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# KEYS TO THE FAMILIES OF CICADOMORPHA AND SUBFAMILIES AND TRIBES OF CICADELLIDAE (HEMIPTERA: AUCHENORRHYNCHA)

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ABSTRACT

Illustrated keys to adults reflecting the current higher classification are provided for families of Cicadomorpha (cicadas, spittlebugs, leafhoppers, and treehoppers) and for subfamilies and tribes of Cicadellidae (leafhoppers), excluding Deltocephalinae. The following families (and superfamilies) are recognized: Cicadidae and Tettigarctidae (Cicadoidea); Aphrophoridae, Cercopidae, Clastopteridae, Epipygidae, and Machaerotidae (Cercopoidea); Aetalionidae, Cicadellidae, Melizoderidae, Membracidae, Myerslopiidae (Membracoidea). The higher classification of Cicadellidae is currently undergoing revision, but a provisional key to subfamilies and tribes (except Deltocephalinae) is provided. Two new synonymies are proposed: Signoretiinae Baker, 1915 equals Phlogisinae Linnavuori, 1979, **new synonym**; Iassini Walker, 1870, equals Hyalojassini Evans, 1972, **new synonym**.

Key Words: morphology, identification, taxonomy, phylogeny, Homoptera

RESUMEN

Se provee claves ilustradados para los adultos que reflejan la clasificación jerárquica actual para las familias de Cicadomorpha (cigarras, cercopidos, chicharas y membrácidos) y para las subfamilias y tribus de Cicadellidae (chicharras), excluyendo los Deltocephalinae. Se reconoce las familias (y superfamilias) siguientes: Cicadidae y Tettigarctidae (Cicadoidea); Aphrophoridae, Cercopidae, Clastopteridae, Epipygidae y Machaerotidae (Cercopoidea); Aetalionidae, Cicadellidae, Melizoderidae, Membracidae, y Myerslopiidae (Membracoidea). La clasificación jerárquica de la familia Cicadellidae esta actualmente bajo una revisión taxonómica, pero se provee una clave provisional de las subfamilias y tribus (menos los Deltocephalinae). Se propone dos sinónimos nuevos: Signoretiinae Baker, 1915 es igual que Phlogisinae Linnavuori, 1979, **sinónimia nueva**; y Iassini Walker, 1870, es igual que Hyalojassini Evans, 1972, **sinónimia nueva**.

The hemipteran (=homopteran) infraorder Cicadomorpha comprises approximately 35,000 described species of plant sap-sucking insects distributed worldwide. Species are grouped into three superfamilies that are well established based on morphological criteria: Cicadoidea (cicadas); Cercopoidea (spittlebugs, froghoppers); and Membracoidea (leafhoppers, sharpshooters, treehoppers) (Figs. 1 and 2). Cicadomorpha may be distinguished from other Hemiptera by the following combination of characters: postclypeus enlarged; antennal pedicel small, without conspicuous sensilla, flagellum aristiform; tegulae absent; forewing anal veins usually separate from base to wing margin; middle coxae small and narrowly separated. Over 3,000 species of Cicadomorpha are recorded from temperate North America, including ca. 70 exotic species, the vast majority of which are native to Eurasia. Relatively few species are economically important, but there are some major pests, such as the glassy-winged sharpshooter, *Homalodisca coagulata* (Say), potato leafhopper, *Empoasca fabae* (Harris), and beet leafhopper, *Neoaliturus* (=*Circulifer*) *tenellus* (Baker). Cicadomorphans injure plants either directly through feeding (Backus 1988; Backus et al. 2005) or indirectly through transmission of plant pathogens (Nielson 1968; Maramorosch & Harris 1979).

Identification of cicadomorphan species is difficult because of their tremendous diversity and the paucity of comprehensive identification keys. Recent sampling suggests that more than 90% of the extant tropical cicadomorphan species remain undescribed (Hodkinson & Casson 1991; Dietrich & Wallner 2002, unpublished data). These, as well as a large proportion of described species, have never been included in a key. Thus, when possible at all, identification of cicadomorphan species usually requires access to a large and obscure taxonomic literature and authoritatively identified reference specimens.

Recent phylogenetic analyses (e.g., Dietrich & Deitz 1993; Dietrich 1999; Dietrich et al. 2001a, b; Shcherbakov 1996; Rakitov 1998; Hamilton 1999; Wallace & Deitz 2004; Cryan et al. 2004; Moulds, unpublished) have begun to elucidate the status and relationships of cicadomorphan family-group taxa, but the higher classification of Cicadomorpha remains controversial and no family-group classification has yet gained universal acceptance. Due in part to this controversy, few attempts have

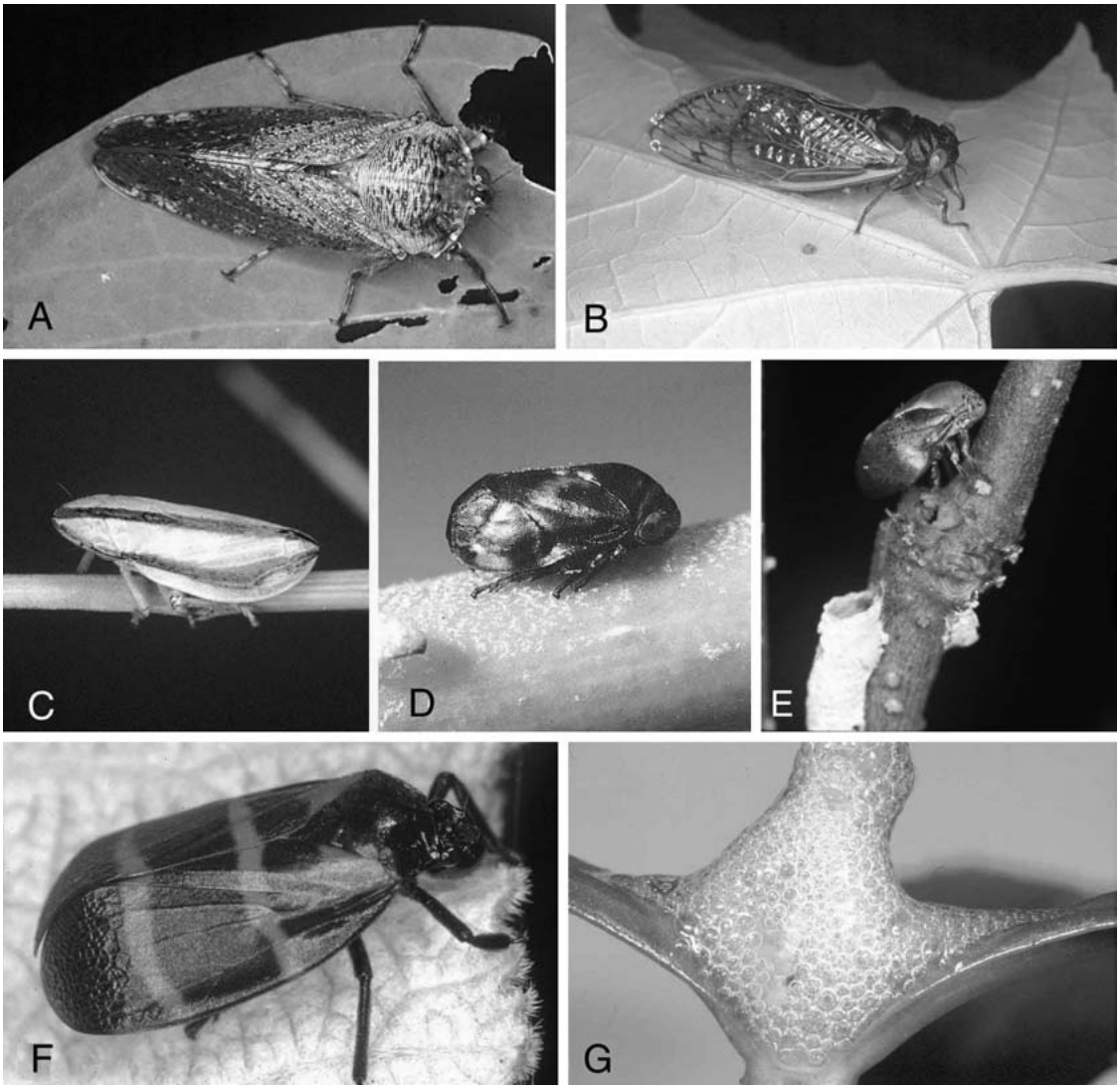


Fig. 1. Cicadoidea and Cercopoidea. A, *Tettigarcta crinita* (Tettigarctidae), Australia. B, *Magicicada cassini* (Cicadidae), Illinois. C, *Paraphilaenus parallelus* (Aphrophoridae), Kyrgyzstan. D, *Clastoptera obtusa* (Clastopteridae), Illinois. E, *Hindola* sp. (Machaerotidae), adult (top center) and tube constructed by nymph (lower left), Taiwan. F, *Tomaspis* sp. (Cercopidae), Mexico. G, spittle mass of *Philaenus spumarius* nymph. Photos by C. H. Dietrich.

been made recently to develop keys for identifying the major cicadomorphan groups (families, subfamilies, and tribes). Although revised keys are available for treehopper family-group taxa (Deitz & Dietrich 1993; Dietrich et al. 2001b; Wallace & Deitz 2004), the most recent comprehensive key to leafhopper subfamilies and tribes is over 50 years old (Evans 1947). The most comprehensive keys to cicada and spittlebug family groups are nearly 100 years old (Distant 1912, 1914; Lallemand 1912). More recent keys are available for certain regional faunas (e.g., Evans 1966; Anufriev & Emeljanov 1988), but interpretations of higher taxa vary among regions and authors. The family-group classifications of cicadas (Moulds, unpublished) and cercopoids (Hamilton, Liang, unpublished) are currently being revised. Revisions to the higher classification of leafhoppers have also been made in recent years. Hamilton (1983) proposed a classification of Cicadellidae that included only ten subfamilies, but subsequent authors have not followed his system. Oman et al. (1990) recognized 40 subfamilies and 119 tribes in their provisional classification and world generic checklist. Subsequent to the 1985 cut-off date for the Oman et al. (1990) checklist, a new subfamily (Godoy & Webb 1994) and two new tribes (Theron 1986; Hamilton 1999) have been described. Also, several

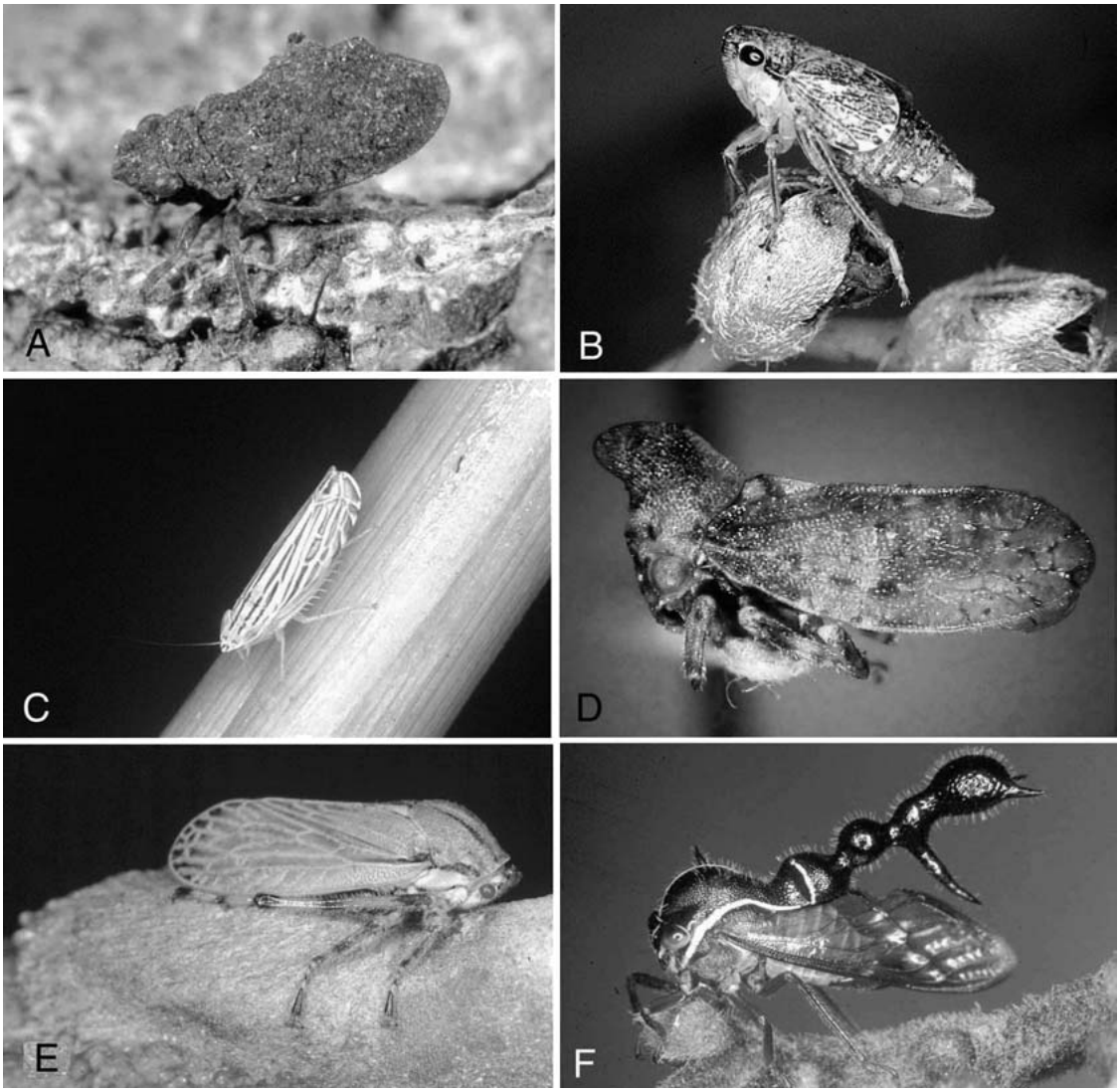


Fig. 2. Membracoidea. A, *Myerslopia chilensis* (Myerslopiidae), Chile. B, *Hylaius oregonensis* (Cicadellidae), Oregon. C, *Flexamia grammica* (Cicadellidae), Illinois. D, *Llanquihuea* sp. (Melizoderidae), Chile. E, *Aetalion reticulatum* (Aetalionidae), Peru. F, *Heteronotus quadrinodosus* (Membracidae), Mexico. Photos by C. H. Dietrich.

family-group taxa listed as valid by Oman et al. (1990) have more recently been treated as junior synonyms (e.g., Dietrich & Rakitov 2002; Dietrich & Dmitriev 2003; Dietrich 2004).

The purpose of this paper is to provide up-to-date keys to the families of Cicadomorpha and to subfamilies and tribes of Cicadellidae that reflect, to the extent possible, current consensus regarding the higher classifications of these groups.

## MORPHOLOGY

The following section describes the basic morphological terminology used in keys to Cicadomorpha but is not intended as an exhaustive treatment. For a more detailed treatment of cicadomorphan morphology, see Kramer (1950). Alternative terminologies have been proposed by various authors (e.g., Blocker & Triplehorn 1985; Hamilton 1981; Mejdalani 1998). There is not yet a universally accepted system of morphological terminology for Cicadomorpha. For a detailed treatment of the morphology of cicadellid nymphs, see Dmitriev (2002).

Head. The cicadomorphan head is highly variable in form, particularly among leafhoppers (Figs. 3A, 3B, 4). For convenience, the term face is used to refer to the anterior part and the term

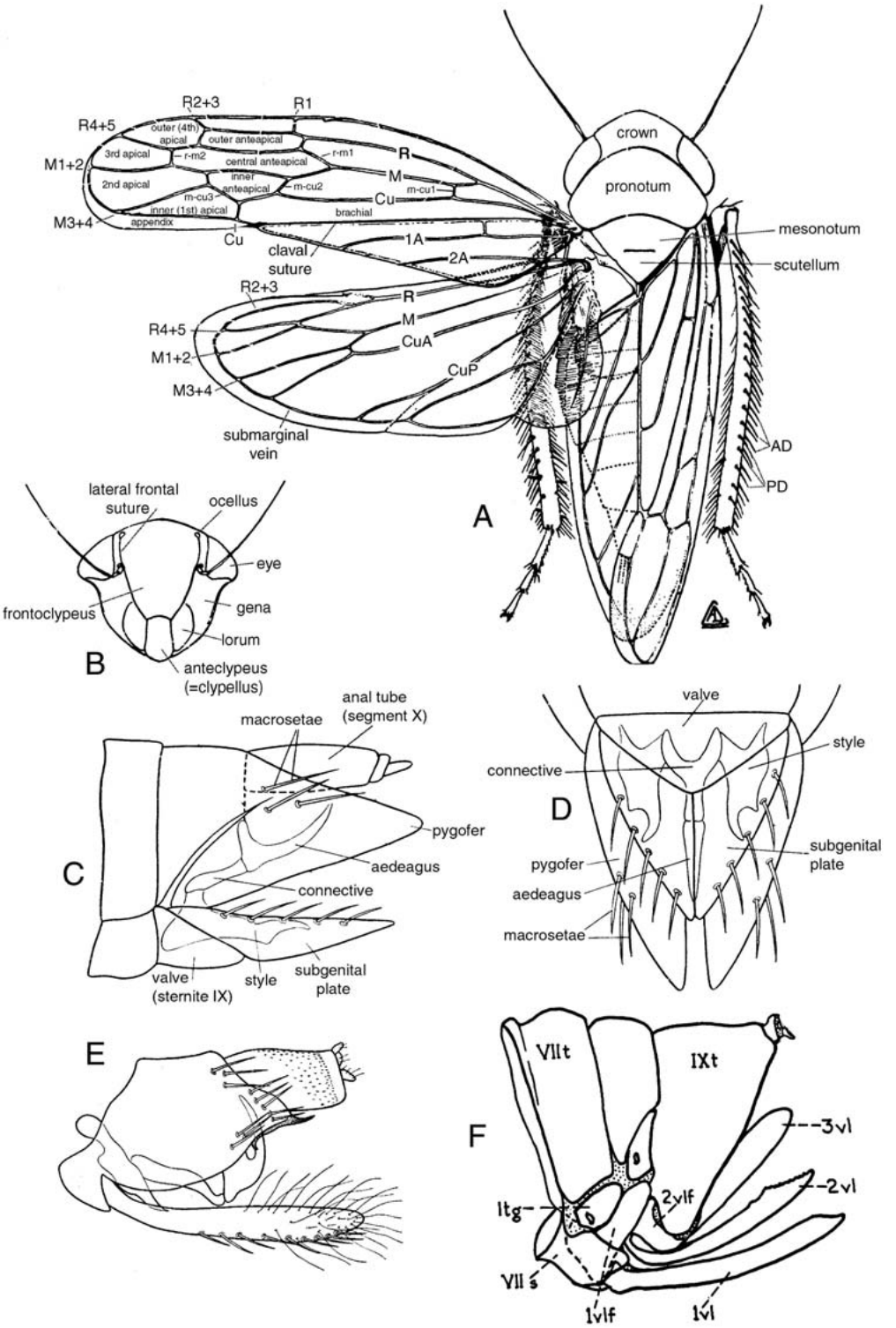


Fig. 3. Leafhopper morphology. A, dorsal habitus. B, head, anterior view (face). C-D, apex of male abdomen, Deltocephalinae, lateral and ventral views, respectively. E, Typhlocybinae, male genital capsule, lateral view. F, apex of female abdomen, lateral view (vl = valvula, vlf = valvifer, s = sternite, t = tergite). Drawings A-B modified from Oman (1949), C-E modified from Anufriev & Emeljanov (1988), F from Kramer (1950).

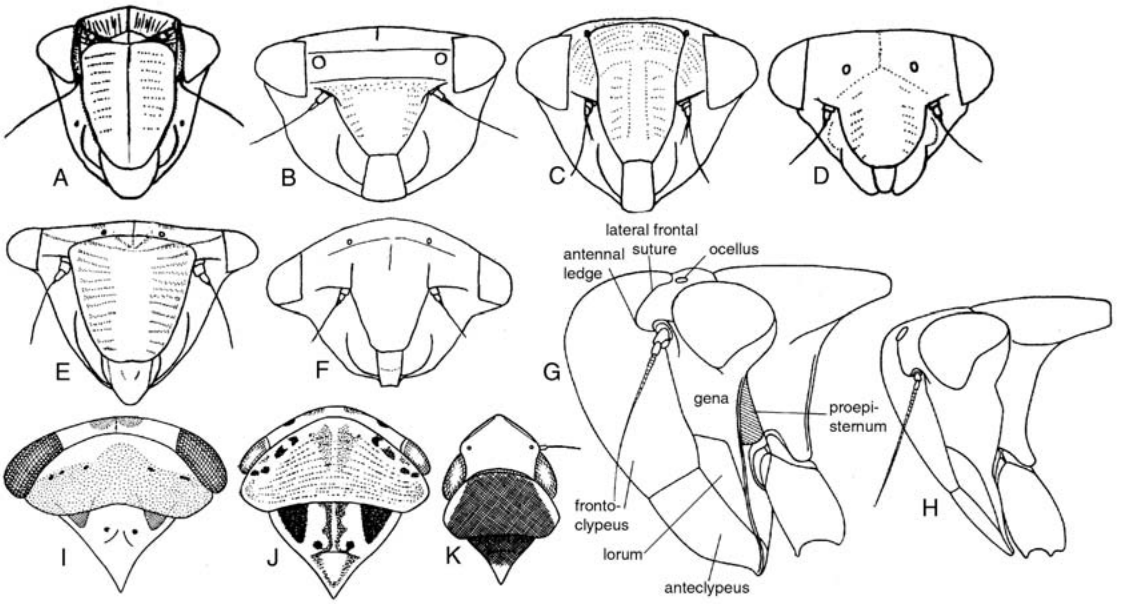


Fig. 4. Leafhopper head morphology. A-F, head, anterior view: A, *Evacanthus* (Evacanthini); B, *Krisna* (Krisnini); C, *Tartessus* (Tartessinae); D, *Platyproctus* (Adelungiini); E, *Bathysmatophorus* (Errhomenini); F, *Thymbrus* (Thymbrini). G-H, head and prothorax, lateral view: G, *Cicadella* (Cicadellini); H, *Matsumurella* (Athysanini). I-K, head, pronotum, mesonotum, and scutellum, dorsal view: I, *Populicerus* (Idiocerinae); J, *Pediopsoides* (Macropsinae); *Oniella* (Evacanthini). Drawings A-F original; G-K from Anufriev & Emeljanov (1988).

crown refers to the dorsal part, although in different groups these areas are made up of parts of different sclerites. Some authors (e.g., Blocker & Triplehorn 1985) use crown and vertex interchangeably, but the term vertex is correctly applied only to the pair of sclerites posterolaterad of the frontal sutures and bearing the lateral ocelli. The rostrum (or beak), the modified labium, varies in length among taxa. The clypeus is almost always divided by the clypeal (or transclypeal) suture into two sclerites, the anteclypeus (clypellus) and postclypeus, both of which vary in texture and proportions among taxa. The postclypeus is usually not clearly divided from the frons dorsally, thus the term frontoclypeus is often used to refer to the combined sclerite, which is usually the largest structure of the head in anterior view. Immediately laterad of the clypeus on the lower part of the face is a pair of mandibular plates called the lora (singular—lorum), which vary in size, shape, and relative position. The lorum is situated on the maxillary plate, which, along with the more dorsally situated gena, forms the lateral margin of the head. In most leafhoppers, the gena and maxillary plate are fused, but a few groups of leafhoppers (e.g., Ulopinae), as well as most other cicadomorphans, have the maxillary plate and gena separated by a distinct suture or cleft. The antennae of Cicadomorpha consist of two short basal segments and an elongate flagellum, which varies in length and shape and may be subsegmented to various degrees. The base of the antenna may be partly covered dorsally by an outgrowth of the vertex called the antennal ledge, which also varies in shape and may extend onto the frontoclypeus. The eyes vary in size and shape, and the ocelli vary in their position relative to the eyes and to the anterior margin of the head. The lateral arms of the epicranial suture, usually termed frontal sutures, are reduced or lost in various taxa and their relative shape and position also varies. In many leafhoppers, these sutures extend to the ocelli and in such cases are often referred to as lateral frontal sutures (or laterofrontal sutures).

Thorax (Fig. 5). The pronotum of Cicadomorpha varies in shape, ornamentation, texture and proportions, particularly in treehoppers (Fig. 2F), which usually have a well developed posterior process that partially or completely conceals the scutellum and may also overlap the wings. The mesonotum and scutellum, divided by the scutellar suture (and often incorrectly referred to collectively as the "scutellum"), vary in proportions and the degree to which they are concealed by the pronotum. Important pleural sclerites include the proepisternum, the mesepisternum, and mesepimeron, which vary in proportions and, in the latter, may bear tubercles or other processes. The mesepisternum is usually divided into an anterodorsal anepisternum and a posteroventral katepisternum, but these two sclerites are fused in treehoppers. The forewing, or tegmen (pl., tegmina),

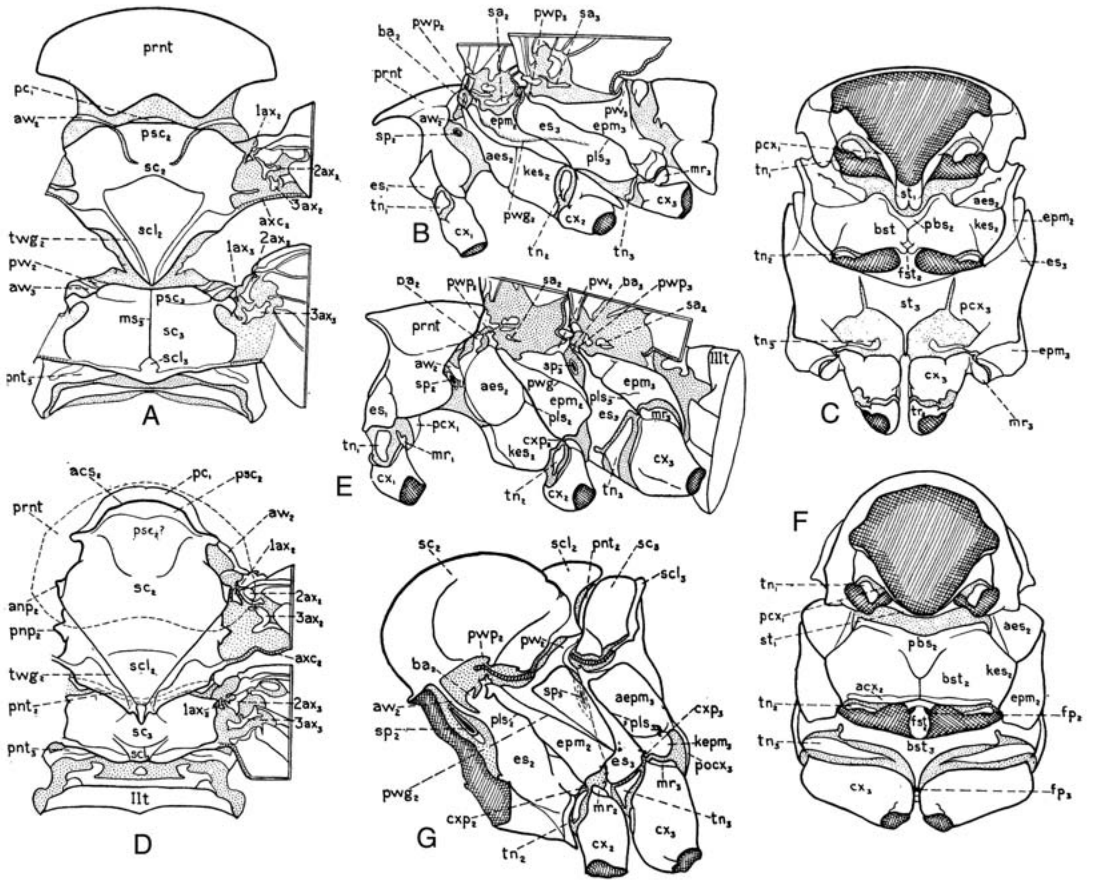


Fig. 5. Morphology of cicadomorphan thorax (from Kramer 1950): A-C, *Lepyronia* (Aphrophoridae), dorsal, lateral, and ventral view (in A, pronotum removed to show mesonotum). D-F, same, *Paraulacizes* (Cicadellidae). G, *Stictocephala* (Membracidae), lateral view of meso- and metathorax. Abbreviations: acs = antecostal suture; acx = antecoxal area; aes = anepisternum; anp = anterior notal wing process; aw = prealar bridge; ax = axillary sclerite; ba = basalare; bst = basisternite; cx = coxa; cxp = pleural coxal process; epm = epimeron; es = episternum; fp = furcal pit; fst = furcasternite; kes = katepisternum; mr = meron of coxa; pbs = prebasisternite; pc = precosta; pls = pleural suture; pnp = posterior notal wing process; pnt = postnotum; pocx = postcoxal bridge; prnt = pronotum; psc = prescutum; pw = postalar bridge; pwg = pleural wing groove; sp = spiracle; st = sternite; tn = trochantin; tr = trochanter; twg = tergal wing groove

and hind wing vary in proportions, texture, and venation. Important features of the wings include the branching pattern of veins and the shape and texture of the cells (areas between veins).

The legs vary in shape, proportions, spination, and chaetotaxy (setal arrangement). Different systems have been proposed for naming the rows and groups of setae on the legs of leafhoppers (Rakitov 1998) and treehoppers (Deitz 1975). In Rakitov's system, adopted here, longitudinal rows of setae are labeled according to their position assuming that the leg is extended perpendicular to the mid-saggital plane of the body; i.e., anterodorsal (AD), posterodorsal (PD), anteroventral (AV) and posteroventral (PV) (Figs. 7G, 7J). The front femur of leafhoppers often bears additional anteromedial (AM) and intercalary (IC) setal rows (Fig. 7K). When appropriate, individual setae are numbered sequentially, beginning with the most distal (e.g., AV1 referrs to the distal seta of the anteroventral row). Setal formulae are often used to describe the arrangement of enlarged setae, or macrosetae, particularly on the front tibia and hind femur. In treehoppers, the number and arrangement of rows of cucullate setae (setae with dark, hoodlike basal sockets) on the hind tibia are important for distinguishing tribes.

Abdomen. The basal segments of the abdomen and adjacent parts of the metathorax are modified, particularly in males, for sound production. In cicadas, the structure of these sound

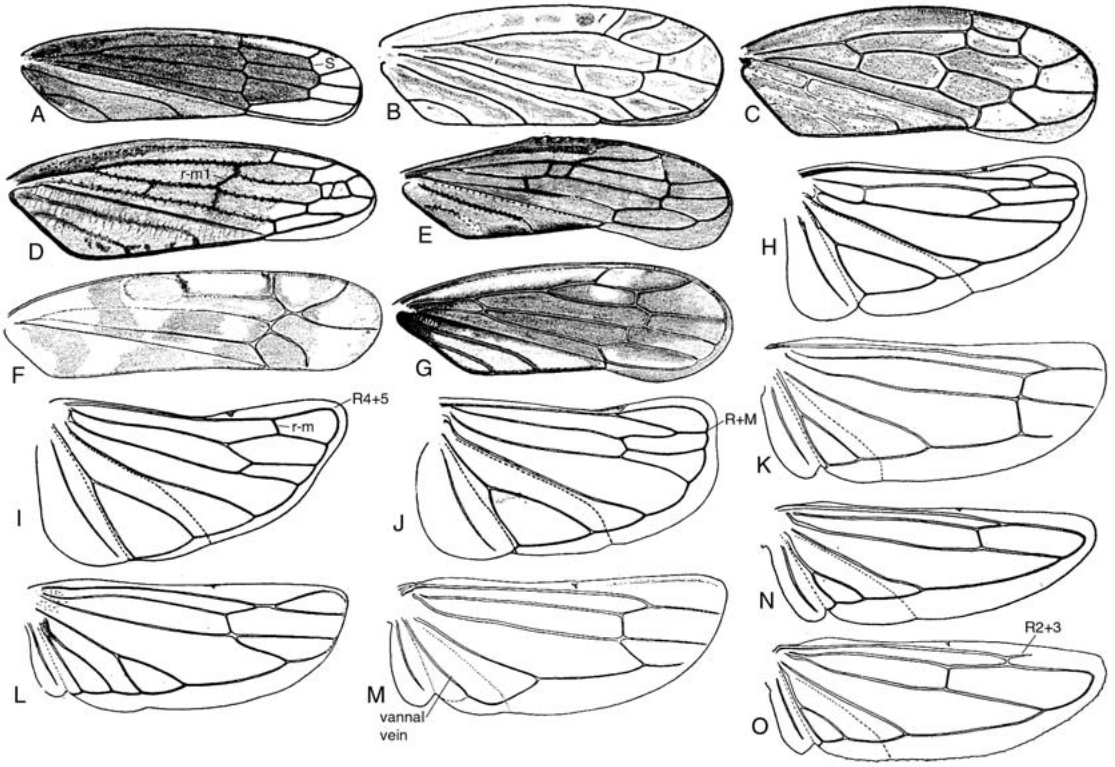


Fig. 6. Leafhopper wings. A-G, forewing: A, *Hortensia* (Cicadellini); B, *Errhomus* (Errhomenini); C, *Deltocephalus* (Deltocephalini); D, *Hamana* (Scarini); E, *Idiocerus* (Idiocerinae); F, *Typhlocyba* (Typhlocybini); G, *Jikradia* (Coelidiinae). H-O, hind wing: H, *Agallia* (Agalliini); I, *Macropsis* (Macropsinae); J, *Penestragania* (Iassini); K, *Typhlocyba* (Typhlocybini); L, *Protalebrella* (Alebrini); M, *Hymetta* (Erythroneurini); N, *Empoasca* (Empoascini); O, *Joruma* (Jorumini). Drawings from Oman (1949).

producing organs, or tymbals, varies among species. The organs of sound detection in cicadas, or tympana, are located ventrally at the base of the abdomen and may be concealed by opercula, which are flaplike outgrowths of the metathorax. Similar structures may occur in other cicadomorphans, but they are not as well developed. In some groups of leafhoppers, the shapes of the internal apodemes of male abdominal segments I-III, associated with the production of species-specific courtship signals transmitted through the substrate, are diagnostic at the species level.

The male genital capsule (Figs. 3C-E) consists of the tergite of segment IX, or pygofer (pygophore), and the sternite of segment IX, or valve, which may or may not be separated from each other by a suture. The pygofer varies in shape and chaetotaxy, and may bear various lobes or processes. In Membracoidea and Cercopoidea, there is a pair of posteroventral lobes called subgenital plates (or, simply, plates) connected to the posterior margin of the valve; these vary in shape, chaetotaxy, and degree of fusion to each other and to the valve. The sclerotized parts of the genitalia of Membracoidea and Cercopoidea consist of a pair of lateral styles, a median connective, and an aedeagus or penis, all of which vary in shape and proportion and may be highly modified with various processes and accessory structures. In cicadas, the styles and connective are vestigial. Segment X, which forms the major part of the anal tube, also varies in shape and proportion and may bear spines or processes.

The female ovipositor (Fig. 3F) consists of two pairs of blade-like structures, the first and second valvulae, and an outer sheath, the third valvulae (gonoplacs). The second valvulae vary in shape, proportion and armature (dorsal teeth or serrations). The first valvulae, which enclose the second, vary in shape, proportion, and texture. When not in use, the ovipositor is partially enclosed by the enlarged ninth abdominal tergite, or pygofer. The seventh abdominal sternite usually overlaps the bases of the ovipositor and pygofer ventrally and varies in shape among species in some groups.

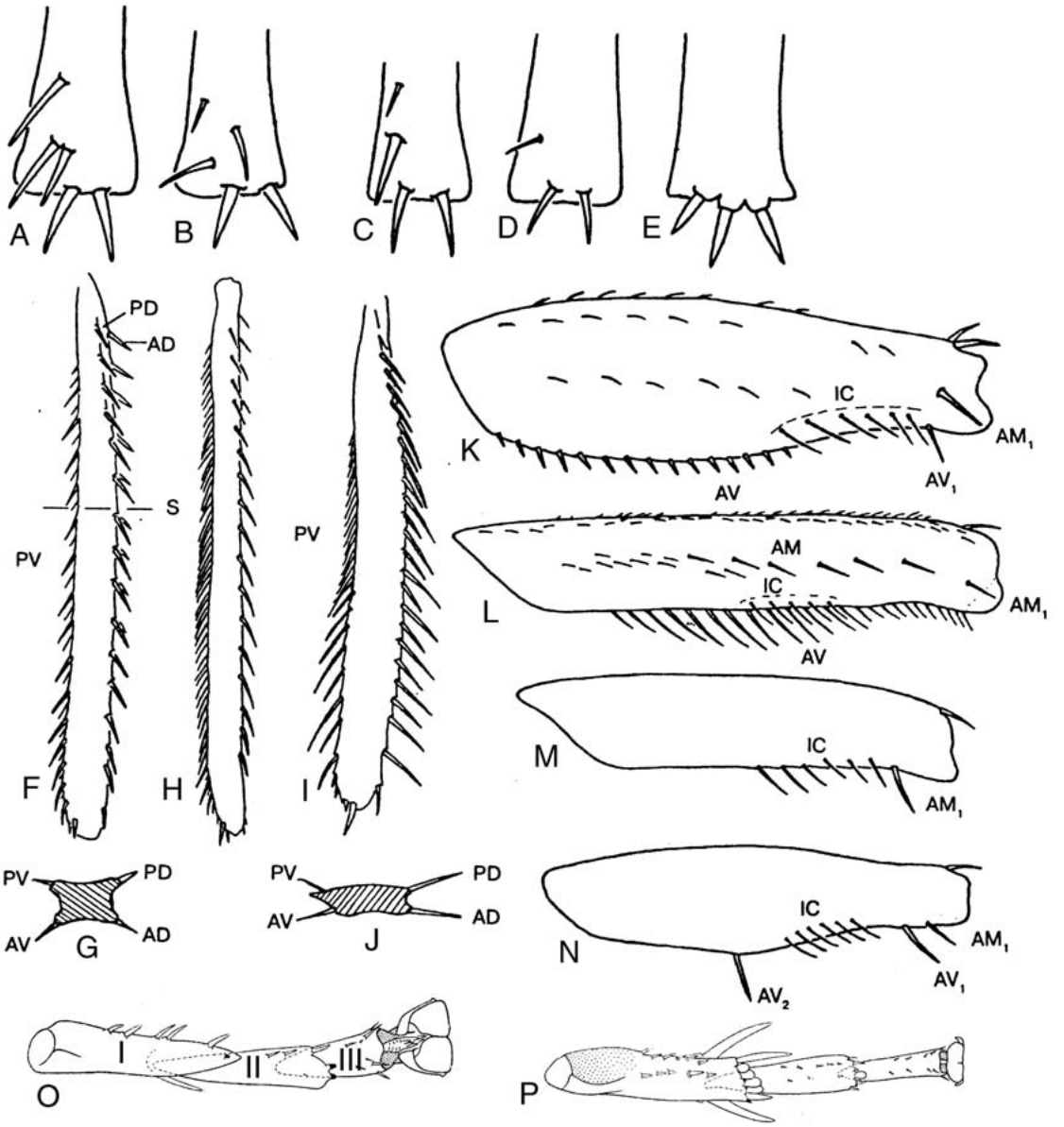


Fig. 7. Leafhopper leg morphology. A-E, apex of hind femur, dorsal view, showing variation in macrosetal formula: A, 2+2+1; B, 2+2+1; C, 2+1+1; D, 2+1; E, 2+1. F-J, right hind tibia, posterior view, except G and J, cross-section: F-G, *Bathysmatophorus* (Errhomenini); H, *Bothrogonia* (Cicadellini); I-J, *Diplocolenus* (Paralimnini). K-N, left front femur, anterior view: K, *Doratura* (Doraturini); L, *Thagria* (Thagriini); M, *Alebra* (Alebrini); N, *Xestocephalus* (Xestocephalini). O-P, hind tarsus, ventral view: O, *Kybos* (Empoascini); P, *Balclutha* (Balcluthini). Drawings A-N from Rakitov (1998), copyright Russian Entomological Journal, used with permission; O-P from Anufriev & Emeljanov (1988).

## IDENTIFICATION

The following key will separate adults of the superfamilies and families of Cicadomorpha. The family classification of Cicadoidea follows that of Moulds (1990); see Duffels & van der Laan (1985) for an alternative classification. That of Cercopoidea follows Metcalf (1960-1962); but see Hamilton (2001) for an alternative classification. That of Membracoidea follows Deitz & Dietrich (1993) and Hamilton (1999).

KEY TO FAMILIES OF CICADOMORPHA

1. Head with three ocelli arranged in triangle on crown . . . . . Cicadoidea, 2

1'. Head with two ocelli, variously positioned, or ocelli absent . . . . . 3

2(1). Pronotum extended to scutellar suture (Fig. 1A) (Australian) . . . . . Tettigarctidae

2'. Pronotum not extended to scutellar suture (Fig. 1B) . . . . . Cicadidae (*sensu lato* = Platypediidae, Plautillidae, Tettigadidae, Tibicinidae)

3(1'). Hind coxa conical (Fig. 5C); tibia cylindrical, often with one or more large preapical spines, but never with rows of enlarged setae; ocelli on crown; body and wing surfaces clothed with fine setae . . . . . Cercopoidea, 4

3'. Hind coxa transverse (Fig. 5F); tibia quadrate, usually with conspicuous longitudinal rows of enlarged setae; ocelli variously positioned; body and wings without a conspicuous vestiture of fine setae . . . . . Membracoidea, 8

4(3). Scutellum much longer than wide; antennal pits deep, concealing antennal base; body length including forewings at rest usually 7 mm or less . . . . . 5

4'. Scutellum little if any longer than wide; antennal pits relatively shallow, base of antenna visible; body length including forewings usually > 7 mm . . . . . 6

5(4). Forewing apices broadly overlapping at rest (Fig. 1D) . . . . . Clastopteridae

5'. Forewing apices not overlapping at rest (Fig. 1E) (Paleotropical) . . . . . Machaerotidae

6(4'). Eye depressed and oblong, distinctly wider than high, less than half its width from forewing base . . . . . 7

6'. Eye globular, no wider than high, usually more than its width from forewing base . . . . . Cercopidae

7(6). Frontoclypeus flattened or concave laterally; eye touching or overlapping forewing base (Neotropical) . . . . . Epipygidae

7'. Frontoclypeus convex throughout; eye not reaching forewing base . . . . . Aphrophoridae

8(3'). Mesanepisternum separated by suture from katepisternum, without dorsal hooklike process (Fig. 5E); pronotum rarely extended to scutellar suture (Signoretiinae), never overlapping scutellum; hind tibia with setae of longitudinal rows usually large and conspicuous . . . . . 9

8'. Mesepisternum not divided by suture, usually with hooklike process dorsally (Fig. 5G); pronotum usually reaching or extending over scutellar suture or, if not, scutellum strongly produced or keeled dorsally; hind tibia with setae of longitudinal rows small and inconspicuous . . . . . 10

9(8). Forewing elytralike (Fig. 2A), hind wing vestigial; mesothoracic coxa with acute basolateral process (Fig. 5B) (Chile and New Zealand) . . . . . Myerslopiidae

9'. Wings variously developed; if forewing elytralike and hind wing vestigial, then mesothoracic coxa without acute basolateral process . . . . . Cicadellidae

10(8'). Pronotum extended posteriorly over and often largely or entirely concealing scutellum or, if scutellum completely exposed, then scutellum with distinct median posterior groove or emargination, or forewing veins M and Cu forming common stem separate from R basally, or both . . . . . Membracidae (= Nicomiidae)

10'. Pronotum not extended posteriorly over scutellum, scutellum completely exposed; forewing veins R and M forming common stem basally or M not clearly united with either R or Cu . . . . . 11

11(10'). Frontoclypeus flat or weakly convex, not produced anteroventrally (Fig. 2E); prothoracic trochanter and femur fused; female pygofer produced posteroventrally (Neotropical and Oriental) . . . . . Aetalionidae

11'. Frontoclypeus strongly convex, produced anteroventrally (Fig. 2D); prothoracic trochanter and femur not fused; female pygofer not produced posteroventrally (Chile) . . . . . Melizoderidae

The interpretation of leafhopper subfamilies and tribes in the following key is based on that of Oman et al. (1990), but with several important exceptions that reflect ongoing revisionary work on the higher classification of Cicadellidae. Following Hamilton (1983), the typhlocybine tribe Helionini is treated as a synonym of Empoascini, and Petalocephalini is treated as a synonym of Ledrini.

Following Hamilton (1983, 1999), Agalliinae, Evansiolinae, and Adelungiinae are considered synonyms of Megophthalminae; these taxa, *sensu* Oman et al. (1990), are here recognized as tribes within Megophthalminae (*sensu lato*). Neopsinae is retained at subfamily rank, following Linnavuori (1978) rather than as a tribe of Macropsinae.

The interpretation of Neocoelidiinae follows Dietrich (2003). Following Dietrich (2004), Nirvaninae is treated as a synonym of Evacanthinae, which includes tribes Evacanthini, Nirvanini, Pagaroniini, and Balbillini. Also following Dietrich (2004), Macroceratogoniini is included as a tribe of Coelidiinae rather than of Evacanthinae. Following Young (1968, 1986) and Linnavuori & DeLong (1977), Errhomeninae (= Bathysmatophorini) and Mileewinae are treated as subfamilies distinct from Cicadellinae. Thus, the present interpretation of Cicadellinae follows Young (1968, 1977) in including only the tribes Cicadellini and Proconiini.

Scarini (=Gyponini) is treated as a tribe of Iassinae following Linnavuori & Quartau (1975), rather than as a distinct subfamily. Following Hamilton (1975), Xestocephalinae is treated as a synonym of Aphrodinae. Following Dietrich & Rakitov (2002) and Dietrich & Dmitriev (2003), the following subfamilies (*sensu* Oman et al. 1990) are considered synonyms of Deltocephalinae: Eupelicinae, Koebeliinae, Paraboloponinae, Penthiniinae, and Selenocephalinae. The name Penthimiinae Kirschbaum, 1868, has priority over Deltocephalinae Dallas, 1870, but the latter name is provisionally retained in view of its long-term usage and because the classification of Deltocephalinae is undergoing revision.

The monobasic subfamily Phlogisinae Linnavuori, 1979, is treated as a junior synonym of Signoretiinae Baker, 1915 (NEW SYNONYMY), and the monobasic tribe Hyalojassini Evans, 1972, is treated as a junior synonym of Iassini Walker, 1870 (NEW SYNONYMY), based on shared characters given in the key.

Two family-group taxa described after the publication of the Oman et al. (1990) checklist are added: Tinterominae, a subfamily described by Godoy & Webb (1994); and Sagmatiini, a tribe of Euacanthellinae described by Hamilton (1999). The endemic South African tribe Equeefini Theron, 1986 (Coelidiinae), is excluded because sufficient material was not available for study. The subfamilies Acostemminae, Arrugadinae, Drakensbergeninae, Mukariinae, and Stegelytrinae, and the tribe Paraphrodini (Aphrodinae) are also excluded. These taxa key to Deltocephalinae and are the subject of an ongoing phylogenetic study and revision of the "deltocephaline-like" leafhoppers (Zahniser & Dietrich, unpublished).

## Key to Subfamilies and Tribes of Cicadellidae

1. Hind tarsomere I acuminate (Fig. 7O), without transverse row of blunt setae; forewing fully developed and without closed anteapical cells (Fig. 6F); small (usually < 5 mm), delicate leafhoppers . . . . . Typhlocybinae, 2

1'. Hind tarsomere I truncate distally (Fig. 7P), usually with transverse row of blunt setae (platellae); forewing usually with one or more closed anteapical cells, or brachypterous; size various, usually not small and delicate . . . . . 8

2(1). Forewing with appendix (Fig. 3A) . . . . . Alebrini

2'. Forewing without appendix (Fig. 6F) . . . . . 3

3(2'). Hind wing with submarginal vein present at wing apex (Fig. 3A) . . . . . 4

3'. Hind wing submarginal vein absent at wing apex (Fig. 6K, M) . . . . . 6

4(3). Hind wing submarginal vein extended around wing apex, continuous with vein R2+3 (Fig. 3A) . . . . . Dikraneurini

4'. Hind wing vein vein R2+3 absent, or if present, not continuous with submarginal vein (Figs. 6M-O) . . . . . 5

5(4'). Hind wing with R4+5 and M1+2 free, connected by crossvein (Fig. 6O) (New World) . . . . . Jorumini

5'. Hind wing with R4+5 and M1+2 confluent distally (Fig. 6N) . . . . . Empoascini (=Helionini)

6(3'). Hind wing vannal vein unbranched (Fig. 6M); forewing inner apical cell elongate, extended to apex; face with lorum well separated from margin of maxillary plate ventrally . . . . . Erythroneurini

6'. Hind wing vannal vein branched (Figs. 6K); forewing inner apical cell short, oblique, not extended to apex (Fig. 6F); face with lorum extended to lower margin of maxillary plate . . . . . 7

7(6'). Hind wing with distal segment of CuA absent, submarginal vein apparently connected directly to CuA preapically (Old World) . . . . . Zyginellini

7'. Hind wing with distal segment of CuA present, submarginal vein apparently connected to CuA by crossvein (Fig. 6K) . . . . . Typhlocybini

8(1'). Mesanepisternum with horizontal keel; head and pronotum coarsely pitted; setae of hind tibial rows small and inconspicuous; head with maxillary plate and gena separated by distinct cleft (Old World) . . . . . Ulopinae, 9

8'. Mesanepisternum not keeled (Fig. 5F); head and pronotum with or without coarse pits; hind tibia with well developed macrosetae; head with maxillary plate and gena fused, at most separated by suture . . . . . 11

9(8). Body elongate, seed shaped; head more than 2× longer than pronotum (South Africa, Australia) . . Cephalelini

9'. Body robust, ovoid; head usually less than 2× longer than pronotum . . . . . 10

10(9'). Ocelli absent; forewing sexually dimorphic, that of male short and truncate, that of female emarginate apically (New Guinea) . . . . . Monteithiini

10'. Ocelli usually well-developed, on crown; forewings not sexually dimorphic . . . . . Ulopini

11(8'). Hind femur with only 3 short, stout macrosetae grouped at apex (Fig. 7E); proepisternum large, not concealed by gena (Fig. 4G) . . . . . Ledrinae, 12

11'. Hind femur without 3 short, stout macrosetae grouped at apex, if only three macrosetae present on femur, then one distinctly preapical (Fig. 7D); proepisternum concealed or exposed . . . . . 15

12(11). Anterior margin of pronotum weakly produced, not extended as far as anteromedial corners of eyes (Fig. 4I); ocelli on crown distant from margin; head usually spatulate . . . . . 13

12'. Anterior margin of pronotum produced to or anterad of anteromedial corners of eyes (Fig. 4J); ocelli position variable, if on crown, not distant from margin; head usually not spatulate (Australia) . . . . . 14

13(12). Forewing appendix well developed, extended around wing apex (Fig. 6G) (New World) . . . . . Xerophloeini

13'. Forewing appendix greatly reduced or absent (Fig. 6F) . . . . . Ledrini (=Petalocephalini)

14(12'). Rostrum elongate, extended to or beyond hind coxae; forewing anal veins confluent distally . . . Stenocotini

14'. Rostrum not extended to hind coxae; forewing anal veins free . . . . . Thymbrini

15(11'). Ocelli absent, wings vestigial, overall habitus beetlelike . . . . . 16

15'. Ocelli on face, distinctly below margin of crown (Fig. 4D) and not visible from above; hind femur macrosetal formula usually 2+1 (Figs. 7D, E) or 2+0, rarely 2+1+1 (Fig. 7C) . . . . . 17

15". Ocelli on crown (Fig. 4K) or on anterior margin of head (Figs. 4B, C); if crown not delimited and head broadly rounded in profile, or ocelli distinctly below sharply delimited crown margin, then hindwing veins R4+5 and M1+2 confluent distally, or middle trochanter with stout ventral seta, or hind femur macrosetal formula 2+2+1 (Figs. 7A, B) . . . . . 28

16(15). Abdomen with prominent paired dorsal tubercles (Australia, Madagascar) . . . . Euacanthellinae, Sagmatiini

16'. Abdomen without paired dorsal tubercles (Juan Fernandez Islands, Chile) . . . . . Megophthalminae, Evansiolini

17(15'). Pronotum strongly produced, anterior margin extended anterad of eyes (Fig. 4J) . . . . . 18

17'. Pronotum not or weakly produced, anterior margin not extended anterad of eyes (Fig. 4I) . . . . . 21

18(17). Proepisternum large, not concealed by gena (Fig. 4G); hind wing vein R2+3 absent, submarginal vein not extended along costal margin basad of R4+5 (Fig. 6I) (worldwide except Neotropical) . . . . . Macropsinae

18'. Proepisternum small, entirely concealed by gena; hind wing vein R2+3 present (Fig. 3A), submarginal vein extended along costal margin basad of R4+5 . . . . . 19

19(18'). Head with lateral frontal sutures obsolete; hind tibia row AD with small cucullate setae between larger macrosetae; coloration pale with darker markings on head and pronotum (South America) . . . . . Neopsinae

19'. Head with lateral frontal sutures well developed; hind tibia row AD with intercalary setae, when present, not cucullate; coloration black or reddish brown, without distinct markings . . . Nioniinae, 20

20(19'). Forewing crossvein s present (Fig. 6A), anal veins connected by crossvein; male with aedeagal shaft undivided, with single gonopore (Old World) . . . . . Magnentiini

20'. Forewing crossvein s usually absent, anal veins not connected by crossvein; male with aedeagal shaft divided, with two gonopores (New World) . . . . . Nioniini

21(17'). Forewing distinctly and densely granulose; hind tibia macrosetal row PD with 0-1 more macrosetae than row AD; ovipositor with first valvula sculpturing not strigate. . . . . Megophthalminae (part), 22

21'. Forewing glabrous; hind tibia macrosetal row PD with many more macrosetae than row AD; ovipositor with first valvula sculpturing strigate . . . . . 24

22(21). Face and pronotum coarsely punctate; frontal sutures carinate (Europe, Africa, and western North America) . . . . . Megophthalmini

22'. Face and pronotum not, or only sparsely punctate; frontal sutures when present not carinate . . . . . 23

23(22'). Forewing venation reticulate; clypeal suture well developed, transverse (North Africa, Middle East, and Central Asia) . . . . . Adelungiini

23'. Forewing venation not reticulate (rarely with a few extra crossveins); clypeal suture arcuate, obsolete medially . . . . . Agalliini

24(21'). Head with crown short but distinctly delimited, flat (Australia) . . . . . Austroagalloidinae

24'. Head with crown poorly delimited, convex, rounded to face . . . . . 25

25(24'). Forewing with crossvein r-m1 elongate, connected between R2+3 and R4+5 (or R with supranumerary branches), with three m-cu crossveins; hind femur in repose not reaching prothorax (Australia). . . . . Eurymelinae, 26

25'. Forewing crossvein r-m1, if present, short, oblique, connected between R1 and R2+3, with two m-cu crossveins (Fig. 6E), or if three present, then s crossvein present and membrane not opaquely sclerotized; hind femur in repose reaching prothorax (worldwide, including Australia) . . . . . Idiocerinae

26(25). Head narrower than hind margin of pronotum; hind tibia row AD with macrosetae evenly distributed and subequal in size. . . . . Pogonoscopini

26'. Head as wide as or wider than hind margin of pronotum; hind tibia row AD with distal setae enlarged with spinose bases . . . . . 27

27(26'). Forewing opaquely sclerotized; male plates with accessory processes . . . . . Eurymelini

27'. Forewing translucent; male plates without accessory processes . . . . . Ipoini

28(15"). Forewing with inner apical cell elongate, vein M3+4 connected to submarginal vein near wing apex (Fig. 6A), or, if forewing reduced (brachypterous), then crown elevated and shelflike mesad of eyes (Fig. 4A); crown between eyes less than twice as wide as median length; anterior margin of pronotum not extended anterad of eyes in dorsal view. . . . . 29

28'. Forewing with inner apical cell shorter (rarely narrow and elongate, Fig. 6D), distal segment of vein M3+4 convergent toward commisural margin and connected to submarginal vein well basad of wing apex (Figs. 3A, 6B-F); or, if M3+4 connected to submarginal vein near wing apex or forewing brachypterous, then crown between eyes more than twice as wide as long, not elevated and shelflike mesad of eyes, and/or anterior margin of pronotum extended anterad of eyes in dorsal view . . . . . 50

29(28). Rostrum with distal segment ≥2× longer than penultimate segment; antennal base in anterior view adjacent to anteroventral corner of eye, ledge absent or very weak; crown width between eyes usually less than eye width; front tibia with accessory row of setae between rows AD and AV . . . . . Coelidiinae, in part, 30

29'. Rostrum with distal segment little, if any, longer than penultimate segment; antennal base in anterior view near mid-height of eye, ledge well-developed; crown width between eyes greater than 1.5× eye width; front tibia without accessory row of setae between rows AD and AV . . . . . 37

30(29). Base of forewing concealed by pronotum; usually brachypterous (New World) . . . . . Tinobregmini

30'. Base of forewing exposed; very rarely brachypterous . . . . . 31

31(30'). Pronotum bicarinate laterally, crown with pair of arcuate longitudinal keels (Neotropical) . . . . Sandersellini

31'. Pronotum unicarinate laterally, crown without keels . . . . . 32

32(31'). Crown distinctly elevated above level of eyes, usually strongly produced anteriorly and with distinct striations convergent toward apex (Fig. 4A); male subgenital plate usually appearing two-segmented . . 33

32'. Crown weakly or not elevated above level of eyes, weakly produced anteriorly and usually without distinct longitudinal striations; male plate not two-segmented . . . . . 35

33(32). Aedeagus with a single shaft and symmetrical, fused to connective; subgenital plate sparsely setose (Afrotropical) . . . . . Hikangiini

33'. Aedeagus bipendulate or asymmetrical, articulated to connective; plate profusely setose . . . . . 34

34(33'). Aedeagus with two shafts (except *Neotharra*); style claw- or hooklike apically (Paleotropical) . . . . . Tharrini

34'. Aedeagus with single shaft; style not clawlike, rarely hooklike apically (Neotropical) . . . . . Youngolidiini

35(32'). Frontoclypeus with complete median longitudinal carina (Fig. 4A) . . . . . Teruliini

35'. Frontoclypeus without or with partial median longitudinal carina . . . . . 36

36(35'). Prothoracic tibia and femur flattened or foliaceous (Neotropical) . . . . . Gabritini

36'. Prothoracic tibia and femur slender . . . . . Coelidiini

37(29'). Forewing membrane clothed with setae and/or scales; abdomen strongly depressed (Afrotropical and Oriental) . . . . . Hylicinae

37'. Forewing membrane without setae or scales; abdomen tectiform . . . . . 38

38(37'). Hind femur macrosetal formula 2+2+1 (Figs. 7A, B) or with supranumerary setae . . . . . 39

38'. Hind femur macrosetal formula 2+1+1 (Fig. 7C), 2+1 (Fig. 7D, E), or 2+0 . . . . . 41

39(38). Anterior margin of head with, at most, a single transverse carina; hind wing veins R4+5 and M1+2 usually confluent apically (Fig. 6J) (New World only) . . . . . Neocoelidiinae

39'. Anterior margin of head with more than one transverse carinae or with irregular striations; hind wing veins R4+5 and M1+2 free, connected by crossvein . . . . . 40

40(39'). Frontoclypeus strongly inflated (eastern Palearctic and western Nearctic) . . . . . Evacanthinae, Pagaroniini

40'. Frontoclypeus flat (N. Australia and New Caledonia) . . . . . Coelidiinae, Macroceratogoniini

41(38). Pronotum extended to scutellar suture, coarsely punctate (Afrotropical and Oriental) . . . . . Signoretiinae (=Phlogisinae)

41'. Pronotum not extended to scutellar suture (Figs. 3A, 5D), punctations indistinct or absent . . . . . 42

42(41'). Forewing fully developed, vein r-m1 absent (Fig. 6B); frontoclypeus with partial or complete median longitudinal carina (Fig. 4A); or if carina absent, frontoclypeus strongly flattened medially, or front femur with single enlarged ventral seta near midlength (Fig. 7N), or both . . . . . Evacanthinae (part), 43

42'. Forewing fully developed with vein r-m1 present (Fig. 3A) or brachypterous; or, if forewing fully developed and r-m1 absent, then frontoclypeus without median carina and not strongly flattened medially, and front femur without single enlarged ventral seta near midlength . . . . . 45

43(42'). Frontoclypeus with complete median carina (Fig. 4A) . . . . . Evacanthini

43'. Frontoclypeus with median carina incomplete or absent . . . . . 44

44(43'). Pro- and mesothoracic tibiae flattened; crown notched anterad of eye, scape of antenna visible in dorsal view (Paleotropical) . . . . . Balbillini

44'. Pro- and mesothoracic tibiae cylindrical; crown entire, concealing scape in dorsal view (Fig. 4K) . . . . Nirvanini

45(42'). Hind wing submarginal vein on or very near wing margin apically (Fig. 6L) (rare inhabitants of tropical cloud forests) . . . . . 46

45'. Hind wing submarginal vein well separated from apical margin (Fig. 3A) . . . . . 48

46(45). Crown margin distinctly carinate; pronotum extended nearly to scutellar suture, distinctly punctate (Philippines) . . . . . Makilingiinae

46'. Crown margin not carinate; pronotum not extended nearly to scutellar suture, puctures if present small and indistinct . . . . . 47

47(46'). Forewing crossvein r-m1 present, appendix inconspicuous; hind tarsus more than half length of tibia (Neotropical) . . . . . Tinterominae

47'. Forewing crossvein r-m1 absent, appendix well developed; hind tarsus less than half length of tibia (Pantropical) . . . . . Mileewinae

48(45'). Antennal ledge in dorsal view prominent; hind femur in repose not attaining posterolateral margin of prothorax (New World) . . . . . 49

48'. Antennal ledge in dorsal view not prominent; hind femur in repose usually attaining posterolateral margin of prothorax . . . . . Cicadellinae, Cicadellini

49(48). Body cylindrical, crown margin not or indistinctly carinate . . . . . Cicadellinae, Proconiini

49'. Body strongly depressed, crown margin sharply carinate (South America) . . . . . Phereurhininae

50(28'). Proepisternum large, not concealed by gena (Fig. 4G); head in dorsal view little, if any, longer than wide; ocelli on crown well separated from margin . . . . . 51

50'. Proepisternum small, concealed by gena (Fig. 4H), or if proepisternum exposed, then head in dorsal view more than twice as long as wide and ocelli on or very near crown margin . . . . . 52

51(50). Gena acutely emarginate or with deep antennal grooves; hind femora without supranumerary macrosetae (Australia) . . . . . Euacanthellinae, Euacanthellini

51'. Gena not acutely emarginate, without antennal grooves (Fig. 4E); hind femur with supranumerary macrosetae (Holarctic) . . . . . Errhomeninae

52(50'). Front tibia with distinct accessory longitudinal row of setae adjacent to row AV on anterior surface near base; male subgenital plates fully exposed, constricted basally, broadened distally (Neotropical) . . . . . Neobalinae

52'. Front tibia without accessory row of setae adjacent to row AV on anterior surface (scattered setae may be present); male subgenital plates of various shapes, sometimes concealed by sternite VII . . . . . 53

53(52'). Head with lateral frontal sutures partly or completely obsolete and not extended to ocelli; if head >2× longer than wide in dorsal view then ocelli not on or slightly above crown margin; male valve and subgenital plates partly to completely concealed by enlarged abdominal sternite VII . . . . . Iassinae (part), 54

53'. Head with lateral frontal sutures well developed and extended to or very near ocelli; or, if lateral frontal sutures not extended to ocelli, then either head >2× longer than wide in dorsal view and ocelli on or slightly above or below crown margin, or male valve and subgenital plates not concealed by enlarged abdominal sternite VII, or both . . . . . 60

54(53). Hind wing veins R4+5 and M1+2 confluent near apex (Fig. 6J), or if veins free, then head in profile broadly rounded, without distinctly delimited crown . . . . . 55

54'. Hind wing veins R4+5 and M1+2 free (Fig. 6H-I), crown well delimited . . . . . 58

55(54). Crown strongly depressed and produced, margin well delimited . . . . . 56

55'. Crown convex, not or only weakly produced, rounded to face . . . . . 57

56(55). Ocelli on or near margin of crown (Australia) . . . . . Reuplemellini

56'. Ocelli on crown, distant from margin (Madagascar) . . . . . Platyjassini

57(55'). Head distinctly bent at right angle across antennal ledges, crown vertical and forming continuous curve with strongly declivous pronotum (Australia) . . . . . Trocnadini

57'. Head with crown and face more or less evenly convex, pronotum usually weakly declivous . . . . . Iassini (=Hyalojassini)

58(54'). Ocelli on crown distant from margin . . . . . Scarini (=Gyponini)

58'. Ocelli on anterior margin of head . . . . . 59

59(58'). Forewing with venation reticulate distally, inner apical cell narrow, acuminate (Paleotropical and Caribbean) . . . . . Krisnini

59'. Forewing venation with, at most, 1-2 supranumerary crossveins, inner apical cell broad (New Caledonia) . . . . . Selenomorphini

60(53'). Pronotum strongly produced, anterior margin extended anterad of eyes (Fig. 4J) . . . . . 61

60'. Pronotum not or weakly produced, anterior margin not extended anterad of eyes (Fig. 4I) . . . . . 62

61(60). Hind tibia macrosetal row AD with small cucullate setae interspersed between large setae; forewing membrane without conspicuous setae (Australia) . . . . . Tartessinae

61'. Hind tibia macrosetal row AD without cucullate intercalary setae; forewing membrane with conspicuous setae (South America) . . . . . Iassinae, Bythoniini

62(60'). Front femur row AV with single stout seta near midlength; female with ovipositor distinctly arcuate . . . . . Aphrodinae, Xestocephalini

62'. Front femur row AV with more than one stout seta or setae absent near midlength; female with ovipositor straight or somewhat recurved . . . . . 63

63(62'). Forewing anal veins free, clavus without crossveins; male subgenital plates constricted basally, widest near or beyond midlength (Fig. 3E); valve with posterior margin not angulately produced; style slender, not broadly bilobed basally . . . . . Aphrodinae (part), 64

63'. Forewing with or without one or more crossveins in clavus, or anal veins partially confluent; male subgenital plates not constricted basally, widest near base and tapered toward apex (Fig. 3D); valve with lateral margin short and posterior margin usually distinctly produced and angulate medially (Fig. 3D); style usually broadly bilobed basally (Fig. 3D) . . . . . Deltocephalinae (*sensu lato* = Eupelicinae, Koebeliinae, Paraboloponinae, Penthimiinae, and Selenocephalinae)

Note: Acostemminae, Arrugadinae, Drakensbergeninae, Mukariinae, and Stegelytrinae, *sensu* Oman et al. (1990) will also key here.

64(63) Frontoclypeus in facial view at least 2× longer than wide; hind wing submarginal vein well developed (Neotropical) . . . . . Portanini

64'. Frontoclypeus in facial view little or no longer than wide; hind wing with submarginal vein obsolete apically (Fig. 4N) (Holarctic) . . . . . Aphrodini

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