae of mesonotum slightly diverging, reaching hind margin. Wings exceeding body by nearly 1/2 length of forewing. Forewings narrow, distally narrowing to rounded apex, row of crossveins in apical 1/3 (Fig. 14D), R forked well proximad of CuA fork (inner subapical cell approx half length of outer subapical cell). Veins ScP + R 3-branched, MP 4 to 5-branched (embracing wing tip), and CuA 3 to 5 branched. Calcar just over 1/2 length of basitarsus, tectiform, subcultrate, bearing 10-13 fine teeth.

Genitalia. Male genitalia with pygofer triangular in lateral view, slightly keeled at lateral angles; concave proximally (Fig. 13F). In caudal view, lateral margins rounded with weakly toothed lateral angles. Parameres forceps-like, curved and tapering to acuminate dorsomedially directed apices; basal angle dorsally projected, rounded (Fig. 17C). Aedeageal phallosome broad and shallowly hooked in lateral view, terminating in a pair of approximately straight processes (15E-F); a short, broad, acute dorsal process arising just below the aedeagus and an elongate, flattened, ventral process, tapering to a forked apex. Segment X in lateral view bearing four symmetrical processes; anterior pair at caudoventral margin, elongate, stout basally, slightly curved retrosely and uniformly tapering to sharp apices; posterior processes just posterior to midlength of ventral margin of X, retrosely directed, 1.3x length of anterior processes, broad basally, uniformly tapered to sharp point. Anal tube elongate and conspicuous, subequal length of segment X.

Etymology.— The specific name is the Latin word “*porrectus*” (stretched out, extended), referring to the head. The specific name is understood to be masculine.

Host.— This specimen was collected from *Muhlenbergia lucida* Swallen on a rock outcrop in pine forest.

Material Examined.— Holotype: “MEXICO: Chihuahua / Barranca del Cobre

Canyon / 31 Oct 1995. C.H.Dietrich/ Vacuum. 95-080 // HOLOTYPE / *Frameus / porrectus* / Bartlett [red paper]" (male, INHS); Paratypes, same data (3 male, 6 female; INHS, UDCC).

Remarks.— This species is most readily separated from other species of *Frameus* by the presence of two pair of uniformly tapering, retrosely directed processes on segment X and the presence of two straight (not hooked) processes on the phallotheca. The type locality is near Batopilas and approximately N 27° 02' 41", W 107° 43' 12". All observed specimens macropterous. Females specimens have wax residues on their gonoplas.

Frameus prolatus new species

Fig. 7 13G, 14E, 15G-H, 17D

Type Locality.— MEXICO: Durango, rt. 40, 24 mi. NE El Salto.

Diagnosis.— Head very long, vertex ratio L:W ~6.2:1. Pygofer with lateral angles keeled, forming a pair of teeth. Phallotheca bearing a short hooked process on the left side arising near the aedeagus, subtended by an elongately acuminate curved process subtended by a rounded lobe. Segment X bearing four symmetrical processes; in lateral view, distal pair elongate, slightly retrosely directed, uniformly tapering to acute apices; proximal processes near midlength of ventral margin, slightly shorter and broader, curved slightly caudad near base abruptly tapering to acute ventrally directed point.

Description.— *Color:* General body stramineous, darker in foveae of legs and gena anterior to subantennal carina. Middorsal portion of vertex, prothorax and mesothorax paler, suggesting median vitta. Forewings faintly marked with fuscous along trailing margin anterior to nodal line.

Structure: All measurements from holotype male (in mm). Body length (including wings): 7.65; body length (without wings) not determined before dissection); width 0.97; length of vertex 2.31; width of vertex 0.37; length of frons 2.66; width of frons 0.35.

Head. In lateral view, vertex slightly sinuate, very slightly reflexed at apex, frons slightly concave, fastigium rounded. Vertex much longer than wide (L:W ratio ~6.2:1), strongly forward projecting. In dorsal view vertex truncate anteriorly, lateral carinae of vertex keeled, slightly converging (parallel with head margin). Median carina of vertex distinct, broadly forked just beyond anterior margin of eyes to submedian carinae. Submedian carinae of vertex distinct, keeled, converging over length to fastigium. In lateral view, lateral carinae of vertex merging with lateral carinae of frons well prior (ca. 0.6 mm) to fastigium, combined carina slightly upturned near apex, obsolete just prior to fastigium.

In ventral view, frons narrow and very long (L:W ratio ~7.6:1); widest near eyes, lateral margins converging slightly dorsally and ventrally (Fig. 7C). Median carina of frons paired, approximated near frontoclypeal suture, diverging anteriorly and becoming more strongly keeled to fastigium. Postclypeus and anteclypeus with conspicuous single median carinae. Rostrum short, exceeding mesocoxae. Subocular suture conspicuous, curved, extending from below eye just in front of antennae to subgenal suture just posterior to lateral carinae of frons. Antennae terete, segment I short, just wider than long; II 3x length of I, bearing group of irregularly placed sensory structures (18 on type) over dorsal surface.

Thorax. Pronotal carinae reaching hind margin, lateral carinae diverging slightly posteriorly. Lateral carinae of mesonotum slightly diverging, reaching hind margin. Forewings narrow, distally narrowed to rounded apex, row of crossveins in apical 1/3 (Fig. 14E); R forked well proximad of Cu fork (outer subapical cell more than twice length of inner subapical cell); ScP + R, MP and CuA 3- to 4-branched (MP₁ and MP₂ embracing wing tip). Calcar approximately 2/3 length of basitarsus, rather thick, tectiform, subcultrate, bearing approximately 16 fine teeth.

Genitalia. Male genitalia with pygofer subtriangular in lateral view, with blunt tooth at lateral angles; sinuately concave proximally (Fig. 13G). In caudal view, pygofer with lateral angles projected into rounded teeth. Parameres forceps-like, curved and tapering to dorsomedially directed apices; basal angle oblique with dorsal tooth (Fig. 17D). Aedeagal phallosome broad, in lateral view approximately hook-shaped, terminating in a pair of processes (Figs. 15G-H), a short hooked process originating near aedeagus on the left side, subtended by a long curved elongately acuminate process originating below the aedeagus; subtended by a rounded lobe. Segment X elongate, taller than wide in lateral view, bearing four symmetrical processes; in lateral view distal pair at caudoventral margin, elongate, slightly retrosely directed, uniformly tapering to acute apices; proximal processes near midlength of ventral margin of X in lateral view, slightly shorter and broader than distal processes, curved slightly caudad near base abruptly tapering subapically to acute ventrally directed point. Anal tube elongate and conspicuous, 4/5 length of segment X.

Etymology.— The specific name is formed from the Latin word “*prolatus*”, meaning extended or elongated, referring to the head, with the masculine termination.

Host.— This specimen was collected from *Muhlenbergia vaginata* Cory.

Material Examined.— Holotype: “MEXICO: Durango / Rt. 40 24 mi. NE El Salto / 2400 m. 26 Oct 1995 / C.H.Dietrich / Vacuum. 95-065 // HOLOTYPE / *Frameus* / *prolatus* / Bartlett [red paper]” (male, INHS).

Remarks.— This species is most easily separated from its congeners by having the processes on segment X converging (the distal process is curved retrosely, the proximal process curved caudally). *Frameus prolatus* is probably most similar to *F. obrienae* n. sp., but has a much longer head, in addition to the shape of the processes of segment X. This species is recorded from a single specimen. The type locality is approximately N 24° 15' 25", W 104° 25' 47". The single available specimen of *F. prolatus* was dissected prior to the description.

***Frameus simatus* new species**

Fig. 8, 13H, 14F, 15I-J, 17E

Type Locality.— Mexico, Durango, “Neveros Road” (Carretera a Borbollones), 4 km N Rt 40, 2660m.

Diagnosis.— Head long, vertex L:W ~4.2:1. Pygofer with rounded tooth at lateral angles. Phallosome with two processes and a tooth; apical process long, elongately acuminate and strongly hooked, subtended by a short, broad acute process; the tooth on left side near crest of subapical hump. Segment X bearing four symmetrical processes; distal pair elongate, curved retrosely and uniformly tapering to sharp apices; proximal processes shorter, anterior to midlength of X,

broad, flattened, abruptly narrowed apically to acute point.

Description.— *Color:* General body gray-stramineous, darker in foveae of legs, anterior to subantennal suture of gena, midventral and laterordorsal portions of abdomen. Middorsal portion of vertex, thorax, and abdomen (except first two segments) pale, suggesting median vitta, bordered by darker. Wings clear except variably developed, narrow, longitudinal fuscous marking near and parallel to trailing margin; with or without spots at apices of peripheral veins along costal margin. Male pygofer pale; female gonoplares and female pygofer pale.

Structure: Body length (including wings) (all in mm): male = 6.88 ± 0.30 (n=16), female = 7.68 ± 0.30 (n=14); body length (without wings) male = 4.58 ± 0.24 (n=12), female = 4.69 ± 0.27 (n=14); width male = 0.99 ± 0.03 (n=16); female = 1.08 ± 0.03 (n=14); length of vertex male = 1.60 ± 0.10 (n=16), female = 1.83 ± 0.07 (n=14); width of vertex male = 0.39 ± 0.02 (n=16), female = 0.42 ± 0.02 mm (n=14); length of frons male = 2.03 ± 0.09 (n=16), female = 2.28 ± 0.07 (n=14); width of frons male = 0.35 ± 0.02 (n=14), female = 0.38 ± 0.01 (n=14).

Head. In lateral view vertex approximately flat, frons sinuate (concave medially, narrowing near apex), fastigium rounded. Vertex much longer than wide (L:W ratio ~4.2:1), anteriorly blunt in dorsal view. Lateral carinae of vertex distinct, keeled, subparallel in dorsal view. Median carina of vertex distinct, forked anteriorly to meet submedian carinae just beyond anterior margin of eyes. Submedian carinae of vertex distinct, keeled, slightly converging over length to fastigium. In lateral view, lateral carinae of vertex merging with lateral carinae of frons well prior to fastigium, combined carinae directed slightly dorsad to reach fastigium.

In ventral view, frons narrow, and very long (L:W ratio ~5.88:1); lateral carinae subparallel, converging anteriorly to blunt apex (Fig. 8C). Median carinae of frons paired, closely approximated near frontoclypeal suture, diverging anteriorly, abruptly converging near fastigium. Rostrum short, reaching mesocoxae. Subocular suture conspicuous, slightly sinuate, extending from below eye just anterior to antennae to subgenal suture at, or just posterior to, lateral carinae of frons. Antennae terete, segment I short, wider than long; II 3x length of I bearing a group of irregularly placed sensory structures, mostly on dorsal anterior margin.

Thorax. Pronotal carinae distinct, reaching hind margin. Lateral carinae of mesonotum subparallel, reaching hind margin. Wings exceeding body by nearly 1/2 their length. Forewings narrow, distally narrowed to rounded apex, row of crossveins in apical 1/3 (Fig. 14F), R forked proximad of Cu fork (outer subapical cell longer than inner); ScP + R, MP, and CuA 3- to 4-branched; MP embracing wing tip. Calcar approximately 3/4 length of basitarsus, foliate, tectiform, subultrate, bearing 10-12 fine teeth.

Genitalia. Male genitalia with pygofer subtriangular in lateral view with rounded tooth at lateral angles, concave proximally (Fig. 13H). In caudal view, lateral margins bluntly toothed at lateral angles. Parameres forceps-like, tapering to pointed dorsomedially directed apices; basal angle rounded (Fig. 17E). Aedeagal phallosome broad in lateral view, subapically humped, with two processes and a tooth (Figs. 15I-J); apical process long, elongately acuminate and strongly ventrally hooked, arising below the aedeagus, subtended by a short, broad acute process; tooth originating on left side of phallobase near crest of subapical phallobase hump. Segment X elongate, taller than wide in lateral view, bearing

four symmetrical processes; in lateral view distal pair at caudoventral margin, elongate, stout basally, curved retrosely and uniformly tapering to sharp apices; proximal processes just anterior to midlength of ventral margin of X, much broader, flattened, 2/3 length of distal processes, abruptly narrowed apically to acute point. Anal tube elongate and conspicuous, 4/5 length of segment X.

Etymology.— The specific name “*simatus*” is a Latin term meaning “press flat, flatten”, referring posterior pair of processes on segment X that are distinctly broader than the anterior processes. The specific term is understood to be masculine.

Host.— *Muhlenbergia* sp. (collected on edge of cliff in pine woodland).

Material Examined.— Holotype: “MEXICO: Durango / Niveros [sic, Neveros] Road 4km N Rt. 40 / 2660m. 24 Oct 1995 / C. H. Dietrich / Vacuum, 95-052 // Holotype / *Frameus / simatus* / Bartlett [red paper]” (male, INHS); Paratypes, same data (15 male, 14 female, 1 nymph; INHS, UDCC, UNAM).

Remarks.— All specimens macropterous. “Neveros Road” indicated on the specimen labels refer to Carretera a Borbollones, just south of Neveros. This species can be separated from all its congeners by its relatively short head (vertex L:W ratio ~4.2:1), the broad proximal process of segment X, and the three processes on the phallobase.

***KELISICRANUS* Bartlett**

Figs. 2D, 13C

Kelisicranus Bartlett, 2006: 292. Type species

Kelisicranus arundiniphagus Bartlett, 2006 by original designation.

Kelisicranus was described as a monotypic genus from the Tennessee side of the Great Smoky Mountains National Park. Gonzon and colleagues (2007) later confirmed the host of this species to be *Arundinaria gigantea* (Walter) Muhl., but the known distribution of the species was limited to Cade’s Cove in the Park. Additional specimens from Illinois and Missouri have since been examined. Of these 20 specify *Arundinaria gigantea* as the host, 5 specify “sweeping cane”, 8 do not annotate a host, and one specifies “*Andropogon scoparius*” evidently a misspelling of *A. scoparius*; = *Schizachyrium scoparium* (Michx.) Nash var. *scoparium*; little bluestem). This last specimen is the one reported by Hamilton (2006) as a member of the Asian genus *Terauchiana* Matsumura, 1915. The later host record needs confirmation. From the seasonal distribution records available, it appears that *Kelisicranus arundiniphagus* is most abundant early (late May, early June) and late (August, September) in the season (I failed to collect the species at the type locality in July 2003).

Material examined.— **Illinois:** Pope Co., Eddyville, Lusk Cr., May 1, 1953, Ross & Stannard (5 female, INHS); Eddyville, 16 Sept. 1954, Mills + Ross GL103, ex *Andropogon scoparius* (missp. of *Andropogon scoparius*; = *Schizachyrium scoparium* (Michx.) Nash var. *scoparium*) (1 female, CNCI); Eddyville, May 16, 1947, B. D. Burks (3 female, INHS, UCMC); Herod, April 9, 1947, Burks & Riegel (crossed out), Sweeping cane” (2 males, 5 females, INHS, UCMC). **Missouri:** Cape Girardeau Co., Cape Woods CA [Conservation Area], 25 May 07 (2 female, UCMC, UDCC), 1 April 07 (3 female, 2 male; UDMC, UDCC); 9 Sept. 06 (1 female, 1 male, UDMC); 4 Oct. 06 (2 female, UDMC), Apple Creek CA, 30

Aug. 07 (3 male, UDMC, UDCC), 30 Aug 06 (1 male, UDMC); Cape Woods, 27 Sept. 06 (1 male, UDCC); 2 Aug. 06 (1 male, UDMC); Bollinger Co., Sweetgum Access, 31 July 06 (1 male, UDCC); 1 Sept 07 (1 male, 1 female, UDMC, UDCC). All specimens from Cape Girardeau and Bollinger County, MO, were collected from *Arundinarea gigantea*.

***OBTUSICRANUS* Bartlett**

Obtusocranus Bartlett, 2006: 300. Type species *Obtusocranus bicarinus* Bartlett, 2006 by original designation.

Obtusocranus was described with a single species from Arizona and Colorado. Two additional specimens tentatively assigned to the type species have also been examined from Utah and Arizona (USA: Utah; Utah Co.; Rock Canyon, E. of Provo; 20-V-2000; T.D. Waite, 1 brachypterous female, NYSM tissue collection; Arizona [Coconino Co.], Jacob L[ake], IX-14-1996, F. H. Parker (1 macropterous female, UIAC). An additional species in this genus collected in the Federal District of Mexico is described here. The specimens of both *Obtusocranus bicarinus* and the new species *O. bifidus* were collected in mountainous regions.

Diagnosis.— Head rather broad, produced 0.5-1.0x length of eye, angle of fastigium blunt; carinae of head not keeled. Vertex rather broad, approximately twice as long as wide, rounded in dorsal view. Median carinae of frons paired, subparallel, approximate at frontoclypeal suture, diverging nearly to apex before abruptly meeting at fastigium. Calcar thickly foliate, slightly tectiform, subcultrate, with many small, black-tipped teeth on lateral margin. Gonoplas greatly expanded. Male genitalia with forceps-like parameres. Diaphragm of pygofer well developed, armature absent. Aedeagus long, fine; mobile within elongate phallosome. Connective between segment X and phallosome without subanal process. Segment X with two pair strong, symmetrical, widely separated processes, first from dorsolateral margins, second broad, anterior to midlength of segment X ventral margin in lateral view.

KEY TO SPECIES OF *OBTUSICRANUS*

1. Larger species (~5.4mm), with median vitta on thoracic nota and vertex; apex of phallobase with pair of processes (Figs. 13A, 16A, B) *O. bifidus* n. sp.
- Smaller species (~4.1 mm), without vitta; apex of phallobase with a single process (Fig. 13B) *O. bicarinus* Bartlett

***Obtusocranus bifidus* new species**

Figs. 9, 13A, 14A, 16A-B, 17F

Type Locality.— Mexico, Federal District, Parque Nacional Cumbres del Ajusco, Cumbres de Ajusco, Llano de Cantimplora, 3340 m.

Diagnosis.— Exceeding 5 mm body length, frons bicarinate. Male segment X bearing 2 pair short symmetrical processes, subequal in length, proximal pair broad. Aedeagal phallobase terminating in a pair of caudoventrally directed acuminate processes.

Description.— *Color.* General body uniformly tan, slightly darker on clypeus, anterior to subantennal suture, and portions of thoracic pleural region; median dorsal pale vita extending from posterior compartments of vertex to apex of mesonotum, bordered by dark tan on mesonotum; dorsum of abdomen dark except along midline; median portion of abdominal venter darkened; pygofer pale. Carinae concolorous with body. Legs pale with darker foveae. Wings clear, veins pale; variably developed longitudinal dark bar of varying length, best developed distally approximately following vein MP; tips of veins dark at costal margin. Venter of female pale except 5-7 small brown spots midlaterally; gonapophyses light brown.

Structure. Body length (with wings) (all in mm): male = 5.33 ± 0.25 (n=3), female = 5.72 ± 0.15 (n=3); Body length (without wings): male = 3.51 ± 0.03 (n=3), female = 4.05 ± 0.20 (n=3); male = width 0.92 ± 0.02 (n=4), female = 0.96 ± 0.01 (n=3); vertex length male = 0.63 ± 0.04 (n=4), female = 0.67 ± 0.01 (n=3); width of vertex male = 0.35 ± 0.01 (n=4), female = 0.38 ± 0.01 (n=3); frons length male = 0.90 ± 0.02 (n=4); female = 0.93 ± 0.03 (n=4); width of frons male = 0.37 ± 0.01 (n=4), female = 0.38 ± 0.01 (n=4).

Head, including eyes, just narrower than pronotum (Fig 9A). Vertex posteriorly truncate with eyes projecting posteriorly beyond vertex for 1/3 length. Vertex much longer than wide (L:W ratio ~1.77:1), projected in front of eye for approximately half eye total length. Vertex anteriorly rounded. Lateral carinae of vertex in dorsal view subparallel to rounded apex. Median carina of vertex distinct, forked anteriorly near anterior margin of eyes to meet submedian carinae at anterior margin of eyes. Submedian carinae of vertex converging at nearly 40° angle to meet near fastigium. In lateral view, lateral carinae of vertex joining with lateral carinae of frons near fastigium, at ~65° angle; vertex slightly declinate in apical half, with submedian carinae appearing raised above level of lateral carinae. Angle of fastigium approximately 40°. In ventral view, frons rather broad, long (L:W ratio ~2.45:1); lateral carinae slightly arced, widest near midlength (Fig. 9B), anterior apex rounded, concave at frontoclypeal suture. Median carina of frons paired, approximated near frontoclypeal suture, diverging anteriorly, converging near fastigium. Postclypeus and anteclypeus with single median carinae, together approximately 1/2 length of frons. Rostrum short, reaching mesocoxae. Subocular suture conspicuous, slightly sinuate, extending from below eye just anterior to antenna to subgenal suture at lateral carinae of frons. Antennae terete; segment I short, wider than long; II 3x length of I bearing group (ca. 10) of irregularly placed sensory structures, mostly distally and on dorsal anterior margin.

Pronotum in dorsal view less than half as long as vertex along midline, narrowing anteriorly on posterolateral margins behind eyes, arced between eyes to truncate apex; posterior margin concave. Pronotal carinae reaching hind margin. Carinae of mesonotum conspicuous; lateral carinae slightly diverging, reaching hind margin; median carina obsolete at scutellum. Wings exceeding body by nearly 1/3 their length; forewings distally narrowed to rounded apex, row of crossveins in apical 1/3 (Fig. 13A), R forked proximad of CuA fork (outer subapical cell 1.3x length of inner); ScP + R 3-branched, MP 3-branched (MP₁, MP₂, MP₃₊₄, wing tip between MP₂ and MP₃₊₄), CuA 4-branched, anal veins fused near midlength of clavus. Metatibiae with two lateral spines (Fig. 9D). Metabasitarsus longer than tarsomeres 2 + 3 combined; spinulation 5 (2+3) (tarsus), 7 (2 + 5)

(basitarsus), 4 (2nd tarsomere). Calcar approximately 3/4 length of basitarsus, thickly foliate, tectiform, subcultrate, bearing 10-14 coarse teeth and pad of fine pubescence on trailing margin.

Male genitalia with pygofer triangular in lateral view concave proximally (Fig. 13A), much longer ventrally than dorsally. In caudal view, opening about as tall as wide, lateral margins rounded, ventral margin concave at parameres. Diaphragm developed, slightly thickened along dorsal margin but without armature. Parameres directed caudodorsally, forceps-like, tapering to sharp dorsomedially directed apices; basal angle rounded (Fig. 17F). Aedeagus fine, sclerotized, somewhat serpentine; mostly enclosed within weakly sclerotized phallosome (Fig. 16A-B), in caudal view appearing to exit phallosome on left side; phallosome in lateral view terminating in a pair of caudoventrally directed acuminate processes. Segment X slightly taller than wide in lateral view, about 0.5x as tall as pygofer, bearing four symmetrical processes, subequal in length, separated at base (in caudal view): 2 slightly curved, acuminate processes from dorsolateral corners, and two broad, strongly flattened processes proximal of other. Anal tube elongate and conspicuous. Female with gonopods greatly expanded.

Etymology.— The specific name is formed from “*bi-*” (Latin, two, twice, double) plus “*-fid*” (Latin, from “*findo*”, parts, cleave, split), referring pair of distal processes on the phallosome, with the masculine Latin termination “*-us*”.

Hosts.— *Bromus exaltatus* Bernh. (Pooaceae: Pooideae: Bromaceae).

Remarks.— All available specimens of *Obtusocranus bifidus* n. sp. are macropterous, in contrast to *O. bicarinus* Bartlett, that was described from stenopterous (narrowed, shortened forewings, reduced hindwings) specimens, although a macropterous specimen of *O. bicarinus* is reported here. *Obtusocranus bifidus* can be definitively separated from *O. bicarinus* by the pair of processes at the apex of the phallosome of *O. bifidus*, compared to only one in *O. bicarinus*. *Obtusocranus bifidus* is also a larger (5.4 vs. 4.1 mm) and darker species, with a blunter head, darker wing markings, and a median vitta on the thoracic nota and posterior vertex. The females of *O. bifidus* that I have observed do not bear wax on the gonopods, which was present in *O. bicarinus*. The type locality is approximately N 19°12'37", W 99°16'31".

Material Examined.— *Holotype*: “MEXICO, D.F., P.N./Cumbres de Ajusco/ Llano de Cantimplora/3340m. 4 Sept. 1982 // HOLOTYPE / *Obtusocranus bifidus* / Bartlett [red paper]” (1 male, CASC). *Paratypes*: MEXICO: *Federal District*: same as holotype. (2 male, 3 female LBOB, UDCC); Hwy 95, 21 km. S. Mexico City, 5 Sept. 1982 C.W. & L. O'Brien & G. Wibmer. On *Bromus exaltatus* (3 males 1 female; UNAM, LBOB, UDCC); Mex. [City?]. 1200 ft. S. 43 kms, IX 5 39, Delong & Plummer (2 males, 1 broken; LBOB).

STENOCRANUS Fieber, 1866

Figs. 11, 13

Stenocranus Fieber, 1866: 519. Type species *Stenocranus minutus* (Fabricius, 1787) designated by Oshanin, 1912: 118 (Type locality: Germany ["Halae Saxonum" Fabricius, 1787: 262]).

Stenocranus is a Holarctic genus in need of a holistic treatment. Most North American forms have a shortened phallosome with an elongate process (e.g., Figs. 11D, 13I), differing from the type species which bears a more elongate phallobase, mostly enclosing the aedeagus. *Stenocranus similis* Crawford, 1914, along with the Asian *Stenocranus* species I have examined, lack greatly expanded gonopods (similar to Fig. 3B) found on the type species. These features suggest that *Stenocranus* as currently treated is probably not monophyletic.

New World *Stenocranus* consist of 15 nominative species (Metcalf 1943, Beamer 1946a, b, Hamilton 2006), although two of these (*S. maculipes*, and *S. luteivitta* Walker, 1851) do not belong in *Stenocranus* (see below). The Canadian fauna of *Stenocranus* was recently revised by Hamilton (2006), and the fauna north of Mexico is currently under revision by Stephen Wilson (University of Central Missouri). Hamilton placed 10 North American species in a new subgenus *Codex* (viz. *S. acutus* Beamer, 1946a, *S. arundineus* Metcalf, 1923, *S. brunneus* Beamer, 1946a, *S. delicatus* Beamer, 1946a, *S. dorsalis* (Fitch, 1851), *S. lautus* Van Duzee, 1897, *S. ramosus* Beamer, 1946a, *S. similis* Crawford, 1914, *S. unipunctatus* (Provancher, 1872 *nec.* Beamer, 1946a), and *S. vittatus* (Stal, 1862)) (based most importantly on "face unusually narrow, with parallel-margined facial carinae (Hamilton 2006: 497)" and 2 species explicitly placed in the typical subgenus (*S. felti* Van Duzee, 1910, and *S. sandersoni* Beamer, 1946b), leaving 3 species untreated (*S. angustus*, *S. luteivitta*, and *S. maculipes*). *Stenocranus angustus* would appear to be in Hamilton's *Codex* (based on 3 female specimens from Belize [as British Honduras], Rio Temas, Sept. 1937, A. J. White; NCSU, UDCC). In addition to the described species, I am aware of undescribed species from California and Cuba.

Stenocranus luteivitta (Walker, 1851) is not a *Stenocranus*. *Stenocranus luteivitta* was described as a *Delphax*, moved to *Dicranotropis* by Van Duzee (1916), then to *Stenocranus* by Muir and Giffard (1924). It was placed in *incertae sedis* by Beamer (1946a). The type specimen is at the British Museum of Natural History. Walker (1851: 354) gave the specimen information only as "United States. Presented by E. Doubleday, Esq." (from St. Johns Bluff, Florida). I have been informed that the information on the specimen consists of only the registration number on a circular white label clockwise from left "5 41 17 229.1", indicating entry 229 of the 17th May 1841. The specimen is a male in poor condition, evidently teneral, with the head damaged, wings detached, and the genitalia in a plastic vial (M. Webb, British Museum Natural History, and K.G.A. Hamilton, Canadian National Museum, *pers. comm.*). Preliminary observations regarding the type specimen of *Delphax luteivitta* (including sketches of the genitalia by M. Webb) suggest that it may be conspecific with one of two subsequently described species currently in the genus *Delphacodes* (M. Webb, British Museum Natural History, and K.G.A. Hamilton, Canadian National Museum, *pers. comm.*), although further investigation will be needed to firmly establish the synonymy and

explore nomenclatural implications. Until that work has been completed, this species is here transferred to the genus *Delphacodes* as *D. luteivitta* (Walker, 1851), **new combination**.

Stenocranus maculipes (Berg, 1879) from Argentina, described as a *Delphax* and moved to *Stenocranus* by Berg 1883, is the only New World *Stenocranus* not from North America. Photos of the type material of *Stenocranus maculipes* (Berg), a female from Buenos Aires, provided by Ana Maria de Remes Lenicov (Universidad Nacional de La Plata, Facultad de Ciencias Naturales y Museo, División Entomología) reveal that this species is clearly not a *Stenocranus*, but probably a *Megamelus* (Delphacinae: Delphacini), although it does not appear to be one of the species recently treated by Sosa et al. (2007). Until a male is located, this species is best treated as *incertae sedis*.

The hosts of many of the North American species are in the Cyperaceae (Table 1), although *Phragmites* has been reported as the host for 7 species from the Far East. *Eleocharis quadrangulata* (Michaux) Roem. and Schult. was reported as the host of *Stenocranus similis* by Bartlett in Bartlett and Wheeler (2007), but these specimens were later determined to be *Nothodelphax slossonae* (Ball, 1903), and so the *S. similis* host record is in error.

TANYCRANUS new genus

Type species.— *Tanycranus elongatus* n. sp., here designated

Diagnosis.— Head narrow, elongate, greatly projecting in front of eye, fastigium truncate. Carinae of head mostly distinct, median carina of vertex weak. Head in lateral view with lateral carinae of the vertex and frons meeting just prior to the fastigium and forming a short combined carina. Vertex narrow, ratio L:W exceeding 6:1; submedian carinae not joining, reaching fastigium as paired carinae. Median carinae of frons dividing into paired carinae between eyes, slightly diverging to fastigium. Calcar foliate, tectiform, subcultrate, with small, black-tipped teeth on lateral margin. Gonoplasts greatly expanded, concealing ovipositor. Male genitalia with forceps-like parameres, strongly curved medially, directed caudoventrally. Diaphragm of pygofer developed, armature absent. Aedeagus long, fine; phallosome surrounding aedeagus at base with a long sclerotized projection subtending and subequal in length to aedeagus. Connective between segment X and phallosome without subanal process. Segment X with one pair of processes from dorsolateral margins.

Description.— *Color*: Body stramineous, paler middorsally on vertex, prothorax, mesothorax and midventrally on frons; darker (often orange) laterally on pro-, mesonotum and genae. Wings clear to slightly infuscate, veins pale.

Structure. Head, including eyes, narrower than pronotum; with long anterior projection (vertex L:W ~7-8:1). In dorsal view, vertex shallowly incised medially on posterior margin; eyes projecting posteriorly beyond vertex. Median carina of vertex either obsolete near anterior margin of eyes or broadly forked to submedian carinae. Submedian carinae of vertex distinct, slightly converging anteriorly, not meeting. In lateral view, lateral carinae of vertex merging with lateral carinae of frons prior to fastigium (~0.2 mm on holotype), forming combined carina. In ventral view, frons narrow and very long, lateral carinae subparallel. Median carina of frons weak near frontoclypeal suture, forked and more evident between eyes, diverging slightly to apex. Postclypeus with single

median carinae. Rostrum short, reaching or exceeding mesocoxae. Subocular suture conspicuous, extending from below eye anterior to antenna to subgenal suture at junction with lateral carinae of frons. Antennae terete, segment I about as wide as long; II ~2-3x length of I, bearing irregularly placed rhinaria dorsally.

Pronotum in dorsal view subequal in length to scutum of mesonotum, anterior margin truncate, posterior margin broadly and shallowly concave. Carinae of pro- and mesonotum distinct. Carinae of pronotum attaining posterior margin, lateral carinae arched. Lateral carinae of mesonotum subparallel, just reaching hind margin; median carina obsolete near scutellum.

Wings exceeding body for approximately half length of forewings; forewings exceeding hindwings. Forewings narrowing in distal 1/2 to rounded apex, row of crossveins in apical 1/2 (Fig. 14G). Fork of R just proximad to CuA fork (outer subapical cell slightly longer than inner subapical cell), ScP + R 3-branched, MP 3-branched (MP₁, MP₂, MP₃₊₄, wing tip between MP₂ and MP₃₊₄), CuA 4-branched, anal veins fused before midlength of clavus.

Metatibiae with two lateral spines. Metabasisarum longer than tarsal segments 2 + 3 combined; spinulation 5 (2+3) (tarsus), 7 (2 + 5) (basitarsus), 4 (2nd tarsomere). Calcar tectiform, subcultrate, bearing 14+ fine teeth. Abdomen with weakly developed pits on each lateral margin of ventral side of segments 4-6.

Male genitalia with pygofer subtriangular in lateral view concave proximally. In caudal view, opening slightly taller than wide, lateral margins rounded, projecting at ventral and dorsocaudal angle, ventral margin concave at parameres. Diaphragm developed, without armature. Parameres directed caudodorsally in lateral view, forceps-like, strongly arched medially, with apices curved dorsad; a tooth near basal angle. Aedeagus fine, sclerotized; enclosed at base within phallosome; phallosome with long fine sclerotized process, subequal in length to aedeagus. Segment X long, in lateral view bearing one pair of slightly asymmetrical processes. Anal tube elongate and conspicuous. Female with gonoplaea greatly expanded, concealing gonapophyses.

Eymology.— The generic name is formed from the Greek “*tany-*” (long), combined with “*-cranus*”, derived from the Greek “*kranos*” (head, helmet), given the masculine termination “*-us*”.

Remarks.— This genus is the undescribed taxon referred to by Hamilton 2006 (illustrated in his fig. 4). Members of this genus are most similar to *Frameus* in having a greatly elongate head, but differ in that the head is truncate apically instead of rounded or blunt, and the median carinae of the frons divides into paired carinae near the anterior margin of the eyes, instead of much closer to the frontoclypeal suture. The genitalia of *Tanycranus* are quite distinct from *Frameus* in that *Tanycranus* has a short phallobase bearing a long, sclerotized process (similar to many North American *Stenocranus*), and a single pair of processes on segment X.

Tanycranus elongatus new species

Figs. 12, 13J, 14G, 16C, 17G

Type Locality.— Uruguay, Maldonado, 22 km NE Aiguá.

Diagnosis.— Approximately 6.5-8.5 mm body length, apex of head truncate, sublateral carinae of vertex not joined, reaching fastigium as separate carinae; median carina of frons forked near anterior margin of eye. Male segment X

bearing a pair of slightly asymmetrical, retroseely curved processes. Aedeagal phallobase short, bearing long sclerotized process subequal in length to aedeagus.

Description.— *Color.* Body stramineous, paler medially on vertex, pronotum and mesonotum; and midventrally on frons; darker (often orange) laterally on pronotum, mesonotum, and along subocular suture.

Structure. Body length (with wings) (all in mm): male = 6.63 ± 0.22 (n=4), female = 7.87 ± 0.68 (n=4); Body length (without wings): male = 4.76 ± 0.12 (n=3), female = 5.60 ± 0.21 (n=4); male = width 0.86 ± 0.02 (n=4); female = 0.96 ± 0.06 (n=4); vertex length male = 1.81 ± 0.14 (n=4), female = 2.07 ± 0.27 (n=4); width of vertex male = 0.26 ± 0.01 (n=4), female = 0.32 ± 0.01 (n=4); frons length male = 2.09 ± 0.15 (n=4); female = 2.34 ± 0.27 (n=4); width of frons male = 0.27 ± 0.01 (n=4), female = 0.32 ± 0.02 (n=4).

Head. In lateral view, vertex slightly sinuate (may be slightly upcurved or downcurved apically), frons slightly concave medially, fastigium truncate. In dorsal view, eyes projecting posteriorly beyond vertex, vertex weakly indented posteriorly. Vertex much longer than wide (L:W ratio ~7.5:1). Vertex anteriorly truncate in dorsal view. Lateral carinae of vertex distinct, subparallel in dorsal view. Median carina of vertex weak, obsolete or forked to meet submedian carinae near anterior margin of eyes. Submedian carinae of vertex distinct, weakly converging over length of vertex. In lateral view, lateral carinae of vertex merging with lateral carinae of frons prior to fastigium, combined carinae directed slightly dorsad to fastigium.

In ventral view, frons narrow, and very long (L:W ratio ~6.75:1); lateral carinae subparallel, contiguous with lateral carinae of vertex (Fig. 12C). Median carina of frons weak near frontoclypeal suture, stronger anteriorly; forked near anterior margin of eyes, diverging anteriorly. Postclypeus with single median carinae, weaker on anteclypeus. Rostrum short, reaching or exceeding mesocoxae. Subocular suture conspicuous, slightly angled, extending from below eye anterior to antennae to subgenal suture at lateral carinae of frons. Antennae terete; segment I short, just wider than long; II nearly 3x length of I bearing a group of irregularly placed sensory structures, mostly on dorsal margin.

Thorax. Pronotal carinae distinct, arched, reaching hind margin. Lateral carinae of mesonotum subparallel, just reaching hind margin. Wings exceeding body by nearly 1/3 their length. Forewings elongate, distally narrowed to rounded apex, row of crossveins in apical 1/3 (Fig. 14G), R forked just proximad of Cu fork (outer subapical cell longer than inner); ScP + R 3 or 4-branched, MP 2 or 3 branched (wing tip between MP₁₊₂ and MP₃₊₄); CuA 4-branched; anal veins fused near midlength of clavus. Calcar approximately 3/4 length of basitarsus, foliate, tectiform, subcultrate, bearing 14-16 fine teeth, with larger terminal tooth.

Genitalia. Male genitalia with pygofer subtriangular in lateral view, concave proximally (Fig. 13J), lateral angles projecting as broad, acute teeth; pygofer abruptly narrowed above anal angles that project caudally as rounded teeth. In caudal view, lateral margins rounded (pygofer setose on caudolateral margins), projecting at ventral and dorsocaudal angle, ventral margin concave at parameres. Diaphragm developed, without armature. Parameres in caudal view forceps-like, broad, strongly arched, tapering to blunt apices; curved dorsally near apex; a small acute tooth at basal angles (Fig. 17G). Aedeagus fine, strongly humped before middle. Aedeagal phallosome short, bearing an elongate fine process subtending aedeagus (Fig. 16C). Segment X elongate, in lateral view nearly 2x taller

than wide, bearing 2 slightly asymmetrical processes, recurved and tapering to sharp apices. Segment XI elongate, 4/5 length of segment X.

Etymology.— The specific name is the Latin adjective “*elongatus*”, meaning “prolonged”.

Host.— *Carex* sp.

Remarks.— The specimens from Uruguay are slightly larger and paler than the specimens collected from southern Brazil (males average 6.7 vs. 6.5; females 8.4 vs. 7.4 mm); however, there appears to be no substantive morphological difference between the specimens from Brazil and Uruguay. The single female specimen from French Guiana is similar in size and coloration to the Uruguay specimens and is tentatively included with this new species, but excluded from the paratype series, as is a single female specimen from Bolivia.

This species is the undescribed stenocranine from Brazil reported by Hamilton (2006) and illustrated in his Figure 4. As noted by Hamilton, this taxon bears a remarkable superficial similarity to the African genus *Embolophora*, particularly in the shape of the head, which might suggest a link between the stenocranine fauna of Africa and South America. This hypothesis is probably best explored through molecular phylogenetic tools. *Embolophora* (see Asche 1983) is different from *Tanycranus* most obviously in having the lateral carinae of frons and vertex joining very close to the fastigium, by the phallobase surrounding the aedeagus, and by the shape of the pygofer (lacking prominent lateral and anal angles). However, such differences are not sufficient to reject the hypotheses of sister group relationships between *Tanycranus* and *Embolophora* (as opposed to *Tanycranus* and *Frameus*, with parallelism in *Embolophora*). The general Holarctic distribution of stenocranine planthoppers tends to suggest that stenocranines with southern distributions were derived by dispersal from northern taxa, suggesting that the similarity of *Tanycranus* and *Embolophora* is the result of convergence. At present, the age of the stenocranine lineage of delphacids has not been determined to evaluate against geologic history, so neither hypothesis can be substantively preferred.

Material Examined.— Holotype: “URUGUAY, Maldonado / R13, 22km.NE.Aiguá / Feb. 5, 1989 CW.&L./ O’Brien&G.Wibmer” (male, CASC). Paratypes: **Uruguay**: same as type (1 female, LBOB); Rocha, R9, 9km. W. Castillos, Feb. 5, 1989, C.W. & L. O’Brien & G. J. Wibmer, on large *Carex* (1 male, 1 female; UDCC). **Brazil**: Nova Teutonia, 27° 11' B[south], 52° 23' [west], 300-500m [elevation], Fritz Plaumann, May 1975, T. R. Yonke Collection (4 male, 3 female; CNCI, UMSC); Santa Catarina, Nov. 1953, F. Plaumann (1 female, NCSU). Excluded from paratypes: **French Guiana**: 8 km W. Risquetout, 45m [elevation], 10-11-VI-2005, J. E. Eger, MV light, N04° 55.09", W052° 33.121' (1 female, LBOB). **Bolivia**: Santa Cruz, 5km ESE Warnes, hotel Rio Selva, 20.x.2000, M. Thomas, Light trap [ca. 330 m elevation] (1 female, UDCC).

DISCUSSION

New World stenocranine are a relatively small group of planthoppers, yet recent study has revealed greater diversity than heretofore anticipated. The seven new species described here increases the known fauna from 15 (excluding *Stenocranus luteivitta* and *S. maculipes*) in 3 genera to 22 in 5 genera. New World *Stenocranus* require revision both to reassess their generic placement and to describe additional new taxa. The type specimens of *Stenocranus luteivitta* (Walker, 1851) and *S. maculipes* (Berg, 1879) were investigated and found not to be stenocranines; *S. luteivitta* is here referred to *Delphacodes*, and *S. maculipes* to *incertae sedis*. Both the striking nature of the new taxa and the extension of the distribution of stenocraninae into the Neotropics emphasize our limited knowledge of delphacid planthopper taxonomy. Of eight localities in Mexico where stenocranines were found, seven yielded different new species.

Wing venation was investigated here as a potential source of taxonomic features since it had been previously used for species identification (viz. Beamer 1946a). It was found here that venation details, including number and arrangement of branches, varied among specimens of the same species, and sometimes between the left and right wing of an individual. While this does not preclude wing venation from being taxonomically useful for stenocranines, it clearly at-tests that it must be used with caution.

Five taxa in the new genus *Frameus* were taken from grasses in the genus *Muhlenbergia*, and one on *Festuca amplissima*, with four different host species reported (and two recorded as *Muhlenbergia* sp.). Unlike most reported hosts for stenocranine planthoppers (Table 1), *Muhlenbergia* is a C₄ grass, suggesting that the change in photosynthetic pathway may not represent a barrier to host switching for delphacid planthoppers, and host plant affinities alone may not explain the limited success of stenocranine planthoppers to substantively diversify in southern latitudes, as opposed to the derived Delphacini.

All *Frameus* and *Obtusocranus* species with recorded elevations were collected at middle to high elevation localities, from 2,320 to 3,340 meters. The type locality of *Obtusocranus bicarinus* is the White Mountains in Arizona, suggesting that this species may also be from higher elevations. Collectively these suggest that there is almost certainly a richer stenocranine fauna to be discovered from the mountainous regions of southwestern United States and Mexico. *Tanycranus* was recorded only at low elevations.

The overall distribution of stenocranine delphacids suggests a Holarctic origin, with subsequent dispersal into the tropics; however, the striking superficial similarity of *Tanycranus* n. g. in the Neotropics with *Embolophora* in the Paleotropics tempts one to investigate alternative hypotheses. The hypotheses that *Tanycranus* and *Embolophora* are sister groups cannot be tested at this time since the relationships among the stenocranine genera has not been formally investigated, and the age of the origin of the stenocranine planthoppers remains unknown. The striking superficial similarity between *Tanycranus* and *Embolophora* does represent either a remarkable parallelism, or a link between Old and New World faunas.

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Table 1. Reported host records for stenocranine planthoppers (updated from Wilson et al. 1994). (Species / Distribution / Host family (Higher level classification of grasses from Flora of North America Editorial Committee (2003, 2007) / Reported Host / References)

Species: *Keliscranus arundiniphagus* Bartlett, 2006
 Distribution: USA
 Host family: Poaceae: Bambusoideae: Bambuseae (*Arundinaria*); Panicoideae: Andropogoneae (*Schizachyrium*)
 Reported Host: *Arundinaria gigantea* (Walter) Muhl.; *Schizachyrium scoparium* (Michx.) Nash var. *scoparium* References: Bartlett 2006, Gonzon et al. 2007

Species: *Preterkelisia magnispinosus* (Kuoh, in Ding and Kuoh 1981)
 Distribution: Taiwan
 Host family: Gleicheniaceae
 Reported Host: *Dicranopteris dichotoma* (Thunb.) Bernh.
 References: Ding 2006

Species: *Preterkelisia yasumatsui* (Esaki et Ishihara, 1950)
 Distribution: China
 Host family: Poaceae: Pooideae: Triticeae
 Reported Host: *Agropyron cristatum* (L.) Gaertn.
 References: Ding 2006

Species: *Stenocranus agamopsyche* Kirkaldy, 1906
 Distribution: Australia, Taiwan, China, Philippines, Guam, South Mariana Is., Western Caroline Is.
 Host family: Poaceae: Arundinoideae: Arundineae
 Reported Host: *Phragmites australis* (Cav.) Trin. ex Steud. (as *Phragmites communis* Trin.)
 References: Yang 1989, Ding 2006

Species: *Stenocranus arundineus* Metcalf, 1923
 Distribution: Canada, USA
 Host family: Poaceae: Bambusoideae: Bambuseae
 Reported Host: *Arundinaria* sp.
 References: Metcalf 1923; Beamer 1946a

Species: *Stenocranus brunneus* Beamer, 1946a
 Distribution: USA
 Host family: Cyperaceae
 Reported Host: *Carex cumberlandensis* Naczi, Kral and Bryson; *C. gracilescens* Steud., *C. radfordii* Gaddy, *C. pennsylvanica* Lam., *C. stricta* Lam., *C. intumescens* var. *fernaldii* Bailey
 References: Bartlett and Wheeler 2007

Species: *Stenocranus cyperi* Ding, 2006
 Distribution: China
 Host family: Cyperaceae
 Reported Host: *Cyperus* sp., *Scirpus lineolatus* Franch. & Sav.
 References: Ding 2006

Species: *Stenocranus dorsalis* (Fitch, 1851) (as *S. unipunctatus sensu* Beamer, 1946)
 Distribution: Canada, USA, West Indies
 Host family: Cyperaceae
 Reported Host: *Carex intumescens* Rudge
 References: Bartlett and Wheeler 2007

- Species: *Stenocranus fuscovittatus* (Stal, 1858)
 Distribution: Widespread Palearctic
 Host family: Cyperaceae
 Reported Host: *Carex* sp., *Cladium mariscus* (L.) Pohl (as *Claudium mariscus*)
 References: Ashe 1982, Drosopoulos et al. 1983, Nickel and Remane, 2002
- Species: *Stenocranus gialovus* Ashe et al. 1983
 Distribution: Greece
 Host family: Poaceae: Pooideae: Poeae
 Reported Host: *Phalaris aquatica* L.
 References: Ashe and Hoch 1983, Drosopoulos et al. 1983
- Species: *Stenocranus harimensis* Matsumura, 1935
 Distribution: Japan
 Host family: Cyperaceae
 Reported Host: *Carex thunbergii* Steud.
 References: Wilson et al. 1994
- Species: *Stenocranus hongtiaus* Kuoh (in Kuoh et al. 1980)
 Distribution: China
 Host family: Poaceae: Arundinoideae: Arundineae
 Reported Host: *Phragmites* sp.
 References: Chen and Liang 2005
- Species: *Stenocranus lautus* Van Duzee, 1897
 Distribution: Canada, USA
 Host family: Cyperaceae
 Reported Host: *Carex lurida* Wahl., *Ca. cumberlandensis* Naczi, Kral and Bryson; *Cyperus esculentus* L., *Cy. strigosus* L.
 References: Calvert and Wilson 1986, Bartlett and Wheeler 2007
- Species: *Stenocranus longipennis* (Curtis, 1837)
 Distribution: Europe, Russia,
 Host family: Cyperaceae
 Reported Host: *Carex paniculata* L., *C. acutiformis* Ehrh.
 References: Nickel and Remane, 2002, Baugnee 2003, Holzinger et al. 2003
- Species: *Stenocranus macromaculatus* Ding, 2006
 Distribution: China
 Host family: Poaceae: Arundinoideae: Arundineae
 Reported Host: *Phragmites australis* (as *Phragmites communis*)
 References: Ding 2006
- Species: *Stenocranus major* (Kirschbaum, 1868)
 Distribution: Malaysia, Europe
 Host family: Poaceae: Pooideae: Poeae (both genera)
 Reported Host: *Phalaris arundinacea* L., *Calamagrostis epigejos* (L.) Roth
 References: Ossiannilsson 1978; Nickel and Remane, 2002, Holzinger et al. 2003

Species: *Stenocranus matsumurai* Metcalf, 1943
 Distribution: Japan, China, Russia, Taiwan
 Host family: Poaceae: Arundinoideae: Arundineae (*Phragmites*); Pooideae: Poeae (*Phalaris*);
 Panicoideae: Andropogoneae (*Miscanthus*); Pooideae; Triticeae (*Hordeum*); Equisetaceae
 (*Equisetum*)
 Reported Host: *Phragmites australis* (as *Phragmites communis*); *Phalaris arundinacea* L.,
Miscanthus sinensis Andersson, *Hordeum vulgare* L., *Equisetum arvense* L.
 References: Lee and Kwon 1980, Yang 1989, Ding 2006

Species: *Stenocranus minutus* (Fabricius, 1787)
 Distribution: Widespread: Europe, Russia, North Africa
 Host family: Poaceae: Pooideae: Poeae (*Dactylis*); Brachypodiaceae (*Brachypodium*)

Reported Host: *Dactylis glomerata* L., *D. glomerata lobata* (Drejer) H. Lindb. (as *D. polygama* Horv.); *Brachypodium pinnatum* (L.) P. Beauv.
 References: Ossianilsson 1978; Cobben and Rozeboom 1983, Asche 1982, Drosopoulos et al. 1983, Nickel and Remane, 2002, Holzinger et al. 2003

Species: *Stenocranus montanus* Huang & Ding (in Kuoh et al. 1980)
 Distribution: China
 Host family: Poaceae: Chloridoideae: Cynodonteae
 Reported Host: *Neyraudia reynaudiana* (Kunth) Keng ex Hitchc.
 References: Ding 2006

Species: *Stenocranus pacificus* Kirkaldy, 1907
 Distribution: Fiji, Caroline Islands, Palau, Philippines, Viet Nam
 Host family: Poaceae: Panicoideae: Andropogoneae
 Reported Host: *Zea mays* L.
 References: FAO 2007

Species: *Stenocranus qiandainus* Kuoh (in Kuoh et al, 1980)
 Distribution: China
 Host family: Cyperaceae
 Reported Host: *Cyperus iria* L.
 References: Ding 2006

Species: *Stenocranus rufilinearis* Kuoh (in Ding and Kuoh, 1981)
 Distribution: China
 Host family: Cyperaceae
 Reported Host: *Eleocharis dulcis* (Burm. f.) Trin. ex Henschel (as *Eleocharis tuberosa* (Roxb.) Schult.), *E. kuroguwai* Ohwi; *Cyperus rotundus* L., *C. triqueter* Boeck.
 References: Ding and Kuoh 1981, Ding 2006

Species: *Stenocranus similis* Crawford, 1914
 Distribution: USA
 Host family: Poaceae: Bambusoideae: Bambuseae
 Reported Host: *Arundinaria gigantea tecta* (Walter) McClure (as *Arundinaria tecta*)
 References: Dozier 1922

Species: *Stenocranus spinosus* Ding (in Ding and Zhang 1994)
 Distribution: China
 Host family: Poaceae: Arundinoideae: Arundineae
 Reported Host: *Phragmites australis* (as *Phragmites communis*)
 References: Ding 2006

Species: Species: *Stenocranus yasumatsui* Ishihara, 1952
Distribution: Japan
Host family: Cyperaceae
Reported Host: *Carex* sp.
References: Lee and Kwon 1980

Species: *Stenocranus yuanmaonus* Kuoh (in Kuoh et al. 1980)
Distribution: China
Host family: Poaceae: Arundinoideae: Arundineae
Reported Host: *Phragmites australis* (as *Phragmites communis*)
References: Ding 2006

Species: *Stenocranus zalantunensis* Ding & Hu (in Ding and Zhang 1994)
Distribution: China
Host family: Poaceae: Arundinoideae: Arundineae
Reported Host: *Phragmites australis* (as *Phragmites communis*)
References: Ding 2006

Species: *Terauchiana nigripennis* Kato, 1933
Distribution: Japan
Host family: Poaceae: Panicoideae: Andropogoneae
Reported Host: *Imperata cylindrica* (L.) P. Beauv. var. *koenigii* (Retz.) Perkins
References: Lee and Kwon 1980

Species: *Terauchiana singularis* Matsumura, 1915
Distribution: Japan, Korea, Russia
Host family: Poaceae: Arundinoideae: Arundineae (*Phragmites*); Panicoideae: Andropogoneae (*Imperata*, *Miscanthus*); Pooideae: Poae (*Poa*); Dryopteridaceae (*Onoclea*)
Reported Host: *Phragmites australis* (as *Phragmites communis*); *Imperata cylindrica* (L.) P. Beauv. var. *koenigii* (Retz.) Perkins; *Miscanthus sinensis* Andersson, *Poa annua* L., *Onoclea sensibilis* L.
References: Lee and Kwon 1980

Table 2. Number and distribution of stenocranine delphacid specimens examined and reported.

Species	Gender		Distribution of Examined specimens
	Males	Females	
<i>Embolophora britmusei</i> Asche, 1983	1	1	South Africa (Eastern Cape)
<i>Embolophora monoceros</i> Stal, 1855	3	2	Democratic Republic of the Congo (Kalemie) (as Albertville, Congo Belge); South Africa (Limpopo, as Transvaal)
<i>Frameus dissociatus</i> n. sp.	2	0	Mexico (Durango)
<i>Frameus obrienae</i> n. sp.	51	48	Mexico (Federal District, Michoacán, Morelos)
<i>Frameus porrectus</i> n. sp.	4	6	Mexico (Chihuahua)
<i>Frameus prolatus</i> n. sp.	1	0	Mexico (Durango)
<i>Frameus simatus</i> n. sp.	16	14	Mexico (Durango)
<i>Frameus</i> sp.	1	1	Mexico (Durango, Federal District)
<i>Kelisicranus arundiniphagus</i> Bartlett	13	21	USA (Illinois, Missouri)
<i>Obtusicranus bicarinus</i> Bartlett, 2006	0	2	USA (Utah)
<i>Obtusicranus bifidus</i> n. sp.	8	4	Mexico (Federal District)
<i>Tanycranus elongatus</i> n. sp.	5	8	Brazil, Uruguay, French Guiana, Bolivia
<i>Terauchiana singularis</i> Matsumura, 1915	1	3	Japan (Tokyo, Tochigi)
<i>Terauchiana sagitta</i> (Kusnezov, 1929)	1	3	Kazakhstan (Uralsk, Kara-Kolpak)
Totals	107	113	