

Homoptera (Insecta) in Pacific Northwest grasslands. Part 1 – New and revised taxa of leafhoppers and planthoppers (Cicadellidae and Delphacidae).

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ABSTRACT

Nine new combinations are created when *Acanthodelphax* LeQuesne (Delphacidae) is synonymized with *Kosswigianella* Wagner and the genus *Aschedelphax* Wilson is reduced to subgenus in *Elachodelphax* Vilbaste: *Delphacodes analis* Crawford and three Palearctic species in *Acanthodelphax* are transferred to *Kosswigianella*; *Aschedelphax hochae* Wilson, *Delphacodes coloradensis* Beamer, *D. indistinctus* Crawford, *D. bifidus* Beamer, and *D. pediforma* Beamer are transferred to *Elachodelphax*. Seven other new combinations include *Delphacodes atridorsum* Beamer, transferred to *Caenodelphax* Fennah; *Delphacodes kilmani* (Van Duzee), transferred to *Paraliburnia* Jensen-Haarup; *Delphacodes venusta* Beamer, transferred to *Nothodelphax* Fennah; *Eurysa magnifrons* (Crawford), *E. montana* Beamer and *E. obesa* Beamer, transferred to *Eurybregma* Scott; plus the leafhopper *Sorhoanus helvinus* (Van Duzee) transferred to *Lebradea* Remane. Twenty new species and 3 new subspecies are described from the Pacific Northwest, including the leafhoppers *Athysanella castor*, *A. hyperoche*, *A. lemhi*, *A. occidentalis megacauda*, *A. repulsa*, *Diplocolenus configuratus bicolor*, *Mocuellus caprillus anfractus*, *M. quinquespinus*, *Psammotettix diademata*, *P. nesiotus*, *Sorhoanus involutus*, *S. virilis*, *S. xiphosura*, *Stenometopiellus vader* and *Unoka dramatica*, plus the planthoppers *Achorotile apicata*, *Elachodelphax unita* and *E. mazama* (both compared to *E. borealis* sp. nov. from east of the Rocky Mountains), *Eurybregma eurytion*, *Kosswigianella irutilo*, *K. wasatchi*, *Paraliburnia furcata* and *P. lecartus*. Two new names are created: *Athysanella (Gladionura) hicksi* for *A. expulsa* Blocker and Hicks (preoccupied), and *Psammotettix greenei* for *P. emarginata* Greene (preoccupied). The presence of intermediate morphs suggestive of hybrids reduce *Athysanella ladella* Johnson and *A. wilburi* Ball & Beamer to subspecific status in *A. occidentalis* Baker, *Diplocolenus nigrior* Ross & Hamilton to subspecies status in *D. configuratus* (Uhler) and *Mocuellus strictus* Ross & Hamilton to subspecies status in *M. caprillus* Ross & Hamilton. Variation within series over a wide area reduces *Athysanella vativa* Blocker to synonymy with *A. terebrans* Gillette & Baker, and *A. mansa* is synonymized with *A. occidentalis wilburi* as a hybrid morph.

INTRODUCTION

Grasslands form a minor part of the rugged landscape of the Pacific Northwest (PNW). They are restricted to favourable elevations sandwiched between huge areas of coniferous forest and sagebrush semidesert. The elevation of these grasslands varies with both latitude and local topography. In the southern Okanagan Valley of British Columbia (latitude 49°) the following communities are generally found on west-facing slopes at the following elevations: sagebrush steppe to 350 m; steppe-grassland ecotone, to 700 m; Palouse grassland to 800 m; grassland-forest ecotone to 1000 m. At Bannock Pass on the Idaho-Montana border (latitude 45°) sagebrush steppe reaches 2000 m and forests begin again just above the pass (2200 m), compressing grassland and its ecotones into a few hundred metres. South-facing slopes can raise the elevation of the grassland community as much as 200 m. Conversely, grasslands are

often absent on steep north-facing slopes.

Much of these grasslands have been converted to agriculture, or confined to small patches in intermontane valleys, dissected by deep canyons, or separated by mountain ranges. Pacific Northwest grasslands extend over six states and two provinces. Their main mass runs from isolated valleys of central British Columbia (BC) south to the Palouse hills of Washington (WA) and the Snake River plains of Idaho (ID), and down the foothills of the Cascade Mountains to Oregon (OR). Patches of this grassland may be found on mountains of Colorado (CO), Utah (UT) and Wyoming (WY). On the eastern slopes of the Rocky Mountains a similar grassland extends from southwestern Alberta (AB) to southern Montana (MT).

PNW grasslands are home to many grassland-endemic phytophagous insects. The most numerous species of these endemics belong to the leafhopper family Cicadellidae (Figs. 1-2). Leafhoppers are diverse, with over 2000 species in North America (Oman 1949). A large proportion of these are grassland insects (Ross 1970) which include more than 150 species monophagous on grasses (Hamilton and Whitcomb 1993) and many others oligophagous on arid-adapted forbs, principally composites such as sagebrush, *Artemisia* spp., balsamroot, *Balsamorhiza* spp. and rabbitbrush, *Chrysothamnus* spp. (Hamilton 1998a, Hamilton and Zack 1999).

The leafhopper fauna we find today in the PNW has a high percentage of endemic species. A smaller number of leafhopper species are widely dispersed across many habitat types. These have little to tell us about historical biogeography. For example, species of *Helochara* Fitch (Hamilton 1986, maps 17-18) which are not restricted to prairie plants range far outside native grasslands.

The purpose of this paper is to present new and revised taxa of PNW endemic leafhoppers and planthoppers (Fulgoroidea) of the family Delphacidae (Fig. 3). The second part analyses their biogeography, together with that of planthoppers of the family Caliscelidae (Fig. 4), for evidence of endemism and postglacial spread. These planthoppers, although fewer in number and less studied than leafhoppers, show similar dispersal patterns and thus are included in this analysis.

METHODS

Numerous leafhopper and planthopper species inhabit prairies and semidesert grasslands adjacent to the PNW, but have no populations in the PNW. They are therefore excluded from this study. These include the leafhopper genera *Dicyphonia* Ball, *Driotura* Osborn & Ball, *Extrusanus* Oman, and various genera of the Sonoran subregion. Nevertheless, hundreds of grassland-endemic leafhopper and planthopper species do inhabit PNW grasslands, permitting detailed analysis of their known distributions.

The few PNW species of the leafhopper genera *Acinopterus* Van Duzee, *Chlorotettix* Van Duzee, *Commellus* Osborn & Ball, *Endria* Oman, *Frigartus* Oman, *Hardya* Edwards, *Idiodonus* Ball, *Lonatura* Osborn & Ball, *Lystridea* Baker, *Mesamia* Ball, *Paluda* DeLong, *Pinumius* Ribaut, *Stragania* Stål, *Twiningia* Ball and *Xerophloea* Germar are distinctive (Oman 1949; Beirne 1956) and present no taxonomic problems to the biogeographer. Revisionary work has been done for the more complex leafhopper genera *Amblysellus* Slesman (Kramer 1971), *Athysanella* Baker (Blocker and Johnson 1988, 1990a, b, c; Blocker and Hicks 1992), *Attenuipyga* Oman (Hamilton 2000), *Auridius* Oman (Hamilton 1999), *Balclutha* Kirkaldy (Hamilton 1983), *Carsonus* Oman (1938), *Ceratagallia* Kirkaldy (Hamilton 1998a), *Colladonus* Ball (Nielson 1957), *Cuerna* Melichar (Hamilton 1970), *Diplocolenus* Ribaut (Ross and Hamilton 1970a), *Draeculacephala* Ball (Hamilton 1985), *Elymana* DeLong (Chiykowski and Hamilton 1985), *Errhomus* Oman (Hamilton and Zack 1999), *Euscelis* Brullé and *Evacanthus* LePeletier & Serville (Hamilton 1983), *Flexamia*

DeLong (Whitcomb and Hicks 1988), *Gyponana* Ball (Hamilton 1982), *Hebecephalus* DeLong (Hamilton 1998b), *Hecalus* Stål (Hamilton 2000), *Laevicephalus* DeLong (Ross and Hamilton 1972a), *Latalus* DeLong & Slesman (Ross and Hamilton 1972b), *Limotettix* Sahlberg (Hamilton 1994), *Mocuellus* Ribaut (Ross and Hamilton 1970b), *Norvellina* Ball (Lindsay 1940), *Orocastus* Oman (Beirne 1956; Ross and Hamilton 1972b), *Paraphlepsius* Baker (Hamilton 1975), *Prairiana* Ball (DeLong 1942), *Psammotettix* Haupt (Greene 1971), *Rosenus* Oman (Ross and Hamilton 1975), *Scaphytopius* Ball (Hepner 1947), *Texananus* Ball (Crowder 1952); in Caliscelidae, *Bruchomorpha* Newman (Doering 1940); and among Delphacidae, *Eurysa* Fieber (Beamer 1952), *Laccocera* Van Duzee (Scudder 1963), and *Pissonotus* Van Duzee (Bartlett and Deitz 2000).

The first part of this study comments on the taxonomy of the leafhopper genera *Athysanella* (with four new species and one new subspecies), *Mocuellus* and *Sorhoanus* Ribaut (each with three new species), *Psammotettix* (two new species and one new name), *Stenometopiellus* Haupt and *Unoka* Lawson (each with one new species), and *Diplocolenus* (one new subspecies). One Delphacid is newly assigned to *Nothodelphax* Fennah, and eight others to four genera that are recorded from the Nearctic for the first time: *Elachodelphax* Vilbaste, *Eurybregma* Scott, *Kosswigianella* Wagner and *Paraliburnia* Jensen-Haarup. Eight new Delphacid species are described in *Elachodelphax* subgenus *Aschedelphax* Wilson, stat.nov. (three new species), *Kosswigianella* and *Paraliburnia* (each with two new species), and *Eurybregma* (with one new species).

CICADELLIDAE

Cicadellid species are identified mainly by male genital structures (Figs. 5-37), although proportions of the head and colour patterns are sometimes useful. Many grassland leafhoppers feed on only one species (monophagous) or one genus of plant (oligophagous). This often helps resolve species complexes where morphologically similar insects have different biological requirements (see below). Leafhopper genera mentioned here are identifiable using keys presented by Oman (1949). The following leafhopper taxa represent two redefined genera, two new synonymies, two new names, 12 new species and three new subspecies.

Athysanella (*Athysanella*) *terebrans* (Gillette & Baker)

(Figs. 5 A-E)

Eutettix terebrans Gillette & Baker, 1895: 102.

Nephotettix terebrans: Van Duzee 1917: 653.

Athysanella terebrans: Osborn 1930: 703 (misidentification of *A. fredonia* Ball & Beamer).

Athysanella incongrua: Osborn 1930: 703 (nec Baker, 1898).

Athysanella vativala Blocker [in Blocker and Johnson], 1988: 38 (**new synonymy**).

Diagnosis. This species has been much confused with other taxa. Because the holotype of *terebrans* is a female without associated male, its identity can be deduced only from colour, female genitalia and locality (North Park, Colorado). Lengthy series from northern prairie localities show that only a few species agree in all three particulars with the type of *terebrans*. *Athysanella incongrua* Baker (TX-CO) is eliminated because it is monophagous on little bluestem, *Schizachyrium scoparium* (Michx.) Nash, a grass that does not occur in Colorado. More southerly species, such as *A. laeta* Ball & Beamer (AZ-NM), are highly unlikely to occur at the type-locality in northern CO. This leaves only three possibilities (with south-to-north range in brackets):

- (1) *Athysanella fredonia* Ball & Beamer (AZ-WY), monophagous on galleta, *Hilaria jamesii* (Torr.) Benth.
- (2) *A. kadokana* Knull (CO-AB), monophagous on alkali grass, *Distichlis stricta* (Torr.) Rydb.;

(3) *A. vativala* Blocker (UT-AB), monophagous on sand grass, *Calamovilfa longifolia* (Hook.) Scribn.

Series of these three species taken on their hosts were examined to ensure that no mixing of populations had occurred. Only specimens of *A. vativala* match the figure of the female pregenital sternite in the type of *terebrans*, with long, conical lobes separated by a small median lobe. The lobes of *A. kadokana* and *A. fredonia* are low and rounded, and in the latter the median lobe is wide. Therefore the type of *terebrans* from Colorado is clearly conspecific with *A. vativala*.

The male genitalia of *A. terebrans* are similar to those of *A. incongrua* and *A. laeta*, but the latter characteristically have an apically enlarged aedeagus. The male characters cited by Blocker to differentiate “*terebrans*” from “*vativala*” are variable within lengthy series, for example in series collected on sand grass from 40 km S Orion, Alberta, from Colorado Springs, Colorado, and from Fertile, Minnesota (Figs. 5A-E) which represent the extremes of its distribution on the prairies. These forms therefore represent a single species.

***Athysanella (Amphipyga) occidentalis megacauda* ssp. nov.**

(Figs. 8 A-B)

Etymology: *mega*, large; *cauda*, tail, in reference to the aedeagal size.

Adults. Characters as in typical *A. occidentalis* Baker (Blocker and Johnson 1990a: 126, figs. 102-104), but aedeagus 1.4 × as long as in typical subspecies, and more evenly curved, with finer lateral serrations (Fig. 8A-B).

Types. Holotype male, **CANADA**. BC- Osoyoos IR 1, 119°29'W 49°04'N, 3 Oct. 1994-11 Apr. 1995 (G.G.E. Scudder) pitfall trap. Paratypes: 20 males, 1 female, 11 nymphs, same data as holotype; 3 males, 1 female, same data, 119°32'W 49°09'N, 31 May-5 July 1994; 7 males, 8 females, same data, 119°31'W 49°13'N, 2 June-7 July 1994; 1 male, 3 females, same data, 119°32'W 49°13'N, 7 July-4 Aug. 1994. All types No. 22831 in CNCI.

Additional material: 54 males, 55 females, 6 nymphs from **CANADA**- BC: Chopaka, Douglas Lake, Hedley, Kamloops, Lac du Boris, Oliver, Osoyoos, Penticton; **USA**- WA: Azwell, 9 km SW Havillah, 9 km NE Tonasket, 5 km NE Vantage.

Diagnosis. Populations of *A. occidentalis megacauda* from central WA to Kamloops, BC show little if any variation in aedeagal size. However, populations from the north side of the upper Snake River valley in ID and the Bitterroot valley in adjacent MT show evidence of introgression, having an aedeagus of intermediate length (0.40 mm) between the typical subspecies (aedeagal length 0.35 mm, Fig. 7) and the western *megacauda* (0.50 mm, Fig. 8).

Additional samples of *A. occidentalis* from ID and CO indicate there are two more subspecies, discussed below.

***Athysanella (Amphipyga) occidentalis ladella* Johnson, stat.nov.**

(Figs. 6 A-B)

Athysanella ladella Johnson [in Johnson and Blocker], 1979: 383.

Diagnosis. A population on the south side of the upper Snake River valley near the UT border is intermediate between *A. occidentalis megacauda* and *A. ladella*, a taxon described from southern NM. This population has a broader aedeagal shaft in caudal aspect (Fig. 6A-B) than that figured by Blocker and Johnson (1990, figs. 58-59) from the type series of *ladella*. This taxon therefore becomes a subspecies of *A. occidentalis* Baker (1898).

***Athysanella (Amphipyga) occidentalis wilburi* Ball & Beamer, stat.nov.**

Athysanella wilburi Ball & Beamer, 1940: 38.

Athysanella mansa Johnson [*in* Johnson and Blocker], 1979: 381, **syn.nov.**

Diagnosis. *A. wilburi* (described from Kansas) appears to hybridize occasionally with *occidentalis* where their ranges meet in CO. The intermediate form *mansa* Johnson & Blocker probably represents local hybrids, as all three taxa are known to occur together (e.g., at Ellicott, CO).

***Athysanella (Gladionura) hicksi* nom.nov.**

A. (Gladionura) expulsa Blocker and Hicks, 1992: 41, preoccupied; nec *A. (Amphipyga) expulsa* Blocker [*in* Blocker and Johnson], 1990: 112.

Etymology: patronym in honour of A.L. Hicks, who first found this species.

Remarks. This Californian species should not be confused with true *A. expulsa* from OR, discussed under *A. (Pedumella) repulsa* sp.nov.

***Athysanella (Gladionura) hyperoche* sp.nov.**

(Figs. 9 A-B)

Etymology: *hyperoche* (noun in apposition), summit; process.

Adults. Grey-green (body faded to tan) without definite dark markings, except median lobe of female pregenital sternite which is bordered with black. Ocellus very close to eye; crown obtusely pointed, $0.9 \times$ as long as wide in male, $1.0-1.05 \times$ in female, $0.75 \times$ as long as pronotum in male, $0.67 \times$ in female; hind tibial spur half as long as basitarsomere; female pregenital sternite as in *A. directa* Ball & Beamer (Blocker and Johnson 1990b, fig. 58), but central conical lobe longer, distinctly produced beyond low lateral angles; male subgenital plates large, longer than pygofer, divergent, apices sharp, directed outwards; pygofer apically rounded, with spine on upper margin at tip, directed caudodorsad, then hooked laterad (Fig. 9A), its length one-third that of pygofer; styles as in *A. concava* Ball & Beamer (Blocker and Johnson 1990b, fig. 66), but parallel-margined on apical half almost to narrowed, blunt tip (Fig. 9B); aedeagus smooth and parallel-margined, as in *concava* (idem, fig. 65). Length: male 2.9-3.2 mm, female 4.1-4.3 mm. Width of head: male 0.95-1.0 mm, female 1.05 mm; of crown between eyes: 0.50-0.55 mm, of pronotum: male 0.9-0.95 mm, female 0.95-1.0 mm.

Types. Holotype male, USA. WY- Laramie Mts. summit [on] I-80 [16 km SE Laramie, 2500m], 24 Aug. 1969 (Ross, Ross & Miller) GL 1161 ["heavily pastured range with a variety of close cropped grasses"]. Paratypes: 2 males, 2 females, same data as holotype. All types No. 22832 in CNCI.

Diagnosis. This species shares the rounded pygofer lobe and erect pygofer process of *A. falla* Blocker (Blocker and Johnson 1990b, figs. 72-73), but is distinguished by the much longer pygofer process (Fig. 9A) and style (Fig. 9B). From *A. concava* it is distinguished by the shorter, rounded pygofer with long, hooked dorsal process (in *A. concava* the pygofer is long, tapered to a short hook, as in Blocker and Johnson 1990b, fig. 68).

Biology. The types were taken along with two females of *A. robusta* Baker and one of *A. obesa* Ball & Beamer. These latter species are both specialists on June grass, *Koeleria macrantha* (Ledeb.) Schultes (= *K. cristata* auct.), a grass that is common in heavily grazed, arid sites. Therefore the host of this new species also may be the same grass.

***Athysanella (Pedumella) castor* sp.nov.**

(Figs. 11B-D, F)

Etymology: *castor* (noun in apposition), beaver; named for the Beaverhead Mountains that divide its range.

Adults. Grey-green with abdomen spotted and streaked with black, as in *A. obesa* (Beirne 1956, fig. 436); pleura and sternites often irregularly darkened; median lobe of female pregenital sternite contrastingly black. Ocellus very close to eye; crown parabolically produced, $0.9 \times$ as long as wide, $1.5 \times$ as long as pronotum; hind tibial spur absent; female pregenital sternite short, transverse or weakly emarginate laterally, median lobe prominent to large and rounded; male subgenital plates shorter than pygofer, divergent, apices sharp, directed caudad with small tooth on inner margin just before tip; pygofer tapered to small apical lobe with angle on lower margin at tip (as in Fig. 10A); ventral connective scarcely narrowed on apical half; styles in ventral aspect as in *A. attenuata* Baker (Blocker and Johnson 1990a, fig. 25), but with bladelike tip strongly produced as a flange on inner margin in widest aspect (Fig. 11F) and beyond this, tip tapered, curved ventrad; aedeagus curved cephalad, strongly widened apically, spatulate, bearing paired serrate ridges on anterior and caudal margins (Figs. 11B, D), in caudal aspect $4 \times$ as long as wide. Length: male 3.1-3.6 mm, female 3.8-4.8 mm. Width of head: male 1.1-1.2 mm, female 1.2-1.25 mm; of crown between eyes: male 0.50-0.55 mm, female 0.55-0.60; of pronotum: male 0.95-1.05 mm, female 1.1-1.15 mm.

Types. Holotype male, USA. MT- Badger Pass N of Bannock, 31 May 1992 (K.G.A. Hamilton) [on *Festuca* mixed with *Agropyron*]. Paratypes: 6 males, 16 females, same data; 4 males, 8 females, ID- 8 km NE Carmen, 4 June 1992 (K.G.A. Hamilton); 1 female, ID- 11 km E Tendoy, 29 May 1995 (K.G.A. Hamilton). All types No. 22833 in CNCI.

Diagnosis. The spatulate aedeagus is distinctive, even when reduced in size by parasitism (Fig. 11C).

Remarks. *A. castor* belongs to a group of species along with *A. attenuata*, *A. expulsa* Blocker and two new species (described below). All five of these species differ from other *Athysanella* in having a terminal gonopore and at least two pairs of serrated ridges on the aedeagus (Figs. 10-14). These are tentatively placed in the subgenus *Pedumella* (which presently has only two unrelated species) on the basis of their short pygofer process, tapered subgenital plates with two apical angles making them appear truncate at tips, and massive apical half of the ventral connective.

***Athysanella (Pedumella) lemhi* sp.nov.**

(Figs. 10 A-B, D-F)

Etymology: *Lemhi* (noun in apposition): this species is known only from just below Lemhi Pass.

Adults. Colour and form as in *A. castor*, but male sometimes (type) with crescent-shaped coronal marks; crown more obtuse, $0.8 \times$ as long as wide, $1.25 \times$ as long as pronotum; female pregenital sternite variable, from narrowly and weakly produced medially, to broadly and triangularly produced; male subgenital plates shorter than pygofer, divergent, apices sharp, directed caudad with small tooth on inner margin just before tip; pygofer tapered to small apical lobe with angle on lower margin at tip (Fig. 10A); styles broadly spatulate in widest aspect (Fig. 10F); aedeagus curved cephalad, slightly widened apically, bearing paired serrate ridges on anterior margin and also laterally (Figs. 10B, D), in caudal aspect $3 \times$ as long as

wide. Length: male 3.5 mm, female 4.0-4.9 mm. Width of head: male 1.1 mm, female 1.25 mm; of crown between eyes: male 0.5 mm, female 0.55-0.6 mm; of pronotum: male 1.05 mm, of female 1.2 mm.

Types. Holotype male, **USA.** *ID*- 14 km E Tendoy [16 km by road], 29 May 1995 (K.G.A. Hamilton). Paratypes: 1 female, same data as holotype; 1 male, 8 females, 15 km E Tendoy [17 km by road], 5 June 1992 (K.G.A. Hamilton). All types No. 22834 in CNCI.

Diagnosis. This species has genitalia similar to those of *A. castor*, but the aedeagus is longer and straighter, with the serrate ridge placed laterally rather than along the caudal margin, and the enlarged style apex is spatulate rather than tapered beyond the flange.

***Athysanella (Pedumella) repulsa* sp.nov.**

(Figs. 14 B, D-G)

Etymology: *repulsa*, repelled; named for its allopatric distribution with respect to *A. expulsa*.

Adults. Female unknown. Male grey-green mottled with brown, including two crescentic marks on crown. Ocellus set further than 2 diameters from eye; crown bluntly angled, as long as wide, 1.3 × as long as pronotum; hind tibial spur absent; male subgenital plates short and lyriform, as in *A. expulsa*; pygofer tapered to small, but elongate apical lobe with dark tooth on lower margin at tip; styles tapered to sharp point in ventral aspect (Fig. 14G), with strongly produced flange on upper surface which makes style apex spatulate in widest aspect (Fig. 14F); aedeagus strongly curved cephalad, slender, slightly widening towards apex in lateral aspect, tip obliquely truncate, bearing paired serrate ridges on anterior and caudal margins (Fig. 14B), gonopore lying in shallow dorsal depression (Fig. 14D) at narrowed tip (Fig. 14E). Length to tip of wings: male 2.0 mm (estimated overall length 3.5 mm). Width of head 1.2 mm, of crown between eyes 0.50 mm, of pronotum 1.1 mm.

Types. Holotype male, **USA.** *MT*- 15 km W Philipsburg [1 mi E junction of Hwy. 348 and Upper Willow Creek Road], 1 June 1992 (K.G.A. Hamilton); No. 22835 in CNCI.

Diagnosis. This species has a pygofer lobe intermediate in size between those of *A. lemhi* (Fig. 10A) and *A. expulsa* (Blocker and Johnson 1990a, fig. 27). The aedeagal shaft is much narrower in both lateral and caudal aspect than in *expulsa* (Fig. 12B), more closely resembling that of *A. attenuata* (Fig. 13B), but without lateral flanges. It shares with *A. expulsa* a style tip bearing a large flange on the upper surface and aedeagal shaft strongly curved, bearing serrate margins.

Remarks. *Athysanella repulsa* and *A. expulsa* are probably sister species. Each is known from a very limited geographical area. Their ranges are separated by the width of both the Columbia basin of OR and the Snake River plain of ID. In this respect they resemble the sister species *Auridius vitellinus* Hamilton and *A. cosmeticus* Hamilton which occur in the same widely separated localities.

***Diplocolenus configuratus bicolor* ssp.nov.**

(Fig. 15)

Etymology: *bicolor*, two toned; named for the unusual wing pattern (divided down the midlength) that occurs in half the population.

Adults. Two colour morphs in nearly equal proportions. *Pale morph*: uniformly tan, more or

less mottled with brown as in typical *D. configuratus* (Uhler) (Beirne 1956, fig. 469); *bicolored morph*: head brown with pale coronal margins, body and basal half of tegmina blackish brown with narrow pale lines, apical half of tegmina contrastingly pale with brown mottling along veins. Male subgenital plates variable in length and shape of apices, as long as wide, tapered with tips truncate, or (especially in pale individuals) shorter and apically divergent as in typical subspecies (Ross and Hamilton 1970a, fig. 3C); pygofer shorter than subgenital plates, distinctly shorter than high, abruptly tapered to small apical spine at tip, ventral margin sinuate (Fig. 15); styles evenly tapered, as in typical subspecies (Ross and Hamilton 1970a, fig. 3B); aedeagus strongly curved in lateral aspect as in *D. nigrior* Ross and Hamilton (1972b, fig. 3), in caudal aspect widening towards apex, with divergent prongs at tip as in typical subspecies (Ross and Hamilton 1970a, fig. 3D). Length: male 3.3-3.8 mm, female 2.5-4.2 mm.

Types. Holotype male, bicolored morph, USA. WY- Wilson [W edge of town adjacent to Teton Pass grade] 14 June 1992 (K.G.A. Hamilton) [mainly on *Festuca*]. Paratypes: 19 nymphs, 30 bicolored and 33 pale males, 21 bicolored and 22 pale females, same data, No. 22836 in CNCI.

Diagnosis. The short pygofer with sinuate lower margin is distinctive, as is the bicolored morph. The genitalia most resemble those of *D. nigrior*, which is reduced to subspecific status (see below).

***Diplocolenus configuratus nigrior* Ross & Hamilton, stat.nov.**

Diplocolenus nigrior Ross & Hamilton, 1972b:442.

Diagnosis. The variability of the male subgenital plates suggests that the types are descendants of a hybrid swarm (*configuratus* × *bicolor*). If so, all three subspecies of *D. configuratus* appear to hybridize where their ranges abut. Strongly truncate subgenital plates (Fig. 16) indicate intermediates of *bicolor* × *nigrior* at 20 km E of Alpine, WY, and of *configuratus* × *nigrior* at Lemhi Pass and Spencer, ID. The aedeagus of all these intermediates resembles that of subspecies *bicolor*.

Genus *Lebradea* Remane, redefined

Lebradea Remane, 1959: 386. Type-species by original designation, *L. calamagrostidis* Remane, 1959.

Diagnosis. By redefinition of *Sorhoanus* (see below), species of *Lebradea* are excluded from *Sorhoanus* (sensu lato of Oman 1949; Beirne 1956; Hamilton and Langor 1987). They are more slender, and have a distinctive female pregenital sternite with a long, median process (Beirne 1956, figs. 459, 761). Males are also differentiated in having pygofer setae confined to the caudal margin (Ossiannilsson 1983, fig. 2852) and in having the connective tip turned dorsad just before its articulation with the aedeagus, with the sides unconnected across the apex.

Included species. This small genus consists of the Holarctic *L. flavovirens* (Gillette & Baker), the Californian *L. helvina* (Van Duzee: *Thamnotettix*), **comb.nov.** from *Sorhoanus*, and three Old World species (Nast 1972).

***Mocuellus caprillus anfractus* spp. nov.**

(Figs. 17 A-B, 20)

Etymology: *anfractus*, crooked or twisted, in reference to the curved aedeagal shaft compared

to that of *M. strictus* Ross & Hamilton, which is straight.

Adults. Tawny with indefinite pale brown markings; crown longer than midline of pronotum, as in typical *M. caprillus* Ross & Hamilton (Beirne 1956, fig. 448 “*M. collinus*”); genitalia as in typical *M. caprillus* (Ross & Hamilton 1970b, fig. 3B), but aedeagus in lateral aspect more sinuate throughout length (Fig. 17A), ventral teeth of similar size (Fig. 17B) and style tip with long, conical apical process (Fig. 20). Length to tip of pygofer (omitting setae): male 2.9-3.6 mm, female 3.3-4.2 mm.

Types. Holotype male, **USA.** *UT*- 7 km E Laketown, 13 June 1992 (K.G.A. Hamilton). Paratypes: 2 nymphs, 12 males, 9 females, same data as holotype; 1 male, *UT*- 23 km W Woodruff, 13 June 1992 (K.G.A. Hamilton); 3 males, 2 females, *ID*- 23 km SW Darlington, 7 June 1992 (K.G.A. Hamilton); 2 nymphs, 7 males, 1 female, *ID*- 12 km S Hamer, 19 June 1984 (K.G.A. Hamilton); 4 males, 2 females, *WY*- N of Jackson Hole, 15 Aug. 1971 (H.H. Ross) GL 1265 [on *Poa* and *Agropyron*]. All types No. 22837 in CNCI.

Additional material: 5 females (without associated males) from *ID* - 20 km N Malad City, 20 km N Rexburg, and 15 km W of Stone.

Diagnosis. This taxon resembles *M. strictus*, but has a distinctly sinuate aedeagal shaft. From typical *M. caprillus* it is most readily distinguished by the conical tip of the style. It is judged to be a subspecies of the prairie leafhopper *M. caprillus* based on four males taken along with two nymphs and 13 females at the summit of Lemhi Pass on the ID/MT border. Their male style is intermediate in form (Fig. 21).

Remarks. The subspecies appears to be restricted to the upper Snake River drainage basin of southeastern ID and northeastern UT. It is separated from the typical subspecies in southeastern UT by Daniels Pass (2500m) 27 km SSE of Heber City between the Uinta Mountains and the Monte Cristo Range. The typical subspecies southeast of the pass has a narrower style tip (Fig. 22A) than populations on the plains (Fig. 22B), suggesting character displacement at a time when the two closely related taxa were adjacent.

***Mocuellus caprillus strictus* stat.nov.**

Mocuellus strictus Ross and Hamilton, 1970b: 174.

Diagnosis. Subspecies *strictus* was previously considered to be a distinct species from the prairie-inhabiting *M. caprillus*, as they both occur in AB; but both taxa hybridize with subspecies *anfractus* (q.v.). Presumptive hybrids of *anfractus* × *strictus* from the upper Clark Fork valley in MT have the female pregenital segment with divergent instead of parallel-sided notches (compare in Ross and Hamilton 1970b, figs. 10, 12).

***Mocuellus quinquespinus* sp.nov.**

(Figs. 18 A-C)

Etymology: *quinque*, five; *spinus*, spine (noun in apposition); referring to the armature of the aedeagal tip.

Adults. Tawny with indefinite pale brown markings; crown weakly angled, as long as midline of pronotum, as in *M. larrimeri* (DeLong); genitalia as in typical *M. caprillus* (Ross & Hamilton 1970b, fig. 3B), but aedeagus shorter, in lateral aspect with wider tip and narrower socle (Fig. 18A), in ventral aspect with bulbous shaft and tip armed with an unpaired ventral tooth on the lip of the gonopore at the apical third of shaft, plus 2 pairs of divergent lateral

processes, the longer pair directed caudad either side of rounded, transparent, apical knob (Fig. 18B); style short, tip with small, sharp preapical process (Fig. 18C). Length to tip of pygofer (omitting setae): male 3.4-3.5 mm, female 3.9 mm.

Types. Holotype male, **USA.** *UT*- [SE] Tabiona [0.9 mi S junction hwy. 35 and 208 along dry tributary of Duchesne R.], 11 June 1992 (K.G.A. Hamilton). Paratypes: 1 male, 2 females, same data as holotype. All types No. 22838 in CNCI.

Additional material: 2 females from *UT*- Ouray, 4 Aug. 1986 (R.F. Whitcomb) IPL 002506, and Zion National Park, 8 Aug. 1986 (R.F. Whitcomb) IPL 002561, both in CNCI. The first of these is 60 km E of the type-locality, but at a much lower elevation; the latter is in southwestern UT. Either or both may represent an undescribed species.

Diagnosis. The divergent apical processes are unique. The Palaearctic *M. ruthenicus* Emel'janov has similar male genitalia (Emel'janov 1962, figs. 84-85), but the apical processes are parallel rather than diverging, the aedeagal shaft is tubular rather than bulbous, and the unpaired ventral tooth on the lip of the gonopore lies at midlength of the shaft rather than at the apical third.

***Psammotettix diademata* sp.nov.**

(Figs. 26 A-B)

Etymology: *diadema*, an ornamented fillet, *-ta*, adjectival form; in reference to the wing pattern.

Adults. Grey with dark brown markings; head angled, as in *P. dentatus* Knull (Beirne 1956, fig. 453); tegmina $3 \times$ as long as wide, in female marked with a circlet of 6 dark spots, in male with more extensive markings between veins as in *Hebecephalus occidentalis* Beamer & Tuthill (Beirne 1956, fig. 492); aedeagus in lateral aspect evenly curved and very narrow at base, ballooning to membranous apical half $3 \times$ as wide as narrowest part of shaft (Fig. 26A), in caudal aspect strongly expanded on apical half beyond gonopore, deeply grooved on meson, shallowly notched at tip (Fig. 26B). Length: male 4.0 mm, female 4.2 mm.

Types. Holotype male, **CANADA.** *BC*- Queen Charlotte Islands (Graham I.), North Beach, halfway between Masset and Tow Hill $54^{\circ}02'00''\text{N}$ $131^{\circ}57'00''\text{W}$, 19 Aug. 2001 (Allombewrt & Sylvain) GG-01-052, ENT001-008907. Paratypes: 2 females, same data as holotype, but ENT001-008897 and ENT001-008920. Holotype and paratype in Royal BC Museum; paratype No. 22839 in CNCI.

Diagnosis. This species has an angulate head like *P. dentatus*, from which it may be distinguished by the unusually bold markings and larger size. It is the most robust of the Nearctic *Psammotettix* (other species that are as elongate have narrower tegmina). Its male genitalia resemble those of *P. latipex* (Sanders & DeLong) (Beirne 1956, fig. 1204 "*P. alienus*"), but the gonopore lies further from the base and the shaft is narrower in lateral aspect. Other *Psammotettix* from the Old World that have a shaft with a narrow basal half and flared apical half have the tip pointed or rounded, not notched.

***Psammotettix greenei* nom.nov.**

P. emarginatus Greene, 1971: 25, preoccupied; nec Sawai Singh 1969: 356.

Etymology: patronym in honour of J.F. Greene, who first named this species.

Remarks. This is a species endemic to Oregon, and should not be confused with true *P. emarginatus* from India.

***Psammotettix nesiotus* sp.nov.**

(Figs. 27 A-B)

Etymology: *nesiotus* (noun in apposition), an islander.

Adults. Tan, head bluntly produced but not angled, tegmina $3 \times$ as long as wide; similar to the abundant and ubiquitous *P. lividellus* (Zetterstedt) (Beirne 1956, figs. 456, 759, 1210), but aedeagus in lateral aspect evenly curved throughout length (Fig. 27A), in caudal aspect parallel-margined to tip (Fig. 27B), not narrowed beyond gonopore. Length: male 2.8-3.3 mm, female 3.0-3.5 mm.

Types. Holotype male, **CANADA**. BC- Bowser, [Vancouver I.], 20 June 1955 (G.E. Shewell). Paratypes: 15 males, 36 females, same data as holotype; 9 males, 4 females, Fanny Bay, V[ancouver] I., 20 July 1976 (K.G.A. Hamilton); 8 males, 5 females, Sea I., Vancouver [airport] (H.H. Ross) GL 458 on *Agrostis palustris*. All types No. 21874 in CNCI.

Diagnosis. As in dozens of other species in the genus *Psammotettix*, species characters are confined to details of the aedeagus. The evenly curved aedeagus of *nesiotus* is similar to that of *P. dentatus* Knull (Beirne 1956, fig. 1207), but lacks the toothed lateral margins. From the new-world *P. attenuens* (DeLong & Davidson) (Beirne 1956, fig. 1208) and the holarctic *P. lividellus* (including its possible synonym, *P. altimontanus* Mitjaev, 1969) it may be distinguished by the apical half of the aedeagus being a continuation of the shaft, and not a distinctly flattened process that is straighter than the shaft (Fig. 28A) or recurved. Other species in the genus do not have the aedeagal shaft arising at right angles from the socle.

Remarks. This species occurs on both sides of the Strait of Georgia. This species will probably be found in adjacent parts of Washington state.

Genus *Sorhoanus* Ribaut, redefined

Sorhoanus Ribaut, 1946: 85. Type-species by original designation, *Cicada assimilis* Fallén, 1806.

Boreotettix Lindberg, 1952: 145, **syn.nov.** Type-species by original designation: *Cosmotettix serricauda* Kontkanen, 1949.

Zelenius Emel'janov, 1966: 129, **syn.nov.** Type-species by original designation, *Laevicephalus orientalis* DeLong & Davidson, 1935.

Diagnosis. A number of Nearctic species (Figs. 23-25) do not fit readily into European generic concepts that split *Sorhoanus* into a number of genera based solely on male genitalia (e.g., Ossiannilsson 1983). Thus, the genus in its broad sense (Oman 1949 and Beirne 1956, including species later assigned to *Boreotettix* Lindberg, *Lebradea* Remane and *Zelenius* Emel'janov) is preferred. This broad definition was expanded by Hamilton and Langor (1987) to include *Arthaldeus* Ribaut and *Lemellus* Oman. It is here restricted, by exclusion of *Lebradea* (q.v.), to those species having a combination of tenth segment undivided medially (Fig. 23B) and male pygofers with very long, dense brush of macrosetae extending from midlength. *Cosmotettix* Ribaut and *Hebecephalus* DeLong may have such setae, but their tenth segment is divided or only narrowly connected across the posterior margin.

***Sorhoanus involutus* sp.nov.**

(Figs. 23 A-E)

Etymology: *involutus*, rolled inwards; in reference to the unique pygofer margins.

Adults. Female unknown. Male unmarked yellow except for pale dashes either side of tip of right-angled crown, as in *S. pascuellus* (Fallén) (Beirne 1956, fig. 457), tegmina pale greenish and male abdomen black; male genitalia with pygofer tapered, dorsal edges inrolled and densely spiculate (Figs. 23A-B); tenth tergite longer than wide; internal genitalia similar to those of *S. debilis* (Uhler), but aedeagus shorter and stout (Fig. 23D), with inconspicuous dorsolateral spicules on shaft (Fig. 23E) and style tip blunter (Fig. 23C). Length: male 3.6 mm.

Types. Holotype male, **USA.** CO- Marshall, nr Boulder, 12 June 1961 (C.H. Mann), swept from top of low mesa; No. 22840 in CNCI.

Diagnosis. The inrolled pygofer margin is unique.

***Sorhoanus virilis* sp.nov.**

(Figs. 24A-B, 29A)

Etyymology: *virilis*, of the male; in reference to the large male pygofers.

Adults. Similar to *S. debilis* (Figs. 25A-C, 30A), with dorsum unmarked yellow, tegmina pale green, face brown with pale arcs, abdominal tergites of female and rest of body of male black, but tenth tergite and male pygofers much larger, the latter ending in truncate, coarsely serrate tips (Fig. 24A); aedeagus sinuate at base, serrate on both dorsal and ventral margins (Fig. 29A), style evenly curved and without serrations (Fig. 24B). Length: male 3.7-3.9 mm, female 4.3-4.6 mm.

Types. Holotype male, **USA.** OR- Siskiyou, 14 June 1959 (Kelton & Madge). Paratypes: 1 male, 2 females, same data as holotype. All types No. 22841 in CNCI.

Diagnosis. The long tenth tergite is similar to that of *S. involutus* (Fig. 23B), but these species are not closely related.

***Sorhoanus xiphosura* sp.nov.**

(Figs. 32A, 33A)

Etyymology: *xiphos*, sword; *ura*, tail (noun in apposition); in reference to the long spine at the base of the aedeagus.

Adults. Similar to *S. uhleri* (Oman) (Beirne 1956, figs. 461, 764, 1214), with dorsum unmarked yellow, tegmina pale green, usually influscated on apical cells and sometimes between veins throughout, face brown (at least on margins) with pale arcs, abdominal tergites of female and rest of body of male black; genitalia as in *S. uhleri* (Figs. 34-35A), but aedeagal base sharply pointed, caudal margin not minutely serrate (Fig. 33A), and shaft often longer and more slender (Fig. 32A). Length: male 3.5-3.9 mm, female 4.0-4.5 mm.

Types. Holotype male, **USA.** UT- Smithfield, 30 May 1968 (G.F. Knowlton) GL 983-984. Paratypes: 6 nymphs, 27 males, 8 females, same data as holotype; 26 nymphs, 60 males, 75 females, 22 May-14 August, from **CANADA.** BC- Creston, Michael, Okanagan lakehead, Summerland; **USA.** ID- Arco, Ketcham, 32 km SW Lolo Hot Springs [MT], 20 km N of Malad City, 12 km SE Moyie Springs, 4 km N of New Meadows; MT- 9 km S of Libby, 18 km W of Ovando, 3 km W Potomoc, Wisdom; OR- Bend, Joseph and 11 km E; UT- Logan; WA- 4 km S Del Rio; WY- 13 km SE of Cooke City [MT]. All types No. 22842 in CNCI.

Diagnosis. Males with short aedeagal shafts resemble those of *S. uhleri*, but lack the minute serrations on the shaft, having instead a single sharp point on the anterior angle. Males with longer aedeagal shafts, as in *S. orientalis* (DeLong & Davidson) (Fig. 31A), are immediately distinguishable by the degree to which the aedeagal base is produced. Both *S. uhleri* and *S. xiphosura* differ from *S. orientalis* and other species in *Sorhoanus* in having the caudal third of the ventral connective fused into a common stem, instead of being a simple loop.

Remarks. Associated nymphs vary from entirely tan to greenish with black venters. This series may represent a mixture of species.

***Stenometopiellus vader* sp.nov.**

(Fig. 36A)

Etymology: *vader* (noun in apposition), wanderer; in reference to its disjunct distribution with respect to *S. cookei*.

Adults. Characters as in *S. cookei* (Gillette) (Beirne 1956, figs. 428, 1182), but head markings usually faint, female pregenital sternite with a slightly narrower median process, either with excavated sides and rounded tip, or with straight sides converging at approximately 60°, and aedeagus in lateral aspect most strongly curved near base, shorter by 0.1 mm (Fig. 36A). Length: male 2.2-2.3 mm, female 2.2-2.5 mm.

Types. Holotype male, **USA.** ID- 12 km N Leslie, 6 June 1992 (K.G.A. Hamilton) [ca. 2000 m]. Paratypes: 1 male, 6 females, same data as holotype. All types No. 22843 in CNCI.

Diagnosis. The short, U-shaped aedeagus distinguishes this species from its congener (Fig. 37A). The female pregenital sternite has a narrower process than that of most specimens of *S. cookei* (which usually has a broadly rounded or blunt-tipped process with sides converging at approximately 90°).

Remarks. Some females not associated with males cannot be distinguished with certainty. For this reason, two females taken 8 km W of Anaconda, MT are not included in the type series of *S. vader* although they are probably conspecific.

***Unoka dramatica* sp.nov.**

(Fig. 1)

Etymology: *dramatica*, dramatic; in reference to its bold markings.

Adults. Characters as in *U. gillettei* Metcalf (Beirne 1956, figs. 505, 801, 1259), but more darkly patterned (Fig. 1): head including face and abdominal tergites black or blackish-rufous, as dark as pronotal and tegminal bands, face unmarked or with faintly indicated paler lines on frontal arcs, and gena sometimes marked with brown lines bordering clypellus or with genal lobes embrowned; legs deep crimson to black; scutellum with black band at base sometimes extending across half its length; tegminal bands broad, uninterrupted, at least as wide at costa as distance between them.

Types. Holotype male, **CANADA.** BC- Osoyoos L., Osoyoos IR 1, 49°04'N 119°29'W, 5-30 May 1994 (G.G.E. Scudder) pitfall trap P 3-2 [in] *Purshia* assoc. AN BGxh. Paratypes: 14 males, 8 females, 2 nymphs, same data as holotype, but various traps; 2 males, same locality, 6-31 May; 5 males, 13 females, same data, 30 May-4 July; 1 male, same data, 3 Oct. 1994 - 11 Apr. 1995; 7 males, 5 females, Inkaneep, Osoyoos IR 1, 49°09'N 119°32'W, 31 May-5 July

1994; 1 male, Mud L., Osoyoos IR 1, 49°13'N 119°31'W, 2 June-7 July 1994. Holotype and 29 paratypes No. 22844 in CNCI; 29 paratypes in University of British Columbia, Vancouver.

Additional material: 30 males, 15 females from CANADA. BC- Mt. Kobau 560 m, Oliver, Osoyoos, Vaseau Ck., Venables Vly. [50° 36'30" N 121° 20'0" W], 30 May, 3 and 23 June, 16 July, 14-17 Aug. and (female only) 2 Sept. Possibly two broods (May - 4 July, 16 July - 2 Sept.)

Diagnosis. This species is closely related to *U. gillettei*, but has more extensive dark markings and a darker head. The latter species usually has a rufous head, which in the darkest form has paler brown areas across the clypellus; the pronotal band as well as the abdominal tergites may also be paler than the tegminal bands; the tegminal bands are narrower than the white spaces between them (Fig. 2), and the median band is often broken into spots or obsolete between the costas.

Biology. According to G.G.E. Scudder (pers. comm.) the type-locality has much sand dropseed, *Sporobolus cryptandrus* (Torrey) A. Gray. This is probably its host, since the related *U. gillettei* is a specialist on this grass.

Remarks. This species is known from two widely separated localities in southern BC: the southern Okanagan Valley and the Fraser Valley south of Ashcroft.

DELPHACIDAE

Delphacidae (Figs. 3, 38-60), in contrast to leafhoppers, exhibit considerable interspecific variation in head, body and leg proportions; their colour patterns are generally conservative within most genera or subgenera. The characteristic Delphacid "calcar" or hinged process at the apex of the hind tibia is an important but unused generic character. The higher classification of Nearctic Delphacidae is presently under revision, and keys to the Canadian fauna will become available in the near future. The following Delphacid taxa represent five redefined genera with one new synonymy, one genus reduced to subgenus, four new combinations, and nine new species.

Achorotile apicata sp.nov.

(Figs. 38A-C)

Etymology: *apicata*, apical; in reference to the spiny tip of the aedeagal shaft.

Adults. Colour and form as in *A. acuta* Scudder (1963, figs. 1 a-c), but male anal process shorter, more strongly hooked (Fig. 38B); aedeagus straight nearly to tip, strongly constricted beyond midlength, apex with multiple rows of spicules, apical gonopore small and round (Figs. 38A, C). Length: brachypterous male 2.5 mm, female 2.5-2.9 mm; macropterous form unknown; width of crown between eyes 0.3 mm, of male pronotum 0.8 mm, of female 0.9 mm, slightly wider than head; length of face above clypellus 0.5-0.6 mm, of antenna 0.4 mm, with 2nd antennal segment subequal to calcar; medial length of fore tibia 0.6 mm, of hind tibia 0.7-0.8 mm, of hind tarsus 0.7 mm.

Types. Holotype male, USA. UT- Summit Co., 58 km S of Evanston (WY), 12 June 1992 (K.G.A. Hamilton). Paratypes, 2 males, 18 females, same data as holotype. All types No. 22845 in CNCI.

Diagnosis. This species is similar to *A. acuta*, but the male has longer legs (fore tibia 0.5 mm

and hind tarsus 0.6 mm in *A. acuta*); the most striking genital character is the aedeagus with a distinctly shorter, more spiculate tip. Other species of *Achorotile* Fieber have the tip of the aedeagus bent ventrad or with a ventral process near midlength.

Genus *Caenodelphax* Fennah, redefined

Caenodelphax Fennah, 1965:96. Type-species by original designation: *Liburnia teapae* Fowler, 1905.

Diagnosis. This genus with a tropical genotype and 10 Nearctic species (currently placed in *Delphacodes* Fieber) have males which combines a narrow crown and a black dorsum with contrastingly pale antennae. Their calcars are small and knife-shaped, as in the transcontinental pest species *Delphacodes campestris* (Van Duzee) and other wide-headed genera including *Eurybregma* and *Kosswigianella*. Other Delphacid genera with narrow crowns have large, foliaceous calcars. In some species of Nearctic *Caenodelphax* the face is unusually broad, convex and shining; these species may be sexually dimorphic, with females pale tan without contrasting antennae.

Included species. Included species. The only species that occurs in the PNW, *Caenodelphax atridorsum* (Beamer), comb. nov. from *Delphacodes*, is a dimorphic species with a wide face like that of *Caenodelphax nigriscutellatus* (Beamer) (see Bouchard et al., 2002). Other species in the genus occur in eastern and central North America and will be discussed in a later paper.

Genus *Elachodelphax* Vilbaste, redefined

Elachodelphax Vilbaste, 1965: 14. Type-species by original designation: *Liburnia metcalfi* Kusnezov, 1929.

Aschedelphax Wilson, 1992: 89, **stat.nov.** (subgenus). Type-species by original designation: *A. hochae* Wilson, 1992.

Diagnosis. This Holarctic genus (with 1 Palaearctic species) is defined by the dark gena contrasting with the pale face, a character otherwise only known from tropical Delphacidae of the genus *Sogatodes* which have a much narrower crown. The gena is most strongly darkened in subgenus *Aschedelphax*. The styles are also usually short; but in other characters (e.g., foliaceous calcar shape) this genus resembles *Javasella* Fennah.

Included species. Five new combinations are created by this generic definition: *Elachodelphax* (s.s.) *indistinctus* (Crawford), *E. (Aschedelphax) bifida* (Beamer) and *Elachodelphax (Aschedelphax) pediforma* (Beamer), all from *Delphacodes*, plus *E. (A.) coloradensis* (Beamer) and *E. (A.) hochae* (Wilson), both from *Aschedelphax*.

Elachodelphax (Aschedelphax) borealis sp.nov.

(Figs. 40A, 51A)

Etymology: *borealis*, of the north wind.

Adults. Colour and form as in *A. hochae* Wilson (1992, figs. 62-66), but male pygofers smaller, not wider than preceding segment, tips bearing only one short hook (Fig. 51A) instead of two; styles when viewed edgewise narrow (as in Fig. 53A), but in widest aspect truncate with sharp, outwardly directed angles; aedeagus broad to midlength, then abruptly narrowed to half its width, straight nearly to rounded tip (Fig. 40A). Length: brachypterous male 2.3-2.9 mm, female 2.8-3.5 mm; macropterous male 4.3 mm, female 4.4-4.9 mm; width of crown between eyes 0.2 in male, 0.3 mm in female, of pronotum 0.8-0.9 mm, 0.1 mm wider than head; length of face above clypellus 0.6-0.7 mm, of antenna 0.3-0.4 mm, with 2nd antennal segment much shorter than calcar, entire antenna not more than 0.05 mm longer than calcar;

apical 2 segments of rostrum 0.35-0.4 mm; medial length of fore tibia 0.9 mm in male, 0.8 mm in female, of hind tibia 1.1 mm in male, 1.2 mm in female, of hind tarsus 0.9 mm in male, 0.8 mm in female.

Types. Holotype brachypterous male, **USA.** *NH*- Oakes Gulf, Mt. Washington 4700-5000' [1400-1500 m], 8 Aug. 1954 (Becker, Munroe & Mason). Paratypes, 3 brachypterous males, same data; 9 brachypterous males and 4 brachypterous females, same data, but 1 Aug.; 4 brachypterous males and 2 brachypterous males, same data, but 9 Aug.; 2 brachypterous males and 1 brachypterous female, Mt. Washington, 14 Aug. 1958 (J.R. Vockeroth); 1 brachypterous male, Mt. Washington 5000', 13 Aug. 1951 (G.S. Walley); 34 brachypterous males, 8 brachypterous and 8 macropterous females, *NY*- Whiteface Mt. 4600-4872', 19 July 1962 (J.R. Vockeroth); **CANADA.** *AB*- 1 brachypterous male each, Elkwater, 9 June 1956 (O. Peck) and Grande Prairie, 11 June 1951 (A.R. Brooks); *NF* (Labrador) - 1 brachypterous male and 6 brachypterous females, Goose Bay, 10-19 July 1978 (W.E. Beckel); 2 brachypterous males, 3 brachypterous females, Nutak, 26 July 1954 (E.E. Sterns); *QC*- 1 macropterous male, Forestville, 9 July 1950 (R. de Ruelle); 2 brachypterous males, Mt. Lyall 1500' [450 m], 25 July 1933 (W.J. Brown); 2 brachypterous males, 3 brachypterous females, Parke Reserve, Kam. Co., 9 July 1957 (G.E. Shewell). All types No. 22846 in CNCI.

Additional material. Eleven brachypterous females (without associated males): 21 May-19 Sept., from **CANADA.** *NWT*- Bathurst Inlet; *ON*- Minnitaki; *SK*-Saskatoon.

Diagnosis. The styles are more obviously short and truncate than in any other species in the genus. This common and widespread Nearctic species appears to be related to *E. bifida* (from Arizona), but the styles are not bifid and the aedeagus is longer in proportion to its width, and does not have the tips turned dorsad.

***Elachodelphax (Aschedelphax) mazama* sp.nov.**

(Figs. 41A, 52A-B)

Etymology: *Mazama* (noun in apposition), a settlement northwest of the type-locality.

Adults. Colour and form as in *A. hochae* Wilson (1992, figs. 62-66), but male pygofers intermediate in size between that species and *A. borealis* (Fig. 52A); styles in widest aspect with fingerlike processes directed caudolaterad; aedeagus broad on basal third, then abruptly narrowed to half its width, straight nearly to rounded tip (Fig. 41A). Length: brachypterous male 2.6 mm, female 2.8-3.2 mm; macropterous form unknown; width of crown between eyes 0.3 mm, of pronotum 0.9-1.0 mm, 0.1 mm wider than head; length of face above clypellus 0.6 mm, of antenna 0.35 mm, with 2nd antennal segment much shorter than calcar, entire antenna 0.05 mm longer than calcar; apical 2 segments of rostrum 0.35-0.4 mm; medial length of fore tibia 0.9 mm in male, 0.8 mm in female, of hind tibia 1.1 mm, of hind tarsus 0.9 mm in both sexes.

Types. Holotype male, **USA.** *WA*- [4 km NW] Winthrop, [ca. 18 km SE Mazama], 10 June 1984 (K.G.A. Hamilton). Paratypes: 1 male, 4 females, same data as holotype. All types No. 22847 in CNCI.

Diagnosis. Although the series from WA is short, it shows consistent differences from the widespread *A. borealis*. The pronotum is 0.1 mm wider, the hind leg proportions of tibia to tarsus are identical in both sexes instead of being sexually dimorphic, the male genitalic capsule is 0.2 mm wider, the styles are more pointed (compare Fig. 52A to Fig. 51A) and the

aedeagus has a longer tip beyond the wide base (compare Fig. 41A to Fig. 40A).

Remarks. These two species appear to be glacial-age disjuncts of a formerly transcontinental species.

***Elachodelphax (Aschedelphax) unita* sp.nov.**

(Figs. 42A, 53A-B)

Etymology: *Unita* (noun in apposition), a mountain range in UT.

Adults. Colour and form as in *A. borealis*, but male pygofers narrower in lateral aspect, sternal region oblique, producing apparent ventral extension in caudal aspect (Figs. 53A-B); styles fingerlike, directed dorsad; aedeagus tapered, somewhat narrowed at midlength, sinuate to pointed tip (Fig. 42A). Length: brachypterous male 2.4 mm, female 2.5-3.1 mm; macropterous form unknown; width of crown between eyes 0.2 mm in male, 0.3 mm in female, of pronotum 0.8 in male, 0.9 mm in female, 0.1 mm wider than head; length of face above clypellus 0.6 mm, of antenna 0.3 mm, with 2nd antennal segment much shorter than calcar, entire antenna 0.05 mm longer than calcar; apical 2 segments of rostrum 0.4-0.45 mm; medial length of fore tibia 0.7-0.8 mm, of hind tibia 0.9 mm in male, 1.0 mm in female, of hind tarsus 0.8 mm in both sexes.

Types. Holotype male, **USA.** UT- Cub Creek, Uinta [sic] Mts, 17 July 1952 (Bohart, Knowlton). Paratypes: 10 females, same data as holotype. All types No. 22848 in CNCI.

Diagnosis. The male genitalia are distinctive.

Genus *Eurybregma* Scott, redefined

Eurybregma Scott, 1875. Type-species by monotypy: *E. nigrolineata* Scott, 1875: 92.

Diagnosis. The North American species formerly included in *Eurysa* Fieber and later, tentatively placed in *Chilodelphax* Vilbaste (Wilson 1988), do not belong in either of these genera. *Chilodelphax* is only superficially similar to one of the Nearctic species in male genitalia, but the external characters (e.g., narrow crown) are quite different. *Eurysa* has a spotted face found in the new world fauna only in *Phyllodin* Van Duzee and *Bakerella* Crawford. Nymphs of *Eurysa* have few abdominal pits (Ossiannilsson 1978), while nymphs of *Eurybregma* (including the Nearctic species) have characteristic rows of numerous abdominal pits (Anufriev 1987, fig. 3). This pit arrangement differs from those of *Achorotile* and *Laccocera* in having the most medially located pit removed at a greater distance than the others.

Included species. This data necessitates the removal of three North American species formerly in *Eurysa* to **new combinations**: *Eurybregma magnifrons* (Crawford), *Eurybregma montana* (Beamer) and *Eurybregma obesa* (Beamer).

***Eurybregma eurytion* sp.nov.**

(Figs. 43A, 44A-B, 54B)

Etymology: *eurys*, widespread; *-tion*, result; in reference to the ubiquity of this species in PNW grasslands wherever its sister species does not occur.

Adults. Colour and form as in *E. magnifrons* (Beamer 1952, fig. 2), but slightly narrower, head slightly narrower than pronotum in male, as wide as pronotum to slightly wider in female; anal process tiny; pygofer process inturned on upper margin (Fig. 54B); aedeagus straight

nearly to tip, upper margin at tip sinuate (Fig. 44A) or (in southern morph, Fig. 43A) "kinked," lower margin spiculate, convex on apical third, apex serrate around apical gonopore (Figs. 43A, 44A-B). Length: brachypterous male 2.5-3.2 mm, female 2.7-3.5 mm; macropterous male 4.1-4.4 mm, female 4.2-4.7 mm; width of crown between eyes 0.3-0.4 mm, of head and pronotum 0.8-0.9 mm; length of face above clypellus 0.5-0.6 mm, of antenna 0.3 mm, with 2nd antennal segment subequal to calcar; apical 2 segments of rostrum 0.35-0.4 mm; medial length of fore tibia 0.7 mm, of hind tibia 0.8-1.0 mm, of hind tarsus 0.8 mm.

Types. Holotype male, **USA.** *ID*- 23 km SW Darlington, 7 June 1992 (K.G.A. Hamilton). Paratypes: 8 males, 10 females, same data as holotype; 1 male and 5 females, all macropterous, from *ID*- Mud Lake, 19 June 1984 (K.G.A. Hamilton) on *Agropyron*; 4 males, 2 females, all macropterous, *WA*- 9 km S of Methow, 10 June 1984 (K.G.A. Hamilton); 1 nymph, 38 brachypterous males and 41 brachypterous females, 1 macropterous male and 5 macropterous females, 25 May-19 June and 22 July, from **CANADA.** *BC*- 7 km W Douglas Lake, 5 mi W Hedley, Mission Flats [nr Kamloops], Princeton [airport]; **USA.** *ID*- 6 km S Baker, Galena Summit 2800m [S of Obsidian], 10 km E Howe, 12 km N Leslie, Lowman, and 37 km NE; *MT*- 5 km N Conner, Florence, Ketcham, 7 km W Lincoln, 8 km N Missoula, 18 km W Ovando, 15 km W Philipsburg, 6 km SE St. Regis; *OR*- Bend (Pilot Butte), 13 km E Joseph; *WA*- 5 km SW Chesaw, 7 km N Havillah, Orient, 12 km E Teanaway. All types No. 22849 in CNCI.

Additional material. Southern morph: 11 males and 8 females, all brachypterous, 8-13 June, from **USA-** *ID*: 20 km N Malad City; *UT*: 4 km SW Lakeside Resort, 7 km E Laketown. No associated males: 21 brachypterous females, 30 May-26 July, from **CANADA-** *BC*: Clinton, Jesmond, Osoyoos, Kamloops, 2 mi S Louis Creek, Venables Valley Rd. at Hwy. 97; **USA-** *ID*: Obsidian; *MT*: 8 km W Anaconda, Florence, 10 km N Three Forks, Cardwell; *WA*: 8 km S Grand Coulee.

Diagnosis. This species differs from *E. magnifrons* (Figs. 45A-B, 55B) in its stouter aedeagal shaft which is straight on the basal half, and in its inturned pygofer process. The ranges of typical *eurytion* and *magnifrons* abut at Princeton, BC without any sign of introgression.

Genus *Kosswigianella* Wagner, redefined

Kosswigianella Wagner, 1963: 169. Type-species by original designation: *Delphax exigua* Boheman, 1847.

Acanthodelphax LeQuesne, 1964: 57, **syn.nov.** Type-species by original designation: *Delphax denticauda* Boheman, 1847.

Diagnosis. Spatulate antennae with the apical segment not more than twice as long as wide, and a contrastingly dark male abdomen, are synapomorphies linking the genera *Kosswigianella* Wagner and *Acanthodelphax* LeQuesne. A new species, described below, shows the close relationship between these taxa in having male genitalia combining the truncate pygofer and drop-shaped basal aedeagal attachment of *Kosswigianella* and ventral pygofer tooth of *Acanthodelphax*.

Included species. Synonymy of these genera creates **new combinations** for the species formerly in *Acanthodelphax*: the North American *K. analis* (Crawford) and 3 Palaearctic species, *K. denticauda* Boheman, *K. spinosus* (Fieber) and *K. transuralica* Anufriev.

***Kosswigianella irrutilo* sp.nov.**

(Figs. 3, 46A, 56A-B)

Etymology: *irrutilo*, become ruddy.

Adults. Redbrown, male (and sometimes female) abdomen deep chocolate brown. Head as wide as pronotum in male, slightly narrower in female; face above clypellus broad, 25% longer than wide, weakly inflated, smooth and shining with median carina scarcely evident; crown slightly wider than long in male, as long as wide in female; antenna short, 2nd segment spatulate as in *Kosswigianella exigua* (Boheman). Thorax with pronotal carinae short, curved outwards, ending near midlength of segment; brachypterous tegmina truncate, 25% longer than wide, covering only extreme base of abdomen, leaving 5 large abdominal segments exposed; hind tibia bearing two minute spines on outer edge; calcar small and knife-shaped. Male anal process strongly angled ventrad; genital ring with pygofer truncate, minute median process on venter (Fig. 56B); diaphragm transverse, with inturned upper edge; styles abruptly narrowed just beyond midlength, apices furcate (Fig. 56A); thecal ring drop-shaped, narrow upper end articulated between bases of anal tube; aedeagus lamellate, in lateral aspect sinuate with minute tooth near base and gonopore confined to narrowly rounded tip (Fig. 46A). Length: brachypterous male 1.6 mm, female 1.7-2.1 mm (only specimen of macropterous form with wing tips damaged); width of crown between eyes 0.3 mm, of head and pronotum 0.6 mm in male, 0.7 mm in female; length of face above clypellus 0.4 mm, of antenna 0.25-0.3 mm, with 2nd antennal segment subequal to calcar; apical 2 segments of rostrum 0.25-0.3 mm; medial length of fore tibia 0.3-0.35 mm, of hind tibia 0.5-0.55 mm, of hind tarsus 0.4-0.45 mm.

Types. Holotype brachypterous male, **USA.** CO- Tarryall, 17 June 1954 (H.H. Ross) GL 947. Paratypes: 1 brachypterous male, 180 brachypterous and 1 macropterous females, same data as holotype. All types No. 22850 in CNCI.

Diagnosis. The broad, shiny face, large anal processes, furcate styles and lamellate aedeagus are distinctive.

***Kosswigianella wasatchi* sp.nov.**

(Figs. 47A, 57A)

Etymology: *Wasatch* (patronym), a mountain range in UT.

Adults. Colour and form as in *K. analis* (Crawford) (Figs. 48A-B, 58A), but face above clypellus broader, 45% longer than wide, crown less strongly produced; diaphragm narrowed either side of broad, median process on dorsal edge, and bearing prominent "heel" between bases of styles (Fig. 57A); aedeagus as in *K. analis* (Fig. 48A), but longer and more slender (Fig. 47A). Length: brachypterous male 1.8-1.9 mm, female 2.3-2.4 mm; macropterous male unknown, female 3.2-3.3 mm; width of crown between eyes 0.2 mm in male, 0.25 mm female, of male pronotum 0.7 mm, of female 0.8 mm, 0.1 mm wider than head; length of face above clypellus 0.4 mm in male, 0.5 mm in female, of antenna 0.25 in male, 0.3 mm in female, with 2nd antennal segment subequal to calcar; apical 2 segments of rostrum 0.25-0.3 mm; medial length of fore tibia 0.4 mm in male, 0.5 mm in female, of hind tibia 0.7 mm in male, 0.8 mm in female, of hind tarsus 0.5 mm in male, 0.6 mm in female.

Types. Holotype male, **USA.** UT- 11 km SW of Scofield, 10 June 1992 (K.G.A. Hamilton). Paratypes, 1 male, 5 brachypterous females, 2 macropterous females, same data as holotype. All types No. 22851 in CNCI.

Diagnosis. This species is a sister-species of the transcontinental *K. analis*, from which it may be distinguished by the slender aedeagal shaft and differently shaped diaphragm.

***Nothodelphax venusta* (Beamer), comb.nov.**

Delphacodes venusta Beamer, 1948: 115.

This is a sister-species to *N. foveata*, the type-species of the genus.

Genus *Paraliburnia* Jensen-Haarup, redefined

Paraliburnia Jensen-Haarup, 1917: 2. Type-species by original designation: *P. jacobseni* Jensen-Haarup, 1917 [= *Delphax concolor* Fieber, 1866].

Diagnosis. This broad-headed genus has an unusually long rostrum (apical two joints together 0.55-0.7 mm, at rest extending at least to metatrochanters) and very large, foliaceous calcar similar to those of the narrow-headed genus *Megamelus* Fieber. New World species also have close-set arms of the forked median carina extending onto the face between the eyes, although the smoothness of the apex of the head in some individuals makes these carinae hard to distinguish.

Included species. There are two Palaearctic species (Nast 1972). One Nearctic species *Paraliburnia kilmani* (Van Duzee: *Liburnia*) **comb.nov.** is transferred from *Delphacodes*. Two new, related species are described below.

***Paraliburnia furcata* sp.nov.**

(Figs. 49A-B, 59A-B)

Etymology: *furcata*, forked; in reference to the styles.

Adults. Colour and form as in *P. kilmani* (Van Duzee) (Wilson 1992, figs. 125-127), but much larger; crown of head slightly wider than long in male; anal process more robust (Fig. 59B); diaphragm narrowed mesally and produced caudad; styles small, abruptly narrowed on apical third, appearing furcate (Fig. 59A); aedeagus unarmed, tip dorsoventrally flattened above subterminal gonopore (Figs. 49A-B). Length to tip of brachypterous tegmen 2.5 mm [estimated overall length 3.0 mm]; width of crown between eyes 0.3 mm, of head 0.9 mm, of pronotum 1.0 mm; length of face above clypellus 0.7 mm, of antenna 0.55 mm, with 2nd antennal segment one-third length of calcar; apical 2 segments of rostrum 0.7 mm; medial length of fore tibia 0.9 mm, of hind tibia 1.0 mm, of hind tarsus 0.5 mm; calcar 0.5 mm; macropterous form and female unknown.

Type. Holotype male, CANADA. BC- Quesnel, 12 June 1949 (G.J. Spencer); No. 22852 in CNCI.

Diagnosis. In size and genital characters this species is most similar to the European genotype, but the styles are short and appear furcate, and the aedeagus is unarmed.

***Paraliburnia lecartus* sp.nov.**

(Figs. 50A, 60A-B)

Etymology: *lecartus*, arm (noun in apposition); in reference to the shape of the aedeagal shaft.

Adults. Colour and form as in *P. kilmani* (Wilson 1992, figs. 125-127), but with head wider, crown slightly wider than long in male (as in *P. furcata*) and as wide as long in female; anal process smaller; pygofer strongly bowed outwards above lower margin (Fig. 60B); diaphragm weakly sclerotized; styles short, strongly tapered, divergent (Fig. 60A); aedeagus armlike in lateral aspect, tapered towards enlarged tip, with ventral margin straight, upper margin concave

and serrate, sides bearing unequally aligned serrate rows in a spiral pattern, that of the right side being most dorsally situated near the tip, but more ventrally placed near the base (Fig. 50A); gonopore just below tip. Length: brachypterous male 2.3 mm, female 2.1 mm; width of crown between eyes 0.25 mm, of head 0.75 mm, of pronotum 0.8 mm; length of face above clypellus 0.55 mm, of antenna 0.4 mm, with 2nd antennal segment slightly shorter than calcar; apical 2 segments of rostrum 0.7 mm; medial length of fore tibia 0.7 mm, of hind tibia 0.9-0.95 mm, of hind tarsus 0.4 mm; calcar 0.35 mm.

Types. Holotype male, **CANADA.** BC- Fort St. John, Peace River, 10 June 1959 (G.G.E. Scudder); paratype female, same data; both types No. 22853 in CNCI.

Diagnosis. No other species in this genus has as small a calcar. The spiral arrangement of aedeagal serrations is also unusual.

ACKNOWLEDGEMENTS

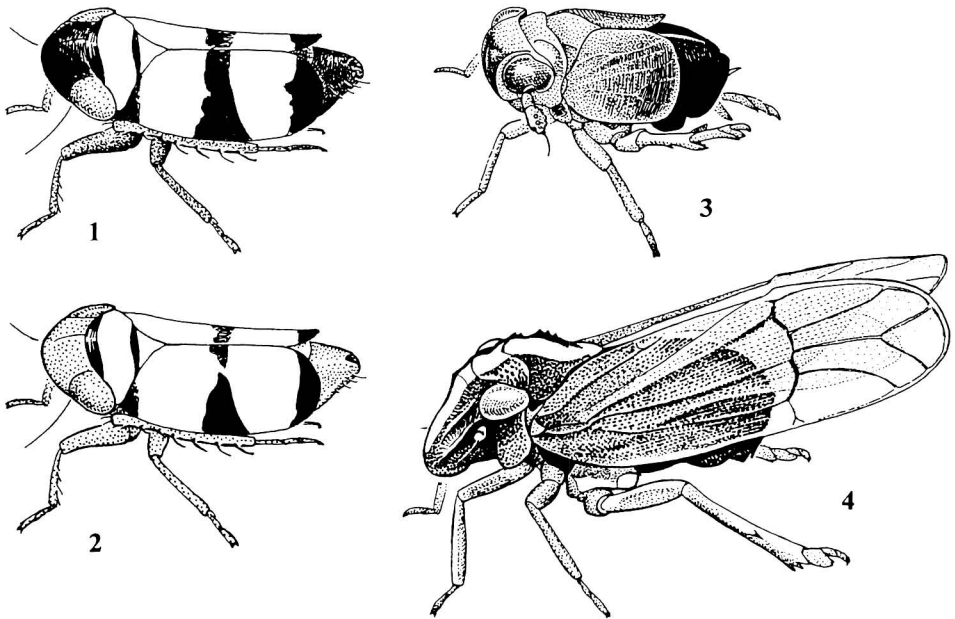
This study is dedicated to the memory of H.H. Ross (1908-1978). It is the outcome of many years of leafhopper surveys by "Herb" and his students to document the leafhopper fauna of North American grasslands, with special focus on Rocky Mountain grasslands. The manuscript was reviewed by D. Lafontaine of AAFC, Ottawa.

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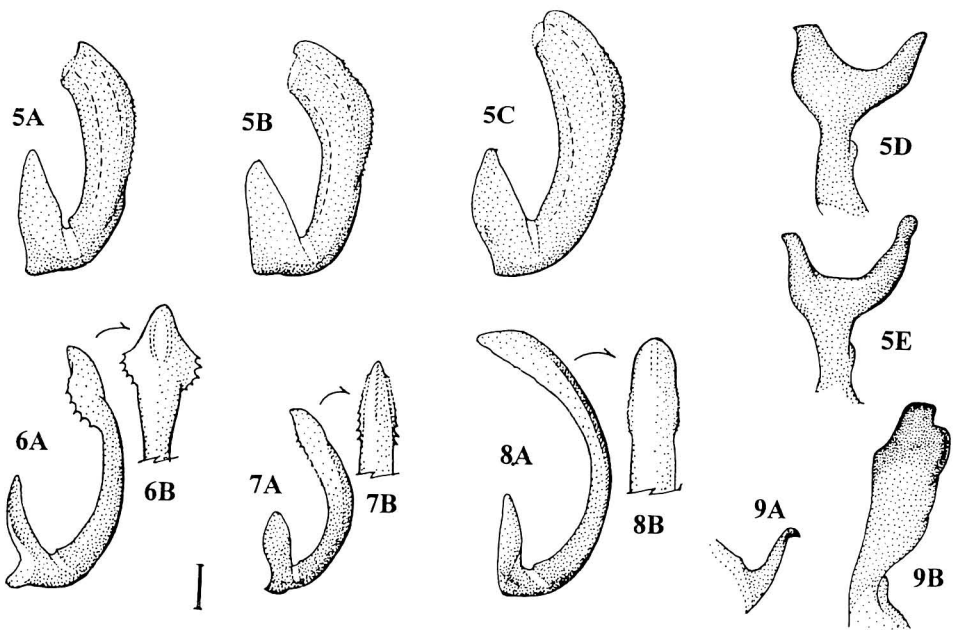
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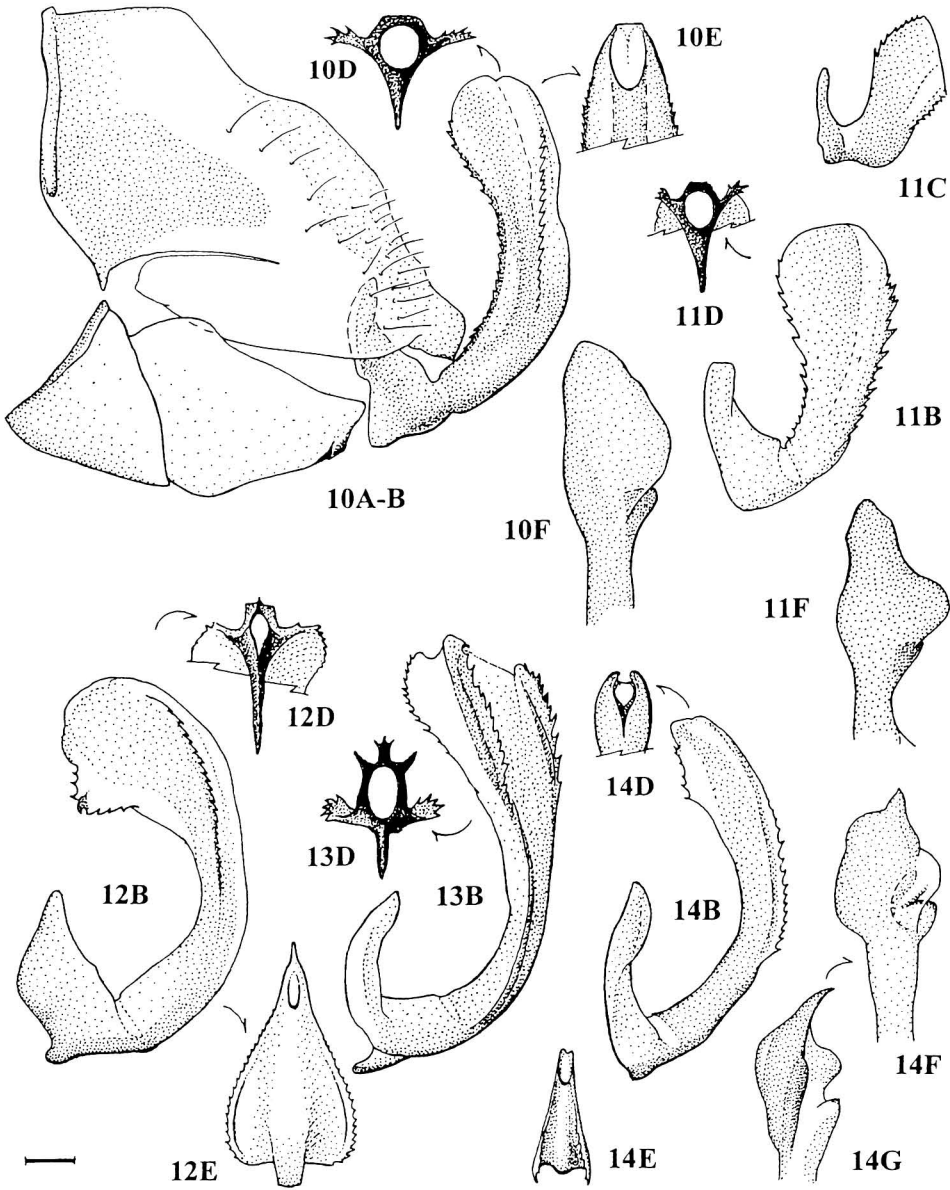
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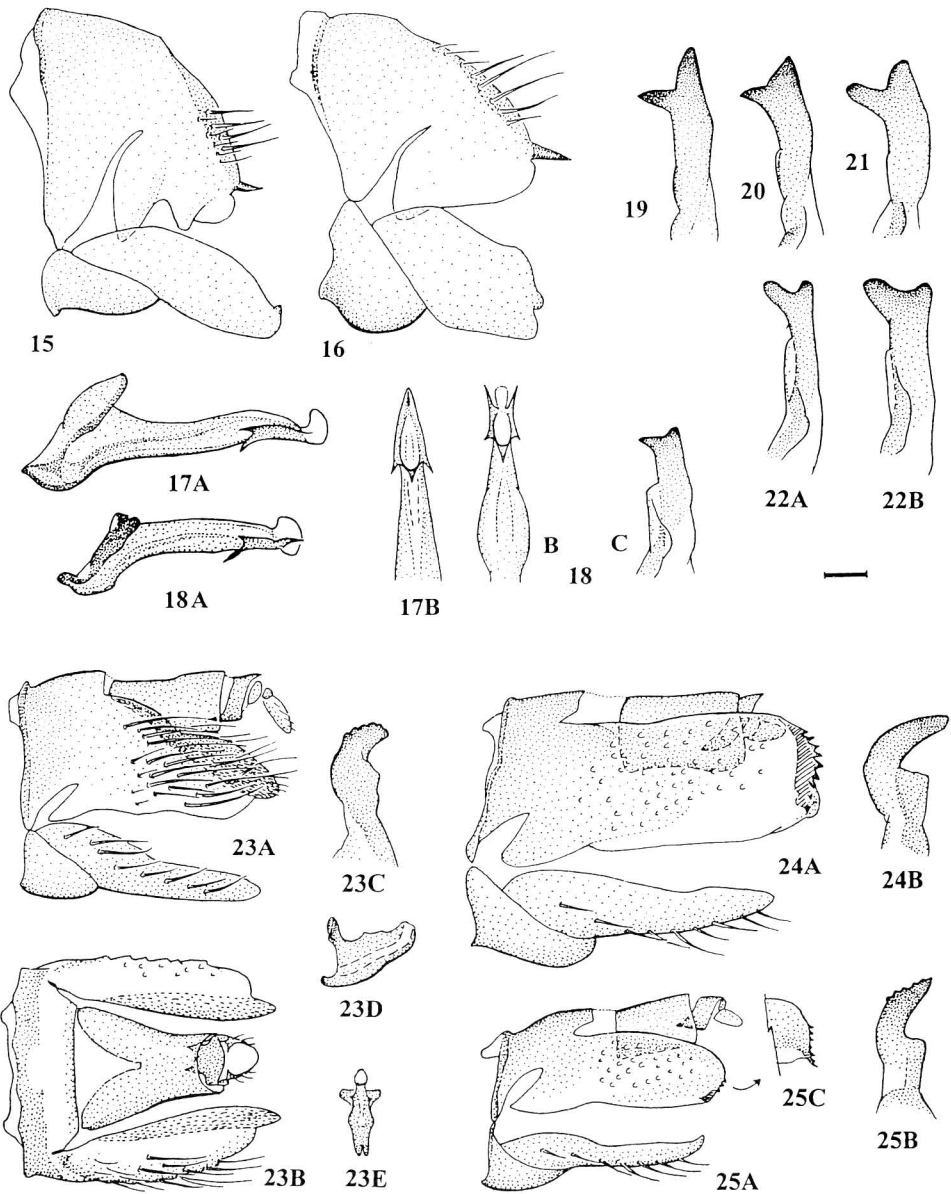
Figures 1-4. Homoptera-Auchenorrhyncha of PNW grasslands. 1, *Unoka dramatica*, palest form, Cicadellidae; 2, *Unoka gillettei*, darkest form; 3, *Kosswigianella irruilo*, Delphacidae (brachypterous form); 4, *Bruchomorpha beameri*, Caliscelidae (macropterous form).



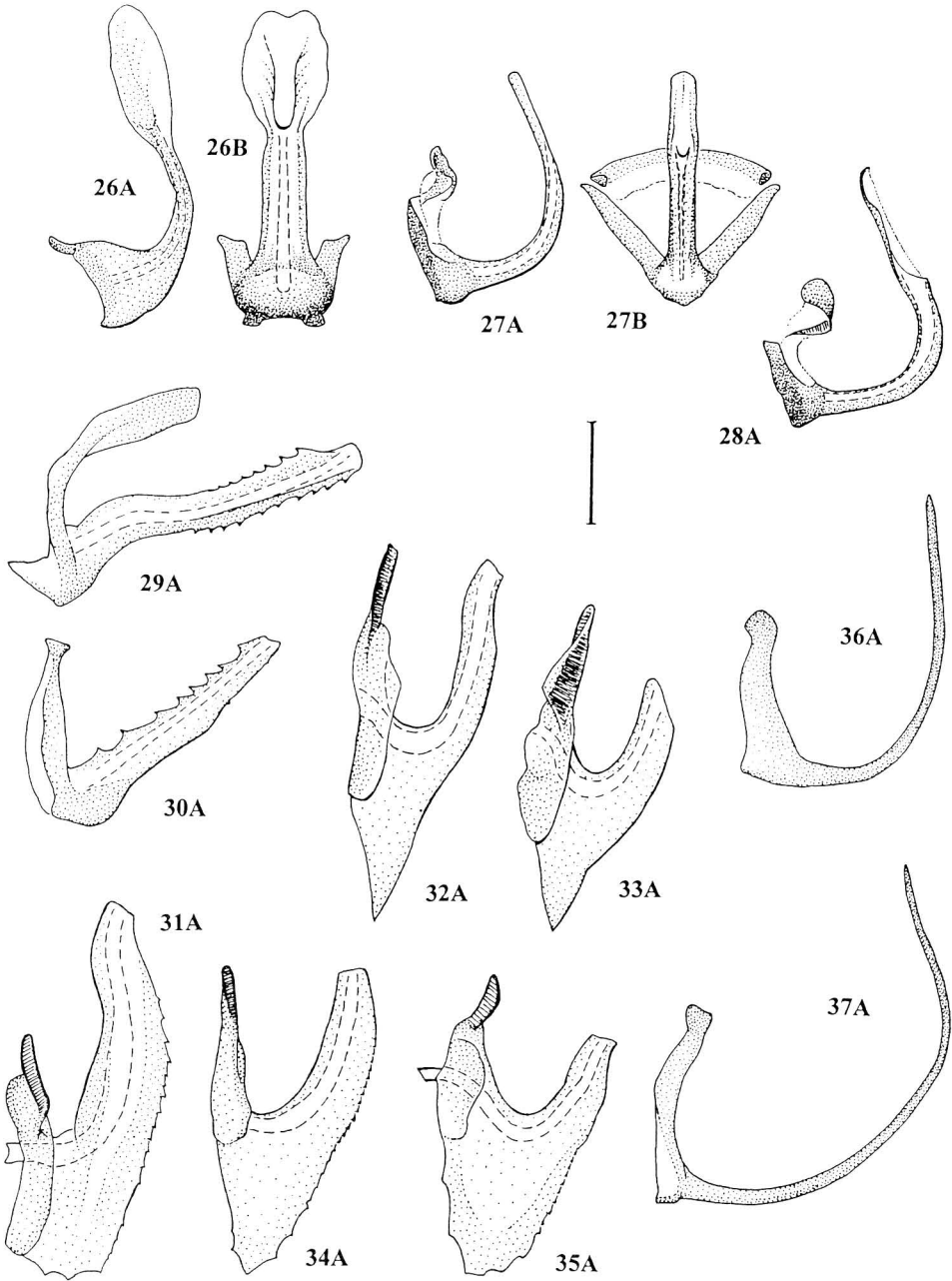
Figures 5-9. Male genitalia of Cicadellidae. 5, *Athysanella terebrans*, variation in lateral aspect of aedeagus (A-C) and distal part of style in widest aspect (D-E); 6, *A. occidentalis ladella*, lateral aspect of aedeagus (A) and tip of aedeagus in caudal aspect (B); 7, same, of *A. occidentalis s.s.*; 8, same, of *A. occidentalis megacauda*; 9, *A. hyperoche*, tip of pygofer (A) and distal part of style in widest aspect (B). Scale line: 0.1 mm.



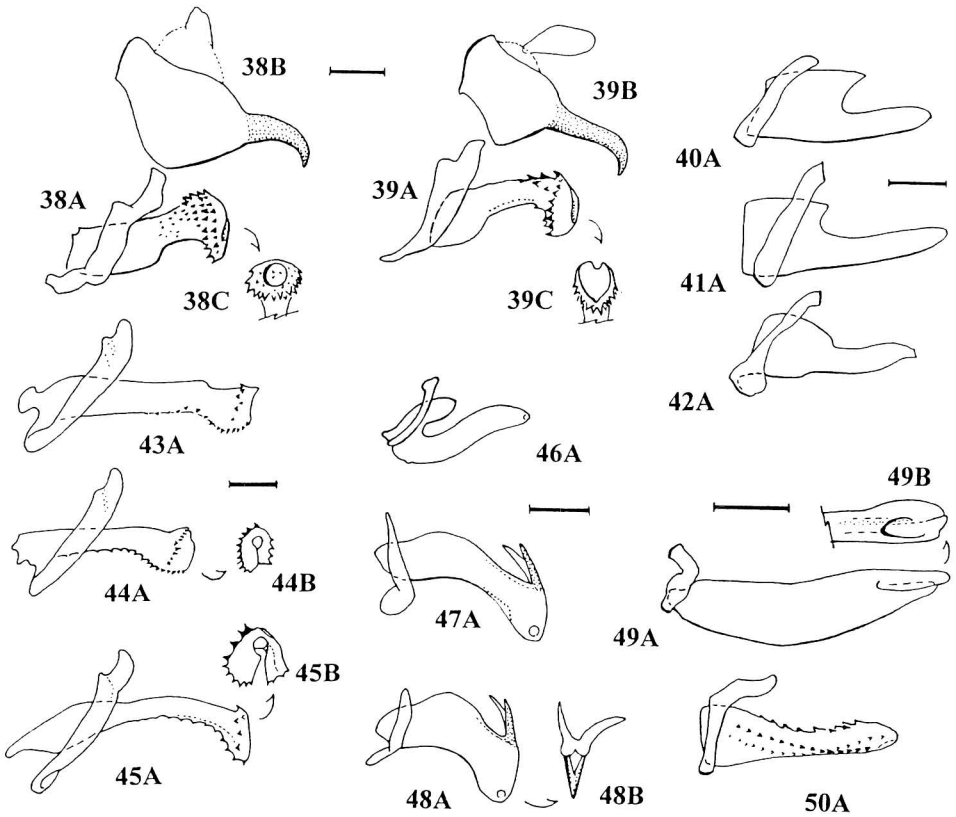
Figures 10-14. Male genitalia of Cicadellidae: genitalic capsule in lateral aspect (A), same, of aedeagus (B), same, parasitized individual (C), tip of aedeagus in dorsal aspect (D), same, in caudal aspect (E), distal part of style in widest aspect (F) and in narrowest aspect (G). 10(A-B, D-F), *Athysanella lemhi*; 11(B-D, F), *A. castor*; 12(B, D-E), *A. expulsa*; 13(B, D), *A. attenuata*; 14(B, D-G), *A. repulsa*. Scale line: 0.1 mm.



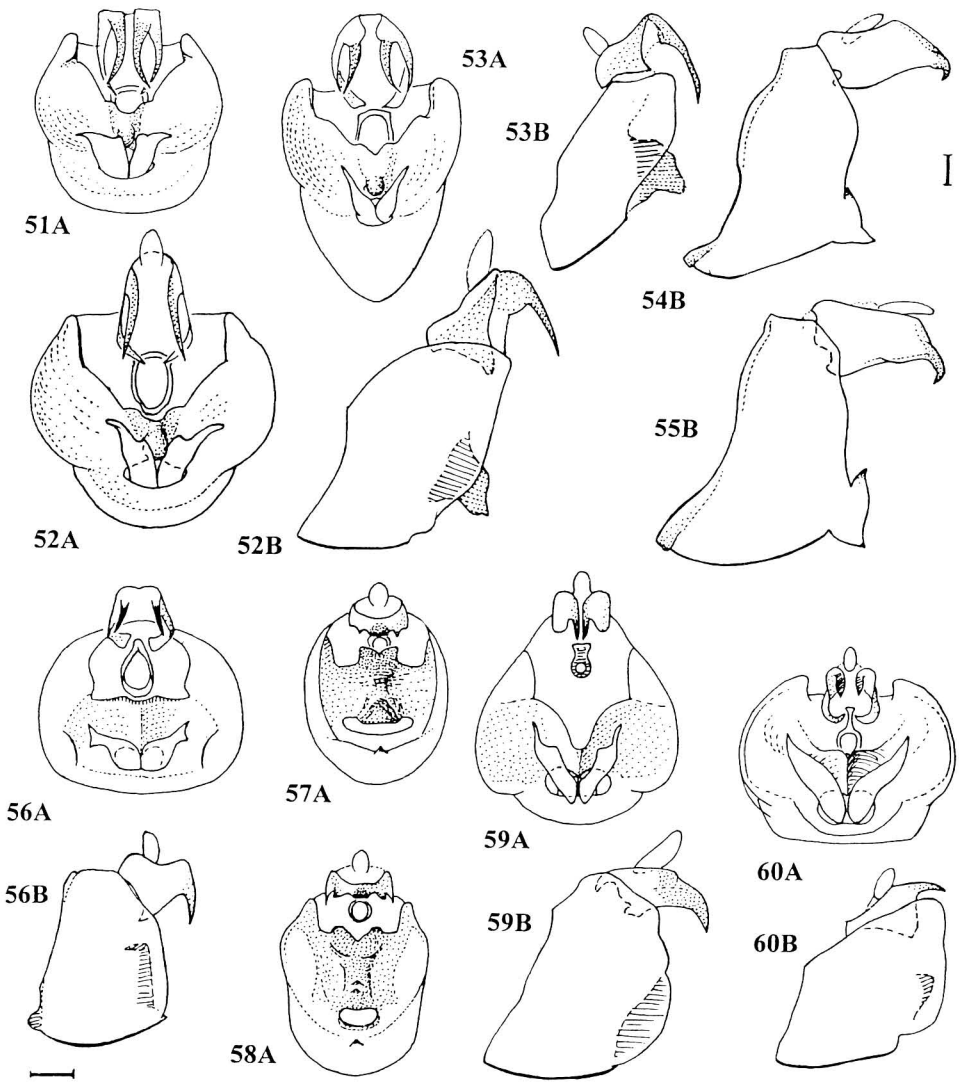
Figures 15-25. Male genitalia of Cicadellidae. 15, *Diplocolenus configuratus bicolor*, genitalic capsule in lateral aspect; 16, same, of *D. configuratus nigrior*; 17, *Mocuellus caprillus anfractus* aedeagus in lateral aspect (A) and in caudal aspect (B); 18, same, of *M. quinquespinus*, with distal part of style in widest aspect (C); 19, *M. caprillus strictus*, distal part of style in widest aspect; 20, same, *M. caprillus anfractus*; 21, same, of *M. caprillus* \square *anfractus* from Idaho/Montana border; 22, same, of *M. caprillus* s.s. from Utah (A) and from Alberta (B); 23, *Sorhoanus involutus*, genitalic capsule in lateral aspect (A), in dorsal aspect (B), distal part of style in widest aspect (C), aedeagus in lateral aspect (D) and in caudal aspect (E); 24, *S. virilis*, genitalic capsule in lateral aspect (A) omitting pygofer setae, and distal part of style in widest aspect (B); 25, same, in *S. debilis*, with detail of pygofer apex in ventrolateral aspect (C). Scale line: 0.1 mm.



Figures 26-37. Aedeagi of Cicadellidae, lateral aspect (A) and caudal aspect (B). 26, *Psammotettix diademata*; 27, *P. nesiotus*; 28, *P. lividellus*; 29, *Sorhoanus virilis*; 30, *S. debilis*; 31, *S. orientalis*; 32, *S. xiphosura*, holotype; 33, same, variety; 34-35, *S. uhleri*, varieties; 36, *Stenometopiellus vader*; 37, *Stenometopiellus cookei*. Scale line: 0.1 mm.



Figures 38-50. Male genitalia of Delphacidae: lateral aspect of aedeagal shaft (A), anal tube (B), and gonopore aspect of aedeagal shaft (C). 38, *Achorotile apicata*; 39, *A. acuta*; 40, *Elachodelphax borealis*; 41, *El. mazama*; 42, *El. unita*; 43, *Eurybregma eurytion* from Malad City, ID; 44, *Eu. eurytion*, smallest specimen from same locality as holotype; 45, same, of *Eu. magnifrons*; 46, *Kosswigianella irrutilo*; 47, *K. wasatchi*; 48, *K. analis*; 49, *Paraliburnia furcata*; 50, *P. lecartus*. Scale line: 0.1 mm, same scale for each genus.



Figures 51-60. Male genitalia of Delphacidae: caudal aspect of genitalia (A), omitting aedeagal shaft and (in Figs. 57-58), omitting small styles; lateral aspect of genital capsule and anal tube (B). 51, *Elachodelphax borealis*; 52, *El. mazama*; 53, *El. unita*; 54, *Eurybregma eurytion*; 55, *Eu. magnifrons*; 56, *Kosswigianella irrutilo*; 57, *K. wasatchi*; 58, *K. analis*; 59, *Paraliburnia furcata*; 60, *P. lecartus*. Scale line: 0.1 mm (Fig. 56A-B slightly larger).

