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THE PSYLLIDS OF AMERICA  
NORTH OF MEXICO (PSYLLIDAE: HOMOPTERA)  
(Subfamilies Psyllinae and Triozae)

LEONARD D. TUTHILL

Department of Zoology and Entomology, Iowa State College

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## INTRODUCTION

The psyllids, sometimes called jumping plant lice, are small homopterous insects constituting the family Psyllidae. They resemble the plant lice or aphids in many respects but may be distinguished from them by the stout legs which are adapted for leaping, the presence of nine or ten segments in the antennae (three to six in the aphids), the greater sclerotization of the exoskeleton, and the venation of the wings which, although somewhat variable, is quite unlike that of the aphids.

Although much interest exists concerning those species which are of economic importance, taxonomic work in the group has been sporadic since the publication, in 1914, of Crawford's monograph of the forms known to occur in the Western Hemisphere. Numerous new forms have been described since that time in scattered articles. This presentation is an attempt to incorporate the known data, other than that of purely economic import, of all the forms of the two principal subfamilies known to occur in America north of Mexico. It is hoped that it will be of interest and value not only to insect taxonomists but also to all those who are interested in these insects for any reason.

## HISTORICAL RESUME

In 1851 Fitch described six species of psyllids from the state of New York. This is apparently the first definite record of the occurrence of these animals in North America. The following year Walker, in his List of the Homopterous Insects of the British Museum, listed Fitch's species, several more of Fitch's manuscript names, and added one new species from Hudson Bay. Provancher added three names to the list in 1872. In 1890 he described six species as new, then in the Errata and Corrigenda of the same volume made two of them synonyms of his older species. Unfortunately, he had the genera confused. Although one can almost be positive of what his genera really were, the specific descriptions are almost entirely of the coloration except for characters which are of only generic or family significance. Until his specimens can be seen (if they are still extant), his names must remain *nomina inquirenda*. Beginning in 1876 C. V. Riley published various articles on Psyllidae intermittently for the next fifteen years, describing several new genera and species. Various workers added a few names to the growing list of species known from

North America until, when Mally published a list of all such in 1894, a total of thirty-one species was listed (several of these have since proved to be synonyms). The first worker in this country to take an active interest in other than North American forms was Schwarz, who made a few contributions to the knowledge concerning this group in other parts of the world as well as describing several new forms from this continent.

About 1910 two workers, who were to add a great deal to our fund of knowledge of the psyllids, became interested in this family. The first of these was Patch, who described numerous species, noted the life history of several, and worked out the wing venation, homologizing it with the venation in other Homoptera and applying the Comstock-Needham system of nomenclature to the veins. The second was Crawford, who culminated several years of very active work with his Monograph of the Jumping Plant-Lice or Psyllidae of the New World in 1914. In this paper he revised the subfamily classification. As far as the North American genera are concerned at least, this classification appears to be valid for the most part, and it is followed here without exception, as the possible misinterpretations are in those subfamilies which are largely exotic and with which the author is not familiar. Crawford continued active work in the field until quite recently, but as soon as he removed to Hawaii most of his interest devolved to the Pacific fauna.

Numerous contributions have been made since Crawford's work, notably by Ferris, Klyver, Van Duzee, and Caldwell. The forms of economic importance have, of course, received a great deal of attention, especially the pear psylla (*Psylla pyricola* Förster) and the potato psyllid (*Paratriozza cockerelli* (Sulc)). A very voluminous literature has developed about these two species.

#### GENERAL DISCUSSION

##### MORPHOLOGY

The first extensive work on the structure of the Psyllidae was that of Witlaczil who in 1885 published his *Die Anatomie de Psylliden* (reviewed by Macloskie, Am. Nat. 20, 1886), treating not only the external anatomy but also the internal structure, with especial emphasis on the nervous system. Stough, 1910, published on *Pachypsyllea celtidis-mamma* at some length, but as this species is one of the more specialized and was studied without a background of the generalized species, his interpretations are somewhat erroneous. As is mentioned above, Patch determined the homologies of the wing veins in 1909.

Crawford's work on the external morphology remains as the most complete and thoroughly done. With a few changes in terminology, his interpretations are followed by the author. The figures explanatory of the morphology are adapted from those of Crawford (Figs. 2, 3, 4, 5, and 6).

The structure of the nymphs has received comparatively little attention. Mally described and figured a few in 1895. Ferris has published

several papers on various species. He started a series in which he planned to study the nymph of the type of each genus; this was subsequently turned over to Klyver and unfortunately seems to have been abandoned.

As this family is of world-wide distribution and is quite highly evolved, great variation in structure occurs, and considerable work remains to be done in homologizing and interpreting structures both within the family and with other Homoptera.

##### BIOLOGY

The biology of the forms in this family has received but desultory interest for the most part. Notes on observations of time of emergence of adults, egg-laying, appearance of nymphs, gall formation, etc., make up the bulk of our knowledge. The complete life cycle of several species has been worked out, however; Ashmead (1881) being the first to give such data for some of his species. Among others who have recorded some complete life cycles are Mally, Ferris and Hyatt, and Caldwell. The biology of the economically important species has, of course, been studied extensively, and most of their life cycles are known in detail. Much more life history work needs to be done, as much of the taxonomic work is, and shall remain quite uncertain until biological evidence such as the amount of variation within a species, the degree of host specificity, etc., is known. This is especially true in *Aphalara*, *Aphalaroida*, and certain complexes of *Trioza* and *Psylla*.

The most common life cycle finds the adult as the overwintering stage, the eggs deposited singly on the foliage of the host plant in the spring, one or more generations developing through the summer. Several species, however, overwinter as nymphs, emerging as adults late the following spring. This variation in life cycle occurs between members of the same genus.

The coloration of both nymphs and adults is quite variable as has been noted by all who have worked on these insects. Löw, Mally, Froggatt, Patch, Caldwell, and others have remarked on this variation and noted that it occurs among individuals of the same age and brood and that there is no correlation between the amount of pigmentation in the nymph and the adult.

Without known exception the members of this family are plant feeders, sucking the sap and cell contents from their hosts. The great majority live upon trees and shrubs. Some occur on herbaceous plants of various kinds other than grasses (Gramineae). There are a few that develop on *Juncus*, however.

The feeding of the nymphs of many species causes the production of galls or pseudogalls on their hosts. Among the more remarkable gall-formers are the pachypsyllids—the entire genus produces galls on the leaves, twigs, or branches of *Celtis* spp. (hackberries). In most of the other genera occasional species cause gall formation. Some species, not-

ably *Paratriozia cockerelli*, apparently inject a toxic material into the host plant, thereby causing a physiological disturbance, an insect disease.

The different species vary markedly in the amount of host specificity which they exhibit, some being limited to a single species and others developing on a number of hosts of various degrees of relationship. The adults seem to be able to maintain themselves on a wider variety of plants than the immature stages. At least a few species apparently have a definite alternation of hosts between the nymphal and imaginal stages, although the adult host range does not seem to be as limited as it is in many of the aphids which exhibit the same type of relationship. Because of the variability in the feeding habits of the adults, no plants are recorded in the following pages as hosts unless it is quite certain that the nymphs develop thereon. The literature of this group is full of references to hosts many of which seem to have been merely plants on which adults were resting at the time of collection. All recorded host records are, therefore, disregarded unless there is some evidence given that the plant named as host actually supports the developmental stages. Unfortunately, such discrimination has not always prevailed, and thus we have species named for plants which are not hosts at all.

The production of honey dew and of wax is general throughout the family. Many of the nymphs secrete large quantities of wax which may occur as a filamentous or a powdery deposit. Some of the adults also secrete wax but usually in less abundance.

#### COLLECTING AND PRESERVING

The psyllids are commonly overlooked by most collectors due in part to their small size but even more to their habits when swept up in a net. For several minutes after being thus captured, most of the specimens remain quiet in any debris which may be present in the net. Their first activity is usually to jump from the net in two or three leaps. This type of action causes them to be very easily missed.

As most of the species occur on trees and shrubs and many cling very tightly to the host, the ordinary type of sweeping often fails to dislodge them. Beating or a thorough shaking of a plant within the net will sometimes produce specimens which are utterly unobtainable by other means. They are so small and jump so quickly that an aspirator, while not indispensable, is of the greatest aid in their capture.

The adults may be preserved in alcohol or mounted dry on points or minuten nadeln. Mounting of the entire insect on slides after clearing and dismembering as practiced and recommended by Ferris and Klyver, who carried the idea over from the former's work with coccids, is not satisfactory. This is especially true where only one or two specimens are known. By this method one can ascertain many minutiae, of course, such as the exact number and shape of setae or glands, but some of the more general and certainly more usable characters, such as proportionate length of various parts, shape of vertex and genal processes, angle of the latter with respect to the vertex, and color, are lost. It is often desirable

to clear and study some parts, such as the genitalia, under higher magnifications. When this is necessary a temporary glycerine mount of the cleared parts is preferable for study; after such study is completed, the part or parts are placed, still in a small drop of glycerine, in a minute vial, covered with refined mineral oil, corked, and placed with the untreated part of the insect by pinning through the cork. In this way the material is always available for further study, it may be viewed from any angle, further dissection may be made if desired and no distortion occurs such as is unavoidable in slide mounts. By the use of oil to cover and thus seal off the small drop of glycerine, any possibility of its creeping out and rusting the pin or ruining the label is forestalled.

Nymphs, on the other hand, are best preserved and studied as permanent slide mounts. As they are quite strongly flattened, almost no distortion occurs in such mounting nor are any characters obscured.

#### EXPLANATION OF TERMS AND METHODS

In order to prevent misunderstanding and confusion, the following explanations and definitions are given.

Only the over-all length from the tip of the head to the tip of the folded wings is given in millimeters. In making this measurement the insect is measured with a millimeter rule under a binocular microscope. This measuring is not done more accurately and no other such measurements are given for the reason that it has become evident from study of large series of specimens of various species that so much variation in size occurs within a species that exact measurements are of little significance. The proportions between various parts of the insect are in general quite constant, however, and have been utilized in lieu of metric fractions in the conviction that they are of much more value than the latter. The proportional measurements are made by means of a squared eyepiece in the ocular of the microscope.

The principal mensural terms are defined as follows:

*Width of head*—distance across head including eyes.

*Length of vertex*—total length from most caudal points to most anterior points, measured with vertex flat (not the median length).

*Width of vertex*—width between compound eyes.

*Length of genal processes*—length measured on median line from base of frons to apices of processes.

*Length of antennae*—total length including the two basal segments.

*Width of thorax*—width at widest point, as seen in dorsal view, usually across mesoscutum.

*Length of forewing*—total length measured parallel to straight portion of anal margin.

*Width of forewing*—greatest width at any point.

Wherever such comparative terms as long, short, large, etc., are used, they mean, of course, in proportion to the rest of the insect and imply comparison with the same structure in related species.

All descriptions are from dried specimens unless otherwise indicated.

The term *genal processes* has been substituted for *genal cones* as used by Crawford *et al.*, to obviate the absurdity of such expressions as, cones conical, cones transverse, etc.

The cell in the forewings between the branches of media is termed the *medial cell*, and that between the branches of cubitus, the *cubital cell*, for reasons of brevity and convenience. These names are much less confusing than the previously used *first marginal* and *second marginal*.

In those descriptions in which minute setae on the wing membrane are referred to, the tiny setae which were called points by Ferris *et al.* are meant, not the larger hairlike setae which occur quite commonly on the veins and occasionally on the membrane. These minute setae are often continuous with, but much smaller than those which make up the radular areas near the wing margin (the alar radulae of authors).

A group of individuals is considered as a *subspecies* when it shows some constant but minor morphological differences, usually coupled with a somewhat different range. Such probably represent incipient species.

*Variety* as herein used refers to a distinct, constantly reappearing variation in color or color pattern. Most of Crawford's varieties are based on morphological differences and are here classed as *subspecies*.

#### SYNONYMY AND BIBLIOGRAPHY

Under each species is listed the complete synonymy as known to the author. A complete list of references is included for most of the species. For those forms which are of considerable economic importance or for some other reason have received great attention, the list is necessarily curtailed and includes only those which are deemed pertinent to a work of this nature, that is, those which deal with the taxonomy, biology, or morphology of the species, or which contain a considerable bibliography of other types of papers. In these specific lists only abbreviated references are given. In the bibliography the complete title of the paper and of the publication is given.

The bibliography includes all works cited plus other important contributions with especial emphasis on those not included in Crawford's monograph.

Except where otherwise indicated, the original of all references has been seen.

#### ILLUSTRATIONS

An attempt has been made to include all such illustrations as are necessary for identification of species, but unnecessary repetition has been avoided as much as possible. Illustrations occurring in the literature which have been found satisfactory have been used in lieu of preparing new drawings. In choosing such illustrations, preference has been given to drawings published with the original description or those known to be of the type specimens. All such figures used have been checked against specimens wherever they have been available, and slight changes have

been incorporated in many. The author of each figure is given in the list of illustrations, those not otherwise credited are original.

#### LOCATION OF TYPES

Some of the insects in Fitch's collection, including the *Psyllidae*, found their way to the United States National Museum, and the types of his psyllid species are there. Van Duzee (Can. Ent. 44: 317-329) discussed Provancher's collection, which he had studied, but he made no mention of the *Psyllidae*. It seems doubtful, therefore, that they have been preserved. Riley's types (where designated) are in the National Museum as are those of Ashmead and Schwarz. Mally's types, the location and existence of which have been problematical, are in the Iowa State College collection at Ames, Iowa. In reply to a query concerning the types of some of her species, Dr. Patch replied that the specimens "must be among those lent some time ago to someone who has not yet returned them." Whether this means that all of her types are thus lost I am unable to say. As the type specimens were not listed as such in many cases, no data concerning them have been available. Fortunately, photographs were published with her descriptions which make the identity of most of her species quite certain. Crawford's types are in the United States National Museum, and in his own collection, which has been recently added to the National Museum. The whereabouts of Klyver's types is unknown to the writer—presumably they are in his personal collection at San Mateo Junior College, San Mateo, California. Those of Van Duzee are in the Museum of the California Academy of Sciences. Caldwell reports that his types are in the Ohio State University collection. The European workers who have described species occurring in North America seem to have designated no types; at least no mention of them has been made in the literature.

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It was at the suggestion of Dr. C. J. Drake that this work was initiated, and it has been pursued under his direction. Dr. H. H. Knight and Dr. H. M. Harris have been of great assistance by their constant help and suggestions.

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## SYSTEMATIC TREATMENT

### FAMILY PSYLLIDAE LATREILLE

- 1807 *Psyllidae* Latreille, Gen. Crust. Ins. 3:168.
- 1810 *Psyllidae* Latreille, Consid. Gen. sur L'Ordre Nat. Anim. 252, 264.
- 1814 *Chermides* Fallen, Spec. Nova. Hemip. Disp. Meth. Exhib. 3, 22.
- 1815 *Psyllides* Leach, Edinb. Encycl. 9:125 [fide Aulmann].
- 1825 *Psyllodes* Latreille, Fam. Nat. Règne Anim. 428.
- 1835 *Psyllodes* Burmeister, Handb. d. Ent. 2:95.
- 1840 *Psylliens* Blanchard, Hist. des Ins., Hemip. 201.
- 1847 *Saltipedes* Amyot, Ann. Soc. Ent. Fr. 5 (2nd series):456.
- 1861 *Psyllodea* Flor, Rhyn. Lvl. 2:438.
- 1861 *Psyllodes* Flor, Bull. Soc. Imp. Nat. Moscou 34:331.
- 1874 *Psyllodae* Lethierry, Cat. Hemip. du Nord. ed. 2:85 [fide Aulmann].
- 1876 *Psyllidae* Scott, Trans. Ent. Soc. London 1876:525-570.
- 1896 *Psyllina* Edwards, Hemip.-Homop. Br. Is.
- 1904 *Chermidae* Kirkaldy, Ent. 37:255.
- 1908 *Psyllidae* Oshanin, Verz. palae. Hemip. 2:338.
- 1912 *Psyllidae* Oshanin, Kat. paläa. Hemip. 125.
- 1913 *Psyllidae* Aulmann, Psy. Cat. 5.
- 1914 *Psyllidae* Crawford, U. S. Nat. Mus. Bull. 85.
- 1917 *Chermidae* Van Duzee, Cat. Hemip. N. Am. 782.
- 1933 *Psyllina* Haupt, Tierw. Mittel. 4, 3:221, 222.

Antennae filiform, usually of ten segments, sometimes fewer. Three ocelli, one medial on frons, two lateral near compound eyes near caudal edge of vertex. Genae often produced, variously shaped. Beak arising from posterior portion of head, usually enclosed by forecoxae, apparently arising between them. Thorax strongly developed for flying and jumping. Two pairs of wings, usually membranous, anterior pair sometimes thickened, coriaceous, veins of forewings consisting of radius (branched once), media (branched once), cubitus (branched once), first A (claval suture); venation of hind wings very variable, weak, often indicated merely by rows of setae, similar to forewing, radius and media usually unbranched. Usually all legs fitted for jumping; tarsi two-segmented. Metacoxa usually with large spur caudad. Male genital segment bearing a pair of somewhat elongate processes (forceps).

Type genus—*Psylla* Geoffroy.

Much confusion has arisen as to the correct family name for this group of insects since Kirkaldy (1904) proposed the name *Chermidae* for *Psyllidae* Latreille. Kirkaldy erroneously thought that Lamarck (1801) designated *ficus* Linnaeus as the type of *Chermes*. Lamarck, however, merely cited it as an example of the genus, and this is not acceptable as a type designation (Op. 79, Int. Comm. Zoöl. Nom.). Apparently because of this belief that *ficus* was the type of *Chermes*, Kirkaldy considered *Psylla* Geoffroy a synonym of *Chermes*. This left the *Psylla* of Latreille et al. without a name, as *ficus* is not congeneric with the species of the latter. He subsequently (1905) proposed *Psyllia* as a new name for this orphaned group. The family name would not have been *Chermidae* but *Psyllidae*, however, as the type of the family had been set as *Psylla* Latreille in 1807 by Latreille, the changing of the name of this genus

would merely have changed the root of the family name, not transferred it to another genus. Since the type of *Chermes* is *abietis* (an aphid) rather than *ficus*, Kirkaldy's contention is groundless.

E. P. Van Duzee, the chief proponent of the name *Chermidae*, while following Kirkaldy's names, based his argument on different grounds. In an editorial note in the Pan-Pacific Entomologist (7: 96) he states his case quite clearly and in private communications states his views more completely. Briefly stated, his thesis is this: The type of any category must agree in all details with the published description. At first glance this position has a seemingly logical basis, and in the specific instance of *Chermes* versus *Psylla* his position appears sensible, but it is certainly not expedient, nor does it conform to the rules of nomenclature. To abandon the system of nomenclatorial rules established by the Zoölogical Congress and return to such a so called "logical" basis is of course unthinkable, and one shudders to think of the resulting confusion.

The name *Psyllidae* had been in general, almost exclusive, use for about 100 years when this "correction" first appeared, an instance in which, if it had been necessary, the International Commission would surely have suspended the rules to prevent confusion. It is unfortunate, indeed, that this needless confusion has existed and been so long continued.

#### KEY TO THE SUBFAMILIES (AFTER CRAWFORD)

1. Vertex deeply cleft medially, anteriorly (in *Rhinopsylla*, the only genus occurring in our fauna, media and cubitus of the forewing are not petiolate nor are the genae produced). . . . . *Carsidarinae*<sup>1</sup>.
- Head not deeply cleft anteriorly. . . . . 2.
2. Frons covered by genae ventrally; genae usually produced as variously shaped processes. . . . . 3.
- Frons not covered by genae ventrally; genae not produced (except in *Calopha*). . . . . 4.
3. Media and cubitus of forewing with a prominent common petiole; forewings rarely angulate apically; basal segment of metatarsus with two black spines at tip (lacking in *Tetragonocephala*). . . . . *Psyllinae*.  
Media, cubitus, and radius of forewing arising from basal vein at same point (or very nearly so); forewings usually angulate apically; metatarsus without spines. . . . . *Trioziinae*.
4. Vertex flat and horizontal. . . . . *Liviinae*.
- Vertex smoothly rounded down anteriorly. . . . . *Pauropsyllinae*.

<sup>1</sup> Occurring in North America but not within the scope of this work.

#### SUBFAMILY PSYLLINAE LÖW

- 1879 *Psyllinae* Löw, Verh. zool.-bot. Ges. Wien 28:605, 607.
- 1886 *Psyllaria* Puton, Cat. Hém. Faune Paléa. 91.
- 1896 *Psyllidae* Edwards, Hemip.-Homop. Br. Is. 227, 233.
- 1908 *Psyllaria* Oshanin, Verz. palae. Hemip. 2:349.
- 1912 *Psyllaria* Oshanin, Kat. paläa. Hemip. 126.
- 1913 *Psyllinae* Aulmann, Psy. Cat. 5.
- 1914 *Psyllinae* Crawford, U. S. Nat. Mus. Bull 85:18, 105.
- 1916 *Psyllinae* Van Duzee, Check List Hemip. N. Am. 87.
- 1917 *Psyllinae* Van Duzee, Cat. Hemip. N. Am. 799.

Head more or less deflexed. Genae produced as variously shaped processes. Frons covered by genae except a small portion bearing median

ocellus. Antennae ten-segmented, length variable. Eyes hemispherical and lateral or somewhat elongate and recessive. Thorax variously arched. Forewings variable in shape and texture, media and cubitus with a common petiole, pterostigma commonly present but frequently obsolete. Metacoxal spurs present. Metatibiae often armed basally, a variable number of spines apically. Basal segment of metatarsus bearing two black clawlike spines except in *Tetragonocephala*. Male proctiger simple.

This is a very large and widely distributed subfamily, representatives being found throughout the world. There are few characters which can be cited as typical of it which will not show some exceptions. There is always a medial-cubital petiole in the forewing; the genae are produced as variously shaped processes which almost always cover the frons except for a small area which bears the median ocellus. Crawford considered the presence of the two black claws on the basal segment of the metatarsi as of great importance, which indeed it is, although these spines are lacking in one genus.

The nymphs are often quite active and free-living, others are gall-formers. Some are producers of copious quantities of wax; others seem to produce none. They characteristically have the wing pads extending prominently beyond the margin of the abdomen, not produced cephalad at the humeral angles, and are without a fringe of large setae on the margin.

TYPE: *Psylla* Geoffroy.

#### KEY TO THE GENERA OF *Psyllinae*

1. Head somewhat deflexed, not vertical. . . . . 2.  
Head very strongly deflexed, head and pronotum vertical. . . . . 7.
2. Genal processes large, flattened, contiguous, on same plane as vertex; forewings thickened, rugose, rhomboidal. . . . . *Euphyllura* p. 526.
- Genal processes not flattened, rarely contiguous; forewings usually membranous, sometimes thickened and rugose, not rhomboidal (except *Euphalerus propinquus*). . . . . 3.
3. Pleural suture of prothorax extending to middle of lateral margin of pronotum, propleurites equal dorsally. . . . . 5.  
Pleural suture of prothorax oblique, propleurites not equal dorsally. . . . . 4.
4. Forewings broadly rounded apically. . . . . *Psylla* p. 455.
- Forewings strongly narrowed apically. . . . . *Spanioneura* p. 544.
5. Genal processes sharply depressed from plane of vertex, parallel to it. *Arytaina* p. 503.
- Genal processes not depressed from plane of vertex. . . . . 6.
6. Vertex flat, large; eyes recessive; genal processes somewhat porrect; forewings more or less thickened. . . . . *Euphalerus* p. 519.
- Vertex somewhat rounded to vertical genal processes; eyes lateral; forewings membranous. . . . . *Psyllopsis* p. 516.
7. Basal segment of metatarsus with two black claws. . . . . *Pachypsynlla* p. 533.
- Basal segment of metatarsus without black claws. . . . . *Tetragonocephala* p. 542.

#### Genus *Psylla*\* Geoffroy

- 1758 *Chermes* Linne (*pro parte*), Syst. Nat. X:453-455.
- 1762 *Psylla* Geoffroy (?), Hist. Abr. ins. envir. Paris I:482-498 [*non viso, fide auct.*].
- 1764 *Psylla* Geoffroy, Hist. Abr. des Insectes 1:482, pl. X.

\* *Psylla -ae*, Gr. f. noun—a flea.

- 1804 *Psylla* Latreille, Hist. Nat. Crust. Ins. 3:266.  
 1810 *Psylla* Latreille, Consid. Gen. sur L'Ordre Nat. Anim. 434 [designates type].  
 1848 *Psylla* Förster, (pro parte), Verh. natur. Ver. preuss. Rheinl. 5:67.  
 1861 *Psylla* Flor (pro parte), Bull. Soc. Imp. Nat. Moscow 34:335, 337-377.  
 1872 *Psylla* Meyer-Dür (pro parte), Mitt. Sch. Ent. Ges. 3:395.  
 1876 *Psylla* Scott (pro parte), Trans. Ent. Soc. London 1876:530.  
 1877 *Chermes* Thomson, Opusc. Ent. 8:820.  
 1879 *Psylla* Löw, Verh. zool.-bot. Ges. Wien. 28:600-603, 608.  
 1896 *Psylla* Edwards, Hemip.-Homop. Br. Is. 233-249.  
 1905 *Psyllia* Kirkaldy, Wien. Ent. Zeitg. 24:268.  
 1908 *Psylla* Oshanin, Verz. palae. Hemip. 2:350.  
 1912 *Psylla* Oshanin, Kat. paläa. Hemip. 127.  
 1913 *Psylla* Aulmann, Psy. Cat. 8.  
 1914 *Psylla* Crawford, U. S. Nat. Mus. Bull. 85:135.  
 1914 *Brachypsylla* Crawford, (pro parte), U. S. Nat. Mus. Bull. 85:142.  
 1917 *Psyllia* Van Duzee, Cat. Hemip. N. Am. 805.  
 1918 *Labicria* Enderlein, Zool. Anz. 49:348.  
 1921 *Asphagis* Enderlein, Zool. Anz. 52:120.  
 1921 *Asphagidella* Enderlein, Zool. Anz. 52:120.  
 1926 *Baeopelma* Enderlein, Ent. Mitt. 15:399.  
 1935 *Psylla* Haupt, Tierw. Mittel, 4, 3:231, 232.  
 1938 *Psyllia* Caldwell, Ohio Biol. Surv. Bull. 34:260.

Head large, as broad as thorax or nearly so, deflexed. Vertex more or less depressed discally, shape somewhat variable. Genae produced as conical processes usually deflexed from plane of vertex. Eyes hemispherical. Antennae slender, usually longer than head, often much longer. Thorax large, well arched. Pronotum descending anteriorly, not flat. Propleurites not equal at juncture with pronotum, pleural suture oblique, extending to posterior edge of pronotum, or proepimeron not extending to pronotum at all. Forewings membranous, usually hyaline, transparent, rounded apically, cubitus and media with a common basal petiole, pterostigma present, obsolescent, or obsolete. Metatibiae usually with a large or small basal spur and five or six black spines apically. Basal segment of metatarsi with two black clawlike spines.

LOCOTYPE: *Psylla alni* (Linnaeus).

Linnaeus' genus *Chermes* (1758) contained fourteen species including *abietis* and *alni*. The first valid designation of a type species for *Chermes* is that of *abietis* by Passerini in 1863 (Arch. Zool. Anat. Fisiol. 2:205). As *abietis* is an aphid, *Chermes* is established as an aphid genus.

The first use of the name *Psylla* seems to have been in the 1762 edition of "Histoire abrégée des Insectes" which is generally accredited to Geoffroy. If the 1762 edition is not acceptable the name will date from 1764. Geoffroy's treatment is not binomial but is binary which is valid under the international code. Latreille first designated a type for the genus *Psylla* in 1810, naming *alni* Linnaeus.

Kirkaldy (1904) cited *Psylla* as a synonym of *Chermes*, basing this action on the ground that Lamark (1801) had designated *Chermes ficus* Linn. as the type of *Chermes* thereby making *Psylla* Geoffroy a synonym of *Chermes* and leaving *Psylla* Latreille without a name. For this latter group he proposed (1905) the name *Psyllia* Kirkaldy—type *Chermes pyri* Linn. As the type of *Chermes* is not *ficus* but *abietis*, an aphid, his action was groundless, and *Psyllia* is a synonym of *Psylla*.

Enderlein, in the later numbers of his "Psyllidologica," established a great many new genera, apparently without seeing any specimens of many of the species involved and using characters of slight significance. In this way he sometimes has placed very closely related species in different genera on some minor, scarcely specific character. *Labicria*, *Asphagis*, *Asphagidella*, and *Baeopelma* are four fragments which he thus splits from *Psylla* and which I do not believe to be worthy of generic distinction.

#### KEY TO THE SPECIES OF *Psylla*

1. Eyes borne on prominent stalklike portion of head. . . . . 55.  
     Eyes not borne on prominent stalklike portion. . . . . 2.
2. ( 1 ) Antennae twice as long as width of head or longer. . . . . 3.  
     Antennae distinctly less than twice as long as width of head. . . . . 21.
3. ( 2 ) Antennae more than  $2\frac{1}{2}$  times as long as width of head (usually 3 times as long). . . . . 4.  
     Antennae less than  $2\frac{1}{2}$  times as long as width of head. . . . . 10.
4. ( 3 ) Pterostigma present, prominent. . . . . 5.  
     Pterostigma obsolete or almost obsolete. . . . . 7.
5. ( 4 ) Genal processes no longer than their basal width, typically rounded apically. . . . . *alni* p. 460.  
     Genal processes longer than their basal width, sharper apically. . . . . 6.
6. ( 5 ) Female genital segment  $\frac{3}{4}$  as long as rest of body; male forceps enlarged apically. . . . . *caudata* p. 461.  
     Female genital segment not over  $\frac{1}{2}$  as long as rest of body; male forceps nearly parallel margined to apices. . . . . *galeiformis* p. 462.
7. ( 4 ) Female genital segment longer than rest of abdomen, slender, styliform, abruptly enlarged basally; male forceps not notched apically. . . . . *fioccosa* p. 463.  
     Female genital segment shorter than rest of abdomen, stout; male forceps notched apically. . . . . 8.
8. ( 7 ) Uniformly green or greenish yellow in color. *trimaculata* var. *astigmata* p. 465.  
     Not uniformly greenish, at least some red markings. . . . . 9.
9. ( 8 ) With three prominent red spots on dorsum of mesothorax, otherwise unicolorous. . . . . *trimaculata* p. 464.  
     General color red, black bands on abdomen. *trimaculata* var. *cerasi* p. 465.
10. ( 3 ) Forewings with definite maculae. . . . . 11.  
     Forewings without maculae. . . . . 12.
11. ( 10 ) Genal processes cone-shaped, as long as vertex. . . . . *maculata* p. 466.  
     Genal processes small, blunt, less than  $\frac{1}{2}$  as long as vertex. . . . . *nana* p. 467.
12. ( 10 ) Male forceps simple\*, straight in lateral view (except *brevistigmata acuta*). . . . . 13.  
     Male forceps not simple and straight. . . . . 19.
13. ( 12 ) Female genital segment shorter than rest of abdomen. . . . . 14.  
     Female genital segment longer than rest of abdomen. . . . . 16.
14. ( 13 ) Pterostigma large, long; genal processes large, blunt, scarcely divergent. . . . . *albagena* p. 468.  
     Pterostigma broad but short; genal processes slender, subacute, strongly divergent. . . . . 15.
15. ( 14 ) Male forceps straight; vertex and genal processes striped red and white. . . . . *brevistigmata* p. 471.  
     Male forceps bent sharply cephalad in apical  $\frac{1}{3}$ ; vertex and genal processes nearly unicolorous. . . . . *brevistigmata acuta* p. 472.

\* Simple as used in this key means tapered to an acute, subacute, or blunt apex, not broadly truncate, dentate, notched, lobate, emarginate, etc., the forceps may be curved or twisted, however.

16. (13) Female genital segment large basally, then attenuate, styliform. *floccosa* p. 463.  
Female genital segment stout, not styliform..... 17.
17. (16) Apex of dorsal valve of female genital segment sharp..... *carpinicola* p. 468.  
Apex of dorsal valve of female genital segment blunt..... 18.
18. (17) Genal processes large, acute, fully as long as vertex..... *dilonchi* p. 470.  
Genal processes small, blunt,  $\frac{1}{2}$  as long as vertex..... *striata* p. 470.
19. (12) Female genital segment as long as rest of abdomen or longer; male forceps not cleft, bearing a large Y-shaped black tooth apically..... *insignita* p. 473.  
Female genital segment shorter than abdomen; male forceps cleft..... 20.
20. (19) Larger species (3.5 mm.); male forceps with only apical cleft, posterior lobe bearing an acute black tooth..... *magna* p. 473.  
Smaller species (3 mm.); male forceps cleft nearly halfway to the base, caudo-mesal lobe ending in a T-shaped tooth..... *omani* p. 474.
21. (2) Small species (2-2.5 mm.); genal processes separate basally, strongly divergent; forewings more or less fumate..... 22.  
Larger species (2.5 mm. or more); genal processes not separate basally, less strongly divergent; forewings usually not fumate (more or less fumate in *alaskensis*, *pyricola* and *media*)..... 26.
22. (21) Head and thorax very prominently pubescent..... *hirsuta* p. 474.  
Head and thorax not prominently pubescent..... 23.
23. (22) Male forceps simple to apex..... *minuta* p. 475.  
Male forceps not simple..... 24.
24. (23) Male forceps deeply cleft apically..... 25.  
Male forceps notched on lateral margin apically..... *coryli* p. 476.
25. (24) Genal processes  $\frac{1}{3}$  as long as vertex; female genital segment  $\frac{1}{2}$  as long as rest of abdomen, dorsal valve sinuate, upturned apically..... *media* p. 477.  
Genal processes  $\frac{1}{2}$  as long as vertex; female genital segment longer than rest of abdomen, valves straight, subequal..... *difficilis* p. 477.
26. (21) Female genital segment distinctly longer than rest of abdomen, and male forceps simple..... 27.  
Female genital segment at most as long as rest of abdomen, or if longer male forceps not simple..... 32.
27. (26) Antennae  $1\frac{2}{3}$  times as long as width of head or more..... 28.  
Antennae  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times as long as width of head..... 31.
28. (27) Apex of dorsal valve of female genital segment curved ventrad. *hartigii* p. 478.  
Apex of dorsal valve of female genital segment upcurved..... 29.
29. (28) Dorsal valve of female genital segment with apex sharp.... *stricklandi* p. 479.  
Dorsal valve of female genital segment with apex blunt..... 30.
30. (29) Ventral valve of female genital segment nearly as long as dorsal valve, latter very abruptly upturned apically..... *tuthilli* p. 480.  
Ventral valve of female genital segment distinctly shorter than dorsal valve, latter evenly upcurved..... *magnicauda* p. 480.
31. (27) Large species (3.5 to 4 mm. to tip of folded wings)..... *buxi* p. 481.  
Smaller species (2.75 to 3 mm. to tip of folded wings)..... *bulbosa* p. 482.
32. (26) Antennae but slightly longer than width of head..... 33.  
Antennae at least  $1\frac{2}{3}$  times as long as width of head (sometimes slightly less in *alaskensis*)..... 37.
33. (32) Male forceps T-shaped apically..... *parallela* p. 492.  
Male forceps not T-shaped..... 34.
34. (33) Forewings more or less fumate; male forceps with broad platelike caudal lobe..... *manisi* p. 483.  
Forewings not fumate (often whitish); male forceps without platelike caudal lobe..... 35.
35. (34) Uniformly yellowish green in color; head and thorax not punctate; genal processes  $\frac{3}{4}$  as long as vertex..... *breviata* p. 484.  
General color red to reddish brown, more or less marked with black and white; genal processes  $\frac{1}{2}$  or  $\frac{2}{3}$  as long as vertex..... 36.

36. (35) Female genital segment elongate, slender, dorsal valve straight; male forceps in lateral view swollen midway, tapered to apices, curved caudad, apices truncate with a small sharp anterior tooth..... *quadrilineata* p. 484.  
Female genital segment short, dorsal valve concave; male forceps in lateral view very broad, apically twisted caudad, apices broadly rounded teeth..... *confusa* p. 492.
37. (32) Male forceps simple, blunt to acute apically (not truncate)..... 38.  
Male forceps not simple..... 43.
38. (37) Genal processes almost as long as vertex; light green species..... 39.  
Genal processes not over  $\frac{2}{3}$  as long as vertex; dark-colored species..... 40.
39. (38) Length to tip of folded wings 4 mm.; genal processes slender, divergent; female genital segment much shorter than rest of abdomen, valves nearly equal..... *malii* p. 485.  
Length to tip of folded wings 3 mm.; genal processes stout, nearly contiguous; female genital segment nearly as long as rest of abdomen..... *alba* p. 487.
40. (38) Forewings with a black spot at apex of clavus, often somewhat fumate..... 41.  
Forewings immaculate..... 42.
41. (40) Genal processes uniformly white, robust; pterostigma narrow. *ribesiae* p. 487.  
Genal processes dark, at least basally, less robust; pterostigma large..... *pyricola* p. 489.
42. (40) Proctiger distinctly longer than forceps..... *americana* p. 490.  
Proctiger scarcely longer than forceps, usually enclosing latter apically..... *americana curta* p. 491.
43. (37) Forewings with a prominent dark spot at apex of clavus..... *ribesiae* p. 487.  
Forewings immaculate (except pterostigma may be dark; more or less fumate in *alaskensis* and *media*)..... 44.
44. (43) Male forceps narrowed before apex then enlarged and truncate, somewhat T-shaped in appearance..... 45.  
Male forceps not T-shaped..... 47.
45. (44) Length to tip of folded wings 3 mm..... *parallela* p. 492.  
Length to tip of folded wings 3.5 to 4 mm..... 46.
46. (45) General color dark brown to black..... *minor* p. 493.  
General color yellow..... *minor* var. *flava* p. 494.
47. (44) Male forceps deeply notched apically..... 48.  
Male forceps otherwise..... 49.
48. (47) Forewings fumate; pterostigma very small..... *media* p. 477.  
Forewings clear; pterostigma moderately large..... *usitata* p. 494.
49. (47) Male forceps broad, apices very broadly truncate and heavily sclerotized..... *latiforceps* p. 495.  
Male forceps otherwise..... 50.
50. (49) Male forceps very broad, flattened, narrowed toward apices, twisted caudad, apices visible only in caudal view, sharply narrowed near tips, terminating as a blunt rounded tooth, somewhat sinuate on caudal margin..... *confusa* p. 492.  
Male forceps otherwise..... 51.
51. (50) Male forceps strongly sinuate on caudal margin..... *sinuata* p. 496.  
Male forceps otherwise..... 52.
52. (51) Male forceps produced as rounded lobes basally on caudal margin..... *fibulata* p. 497.  
Male forceps otherwise..... 53.
53. (52) Proctiger of male about as long as forceps; forceps hooked cephalad apically..... 54.  
Proctiger of male very long, twice as long as forceps; forceps bent caudad apically, truncate..... *propria* p. 497.
54. (53) Entire apical portion of forceps hooked cephalad, visible in lateral view..... *uncata* p. 498.

- Forceps bearing a small apical hook, scarcely visible in lateral view; forewings typically much narrowed and elongate.....*alaskensis* p. 499.  
 55. (1) Forewings twice as long as wide.....*phoradendri* p. 500.  
 Forewings 2½ times as long as wide.....56.  
 56. (55) Antennae annulated with black.....*annulata* p. 501.  
 Antennae unicolorous except tip dark.....*negundinis* p. 501.

*Psylla alni\** (Linnaeus)

(Figs. 1, 2, 7, 8, 255)

- 1758 *Chermes alni* Linnaeus, Syst. Nat. X:454.  
 1761 *Chermes alni* Linnaeus, Fauna Svecica 263.  
 1773 *Psylla alni* Linnaeus, DeGeer Mem. I, III:148 [fide Aulmann].  
 1841 *Psylla alni* Hartig, Germ. Zeitschr. Ent. 3:373.  
 1848 *Psylla alni* Förster, Verh. natur. Ver. preuss. Rhein. 5:70.  
 1848 *Psylla fuscinervis* Förster, ibid. 5:70.  
 1848 *Psylla heydeni* Förster, ibid. 5:81.  
 1861 *Psylla alni* Flor, Rhynch. Liv. 2:460.  
 1861 *Psylla alni* Flor, Bull. Soc. Imp. Nat. Moscow 34: 342, 350, 353.  
 1869 *Chermes alni* Thomson, Opusc. Ent. 8:831.  
 1872 *Psylla alni* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:395.  
 1872 *Psylla fuscinervis* Meyer-Dür, ibid. 395.  
 1872 *Psylla heydenii* Meyer-Dür, ibid. 395.  
 1876 *Psylla alni* Scott, Trans. Ent. Soc. London 1876:532.  
 1896 *Psylla alni* Edwards, Hemip.-Homop. Br. Is. 248.  
 1907 *Psylla alni* Kuwayama, Trans. Sap. Nat. Hist. Soc. 2:169.  
 1908 *Psylla alni* Oshanian, Verz. palae. Hemip. 2:356.  
 1913 *Psylla alni* Aulmann, Psy. Cat. 9.  
 1914 *Psylla alni americana* Crawford, U. S. Nat. Mus. Bull. 85:139, 156.  
 1914 *Psylla alni gossypiana* Crawford, U. S. Nat. Mus. Bull. 85:157.  
 1917 *Psyllia alni americana* Van Duzee, Cat. Hemip. N. Am. 811.  
 1932 *Psyllia alni americana* Klyver, Pan-Pac. Ent. 8:17.  
 1932 *Psyllia alni americana* Strickland, Can. Ent. 70:204.  
 1939 *Psyllia alni americanella* Strickland, Can. Ent. 71:214.

Length to tip of folded wings 4.5 to 5 mm.

COLOR: General color yellowish green. Antennae dark in distal half. Forewings clear, veins often bright green.

STRUCTURE: Head broad, strongly deflexed. Eyes unusually large. Vertex ½ as long as wide, two discal foveae, clothed with very short, sparse pubescence. Genal processes short, ⅔ as long as vertex, divergent, from blunt to subacute. Antennae about 3 times as long as width of head. Thorax well arched. Pronotum long, half as long as prescutum. Hind tibia with small basal spur. Forewings with typical venation, 2½ times as long as wide, pterostigma small.

GENITALIA: Male proctiger long, straight to near apex then hooked caudad. Forceps in lateral view slender basally, enlarged apically; in caudal view slightly but evenly arched; apex truncate, black-margined, often somewhat excavate thus appearing slightly bidentate. Female genital segment longer than rest of abdomen, prominently pubescent, slightly upcurved, broad basally, evenly narrowed to apex; dorsal valve longer than ventral, styliform in apical third, blunt; ventral valve very slender apically.

\* Genitive of *Alnus*—the generic name of the host plants.

In the tenth edition of *Systema Naturae*, Linnaeus gives North America as the habitat of *alni*. The designation of American specimens as a subspecies is therefore an error. I have examined European specimens (Austria) and find them to be identical with North American material.

As the name indicates the host is *Alnus* (alder), of several species. Strickland records it as occurring on "Betulosa glandulosa" (apparently *Betula*) in Alberta. Numerous specimens are at hand from various localities in California and Oregon; Oak Creek Canyon, Arizona; and Asotin, Washington. It has also been recorded from Nevada, British Columbia, Idaho, and Alberta. Outside North America it has been reported from almost all of Europe, from Russia, and from Japan.

*Psylla caudata\** Crawford

(Figs. 9, 10)

- 1914 *Psylla caudata* Crawford, U. S. Nat. Mus. Bull. 85:139, 157.  
 1917 *Psyllia caudata* Van Duzee, Cat. Hemip. N. Am. 811.  
 1932 *Psyllia caudata* Klyver, Pan-Pac. Ent. 8:17.  
 1932 *Psyllia caudata* Klyver, Ent. News 43:75.

Length to tip of folded wings 4.5 to 5 mm.

COLOR: General color light to dark brown in fully matured specimens. Younger individuals greenish yellow. Antennae dark from third segment.

STRUCTURE: Head rather small, strongly deflexed. Vertex strongly impressed discally, ½ as long as wide. Genal processes rather short, cone-shaped, blunt, about ⅔ as long as vertex, as long as vertex on median line. Antennae slightly over 2½ times as long as width of head. Thorax somewhat arched. Pronotum large. Hind tibia with prominent basal spur. Forewings large, often milky, membrane very thickly set with small setae, 2½ times as long as wide; medial cell large, pterostigma prominent. Hind wings very long, equaling genital segment in female.

GENITALIA: Male proctiger short, straight. Forceps in lateral view slightly curved cephalad, slender basally, much enlarged apically; apices black, notched; in caudal view slender, slightly arched. Female genital segment extremely long, upcurved, about ¾ as long as rest of body (often appearing even longer due to the partially exerted ovipositor); ventral valve slender, attenuate, acute apically; dorsal valve much longer than ventral; very slender and styliform in apical half, apex scarcely acute; an apparent suture across segment midway.

Described from several hundred specimens from Colorado taken on alder (*Alnus* sp.). This species is similar to *galeiformis* in many respects but can readily be separated from the latter by the color, which is typically much darker, the smaller genal processes, and the genitalia of both sexes. Both the forceps and proctiger of the male are much shorter than they are in *galeiformis*, and the forceps are much enlarged apically. The

\* *caudatus -a -um*, L. adj.—tailed.

extremely long and upcurved female genital segment is instantly recognizable.

Klyver has recorded it from Vancouver, British Columbia, and Idaho. These are the only records of its occurrence outside of Colorado where I have taken it in great numbers in company with *P. floccosa*.

TYPE, male, Pagosa Springs, Colorado, Baker, in Crawford Collection.

*Psylla galeaformis*\* Patch

(Figs. 11, 12)

- 1911 *Psylla galeaformis* Patch, Me. Agr. Exp. Sta., Bull. 187:12-14.
- 1914 *Psylla galeaformis* Crawford, U. S. Nat. Mus. Bull. 85:157.
- 1917 *Psylla galeaformis* Van Duzee, Cat. Hemip. N. Am. 812.
- 1923 *Psylla galeaformis* Patch, Hemip. Conn. 249.

Length to tip of folded wings 4.5 to 5 mm.

COLOR: General color green to yellow to reddish brown. Antennae dark distally. Wings hyaline to yellowish.

STRUCTURE: Head strongly deflexed. Vertex with deep discal impressions,  $\frac{1}{2}$  as long as wide. Genal processes large, cone-shaped, straight, blunt, as long as vertex. Antennae slightly less than 3 times as long as width of head. Thorax well arched. Pronotum large, strongly descending. Hind tibia with large basal spur. Forewings typical in size and venation, pterostigma small. Membrane of both fore and hind wings set with minute setae. Hind wings large, exceeding abdomen.

GENITALIA: Male proctiger long, straight, slender. Forceps slender; in lateral view slightly curved cephalad, almost parallel-margined to apices; apices black, notched; in caudal view narrow, strongly arched. Female genital segment longer than rest of abdomen, slender, with prominent pubescence; ventral valve very slender and attenuate in apical half, acute; dorsal valve longer than ventral, apical third very slender, straight, apex blunt with a rosette of short stiff setae.

Described from a large series of specimens from Dixfield, Maine, August 20, 1934, P. W. Oman. Specimens are also at hand from the following states and provinces: Vermont, Massachusetts, New Hampshire, Nova Scotia, Ontario, Michigan, Wisconsin, Minnesota, Manitoba, Saskatchewan, Colorado, Utah, Nevada, Oregon, Washington, and British Columbia. The host is alder (*Alnus*), apparently of several species (*A. incana* and *A. tenuifolia*). It has also been recorded from New York and Connecticut.

As Crawford indicates, this may be identical with *Diraphia viridescens* (= 4-cornis) Provancher. Without seeing Provancher's specimens this cannot be determined, however.

\* From *galea* -ae, L. f. noun—helmet + *formis* (comb. form of *forma* -ae, L. f. noun) — shape.

*Psylla floccosa*\* Patch

(Figs. 13, 14)

- 1909 *Psylla floccosa* Patch, Ann. Ent. Soc. Am. 2:117 [nomen nudum].
- 1909 *Psylla floccosa* Patch, Can. Ent. 41:301-303.
- 1911 *Psylla floccosa* Patch, Me. Agr. Exp. Sta., Bull. 187:11-12.
- 1913 *Psylla floccosa* Aulmann, Psy. Cat. 15.
- 1914 *Psylla floccosa* Crawford, U. S. Nat. Mus. Bull. 85:154.
- 1914 *Psylla styliformis* Crawford, U. S. Nat. Mus. Bull. 85:154.
- 1917 *Psylla floccosa* Van Duzee, Cat. Hemip. N. Am. 810.
- 1921 *Asphagidella floccosa* Enderlein, Zool. Anz. 52:120.
- 1922 *Psylla floccosa* Osborn, N. Y. St. Coll. For., Tech. Pub. 16:54.
- 1923 *Psylla floccosa* Patch, Hemip. Conn. 249.
- 1932 *Psylla floccosa* Klyver, Ent. News 43:73.
- 1938 *Psylla floccosa* Strickland, Can. Ent. 70:204.
- 1939 *Psylla floccosa* Strickland, Can. Ent. 71:215.

Length to tip of folded wings 5 to 5.5 mm.

COLOR: Green to greenish yellow, sometimes brownish dorsally. Antennal segments with dark annuli, distal segments entirely dark. Wings clear.

STRUCTURE: Head scarcely as long as thorax, strongly deflexed. Vertex about  $\frac{1}{2}$  as long as wide, discal impressions shallow, anterior margin not abrupt or overhanging median ocellus. Genal processes large, cone-shaped, blunt, slightly longer than vertex. Antennae typically over 3 times as long as width of head (numerous Colorado, Utah, and Oregon specimens at hand have the antennae slightly less than  $2\frac{1}{2}$  times as long as width of head). Thorax well arched. Pronotum large. Hind tibia with small basal spurs. Forewings large, slightly less than  $1\frac{1}{2}$  times as long as wide; membrane set with minute setae; venation typical, pterostigma almost or entirely lacking.

GENITALIA: Male proctiger long, straight. Forceps much shorter than proctiger; in lateral view straight; in caudal view slender, evenly arched to apices; apices slightly pointed, black. Female genital segment longer than rest of abdomen, large basally, very suddenly narrowed, styliform to apex; ventral valve acute; dorsal valve slightly longer than ventral, more slender, straight, apex upturned as a small dorsal tooth.

Described from many specimens from the following states and provinces: Nova Scotia, New Hampshire, Maryland, Ontario, Michigan, Minnesota, Manitoba, Montana, Wyoming, Colorado, New Mexico, Utah, Nevada, California, Oregon, Washington, and British Columbia.

It has also been recorded from Maine, Connecticut, New York, and Alberta.

The nymphs are very conspicuous on the host, alder (*Alnus* spp.), being covered with a very abundant flocculent waxy secretion. The wax is easily removed, leaving the nymphs naked. Miss Patch has recorded the life history briefly: "The eggs are probably deposited upon the alder in the fall, as the newly-hatched Psyllids appear about the time the alder leaves are unfolding in the spring, and settle upon the ventral surface of

\* *floccosus* -a -um, L. adj.—woolly.

the leaves. . . . The mature winged forms are present in great numbers on the ventral sides of the leaves, freshly emerged and not yet taken to flight (June 6)." Near Creede, Colorado (elevation 9,000 ft.), the adults appear about the first of June. The Colorado specimens and others from the western area have much shorter antennae than the typical form as noted in the description. Specimens from the San Jacinto Mountains of California have the longest antennae of any of the numerous specimens at hand.

Specimens of Crawford's *P. styliformis* are in the United States National Museum.

*Psylla trimaculata\** Crawford

(Figs. 15, 16)

1911 *Psylla alni trimaculata* Crawford, Pom. Coll. Jour. Ent. 3:631.

1914 *Psylla trimaculata* Crawford, U. S. Nat. Mus. Bull. 85:155.

1917 *Psyllia trimaculata* Van Duzee, Cat. Hemip. N. Am. 810.

1922 *Psyllia trimaculata* Osborn, N. Y. St. Coll. For., Tech. Pub. 16:54, 101-104 [life history notes].

1932 *Psyllia trimaculata* Klyver, Ent. News 43:74.

Length to tip of folded wings 5 mm.

COLOR: General color yellow or greenish yellow. A large median spot on anterior portion of prescutum, a large spot on each side of scutum, red. Antennae dark except three basal segments. Forewings hyaline. Hind wings slightly whitish.

STRUCTURE: Head small, narrow. Vertex twice as wide as long, deeply excavate between lateral ocelli. Genal processes as long as vertex, scarcely divergent, slender apically, blunt. Antennae pubescent, 3 times as long as width of head. Thorax well arched. Pronotum large, roundly produced cephalad mesally. Hind tibia with large basal spur. Forewings large,  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times as long as body, very broadly rounded; veins biserially set with small setae; membrane with numerous extremely small setae; medial cell unusually large, elongate, petiole of cubitus and media very short, pterostigma very narrow, almost obsolete. Hind wings very long, greatly exceeding abdomen.

GENITALIA: Male proctiger stout, slightly produced on caudal margin. Forceps short; in lateral view slender, enlarged apically; in caudal view heavy, strongly arched to black apices; in dorsal view apices notched to form two acute black teeth, cephalic tooth larger than caudal, somewhat variable. Female genital segment shorter than rest of abdomen; dorsal valve straight to blunt black apex, apical portion slender; ventral valve upcurved in apical half to meet dorsal, acute; long silky pubescence on both valves.

Described from numerous specimens from New York, New Hampshire, Michigan, Wisconsin, Minnesota, Manitoba, and Florida. This species is apparently numerous wherever its hosts (various species of

\* From tri L. — three + maculatus, L. (p. part. of maculare)—spotted.

*Prunus*, wild cherry) occur. Numerous specimens collected in Minnesota show gradations from typical trimaculate forms to unmarked individuals. The latter are identical with *P. astigmata* Crawford, which name is retained as a variety, however, since typical specimens of the two forms are so distinct in appearance. Osborn (1922) noted the same facts and made *astigmata* a direct synonym of *trimaculata*. Strickland (Can. Ent. LXXI: 215, 1939) has taken both males and females of a darker form, apparently that described as *P. cerasi* Patch from the female only, and concludes that they are only a color variant of *astigmata*. It is interesting to note that both Miss Patch's and Strickland's specimens were taken in September and in quite northerly latitudes. It seems probable that a temperature factor is responsible for the greater pigmentation. Miss Patch notes (1923) that her *P. cerasi* is "pale early in the season but richly colored in fall."

Crawford (1914 l.c.) says of the three forms involved: "It is possible that all three will prove to be but variations of one species."

TYPE, female, Gowanda, New York, August 2 to 9, 1907, Van Duzee, in the Crawford Collection.

*Psylla trimaculata* var. *astigmata\** Crawford n. comb.

1914 *Psylla astigmata* Crawford, U. S. Nat. Mus. Bull. 85:139, 155.

1917 *Psyllia astigmata* Van Duzee, Cat. Hemip. N. Am. 810.

1921 *Asphagidella astigmata* Enderlein, Zool. Anz. 52:120.

1932 *Psyllia astigmata* Klyver, Pan-Pac. Ent. 8:16.

1932 *Psyllia astigmata* Klyver, Ent. News 43:74.

1939 *Psyllia cerasi astigmata* Strickland, Can. Ent. 71:215.

Identical with the typical form except in color. The three red maculae on the mesothorax lacking. Green to yellow unicolorous. Numerous specimens are at hand from Wisconsin, Michigan, Minnesota, Colorado, Arizona, Idaho, California, Oregon, Washington, and British Columbia. Many of the western specimens have genal processes which are proportionately shorter and thicker than is typical. It is also recorded from Nova Scotia and Alberta.

TYPE, female, Polk Co., Wisconsin, July, Baker, in Crawford Collection.

HOST: *Prunus* spp.

*Psylla trimaculata* var. *cerasi†* Patch n. comb.

1912 *Psylla cerasi* Patch, Me. Agr. Exp. Sta., Bull. 202:223.

1914 *Psylla cerasi* Crawford, U. S. Nat. Mus., Bull. 85:156.

1917 *Psyllia cerasi* Van Duzee, Cat. Hemip. N. Am. 810.

1923 *Psylla cerasi* Patch, Hemip. Conn. 249.

1939 *Psyllia cerasi* Strickland, Can. Ent. 71:215.

Distinguished from typical *trimaculata* by the color of the females. Patch describes the color as follows: "dorsal head and thorax rosy, dorsal

\* From tri L. — without + stigma -atis, L. f. noun — mark.

† Genitive of *cerasus* -i, L. f. noun — cherry tree.

abdomen almost vermillion, a black spot on dorsum of 1st abdominal segment, five vivid black transverse bands across the abdominal dorsum, the last coming just cephalad the genital segment. Antennal joints I, II, III rosy, rest black. Eyes bright black and bulging to width of thorax or slightly more. Wings clear and a little brownish. Ventral body pale."

Strickland collected numerous males and females of this form in Alberta. He found the males to be much less highly pigmented than the females, in fact he states that many of the males were indistinguishable from *astigmata*.

Apparently Miss Patch's and Strickland's specimens are the only known collections of this color variety. One teneral female in the United States National Museum bears no locality label.

This is probably Provancher's *Diraphia sanguinea* (as Crawford suggests), but without a study of his types this cannot be determined.

*Psylla maculata*\* Crawford

(Figs. 17, 52, 52a)

1914 *Psylla maculata* Crawford, U. S. Nat. Mus., Bull. 85:137, 141.

1917 *Psylla maculata* Van Duzee, Cat. Hemip. N. Am. 806.

1925 *Psylla maculata* Crawford, Proc. Haw. Ent. Soc. 6:31 [male described].

Length to tip of folded wings 2.50 to 2.75 mm.

COLOR: General color dark brown. Vertex, posterior half of pronotum, posterior portion of prescutum, longitudinal bands on scutum, scutellum, genal processes, distal portions of legs, margins of abdominal sclerites, lighter brown to yellow. Forewings with brown maculae along cubitus and media, including most of medial cell and extending to Rs at margin.

STRUCTURE: Vertex almost twice as wide as long, pubescent on anterior margin, discal foveae very prominent. Genal processes as long as vertex, cone-shaped, separated at base. Antennae slightly over twice as long as width of head. Thorax typical. Basal spur on hind tibia small. Forewings somewhat less than  $2\frac{1}{2}$  times as long as wide; veins setaceous; pterostigma short and wide, Rs sinuate.

GENITALIA: Male proctiger rather short, in lateral view narrow, curved caudad. Forceps bearing a very large acute retrorse hook on caudal margins reaching almost to base, apices acute, black. Female genital segment shorter than rest of abdomen, both valves acute, dorsal longer than ventral, excavate dorsally.

Described from numerous specimens collected at Mesa Verde, Colorado, on *Cercocarpus parvifolius*. Also at hand are specimens from Durango and Poudre River Canyon, Colorado. The males have very distinctive forceps, the large retrorse hooks on them being quite unlike anything known in the genus. The male from California described by Crawford is apparently a different species as he certainly would not

\* *maculatus*, L. (p. part. of *maculare*)—spotted.

have overlooked such a prominent structure. A male of the series at hand (Mesa Verde, Colorado, July 18, 1938, L. D. Tuthill) is therefore designated as the allotype and deposited in the United States National Museum.

TYPE, female, No. 18107 United States National Museum, Colorado, Baker.

Type examined.

HOST: *Cercocarpus parvifolius*.

*Psylla nana*\* Tuthill

(Figs. 53, 54, 277)

1938 *Psylla nana* Tuthill, Ent. News 49:242.

Length to tip of folded wings 2 to 2.55 mm.

COLOR: General body color, including legs, dirty white, with orange markings. Vertex white with margins, median line and discal foveae orange; genal processes white; antennal segments dark on apices, last two segments black. Thoracic dorsum with a median orange line, a pair of broader orange stripes on each side of scutum. Forewings more or less fumate in basal half; membrane whitish with somewhat irregular brown maculae as illustrated; veins white.

STRUCTURE: Head of medium size. Vertex bulging forward between antennae, medial suture and discal impressions prominent. Genal processes small, blunt, somewhat pubescent, slightly over  $\frac{1}{2}$  as long as vertex. Antennae about twice as long as width of head. Thorax relatively flat. Hind tibia with large basal spur. Forewings  $2\frac{1}{3}$  times as long as wide, broadly rounded; venation typical, medial cell larger than cubital, pterostigma very short.

GENITALIA: Male genitalia quite large. Proctiger slightly longer than forceps, tapering from rather broad base, apex bent caudad at right angles. Forceps fairly broad in lateral view, curved cephalad and then caudad near apices, apices black; in caudal view almost straight. Female genital segment shorter than rest of abdomen; dorsal valve straight on dorsal side; ventral valve evenly curved up to apex, slightly exceeded by dorsal valve.

Known from several points in Arizona. (Santa Rita Mountains, Chiricahua Mountains, Patagonia).

Host unknown.

TYPE, male, Santa Rita Mountains, Arizona, in Snow Collection, University of Kansas.

\* *nana -ae*, L. f. noun—dwarf.

*Psylla albagena\** (Caldwell)

(Figs. 18, 19)

1938 *Psylla albagena* Caldwell, Ohio Biol. Surv., Bull. 34:261, 262-264.

Caldwell's description of this species is as follows:

"Length to tip of forewing 2.5-3.5 mm.; forewing 2-2.3 mm.

"Color: Genal cones light gray to white; vertex light orange to yellow; pronotum dark gray; prescutum and scutum orange; abdomen green; legs sooty white; forewings appearing white; sometimes whole body covered with a white dust."

"Head over twice as broad as long. Vertex almost two-thirds as long as broad; dorsal margin concave; depressed discally. Genal cones as long as vertex at median line, divergent; apices not broadly rounded; bases moderately depressed below plane of vertex."

"Thorax strongly arched; pronotum and prescutum strongly descending. Forewing almost two and one-half times as long as broad, hyaline; pterostigma rather broad and long."

"Genitalia: Male genital plate small. Forceps short, moderately stout. Proctiger one and one-half times longer than forceps. Oedeagus swollen and hooked apically."

"Female genital segment shorter than rest of abdomen. Dorsum of dorsal valve sinuate; apical fourth straight, narrow; apex broadly rounded. Ventral valve short, stout."

I have a pair of paratypes of this willow-inhabiting species. Some additional data taken from them are: Genal processes very large, blunt. Antennae twice as long as width of head. Thorax scarcely arched. Hind tibia with small basal tubercle. Male proctiger slightly flexed caudad. Forceps simple, straight, slightly turned cephalad apically.

Caldwell also describes the various stadii nymphs and gives some biological data.

Host *Salix longifolia*.

Type, male, in Ohio Biological Survey Collection, Ohio State University.

*Psylla carpinicola* Crawford

(Figs. 20, 21)

1851 *Psylla carpini* Fitch, 4th Rept. N. Y. St. Mus., 64.[non] *Psylla carpini* Förster, Verh. natur. Ver. preuss. Rhein. 5:72. 1848.1885 *Psylla carpini* Riley, Proc. Biol. Soc. Wash. 2:69.1910 *Psylla carpina* Smith, Ins. N. J. 109.1913 *Psylla carpini* Aulmann, Psy. Cat. 12.1914 *Psylla carpinicola* Crawford, U. S. Nat. Mus., Bull. 85:151.1914 *Psylla cephalica* Crawford, U. S. Nat. Mus., Bull. 85:138, 151.1917 *Psylla carpinicola* Van Duzee, Cat. Hemip. N. Am. 809.1917 *Psylla cephalica* Van Duzee, Cat. Hemip. N. Am. 809.1918 *Psylla carpinicola* McAtee, Ent. News 29:224.1918 *Psylla cephalica* McAtee, Ent. News 29:224.1922 *Psyllia carpinicola* Osborn, N. Y. St. Coll. For., Tech. Pub. 16:54.1938 *Psyllia carpinicola* Caldwell, Ohio Biol. Surv., Bull. 34:266.

Length to tip of folded wings 4 mm.

COLOR: Variable in color from uniform light green to reddish brown. Forewings clear to slightly fumate, veins green.

STRUCTURE: Head large, strongly deflexed (typically). Vertex slightly over  $\frac{1}{2}$  as long as broad, discal impressions slight, genal processes large, blunt, pubescent, variable in angle, in shape, in length, usually about  $\frac{3}{4}$  as long as vertex. Antennae twice as long as width of head (Crawford and Caldwell both record the antennae as  $2\frac{1}{2}$  times as long as width of head, but I have been unable to find any of more than very slightly over twice the head width). Thorax scarcely arched. Hind tibia with large spur at base. Forewings somewhat rugose; membrane evenly set with numerous very small setae,  $2\frac{1}{2}$  times as long as wide; veins biserrately setate, venation variable in curvature of Rs and amount of arching in Cu<sub>1</sub>, pterostigma small, also somewhat variable.

GENITALIA: Male proctiger slender, narrowed, and bent caudad in apical third. Forceps shorter than proctiger; in lateral view stout, straight, slightly enlarged apically; in caudal view very slender, gently arched to apices, terminating in a small black tooth. Female genital segment large, longer than rest of abdomen; dorsal valve much longer than ventral, dorsal margin sinuate, apical third attenuate, apex upcurved, acute; ventral valve acute, upcurved.

At hand are specimens from New York, Connecticut, New Hampshire, Nova Scotia, Pennsylvania, New Jersey, Maryland, District of Columbia, Virginia, North Carolina, Alabama, Florida, Mississippi, Louisiana, Missouri, Illinois, Ohio, Michigan, Wisconsin, Iowa, and Kansas. Crawford (1914) records specimens from Nevada; these, however, are *dilonchi* which he had not separated from *carpinicola*. His confusion of these two forms accounts for some of the indefiniteness of his description.

*P. cephalica* was established on the greater arch in vein Cu<sub>1</sub> and several other minor variations from the type which are apparently of no specific significance. Typical examples of *cephalica* are abundant from Mississippi, Alabama, and Florida. Specimens from more northern localities show a gradual decrease in the amount of variation from the type, which is a specimen from New York.

The host of this very abundant species is *Carpinus caroliniana*.

Fitch's type series is in the United States National Museum.

Type, No. 1343 United States National Museum (Fitch's No. 9680).

Type examined.

\* From *albus -a -um*, L. adj. — white + *gena -ae*, L. f. noun—cheek (gena of insect).

† From *Carpinus* the generic name of the host + *cola*, L.—inhabitant.

*Psylla dilonchi\** (Caldwell)

(Figs. 22, 23)

- 1914 *Psylla coryli* Crawford, U. S. Nat. Mus., Bull. 85:150.  
 [non] *Psylla coryli* Patch, Me. Agr. Exp. Sta., Bull. 202:223. 1912.  
 1938 *Psylla diloncha* Caldwell, Ohio Biol. Surv., Bull. 34:261, 267.

Length to tip of folded wings 3.5 to 4 mm.

COLOR: Pale green to yellow. Apical half of antennae with segments annulated, tip black. Forewings slightly yellowish.

STRUCTURE: Head only slightly deflexed. Vertex  $\frac{1}{2}$  as long as wide, discal impressions slight, scarcely emarginate anteriorly. Genal processes large, cone-shaped, acute, extending forward and almost on same plane as vertex, with long silky pubescence, fully as long as vertex. Antennae about  $2\frac{1}{4}$  times as long as width of head. Thorax scarcely arched. Hind tibia with small basal spur. Forewings large, membrane set with numerous very small setae, veins bearing small setae,  $2\frac{1}{3}$  times as long as wide; venation typical, Rs curved, pterostigma almost obsolete.

GENITALIA: Male proctiger long, slightly narrowed and bent caudad in apical third. Forceps shorter than proctiger; in lateral view slender, straight; in caudal view slender, slightly arched, apices black, acute, many long silky setae on caudal and medial margins. Female genital segment longer than rest of abdomen (much longer in dry specimens); ventral valve elongate, acute, upcurved; dorsal valve attenuate, longer than ventral, dorsal margin sinuate, apex blunt, slightly upcurved.

This species was described from one pair from Ohio. I have taken it in great numbers in Minnesota on hazel brush (*Corylus* sp.) during August. Specimens are also before me from Wisconsin; Onaga, Kansas; Ormsby County, Nevada; Humboldt and Marin County, California (Koebele, on *Corylus rostrata*). The latter specimens are those mentioned by Crawford as a varietal form of *striata* and inadvertently named *Psylla coryli* by him. This name was preoccupied by *P. coryli* Patch; thus Caldwell's name stands for the species.

TYPE, male, Fulton Co., Ohio, H. Osborn, in Ohio Biological Survey Collection, Ohio State University, Columbus, Ohio.

Host *Corylus* sp.*Psylla striata†* Patch

(Figs. 24, 25)

- 1911 *Psylla striata* Patch, Me. Agr. Exp. Sta., Bull. 187:14-15.  
 1914 *Psylla striata* Crawford, U. S. Nat. Mus., Bull. 85:138, 150.  
 1917 *Psyllia striata* Van Duzee, Cat. Hemip. N. Am. 809.  
 1922 *Psyllia striata* Osborn, N. Y. St. Coll. For., Tech. Pub. 16:53.  
 1923 *Psyllia striata* Patch, Hemip. Conn. 249.  
 1932 *Psyllia striata* Klyver, Ent. News 43:73.  
 1938 *Psyllia striata* Brimley, Ins. N. C. 104.  
 1938 *Psyllia striata* Strickland, Can. Ent. 70:205.

\* From di, L. — two + *lonchus* -i, L. m. noun — lance, -i is the correct plural ending.

† P. part. of *stro*, L. v.—wrinkled, striated.

Length to tip of folded wings 3 to 3.5 mm.

COLOR: Yellow, including wings, sometimes greenish. Apical third of antennae dark.

STRUCTURE: Head small, strongly deflexed. Vertex over  $\frac{1}{2}$  as long as wide, discal depressions slight. Genal processes small, blunt, scarcely divergent,  $\frac{1}{2}$  as long as vertex. Antennae twice as long as width of head. Thorax well arched. Hind tibia with basal spur. Forewings with typical venation, about  $2\frac{1}{2}$  times as long as wide; Rs weakly sinuate, pterostigma prominent.

GENITALIA: Male proctiger slender, almost straight, very slightly curved caudad. Forceps in lateral view very narrow, straight; in caudal view slender, arched to acute black apices, medial margins with many long setae. Female genital segment twice as long as rest of abdomen; dorsal valve much longer than ventral, apical half attenuate with dorsal margin straight, apex blunt; ventral valve acute.

Numerous specimens are at hand from Massachusetts, New Hampshire, Nova Scotia, New York, Michigan, Wisconsin, South Dakota, Colorado, Utah, Washington, and British Columbia. It is also recorded from Connecticut, California, and Alberta.

Miss Patch described this species from *Betula* sp. (birch) and gives a few life history notes, the nymphs occurring on the leaves and terminal shoots of birch, covering themselves with inconspicuous woolly masses. The adults emerge late in June in Maine. Klyver records it as occurring in California on *Betula fontinalis*.

There is in the University of Kansas collection one female bearing a paratype label and the data: "Basswood, Ottawa Ont. 1-VII-1904, W. Metcalfe." This is obviously incorrectly labeled as the original description lists only specimens from Orono, Maine. This specimen is actually *P. diloncha* Caldwell.

*Psylla brevistigmata\** Patch

(Figs. 27, 28)

- 1912 *Psylla brevistigmata* Patch, Me. Agr. Exp. Sta., Bull. 202:222.  
 1914 *Psylla brevistigmata* Crawford, U. S. Nat. Mus., Bull. 85:153.  
 1914 *Psylla albirufa* Crawford, U. S. Nat. Mus. Bull. 85:153.  
 1917 *Psyllia brevistigmata* Van Duzee, Cat. Hemip. N. Am. 809.  
 1925 *Psylla brevistigmata* Crawford, Proc. Haw. Ent. Soc. 6:30.  
 1932 *Psyllia brevistigmata* Klyver, Ent. News 43:73.

Length to tip of folded wings 2.5 to 3.25 mm.

COLOR: General color red with white markings as follows: Posterior and anterior margins of vertex, basal  $\frac{2}{3}$  of genal processes, posterior margin of pronotum and prescutum, six longitudinal stripes on scutum, margins of scutellum, margins of abdominal sclerites. Antennae dark distally. Wings somewhat fumate, pterostigma yellow. Variable from typical coloration to dark forms with genal processes, anterior portion of pronotum, venter of thorax, abdomen, and veins of forewings dark

\* From *brevis* -e, L. adj. — short + *stigma*, L. f. noun — mark.

brown. Forewings variable from almost hyaline through whitish to heavily infuscated.

**STRUCTURE:** Head broad, deflexed. Vertex pubescent on anterior margin, less than  $\frac{1}{2}$  as long as broad, very deeply impressed discally, anterior margin abrupt. Genal processes strongly divergent, subacute, nearly parallel to plane of vertex,  $\frac{2}{3}$  as long as vertex, prominently pubescent. Antennae twice as long as width of head. Thorax weakly arched. Hind tibia with prominent basal spur. Forewings long, over  $2\frac{1}{2}$  times as long as wide, often somewhat rugose; small radular areas on apical margin; venation typical, veins biseriately setate, pterostigma broad but typically very short, somewhat variable.

**GENITALIA:** Male genitalia small. Proctiger in lateral view slender, curved caudad apically. Forceps shorter than proctiger; in lateral view slender, straight to acute black apices; in caudal view simple, slender, evenly arched to acute black apices, a fringe of stout setae on medial margins. Female genital segment subject to considerable variation in length, typically much shorter than rest of abdomen even in dried specimens, in some equalling rest of abdomen; dorsal valve longer than ventral, somewhat upturned, subacute; ventral valve evenly curved dorsad, apex acute.

The above description is written from California specimens, but many specimens are at hand from various western states. As may be expected in such an abundant species, considerable variation occurs in characters. In addition to color variations, the pterostigma is quite variable in length as is the female genital segment. It occurs in large numbers on its host plant, mountain mahogany (*Cercocarpus parvifolius*).

Specimens are at hand from numerous localities in California, Arizona, Utah, Colorado, and New Mexico. The type specimens (two females) were from Sequoia National Park, California.

Crawford gives the length of the antennae as  $2\frac{3}{4}$  times the width of the head. I believe this to be a mistake as I have measured numerous individuals and have been unable to find any in which the antennae are more than slightly over twice as long as the width of the head.

#### *Psylla brevistigmata acuta\** Crawford

1914 *Psylla brevistigmata acuta* Crawford, U. S. Nat. Mus., Bull. 85:139, 154.  
1917 *Psylla brevistigmata acuta* Van Duzee, Cat. Hemip. N. Am. 810.

Twelve specimens of this subspecies are at hand, all from Utah. They are uniformly much lighter in color than the typical subspecies, the genal processes are shorter (barely  $\frac{1}{2}$  as long as vertex), more blunt, and more divergent. The male forceps in lateral view tapered from mid-point, strongly bent mesad and cephalad as long slender black apices.

Specimens at hand are from Cedar City, Pintura, Weber Canyon, Providence Canyon, Logan Canyon, and Wasatch Mountains, Utah. One

\* *acutus -a -um*, L. adj. — sharp, pointed.

of the Wasatch Mountains specimens (Koebele) bears a label *Cercocarpus ledifolius*.

TYPE, male, No. 18112 United States National Museum.  
Type examined.

#### *Psylla insignita*\* n. sp.

(Figs. 55, 56, 278)

Length to tip of folded wings 3.25 to 3.50 mm.

**COLOR:** General color red. More or less distinct white markings as in *brevistigmata*.

**STRUCTURE:** Similar to *brevistigmata* except genal processes much larger, almost as long as vertex.

**GENITALIA:** Male proctiger long, stout, parallel-sided. Forceps in lateral view long, slightly swollen apically; in caudal view nearly straight to near apex, turned sharply mesad as black, heavy, sharp apices; in dorsal view apices rounded, bearing a large somewhat Y-shaped black tooth, extending mesad. Female genital segment very large, as long as rest of abdomen or longer; dorsal valve slightly longer than ventral, blunt.

The exact relationship of this form to *brevistigmata* is uncertain, but as it is distinct and readily recognizable it is described as a species of the somewhat confusing *brevistigmata* complex.

Described from numerous males and females bearing data as follows: Salt Lake City, Utah, July 3, 1931; Weber Canyon, Utah, July 4, 1931; Fish Lake, Utah, Aug. 16, 1929; Bray, California, June 30, 1935; all specimens collected by R. H. Beamer; two females from Bray, California, June 30, 1935, P. W. Oman.

**HOLOTYPE**, male, **ALLOTYPE**, female, Salt Lake City, Utah, in Snow Collection, University of Kansas. Paratypes in Snow Collection, United States National Museum, and author's collection.

The females from Bray, California, have an extremely large genital segment the valves of which are somewhat different in shape from the Utah specimens, but the males appear to be identical.

#### *Psylla magna*† Crawford

(Figs. 57, 58)

1914 *Psylla brevistigmata magna* Crawford, U. S. Nat. Mus., Bull. 85:139, 154.  
1917 *Psylla brevistigmata magna* Van Duzee, Cat. Hemip. N. Am. 809.

Similar to *brevistigmata* except in genitalia and size.  
Length to tip of folded wings 3.5 mm.

**GENITALIA:** Male proctiger short; in lateral view straight, broad, excavate on caudal margin apically. Forceps in lateral view nearly straight, enlarged apically, a deep, rounded cleft in apices, anterior lobe short, rounded, posterior lobe ending in a large, black, acute tooth extending antero-mesally; in caudal view weakly arched to black apices. Female

\* *insignitus -a -um*, L. adj.—striking, remarkable.

† *magnus -a -um*, L. adj.—large.

genital segment very short and turned ventrad; dorsal valve slightly longer than ventral, apex blunt.

Crawford described this form as a variety, but due to the very distinct and constant genital characters I am raising it to specific rank.

Numerous specimens are at hand from Bray, California; Carson City, Nevada; Fish Lake, Richfield, Weber Canyon, Zion National Park, and Pintura, Utah.

Host unknown, probably *Cercocarpus*.

TYPE, male, No. 18111, United States National Museum.

Type examined.

*Psylla omani\** n. sp.

(Figs. 59, 60, 279)

Length to tip of folded wings 3 mm.

COLOR: General color light green to white. Flavous to orange markings on thorax. Wings whitish.

STRUCTURE: Head deflexed. Vertex broadly impressed discally, over  $\frac{1}{2}$  as long as wide. Lateral ocelli on raised areas. Genal processes slender, parallel to plane of vertex, scarcely divergent, blunt,  $\frac{2}{3}$  as long as vertex. Antennae twice as long as width of head. Thorax weakly arched. Pronotum strongly descending, long. Hind tibia with prominent basal spur. Forewings somewhat thickened,  $2\frac{1}{2}$  times as long as wide; venation typical, pterostigma short; radular areas at margin of marginal cells and between  $M_4$  and  $Cu_1$ . Membrane of hind wings set with minute setae.

GENITALIA: Male proctiger short, straight. Forceps with long heavy pubescence; in lateral view narrow basally then much enlarged on caudal margin, apices bearing a large, black, somewhat T-shaped tooth near cephalic margin; in caudal view bowed outward basally, deeply cleft, outer lobes slender, erect, acute, inner lobes, stout, bent mesad, then dorsad to black apices, a small hooked tooth apically. Female genital segment shorter than rest of abdomen, bent ventrad; dorsal valve curved, apex blunt; ventral valve equalling dorsal, spoon-shaped apically.

Described from two males and two females from Bray, California, June 30, 1935, P. W. Oman. Holotype and allotype in United States National Museum, paratypes in author's collection.

HOLOTYPE, male, No. 55169 United States National Museum.

It is with great pleasure that I dedicate this species to a friend and colleague, P. W. Oman, of the National Museum.

*Psylla hirsuta†* (Tuthill)

(Figs. 61, 62, 280)

1938 *Arytaina hirsuta* Tuthill, Ent. News, 49: 241-242.

Length to tip of folded wings 2 to 2.25 mm.

COLOR: General body color, including legs, red. Head and thoracic

\* In honor of P. W. Oman, homopterist of the United States National Museum.  
† *hirsutus* -a -um, L. adj.—hairy.

dorsum with prominent white pubescence. Disc of vertex white, except medial line and two foveae black; antennae black at tip. Thoracic dorsum white, heavily marked with black and red; scutum definitely striped. Forewings reddish fumate, darker toward apex; veins red.

STRUCTURE: Head deflexed, slightly broader than thorax. Discal foveae and medial suture of vertex very prominent, postero-lateral portions of vertex, which bear ocelli, prominently raised. Genal processes blunt, pubescent, strongly divergent from base, scarcely touching basally,  $\frac{1}{3}$  as long as vertex. Antennae about  $1\frac{1}{2}$  times as long as width of head. Thorax heavily pubescent, granular. Posterior tibia with very small basal spur. Forewings twice as long as broad, coriaceous; venation typical, pterostigma short and broad.

GENITALIA: Male proctiger longer than forceps, narrow in lateral view. Forceps in lateral view straight, parallel-margined; in caudal view strongly arched, apices notched, medial tooth thus formed, black, enlarged, extending antero-mesally. Female genital segment short, constricted midway and very narrow to apex; dorsal valve slightly longer than ventral.

This species is close to *Psylla coryli* but can readily be distinguished from it by the very heavy pubescence. The forewings are much more coriaceous and darker, the head is larger, and the female genital segment is different. Specimens are at hand from Oregon, Washington, California, Nevada, and Montana. Some of the California specimens bear labels identical with a series of *coryli*. A series from Satus Creek, Washington, April 23, 1938, K. Gray, bears the label "on *Purshia tridentata*".

HOLOTYPE, male, No. 55170 United States National Museum.

*Psylla minuta\** Crawford

(Fig. 26)

- 1914 *Psylla minuta* Crawford, U. S. Nat. Mus., Bull. 85: 137, 142.  
1914 *Psylla purshiae* Crawford, U. S. Nat. Mus., Bull. 85: 142.  
1914 *Brachypsylla purshiae* Crawford, U. S. Nat. Mus., Bull. 85: 142.  
1917 *Psyllia minuta* Van Duzee, Cat. Hemip. N. Am. 806.  
1931 *Psyllia minuta* Klyver, Pan-Pac. Ent. 7: 158.  
1932 *Psyllia minuta* Klyver, Ent. News 43: 71.

Length to tip of folded wings 2.5 mm.

COLOR: General body color light to dark brown or red. Vertex, stripes on scutum, parts of remainder of thoracic dorsum, lighter. Wings more or less fumate, more heavily in apical half.

STRUCTURE: Vertex slightly more than  $\frac{1}{2}$  as long as wide, strongly bulging anteriorly, shallowly depressed discally. Genal processes cone-shaped, slender, acute, separated at base, divergent,  $\frac{2}{3}$  as long as vertex (typically). Antennae  $1\frac{2}{3}$  as long as width of head. Vertex and dorsum of thorax slightly pubescent. Basal spur on hind tibia very small, blunt. Forewings somewhat rugose,  $2\frac{1}{4}$  times as long as wide; venation typical, pterostigma long, large.

GENITALIA: Male proctiger in lateral view narrow, longer than for-

\* *minutus* -a -um, L. adj.—small.

ceps. Forceps straight in lateral view; in caudal view arched to rather blunt, black apices; heavy pubescence, especially on mesal margins. Female genital segment as long as rest of abdomen; dorsal valve longer than ventral, both acute at apex.

This common species is represented in the material at hand by specimens from various localities in California, Arizona, Utah, Colorado, and Idaho. Klyver records it from Nevada also. As is to be expected in such an abundant species, the specimens show considerable variation, especially in color. The host plant is *Purshia tridentata*.

**TYPE**, female, No. 18108 United States National Museum, American Fork Canyon, Utah, Hubbard and Schwarz.

Type examined.

*Psylla coryli\** Patch

1912 *Psylla coryli* Patch, Me. Agr. Exp. Sta., Bull. 202:223.

1914 *Psylla coryli* Crawford, U. S. Nat. Mus., Bull. 85:137, 143.

1917 *Psylla coryli* Van Duzee, Cat. Hemip. N. Am. 806.

Length to tip of folded wings 2 to 2.25 mm.

**COLOR:** General color light brown to yellowish, thoracic dorsum dark brown except for light stripes. Posterior portion of vertex sometimes dark. Forewings yellowish fumate, more heavily so apically.

**STRUCTURE:** Vertex narrow, strongly depressed discally,  $\frac{2}{3}$  as long as wide, strongly overhanging anteriorly. Genal processes large, slightly over  $\frac{1}{2}$  as long as vertex, acute, divergent, almost parallel to plane of vertex. Antennae  $1\frac{1}{2}$  times as long as width of head. Thorax very strongly arched. Only a very slight protuberance on base of hind tibia. Forewings of typical shape and venation, a little more than twice as long as wide; pterostigma broad, of moderate length.

**GENITALIA:** Male proctiger long, straight. Forceps small, straight, and parallel-sided in lateral view; in caudal view arched, each with a large black inner apical tooth, heavy setae on basal half of inner margins. Female genital segment as long as rest of abdomen; valves somewhat attenuate, dorsal longer than ventral, latter black-margined apically, somewhat flattened.

This species was described by Patch from one (?) male specimen from Colorado. Specimens are at hand from Colorado, Arizona, Nevada, California, Idaho, Oregon, Washington, and British Columbia.

Although Miss Patch's specimen is unavailable, her photograph of the male forceps plus Crawford's description make the identification of this species fairly certain.

**TYPE**, male, whereabouts unknown.

No indication of a host plant is given on any of the specimens.

\* Genitive of *Corylus -i*, L. f. noun—a genus of plants (hazel).

*Psylla media\** n. sp.

(Figs. 63, 64, 281)

Length to tip of folded wings 2.5 mm.

**COLOR:** Head and pronotum white with orange markings. Remainder of thorax mostly orange with markings lighter to white. Abdomen dark brown, sclerites white-margined. Forewings somewhat fumate, most heavily along veins M and Cu, whitish spots on margin in medial cell, between  $M_4$  and  $Cu_1$  and in cubital cell. Hind wings white.

**STRUCTURE:** Head small. Vertex  $\frac{3}{5}$  as long as wide, discal impressions broad and deep, deeply emarginate anteriorly. Genal processes cone-shaped, strongly divergent, blunt,  $\frac{1}{3}$  as long as vertex, nearly parallel to plane of vertex. Antennae  $1\frac{1}{2}$  times as long as width of head. Thorax well arched. Pronotum long. Mesopleurites very strongly developed. Forewings long; venation typical, pterostigma very small. Basal spur on hind tibia extremely small.

**GENITALIA:** Male genitalia large. Proctiger short, stout, evenly narrowed to blunt apex. Forceps in lateral view broad, deeply cleft apically; caudal portion extending antero-mesally as a large, heavily sclerotized, obliquely truncate tooth, cephalic lobe rounded; in caudal view stout to cleft apices, well arched. Female genital segment  $\frac{1}{2}$  as long as rest of abdomen; dorsal valve sinuate on dorsal margin, apex slightly upturned, acute; ventral valve shorter than dorsal, acute.

Described from three females and one male from Trout Creek, Utah, May 8, 1934. T. O. Thatcher, taken on "Carcocarbus aedifolius"; one female, Green Canyon, Utah, April 22, 1934, T. O. Thatcher.

**HOLOTYPE**, female, No. 55171 United States National Museum.

*Psylla difficilis†* n. sp.

(Figs 29, 30)

Overall length 2 mm.

**COLOR:** General color of head and thoracic dorsum orange to white. Abdomen and venter of thorax fuscous. Forewings hyaline except pterostigma and borders of veins dark.

**STRUCTURE:** Head small. Vertex deeply impressed, about  $\frac{3}{4}$  as long as wide. Genal processes very short,  $1/6$  as long as vertex, blunt, separate basally. Antennae nearly twice as long as width of head (11.5:6.5). Thorax quite flat. Forewings very small; venation typical, pterostigma small. Hind tibia with small basal spur.

**GENITALIA:** Male genitalia very similar to *media*. Proctiger in lateral view stout, straight, caudal margin oblique apically. Forceps in lateral view straight, moderately broad, deeply cleft apically, lateral lobe rounded, caudo-mesal portion a black, curved hook; in caudal view stout, mesal teeth incurved, touching; in dorsal view mesal portion of forceps

\* *medius -a -um*, L. adj.—ambiguous.

† *difficilis -e*, L. adj.—troublesome.

is obliquely truncate apically. Female genital segment long ( $\frac{2}{3}$  as long as distended abdomen, longer than remainder of abdomen in normal dried specimens), dorsal and ventral valves both straight, slender, acute, nearly equal in length.

This species is quite similar to *media* but is distinct in the length of the antennae, the genal processes, the flatter thorax, and the genitalia of the female. The genitalia of the male are much like those of *media*. It is described from a series of eight males and females from Trident, Montana, Nov. 16, 1939, D. J. Pletsch, taken on mountain mahogany (*Cercocarpus*) and from specimens collected by D. D. Jensen at Pollock, Idaho. The Montana specimens have very small forewings which are much exceeded by the distended abdomens of males and females alike; the Idaho specimens have normal-sized forewings.

**HOLOTYPE**, male, **ALLOTYPE**, female, Trident, Montana, Nov. 16, 1939, D. J. Pletsch, in author's collection. **PARATYPES** with same data and from Pollock, Idaho, D. D. Jensen; paratypes in collections of Montana State College, author, and D. D. Jensen.

*Psylla hartigii\** Flor

(Figs. 31, 32)

- 1861 *Psylla hartigii* Flor, Rhynch. Liv. 2: 450, 469.
- 1861 *Psylla hartigii* Flor, Bull. Soc. Imp. Nat. Moscou 34:335, 343, 351.
- 1874 *Psylla sylvicola* Lethierry, Cat. Hémip. Dept. Nord. 90 [fide Van Duzee].
- 1876 *Psylla sylvicola* Scott, Trans. Ent. Soc. London 1876:539.
- 1896 *Psylla hartigii* Edwards, Hemip.-Homop. Br. Is. 244, pl. XXVIII, fig. 4.
- 1908 *Psylla hartigii* Oshanin, Verz. palae. Hemip. 2: 358.
- 1912 *Psylla hartigii* (?) Patch, Me. Agr. Exp. Sta., Bull. 202:222.
- 1912 *Psylla hartigii* Oshanin, Kat. palæa. Hemip. 127.
- 1913 *Psylla hartigi* Aulmann, Psy. Cat. 16.
- 1914 *Psylla hartigii* Crawford, U. S. Nat. Mus., Bull. 85:146.
- 1917 *Psylla hartigii* Van Duzee, Cat. Hemip. N. Am. 807.
- 1932 *Psylla hartigii* Klyver, Ent. News 43:71.
- 1935 *Psylla hartigii* Haupt, Tierw. Mittel. 4, 3:235.
- 1938 *Psylla hartigii* Strickland, Can. Ent. 70:205.

Length to tip of folded wings 3 to 3.5 mm.

**COLOR:** General color yellow to orange, darkest on dorsum. Antennae black apically. Forewings yellowish fumate.

**STRUCTURE:** Head small, not as strongly deflexed as in *striata*. Vertex slightly over  $\frac{1}{2}$  as long as wide, with very slight discal impressions. Genal processes acute, apices incurved, almost  $\frac{2}{3}$  as long as vertex. Antennae 1 $\frac{1}{3}$  times as long as width of head (sometimes longer—Crawford). Thorax moderately arched. Hind tibia without basal spur. Forewings of average size, slightly less than 2 $\frac{1}{2}$  times as long as wide; venation typical, Rs straight, pterostigma very large.

**GENITALIA:** Male proctiger straight, narrow. Forceps in lateral view broad basally, quickly narrowed and very slender to apices; in caudal view slender, arched to apparently acute black apices; apices slightly bifid in caudal view. Female genital segment longer than rest of abdo-

\* Named in honor of Hartig, an early European entomologist.

men, slender, valves attenuate, ventral valve acute, straight, dorsal slightly longer than ventral, apical third very slender, downcurved.

Described from specimens from Lead, South Dakota, and Douglas Lake, Michigan. Originally described in Europe where it occurs on *Betula alba*, this apparently holarctic species was first recorded from North America by Miss Patch (Maine) on *Betula populifolia*. Additional records are New York, Nova Scotia, and Alberta. No host records are available on the specimens at hand, but the Lead, South Dakota, series was apparently taken with *P. striata*. Other than North America its known distribution is northern and central Europe.

Flor in describing this psyllid used the spelling *hartigii*. According to the international rules of nomenclature, when modern patronymics are originally published as ending in *ii* such names retain their original form even though they have been incorrectly formed (Op. 8).

*Psylla stricklandi\** (Caldwell)

(Figs. 34, 35)

- 1939 *Psyllia stricklandi* Caldwell, Can. Ent. 71:212.
- 1939 *Psyllia stricklandi* Strickland, Can. Ent. 71:215.

Length to tip of folded wings 4 to 4.5 mm.

**COLOR:** General color green to yellow, fully mature specimens with brown markings on thorax, males darker. Antennae dark apically. Forewings slightly yellowish.

**STRUCTURE:** Head small. Vertex  $\frac{1}{2}$  as long as wide, posterior margin almost straight, discal impressions slight. Genal processes slender, blunt, divergent, as long as vertex at middle, vertical. Antennae slightly under twice as long as width of head. Thorax slightly arched. Posterior tibia with small basal spur. Forewings large, broad, barely over twice as long as wide, costal margin strongly arched; venation typical, pterostigma small.

**GENITALIA:** Male proctiger long, slender, bent caudad apically. Forceps as long as proctiger; nearly straight in lateral view to near apex, then narrowed (mostly on caudal margins) to blunt black apices; in caudal view slender, well arched, very long slender setae medially. Female genital segment longer than rest of abdomen; dorsal valve much longer than ventral, attenuate in apical half to slender, acute, slightly upturned apex, dorsal margin almost straight, styliform portion very densely radulate; ventral valve in lateral view acute, radulate apically.

Described from a pair of paratypes from Columbia Ice Field, Alberta (6,700 ft.), July 22, on *Shepherdia canadensis*, and numerous adults and nymphs from Creede, Colorado, taken at about 10,000 to 11,000 feet; also in July on *Shepherdia canadensis* in 1938, 1939, and 1940. In general, the Colorado specimens are lighter in color than the paratypes.

**TYPE**, female, in Canadian National Collection, Ottawa, Ontario.

\* Named in honor of E. H. Strickland, the collector.

*Psylla tuthilli\** (Caldwell)

(Fig. 33)

- 1939 *Psyllia virida* Caldwell, Can. Ent. 71:212.  
 [non] *Psyllia viridis* Hartig, Germ. Zeitschr. Ent. 3:374. 1841.  
 1939 *Psyllia virida* Strickland, Can. Ent. 71:215.  
 1940 *Psyllia tuthilli* Caldwell, Ohio Jour. Sci., 40:50.

"Length to tip of forewing 3 to 3.5 mm.; forewing 2.7 to 3.3 mm."

"Color: Appearing yellow-green throughout; antennae black at joints and distally; forewings yellowish; genital segment brownish."

"Genal cones longer, more divergent, and more slender than in *stricklandi*. Forewings with Cu<sub>1</sub> rather arched, similar to *carpinicola* Crawford."

"Genitalia: Female segment longer than rest of abdomen. Dorsal valve styliform for caudal third, this portion minutely roughened; caudal half of styliform portion abruptly turned up; apex blunt. Ventral valve almost as long as dorsal; very strongly hooked dorsad in lateral aspect. Lateral plates no longer than ventral valve."

"Forceps of male attenuate in apical third in caudal aspect, in lateral aspect appearing very slender and gradually narrowed to apex."—Caldwell.

This species was described from a single female and several males. I have examined one male paratype and find it to be very similar to *P. magnicauda*. The genal processes are more slender than on the latter species, the antennae slightly shorter proportionately, slight differences are apparent in the venation, etc., but nothing of any marked distinction. Caldwell writes that the female was quite distinct, however, and was therefore made the type, that the dorsal and ventral valves of the female genital segment are much more upturned than they are in *magnicauda*, that the valves are nearly the same length, and that the lateral plates do not exceed the ventral valve as they do in *magnicauda*.

Host *Shepherdia argentea*, "Bullberry" (Strickland).

TYPE, female, August 7, 1938, Medicine Hat, Alberta, in Canadian National Collection, Ottawa, Ontario.

*Psylla magnicauda†* Crawford

(Figs. 36, 37)

- 1914 *Psylla magnicauda* Crawford, U. S. Nat. Mus., Bull. 85:138, 149.  
 1914 *Psylla americana abdominalis* Crawford, U. S. Nat. Mus., Bull. 85:150.  
 1917 *Psylla magnicauda* Van Duzee, Cat. Hemip. N. Am. 809.  
 1932 *Psyllia magnicauda* Klyver, Ent. News 43:72.  
 1938 *Psyllia magnicauda* Strickland, Can. Ent. 70:205.  
 1939 *Psyllia magnicauda* Strickland, Can. Ent. 71:215.

Length to tip of folded wings 3.5 to 4.25 mm.

COLOR: Uniformly light green or slightly yellowish, occasionally faint, longitudinal stripes on scutum. Head often whitish. Forewings clear or slightly yellow.

\* Named in honor of L. D. Tuthill.

† From *magnus* -a -um, L. adj.—large + *cauda* -ae, L. f. noun—tail.

STRUCTURE: Head strongly depressed, vertex almost perpendicular. Vertex  $\frac{1}{2}$  as long as wide, rounded down anteriorly, discal impressions prominent. Genal processes large, slender, cone-shaped, about as long as vertex. Antennae almost twice as long as width of head. Thorax well arched. Hind tibia with small basal spur. Forewings broad, less than  $2\frac{1}{2}$  times as long as wide; marginal cells large, Rs sinuate, pterostigma small.

GENITALIA: Male proctiger slender, apical fourth bent caudad. Forceps large, almost as long as proctiger; in lateral view parallel margined; in caudal view slender, arched to black, blunt apices. Female genital segment large and very thick dorso-ventrally, as long as rest of abdomen or longer; dorsal margin of dorsal valve sinuate, apex slender, elongate, radulate, apex upturned; ventral valve much shorter than dorsal, acute, slightly upcurved; lateral plates longer than ventral valve.

Numerous specimens are at hand from Colorado, Wyoming, Montana, North Dakota, Minnesota, British Columbia, Saskatchewan, Manitoba. It is also recorded from California and Alberta. Strickland gives the host of this abundant and widespread species as *Eleagnus commutata* (*Eleagnus argentea*), wolf willow. In Colorado I have taken it on *Shepherdia argentea*.

TYPE, female, Sheridan, Wyoming, Metz, is in the Crawford collection and also bears the type label of *Psylla americana abdominalis*.

*Psylla buxi\** (Linnaeus)

(Fig. 38)

- 1758 *Chermes buxi* Linnaeus, Syst. Nat. 10:454.  
 1848 *Psylla buxi* Förster, Verh. natur. Ver. preuss. Rhein. 5:71.  
 1872 *Psylla buxi* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:399.  
 1876 *Psylla buxi* Scott, Trans. Ent. Soc. London 1876:534.  
 1890 *Psylla buxi* Riley, 5th Rept. U. S. Ent. Comm. 672 [rept. of discovery in N. Y., 1881].  
 1896 *Psylla buxi* Edwards, Hemip.-Homop. Br. Is. 249, pl. XXVIII, fig. 7.  
 1908 *Psylla buxi* Oshain, Verz. palae. Hemip. 2:357.  
 1910 *Psylla buxi* Smith, Ins. N. J. 109.  
 1912 *Psylla buxi* Oshain, Kat. paläa Hemip. 127.  
 1913 *Psylla buxi* Aulmann, Psy. Cat. 11.  
 1916 *Psylla buxi* Britton, 39th Rept. Conn. Agr. Exp. Sta. 186.  
 1917 *Psylla buxi* Weiss and Dickerson, Ent. News 28:40-41.  
 1917 *Psylla buxi* Van Duzee, Cat. Hemip. N. Am. 811.  
 1921 *Asphagidella buxi* Enderlein, Zool. Anz. 52:120.  
 1926 *Asphagidella buxi* Enderlein, Ent. Mitt. 15:399.  
 1926 *Psyllia buxi* Ferris, Can. Ent. 58:19 [desc. and figs. nymph].  
 1932 *Psyllia buxi* Klyver, Ent. News 43:75.  
 1938 *Psyllia buxi* Caldwell, Ohio Biol. Surv., Bull. 34:265.

Length to tip of folded wings 3.5 to 4 mm.

COLOR: General color light green, more or less brown on dorsum and pleurites of thorax, pro- and mesothoracic femora partly embrowned. Forewings slightly yellowish. Hind wings white.

STRUCTURE: Head large, deflexed about 45°. Vertex  $\frac{3}{5}$  as long as wide, with very prominent discal foveae, a sharp sulcus extending from

\* Genitive of *Buxus* -i, L. f. noun—the box-tree (the host plant).

each medio-anteriorly to near anterior margin. Genal processes very large, robust, blunt,  $\frac{1}{2}$  as long as vertex. Antennae 1 $\frac{1}{2}$  times as long as width of head. Thorax well arched. Posterior tibia with large basal spur and small tubercle. Forewings large, much longer than body, somewhat over 1 $\frac{1}{2}$  times as long as wide; membrane thickly set with minute setae; marginal cells large, Rs long, curved, pterostigma almost entirely lacking.

**GENITALIA:** Male proctiger longer than forceps, almost straight. Forceps in lateral view broad, straight, slightly enlarged toward apices; in caudal view stout, slightly arched, apices flattened, incurved, terminating in a large, curved, black tooth. Female genital segment twice as long as rest of abdomen, dorsal valve much longer than ventral, downcurved, apex acute, upturned; ventral valve acute, upturned.

Described from a series of specimens from New York on "Bux." Additional specimens are at hand from Portland, Oregon. It is also recorded from New Jersey, Ohio, Connecticut, and California. Outside of North America its known distribution embraces Great Britain and almost all of continental Europe.

The male specimens at hand are all somewhat teneral, hence the description of the male genitalia may be erroneous in some details.

Enderlein (1921) designated *P. buxi* as type of a new genus, *Asphagidella*, based on the lack of pterostigma in the forewing and venational characteristics of the hind wings, characters which I do not believe to be of generic significance.

This species causes considerable injury to its host, ornamental box (*Buxus sempervirens*).

*Psylla bulbosa*\* n. sp.

(Figs. 67, 68, 283)

Length to tip of folded wings 2.75 to 3 mm.

**COLOR:** Whitish green, scutum and anterior portion of prescutum sometimes yellowish. Forewings slightly fumate. Tip of antennae dark.

**STRUCTURE:** Head strongly deflexed. Vertex almost plane, slightly over  $\frac{1}{2}$  as long as wide. Genal processes large, swollen, rounded, contiguous most of length,  $\frac{3}{4}$  as long as vertex, scarcely depressed below plane of vertex, nearly parallel. Antennae 1 $\frac{1}{3}$  times as long as width of head. Thorax broad, well arched. Hind tibia with prominent spur at base. Forewings broad, but slightly over twice as long as wide; venation typical, pterostigma very broad, of moderate length. Membrane of both fore and hind wings thickly set with minute setae, forming indefinite radular areas on margin of forewing.

**GENITALIA:** Male genitalia large. Subgenital plate unusually large. Proctiger straight, narrow. Forceps nearly reaching tip of proctiger, with long heavy pubescence; in lateral view narrow, slightly sinuate on caudal margin; in caudal view arched to blunt, black apices, somewhat flattened on caudal side near apex; in dorsal view apices truncate, pro-

\* *bulbosus -a -um*, L. adj.—bulbous, in reference to the genal processes.

duced cephalad as small blunt tooth. Female genital segment heavy, longer than rest of abdomen, with long sparse pubescence; dorsal valve longer than ventral, nearly straight, apex subacute, upturned, apical portion radulate; ventral valve nearly straight, acute.

Described from twenty-two specimens from Ruby, Arizona, July 22, 1938, R. H. Beamer, collected on *Salix taxifolia* H.B.K., in the Snow Collection, University of Kansas, and twenty-six specimens in the United States National Museum, twenty-one of which bear a label, "Turkey Creek, Arizona, June 10, 1933, P. W. Oman"; the remaining five are from Nogales, Arizona, June 25, 1933, P. W. Oman.

**HOLOTYPE**, male, **ALLOTYPE**, female, and paratypes in Snow Collection; paratypes in United States National Museum and author's collection.

*Psylla manisi*\* n. sp.

(Figs. 69, 70, 284)

Length to tip of folded wings 3.5 mm.

**COLOR:** General color reddish, genal processes and legs lighter. Antennae black apically. Forewings fumate, most heavily along veins and apically; pterostigma yellowish opaque.

**STRUCTURE:** Head strongly deflexed. Head and thorax punctate. Vertex long, over  $\frac{1}{2}$  as long as wide, slight discal impressions. Genal processes stout, contiguous almost to tips,  $\frac{1}{2}$  as long as vertex. Antennae slightly longer than width of head. Thorax well arched. Pronotum almost vertical. Hind tibia with small basal tubercle. Forewings slightly over 2 $\frac{1}{2}$  times as long as wide; membrane very thickly set with minute setae; cubital cell larger than medial, pterostigma very large.

**GENITALIA:** Male proctiger much longer than forceps, near apex narrowed and flexed caudad. Forceps in lateral view broad basally, much enlarged, then converging (more abrupt on caudal margin) to narrow, cephalically turned, sharp, black apices; in caudal view very broad basally, mesal margins sinuate, lateral margins nearly straight  $\frac{2}{3}$  of length then sharply excavate, slender brown apical portion slightly incurved, sharp lateral margins near base produced caudad as a small flat lobe. Female genital segment shorter than rest of abdomen (much shorter in fresh or alcoholic specimens); dorsal valve slightly upcurved, blunt; ventral valve shorter than dorsal, deep, ventral margin straight to midpoint then angularly bent dorsad to acute apex.

Described from a series of thirty-seven males and females sent to me by H. C. Manis of the University of Idaho, to whom the species is dedicated. They were collected on mountain ash on Moscow Mountain near Moscow, Idaho, September 5, 1940. Three additional females from the same locality were collected in July and August, 1938, by H. M. Harris.

**HOLOTYPE**, male, **ALLOTYPE**, female, and **PARATYPES** in author's collection; paratypes in United States National Museum and University of Kansas.

\* Named in honor of H. C. Manis, the collector.

*Psylla breviata\** Patch

(Figs. 39, 40)

- 1912 *Psylla breviata* Patch, Me. Agr. Exp. Sta., Bull. 202:220.  
 1914 *Psylla breviata* Crawford, U. S. Nat. Mus., Bull. 85:137, 141.  
 1917 *Psylla breviata* Van Duzee, Cat. Hemip. N. Am. 806.  
 1931 *Psylla breviata* Klyver, (?) Pan-Pac. Ent. 7:157.

Length to tip of folded wings 3 mm.

COLOR: Greenish yellow throughout except tip of antennae dark.  
 Wings slightly whitish.

STRUCTURE: Head strongly deflexed. Vertex with prominent discal impressions,  $\frac{2}{3}$  as long as wide. Genal processes slender, straight, blunt,  $\frac{3}{4}$  as long as vertex. Antennae but very slightly longer than width of head. Thorax well arched. Pronotum nearly vertical. Hind tibia with small, blunt basal spur. Forewings broad, but slightly over twice as long as wide; venation typical, pterostigma large. Membrane of both fore- and hind wings very thickly set with minute setae.

GENITALIA: Male proctiger long, straight. Forceps in lateral view long, straight to near apex than excavate on cephalic margin; in caudal view bowed basally, nearly straight to near apex then sharply bent mesad; apices slender, acute, curving cephalad. Female genital segment about as long as rest of abdomen, stout; dorsal valve longer than ventral, attenuate, slightly upcurved and knoblike apically; ventral valve acute.

One female is at hand from Marquette, Michigan, and a large series of males and females from California (Placer and Nevada Counties and Argus Mountains). The description of the male genitalia is from the latter group. That the California specimens are Miss Patch's species I believe is quite doubtful, but until some males are available from the type locality they are placed here. The original description was based on three females from Dows Swamp, Ottawa, Ontario, June 14, 1903. Host unknown.

From the figure of the male genitalia accompanying Klyver's records of *breviata* from Utah and Nevada, his specimens apparently are not the same species. I believe them to be a heretofore undescribed species *Psylla manisi*.

*Psylla quadrilineata†* Fitch

(Figs. 71, 72)

- 1851 *Psylla quadrilineata* Fitch, 4th Rept. N. Y. Sta. Mus. 64.  
 1885 *Psylla quadrilineata* Riley, Proc. Biol. Soc. Wash. 2:69.  
 1890 *Psylla quadrilineata* Provancher, Pet. Faune Ent. Can. 305-306.  
 1893 *Psylla quadrilineata* Fitch, 46th Rept. N. Y. Sta. Mus. (reprint of original desc.).  
 1913 *Psylla quadrilineata* Aulmann, Psy. Cat. 25.  
 1914 *Psylla quadrilineata* Crawford, U. S. Nat. Mus., Bull. 85:148.  
 1917 *Psylla quadrilineata* Van Duzee, Cat. Hemip. N. Am. 808.

Length to tip of folded wings 3 mm.

COLOR: General color red to reddish brown. Lighter on margins of

\* *breviatus*, L. (p. part. of *brevio*)—shortened.† From *quadr-*, L.—four + *lineatus*, L. (p. part. of *lineo*)—striped.

most sclerites. Four light longitudinal stripes on scutum. Wings slightly whitish, pterostigma infuscated.

STRUCTURE: Head and thorax coarsely punctate. Head large, strongly deflexed. Vertex  $\frac{2}{3}$  as long as wide, posterior margin deeply concave, deeply impressed discally, anterior margin very strongly protruding, overhanging median ocellus. Genal processes stout, straight, blunt, scarcely tapered,  $\frac{1}{2}$  as long as vertex. Antennae short, thick, as long as width of head. Thorax moderately arched. Legs short. Hind tibia with short, stout, basal spur. Membrane of both fore- and hind wings thickly set with minute setae, in forewing forming indefinite radular areas on apical margin. Forewings slightly less than  $2\frac{1}{2}$  times as long as wide; marginal cells unusually large; Rs very long, pterostigma very large.

GENITALIA: Male proctiger stout, straight, parallel-margined, with an anterior projection basally and an apical epiphysis. Forceps in lateral view moderately broad basally, enlarged, slightly constricted beyond midpoint, apical portion sharply constricted and flexed caudad to truncate black apices; meso-apical margin produced anteriorly as a small black tooth; in caudal view evenly arched from bases to acute black apices, broadest midway. Female genital segment  $\frac{1}{4}$  shorter than rest of abdomen; dorsal valve straight, apical portion attenuate, blunt; ventral valve shorter, upturned midway, acute.

Described from five females and one male from New Hampshire which have been compared with the type. The TYPE, a female, No. 1342 United States National Museum, and two females of Fitch's type series are in the National Museum. They have been molded but are in fair condition. This species is similar to *P. americana* in many respects.

The host is unknown.

*Psylla mali\** (Schmidberger)

(Figs. 41, 42)

- 1836 *Chermes mali* Schmidberger, Beitr. z. Nat. Schädl. Ins. 4:186 [fide Aulmann].  
 1848 *Psylla mali* Förster, Verh. natur. Ver. preuss. Rhein. 5:72.  
 1848 *Psylla ulmi* Förster, Verh. natur. Ver. preuss. Rhein. 5:71.  
 1848 *Psylla pomii* Förster, Verh. natur. Ver. preuss. Rhein. 5:72.  
 1848 *Psylla crataegicola* Förster, Verh. natur. Ver. preuss. Rhein. 5:72.  
 1848 *Psylla aeruginosa* Förster, Verh. natur. Ver. preuss. Rhein. 5:97.  
 1848 *Psylla occulta* Förster, Verh. natur. Ver. preuss. Rhein. 5:98.  
 1848 *Psylla dubia* Förster, Verh. natur. Ver. preuss. Rhein. 5:73.  
 1861 *Psylla mali* Flor, Bull. Soc. Imp. Nat. Moscou 34:335, 345, 350, 358.  
 1872 *Psylla mali* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:398.  
 1872 *Psylla rubida* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:398.  
 1872 *Psylla claripennis* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:400.  
 1876 *Psylla mali* Scott, Trans. Ent. Soc. London 1876:542.  
 1878 *Psylla mali* Löw, Verh. zool.-bot. Ges. Wien 27:135.  
 1876 *Psylla crataegicola* Scott, Trans. Ent. Soc. London 1876:542.  
 1876 *Psylla viridissima* Scott, Trans. Ent. Soc. London 1876:543.  
 1908 *Psylla mali* Oshanin, Verz. palae. Hemip. 2:355.  
 1910 *Psylla mali* Oshanin, Verz. palae. Hemip. 3:191.  
 1912 *Psylla mali* Oshanin, Kat. paläa. Hemip. 127.

\* Genitive of *malus*—the apple, its principal host.

- 1913 *Psylla mali* Aulmann, Psy. Cat. 19.  
 1919 *Psylla mali* Brittain, Agr. Gaz. Can. 6:823-827 [figs].  
 1923 *Psylla mali* Brittain, N. S. Dept. Agr., Bull. 10:1-69, VI pls. [life history, control].  
 1931 *Psylla mali* Klyver, Can. Ent. 63:114.  
 1935 *Psylla mali* Haupt, Tierw. Mittel. 5:236.

Length to tip of folded wings 4 mm.

COLOR: "Summer coloration. General color pale green, sometimes tinged with yellow; no color difference exists between the sexes in the early part of the season. . . .

"Autumn coloration, female. . . Head varying from bright yellow to dark brown with local modulations; median suture always darker . . . Prothorax, dull yellow varying to dark brown; reddish and dusky markings may occur. Praescutum of mesothorax orange to brown, sometimes greenish; anterior portion usually darker. . . . Scutum, dull yellow to dark orange, dark brown where yellow bars existed in summer coloration. Remainder of thorax, dull yellow and orange with dusky markings varying in location and intensity. Abdomen; the yellow posterior margin of the dorsum of each segment becomes orange or deep blood red, . . . (rest) dusky or jet black. . . . Entire ventral surface of body uniform dull yellow. . . .

"MALE. General body color changed from green to bright orange yellow."—Brittain.

STRUCTURE: Head very strongly deflexed, almost perpendicular to axis of body. Vertex with shallow discal impressions, bulging anteriorly,  $\frac{1}{2}$  as long as wide. Genal processes divergent, slender, blunt, almost as long as vertex. Antennae small,  $1\frac{3}{4}$  times as long as width of head. Thorax strongly arched. Legs small; hind tibia with small basal spur. Forewings somewhat whitish,  $2\frac{1}{2}$  times as long as wide; venation typical, pterostigma very large. Membrane of fore- and hind wings thickly set with minute setae.

GENITALIA: Male genitalia small. Proctiger short, slightly longer than forceps, strongly bent caudad near apex. Forceps simple, slightly arched to blunt, black, apices. Female genital segment shorter than rest of abdomen, stout; dorsal valve blunt, slightly longer than ventral, latter acute.

Described from a short series from Digby and Kings Counties, Nova Scotia, collected by W. H. Brittain, July, 1931, and determined by Oman as *Psylla mali*. I have not seen any European specimens.

Brittain has done a great amount of work on this pest since its discovery in Nova Scotia in 1919. It is treated in detail in Bulletin No. 10 of the Department of Agriculture of Nova Scotia. Briefly, the life history in Nova Scotia is as follows: The eggs are deposited in the fall (September and October). Hatching occurs early in May. The average nymphal life is 34 days, the adults appearing in the last half of June. Mating occurs within a fortnight of emergence and continues for the next two months. There is but one generation per year.

As indicated above the color changes as the season progresses, from a pale green to brown and vivid orange or red.

To date it has been recorded only from Nova Scotia and New Brunswick in North America. It is generally distributed through northern and central Europe and Asia including Japan.

#### *Psylla alba*\* Crawford

(Figs. 43, 44)

- 1914 *Psylla alba* Crawford, U. S. Nat. Mus., Bull. 85:138, 143.  
 1914 *Psylla americana alba* Crawford, U. S. Nat. Mus., Bull. 85:143.  
 1917 *Psylla alba* Van Duzee, Cat. Hemip. N. Am. 806.  
 1932 *Psylla alba* Klyver, Ent. News 43:71.  
 1938 *Psylla alba* Strickland, Can. Ent. 70:204.

Length to tip of folded wings 3 mm.

COLOR: Typically greenish white, some specimens (faded?) yellowish.

STRUCTURE: Vertex a little over  $\frac{1}{2}$  as long as wide, strongly bulging anteriorly, with shallow discal impressions. Genal processes almost as long as vertex, heavy, contiguous basally, rather blunt. Antennae a little more than  $1\frac{1}{2}$  times as long as width of head. Thorax typical. A small basal spur on hind tibia. Forewings large, whitish, transparent; over twice as long as wide; venation typical, pterostigma large.

GENITALIA: Male proctiger long and slender, straight. Forceps small, much shorter than proctiger, stout; in caudal view almost straight to near apices, a large, black, incurved tooth at apex of each. Female genital segment as long as rest of abdomen, dorsal valve a little longer than ventral, both acute.

Described from specimens from Nicolaus, California, which have been compared with the type. Specimens are at hand from California, Washington, Utah, Wyoming, Colorado, and Wisconsin.

TYPE, female, Ormsby County, Nevada, July, Baker, in the Crawford Collection.

The host is *Salix* sp.

#### *Psylla ribesiae*† Crawford

(Figs. 45, 46)

- 1911 *Psyllopa ribesiae* Crawford, Pom. Coll. Jour. Ent. 3:630-631.  
 1912 *Psylla gillettei* Patch, Me. Agr. Exp. Sta., Bull. 202:221.  
 1914 *Arytaina ribesiae* Crawford, U. S. Nat. Mus., Bull. 85:126.  
 1914 *Psylla ribis* Crawford, U. S. Nat. Mus., Bull. 85:127.  
 [non] *Psylla ribis* Patch, Me. Agr. Exp. Sta., Bull. 202:222. 1912.  
 1917 *Arytaina ribesiae* Van Duzee, Cat. Hemip. N. Am. 804.  
 1932 *Arytaina ribesiae* Klyver, Ent. News, 43:39-40.

Length to tip of folded wings 3.25 to 4 mm.

COLOR: Quite variable. From light to dark brown, usually dark. Scutum with light and dark stripes. Vertex white with variable dark markings. Genital processes white. Antennae dark distally, tips of basal

\* *albus -a -um*, L. adj.—white.

† Etymology obscure; apparently based on *Ribes*, the generic name of the host.

segments dark. Forewings clear except for a prominent dark spot at apex of clavus, sometimes a brownish area at base, four more-or-less prominent spots on margin.

**STRUCTURE:** Head large, very strongly deflexed. Vertex shallowly impressed discally, 3/5 as long as wide. Genal processes almost on same plane as vertex, somewhat divergent then incurved slightly, blunt, quite variable in shape and size, usually about 2/3 as long as vertex. Antennae 1 1/4 times as long as width of head. Thorax strongly arched. Hind tibia with small basal spur. Forewings about 2 1/2 times as long as wide; venation typical, pterostigma small; four radular areas along margin, in cubital cell, between Cu<sub>1</sub> and M<sub>4</sub>, in medial cell, between M<sub>1</sub> and R<sub>s</sub>.

**GENITALIA:** Male proctiger stout, straight, length somewhat variable. Forceps in lateral view broad basally, unevenly narrowed to slender truncate apices, turned caudad at apex; in caudal view broad, slightly arched. (Quite variable in size and exact shape.) Female genital segment shorter than rest of abdomen, stout; valves almost equal in length, acute, ventral valve strongly upcurved.

This is a numerous and widespread species occurring over western North America. It is extremely variable in almost all characters, especially color, genal processes, and genitalia, which makes it very difficult to define. In addition to a paratype from Boulder, Colorado, specimens are at hand from numerous localities in the following states: Colorado, Kansas, Nebraska, South Dakota, Wyoming, Idaho, Arizona, California, and Oregon.

Klyver records *Ceanothus thyrsiflorus* as a definite host in California. Many of the specimens at hand bear labels "currant," *Ribes*, *Ribes aureum*. Many of the specimens so labeled are teneral and have cast nymphal skins or nymphs on the pin with them. It would seem, therefore, as if hosts in at least two different genera were capable of supporting this common form. Many of the specimens from which Patch described *gilletti* are in the collection of the Colorado Agricultural College and have been examined.

Crawford placed this species in *Arytaina* apparently because of the position of the genal processes in which character it resembles some members of that genus. The chief distinction between the two genera, however, is the shape of the prothoracic pleurites. On this basis *ribesiae* must go in the genus *Psylla* to which it is similar in most respects. In many specimens a slight groove on the episternum is pigmented and on superficial examination the propleurites do have the appearance of being equal in length and in breadth dorsally. Several other species of *Psylla* exhibit this same character, and in those forms in which the head extends well back over the prothorax laterally, it becomes quite difficult to ascertain the exact condition of these sclerites without dissection.

**TYPE**, female, Boulder, Colorado, Bethel, *Ribes longiflorum*, in the Crawford Collection.

*Psylla pyricola\** Förster

(Figs. 4, 5, 47, 48)

- 1840 *Psylla pyri* Curtis, Gard. Chron. 156 (nec Linn. Faun. Svec. 1761) [fide Aulmann, Psy. Cat. 24].  
 1848 *Psylla pyricola* Förster, Verh. natur. Ver. prœuss. Rhein. 5:77-78.  
 1848 *Psylla apiophila* Förster, Verh. natur. Ver. prœuss. Rhein. 5:78.  
 1861 *Psylla notata* Flor, Bull. Soc. Imp. Nat. Moscou 34:341, 349, 355, 365-367.  
 1872 *Psylla pyricola* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:396.  
 1872 *Psylla apiophila* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:396.  
 1880 *Psylla pyrisuga* Barnard, Proc. A.A.S. 28:478-486.  
 1885 *Psylla pyricola* Riley, Proc. Biol. Soc. Wash. 2:69.  
 1892 *Psylla pyricola simulans* Slingerland, N. Y. (Cornell) Agr. Exp. Sta., Bull. 44:175, 185.  
 1893 *Psylla pyricola* Lintner, 9th Rept. N. Y. Sta. Ent. 317-329.  
 1908 *Psylla pyricola* Oshanin, Verz. palæ. Hemip. 2:352.  
 1910 *Psylla pyricola* Oshanin, Verz. palæ. Hemip. 3:189.  
 1910 *Psylla pyricola* Smith, Ins. N. J. 109.  
 1911 *Psylla pyricola* Patch, Me. Agr. Exp. Sta., Bull. 187:11.  
 1912 *Psylla pyricola* Oshanin, Kat. palæa. Hemip. 127.  
 1913 *Psylla pyricola* Aulmann, Psy. Cat. 24.  
 1914 *Psylla pyricola* Crawford, U. S. Nat. Mus., Bull. 85:144.  
 1917 *Psylla pyricola* Van Duzee, Cat. Hemip. N. Am. 806.  
 1918 *Psylla pyricola* Ross, 49th Ann. Rept. Ent. Soc. Ont. 81.  
 1931 *Psylla pyricola* Klyver, Can. Ent. 63:112.  
 1938 *Psylla pyricola* Caldwell, Ohio Biol. Surv., Bull. 34:261.  
 1938 *Psylla pyricola* Brimley, Ins. N. C. 104.

Length to tip of folded wings (summer form) 2.0 to 2.75 mm., (winter form) 3.3 to 4 mm. (Crawford).

**COLOR:** SUMMER FORM. "General color light orange to reddish brown, with darker markings; vertex, genal cones, scutum between stripes, male genitalia, legs except hind femora, antennae except at tip, light brown to orange; genal cones lighter colored at apex than at base. . . . Wings transparent, clear or often with a slight yellowish tinge, especially in the distal cells; with a conspicuous black spot at tip of clavus. . . ." WINTER FORM. "General color very dark reddish brown to black; markings black; areas noted in summer form as lighter are correspondingly a little lighter here, but antennae mostly dark from base to tip; wings darker on basal portion, apically clear, veins black and very conspicuous, black claval spot more pronounced."—Crawford.

**STRUCTURE:** Vertex a little over 1/2 as long as wide, discal impressions and medial suture very prominent, especially anteriorly. Genal processes 4/7 as long as vertex, robust, contiguous basally, sharp apically. Antennae 1 1/2 times as long as width of head. Thorax strongly arched. Hind tibia with small basal spur. Forewings slightly over twice as long as wide, four diffuse radular areas on margin; venation typical, pterostigma large.

**GENITALIA:** Male proctiger short, slender, curved caudad. Forceps almost as long as proctiger, narrowed from base to acute black apices. Female genital segment shorter than rest of abdomen, stout, dorsal valve slightly longer than ventral, blunt.

\* From *pyrus* -i, L. f. noun—pear + *cola*, L.—inhabitant.

This, the pear psylla, was introduced from Europe early in the 19th century. It is of great importance as a pest on its host plant, *Pyrus communis*, the common pear. Since its introduction into the New England states, it has spread north, south, and west, having been recorded from Nova Scotia, Maine, Connecticut, Massachusetts, New York, New Jersey, Maryland, Virginia, North Carolina, Ohio, Illinois, Michigan, Ontario, British Columbia (?), and California (?). Recently, it has made its appearance in the Pacific Northwest, in the Spokane, Washington, area. Besides North America it is known to occur in most of Europe, and northern and central Asia, including Japan.

Lintner (1893) discusses it in detail, gives figures, life history, damage, and a complete history of its occurrence in North America to that date, including a bibliography.

A brief life history taken from the sources cited above is as follows: The overwintering stage is the adult. Copulation and egg-laying begin in early spring (April in New York). Approximately a month is required for the insects to reach maturity. Breeding continues throughout the season, there being several generations per year.

Due to its economic importance, this psyllid has been discussed at great length and in considerable detail in various bulletins and other economic entomological literature. A great deal of research has been done on control work, especially in New York state. This literature is too voluminous to be cited here but is all listed in the Indices of American Economic Entomology.

#### *Psylla americana\** Crawford

(Figs. 49, 91)

- 1914 *Psylla americana* Crawford, U. S. Nat. Mus., Bull. 85:138, 147.
- 1917 *Psyllia americana* Van Duzee, Cat. Hemip. N. Am. 808.
- 1932 *Psyllia americana* Klyver, Ent. News 43:71.
- 1938 *Psyllia americana* Strickland, Can. Ent. 70:204.

Length to tip of folded wings 3 to 3.75 mm.

COLOR: General color red to reddish brown. Vertex usually whitish medially. Genal processes light basally, dark toward apex. Pronotum black on cephalic half, remainder white. More or less distinct white margin on lateral and posterior margins of prescutum. Variable white lines on scutum and scutellum. Wings hyaline, veins dark, pterostigma dark.

STRUCTURE: Head strongly deflexed. Vertex with deep discal impressions, about  $\frac{2}{3}$  as long as wide, somewhat bulging anteriorly. Genal processes slender, divergent, blunt,  $\frac{2}{3}$  as long as vertex. Antennae about  $1\frac{1}{3}$  times as long as width of head or slightly longer. (I have seen none in which the ratio is as much as 1.5:1). Thorax well arched. Pronotum large, nearly vertical. Hind tibia with small basal spur. Forewings large, about  $2\frac{1}{2}$  times as long as wide; marginal cells large, pterostigma large. Membrane of both fore- and hind wings thickly set with minute setae.

\* Adjectival form of America.

GENITALIA: Male genitalia large. Proctiger long, straight, slightly bent caudad apically. Forceps large; in lateral view broad basally, cephalic margin tapered to acute apices; in caudal view slender, almost straight to subacute black apices. Female genital segment as long as rest of abdomen, slender, straight; dorsal valve straight, apical third very slender, apex acute in both lateral and dorsal view, considerably longer than ventral valve; latter acute.

Described from specimens from "Mountains near Claremont, California"—C. F. Baker. These specimens are considered as typical. Many other specimens are at hand from numerous localities in California, from Utah, and Colorado. It is also recorded from Idaho and Nova Scotia. A series of specimens in the United States National Museum from Banff Springs, Alberta, is, I assume, the basis for Crawford's record for that locality. They represent a distinct species, however, which is described below. The host plants of this abundant species are willow (*Salix* spp.). Crawford records the type as in his collection, but there seems to be no specimen so designated.

#### *Psylla americana curta\** n. subsp.

(Fig. 92)

Length to tip of folded wings 3 mm.

COLOR: Similar to *P. americana*.

STRUCTURE: Similar to typical subspecies except antennae slightly longer,  $1\frac{1}{2}$  times as long as width of head.

GENITALIA: Male genitalia much smaller, heavily pubescent. Proctiger scarcely longer than forceps, stout, curved caudad. Forceps in lateral view stout, tapered to subacute apices, in caudal view stout, somewhat arched, apices touching. Female genital segment shorter than rest of abdomen, slender; dorsal valve straight, long, apical portion slender, straight to blunt tip; ventral valve much shorter than dorsal, not upturned, straight to acute apex.

Biological evidence may subsequently prove this to be a distinct species, but since no such data are available I am unwilling to give it that status even though it can be distinguished from typical *americana*, the only distinct difference being in the male genitalia. This would appear to be the form Crawford had in mind when he established *P. americana minor*. His designated type for that name, however, is distinct from this form.

Specimens are at hand from Del Mar, San Jose, Berkeley, San Francisco, Monterey, Fieldbrook, Little River, Lompoc, Alameda County, and Los Angeles County, California (some of the latter were collected on *Salix californica*, April, Koebele), and Colorado.

HOLOTYPE, male, No. 55172 United States National Museum, Del Mar, California, June 2, 1935, Oman; ALLOTYPE same data. Holotype, allotype,

\* *curtus -a -um*, L. adj.—short.

and paratypes in United States National Museum, paratypes in Snow Collection, University of Kansas, and author's collection.

*Psylla confusa\** n. sp.

(Figs. 73, 74, 285)

Length to tip of folded wings 3 mm.

This form is very similar to *P. americana curta* except in genital characters. Membrane of forewings without or almost without the minute setae which are so numerous on *americana* and *americana curta*. Antennae somewhat shorter, about 1 1/4 times as long as the width of the head. Since it is distinguishable, and from the labels on the specimens at hand appears to live upon an entirely different host, it is somewhat doubtfully given specific rank.

**GENITALIA:** Male genitalia very sparsely pubescent. Proctiger slender, 1 1/2 times as long as forceps, hooked caudad apically. Forceps broad, flat, twisted toward apices with flat surface caudad, sharply narrowed near apices leaving a large blunt apical tooth, caudal margins sinuate. Female genital segment shorter than *curta*; dorsal valve concave dorsally, apical portion slender, tip blunt, slightly upturned; ventral valve shorter than dorsal, sharply upturned.

Described from specimens from Utah, Nevada, and Arizona, all collected in March and April; several bear host plant labels which with one exception are *Covillea tridentata* or *C. tridentata* (creosote bush).

**HOLOTYPE**, male, No. 55173 United States National Museum, St. George, Utah, March 9, 1934, E. W. Davis, *C. tridentata*; **ALLOTYPE** and 11 PARATYPES same data. Other PARATYPES as follows: 9 Hoytsville, Utah, April 17, 1912, V. L. Wildermuth; 3 Riverside, Nevada, Mar. 8, 1934, E. W. Davis, *C. tridentata*; 2 Littlefield, Arizona, April 28, 1931, E. W. Davis, *Covillea tridentata*; 1 same locality and collector Mar. 27, 1931, *Pluchea sericea*; 1 Arizona, C. F. Baker.

Holotype, allotype, and paratypes in United States National Museum. Paratypes in author's collection.

*Psylla parallela†* Crawford

(Fig. 75)

- 1914 *Psylla parallela* Crawford, U. S. Nat. Mus., Bull. 85:137, 141.  
1917 *Psyllia parallela* Van Duzee, Cat. Hemip. N. Am. 805.  
1932 *Psyllia parallela* Klyver, Pan-Pac. Ent. 8:16.

Length to tip of folded wings 3 mm.

**COLOR:** Yellowish green (?). I have seen only the type specimens which are rather old and apparently faded to a yellowish shade.

**STRUCTURE:** Head small, strongly deflexed. Vertex 1/2 as long as wide with deep discal impressions, bulging in front each side of median suture.

\* *confusus -a -um*, L. adj.—confused.

† *parallelus -a -um* L. adj.—parallel, application obscure.

Genal processes small, slender, rather sharp, 2/3 as long as vertex. Antennae short, about 1 1/4 times as long as width of head. Thorax well arched. Pronotum almost vertical. Hind tibia with small basal spur. Forewings of moderate size, almost 2 1/2 times as long as wide; venation typical, pterostigma large, yellow.

**GENITALIA:** Male proctiger straight, swollen from base to middle then tapered to broad, rounded apex. Forceps short; in lateral view narrow basally, caudal margin slightly excavate, cephalic margin strongly bulged midway then narrowed to near apices, apically produced both cephalad and caudad as a black tooth, general appearance T-shaped; in caudal view stout basally, bowed outward, apical third strongly narrowed, bent mesad, apices black, truncate. "Female genital segment as long as rest of abdomen, slender, dorsal valve longer than ventral."—Crawford.

I have seen only the type specimens, which are from Nevada County, California, Castle Rock, collected by Koebele in September. Klyver records it from Washington and British Columbia. I am rather doubtful of these records; the specimens referred to are probably *P. minor*, the male genitalia of which resemble those of *P. parallela*. The former is very abundant in the Pacific Northwest.

Host entirely unknown.

**TYPES**, 2 males (on same pin), No. 18106 United States National Museum, with data given above, have been examined.

*Psylla minor\** Crawford

(Fig. 76, 77)

- 1914 *Psylla americana minor* Crawford, U. S. Nat. Mus., Bull. 85:138, 147.  
1914 *Psylla rufula* Crawford, U. S. Nat. Mus., Bull. 85:148.  
1917 *Psyllia americana minor* Van Duzee, Cat. Hemip. N. Am. 808.  
1932 *Psyllia americana minor* Klyver, Ent. News 43:72.

Length to tip of folded wings 3.5 to 4 mm.

**COLOR:** General color dark brown, abdomen black. Some white on vertex and thoracic dorsum. Females lighter than males. Wings whitish. Veins black. Pterostigma fumate.

**STRUCTURE:** Head strongly deflexed. Vertex about as long as wide, discal impressions prominent. Genal processes slender, slightly divergent, slightly over 2/3 as long as vertex. Antennae 1 1/3 to 1 1/2 times as long as width of head. Thorax well arched. A blunt tooth at base of hind tibia. Forewings large, enlarged toward apices, 2 1/4 times as long as wide; marginal cells large, cubital larger than medial, pterostigma of moderate width, very long. Hind wings very long. Membrane of both fore- and hind wings thickly set with minute setae.

**GENITALIA:** Male genitalia large, very pubescent. Proctiger stout, curved cephalad, then strongly caudad to truncate apex. Forceps almost as long as proctiger; in lateral view broad at base, narrowed, swollen midway, converging slightly to near apices then enlarged, apices roundly

\* *minor -us*, L. adj. (comp. of *parvus*)—smaller.

truncate; in caudal view large, swollen basally, apical third narrowed and straight to truncate apices. Female genital segment somewhat shorter than rest of abdomen; dorsal valve much longer than ventral, straight, apical half slender, apex blunt; ventral valve nearly straight to acute black apex.

Described from many specimens from numerous localities in Oregon, Washington, and Colorado. A series received from Mr. R. L. Post of the Oregon State College, collected in Salem, Oregon, was taken on "pussy willow" and was injuring the plants. This series was erroneously determined as *Psylla parallela* Crawford, a closely related or at least similar species. Other specimens bear labels "willow blossom," "willow bloom," "willow," etc. Crawford records specimens on *Salix lasiolepsis*, *Salix californica*, and *Salix* sp. The hosts are apparently several species of willow (*Salix* spp.). Crawford records it from several localities in California. I believe these records refer to *P. americana curta*, a form which he seems to have had confused with *minor*. The type specimen, a male, on which the above description is based, is not, in my opinion, conspecific with *americana*. It is, however, the same species as Crawford's *americana flava*, the latter being but a color variety of *minor*.

**TYPE**, male, No. 18109 United States National Museum, Colorado, "from Gillette Collection, 1894."

Type examined.

*Psylla minor* var. *flava*\* Crawford n. comb.

- 1914 *Psylla americana flava* Crawford, U. S. Nat. Mus., Bull. 85:138, 148.  
 1914 *Psylla americana longipennis* Crawford, U. S. Nat. Mus., Bull. 85:148.  
 1917 *Psyllia americana flava* Van Duzee, Cat. Hemip. N. Am. 808.  
 1938 *Psyllia americana flava* Strickland, Can. Ent. 70:204.

This form is a color variety of *P. minor*. It is in general yellow instead of reddish brown or black. Specimens are at hand from Vancouver, B.C.; Oregon (Koebele); California; Utah Lake, Alta, and Park City, Utah, and Colorado.

**TYPE**, No. 18110 United States National Museum, is a somewhat teneral female from Victoria, Vancouver, Hubbard and Schwarz.

Type examined.

*Psylla usitata*† n. sp.

(Figs. 78, 79, 79a, 286)

Length to tip of folded wings 3 mm.

**COLOR:** General color yellow. Wings whitish; forewings more or less fumate apically. Antennae dark apically.

**STRUCTURE:** Head strongly deflexed. Vertex slightly impressed distally,  $\frac{1}{2}$  as long as wide, bulging anteriorly, posterior margin nearly straight. Genal processes cone-shaped, blunt, divergent,  $\frac{2}{3}$  as long as

\* *flavus -a -um*, L. adj.—yellow.

† *usitatus -a -um*, L. adj.—ordinary.

vertex. Antennae somewhat over  $1\frac{2}{3}$  times as long as width of head. Thorax moderately arched. Hind tibia with small basal tubercle. Forewings about  $2\frac{1}{2}$  times as long as wide; venation typical, pterostigma of moderate size. Membrane of both fore- and hind wings thickly set with minute setae.

**GENITALIA:** Male proctiger very short, straight on caudal margin, slightly convex on cephalic margin. Forceps very pubescent, nearly as long as proctiger; in lateral view broad, margins parallel to broadly notched apices; in caudal view broad, evenly arched, notched, medial lobes produced as heavy, subacute black teeth; in dorsal view apices deeply notched, anterior lobe large, blunt, caudal lobe produced anteriorly as a black tooth, narrow basally, enlarged and sharply truncate. Female genital segment shorter than rest of abdomen, dorsal valve concave dorsally, apex upturned, acute; ventral valve shorter than dorsal, upturned, acute.

**HOLOTYPE**, male, No. 55174 United States National Museum, **ALLOTYPE**, female, 9 male and 6 female **PARATYPES**, Deborgia, Montana, July 9, 1935, P. W. Oman.

Holotype, allotype, and paratypes in United States National Museum, paratypes in author's collection.

*Psylla latiforceps*\* n. sp.

(Figs. 80, 81, 287)

Length to tip of folded wings 3 to 3.5 mm.

**COLOR:** General color greenish yellow to yellow. Wings hyaline. Distal half of antennae, apical tarsal segments, and wing veins apically, dark. Sometimes a fumate spot in apex of clavus.

**STRUCTURE:** Head small, vertical. Vertex  $\frac{1}{2}$  as long as wide, with deep discal impressions, bulging anteriorly. Genal processes slender, subacute, strongly divergent,  $\frac{2}{3}$  as long as vertex. Antennae rather thick, somewhat less than  $1\frac{1}{3}$  times as long as width of head. Thorax strongly arched. Pronotum nearly vertical. Hind tibia with very small basal spur. Wings very large,  $2\frac{1}{2}$  times as long as wide; venation typical, pterostigma moderately large.

**GENITALIA:** Male proctiger in lateral view broad, parallel-sided, straight or flexed caudad apically, longer than forceps. Forceps in lateral view moderately broad basally, suddenly enlarged on cephalic margin then parallel-sided to apices, apices very heavily sclerotized, obliquely truncate, produced caudad as a short heavy tooth; in caudal view broad, very slightly arched; in dorsal view apices are very heavy, long, produced caudad as a small mesal tooth. Female genital segment longer than rest of abdomen; dorsal valve straight, apex attenuate, slightly downcurved, blunt; ventral valve long, straight, acute.

**HOLOTYPE**, male, **ALLOTYPE**, female, numerous **PARATYPES**, Creede,

\* From *latus -a -um*, L. adj.—broad + *forceps -cipis*, L. m. and f. noun—forceps.

Colorado, July 14, 1940, L. D. Tuthill. Additional PARATYPES: Creede, Colorado, 1936 to 1939, L. D. Tuthill; Redmond, Oregon, April and June, 1939, Schuh and Gray. One teneral pair from Easton, Washington, (Koebele) is perhaps also conspecific.

Holotype, allotype, and paratypes in author's collection. Paratypes in Oregon State College Collection, United States National Museum, and University of Kansas.

The Creede specimens were taken on willow. As many of them are very teneral, and nymphs (presumably of the same species) were taken at the same time, *Salix* sp. is undoubtedly the host.

#### *Psylla sinuata*\* Crawford

(Figs. 93, 94)

- 1914 *Psylla sinuata* Crawford, U. S. Nat. Mus., Bull. 85:137, 140.
- 1914 *Psylla fibulata* *simulans* Crawford, U. S. Nat. Mus., Bull. 85:140.
- 1917 *Psyllia sinuata* Van Duzee, Cat. Hemip. N. Am. 805.
- 1932 *Psyllia sinuata* Klyver, Ent. News 43:71.
- 1938 *Psyllia sinuata* Strickland, Can. Ent. 70:205.

Length to tip of folded wings 3 to 3.5 mm.

COLOR: Light green to light yellow brown to orange. Segments of antennae black-tipped, distal segments entirely black. Wings slightly whitish.

STRUCTURE: Head small, strongly deflexed, almost perpendicular. Vertex with shallow discal impressions, almost flat, nearly twice as wide as long. Genal processes slender, divergent, blunt, slightly over  $\frac{1}{2}$  as long as vertex. Antennae  $1\frac{1}{2}$  times as long as width of head. Thorax scarcely arched. Pronotum strongly descending. Hind tibia with very slight tubercle at base. Forewings about  $2\frac{1}{2}$  times as long as wide; Rs sinuate, marginal cells somewhat elongate, pterostigma of medium size. Membrane of both fore- and hind wings thickly set with minute setae.

GENITALIA: Male genitalia very large with heavy, fine pubescence. Proctiger broad, slightly curved caudad, tapered to sharp apex. Forceps in lateral view evenly curved caudad on anterior margin, caudal margin sinuate to black, blunt apices; in caudal view broad, well arched, produced midway as a large mesal lobe, apices black, heavy. Female genital segment longer than rest of abdomen, very thickly set apically with minute setae; dorsal valve much longer than ventral, straight, flattened and rounded apically; ventral valve strongly upcurved, flattened, acute.

Described from numerous specimens taken on willow at 11,000 feet near Creede, Colorado. Other specimens are at hand from Colorado (C. F. Baker); Ungva Bay, H. B. T., L. M. Turner; Birch River, and Swan River, Manitoba, R. H. Beamer; Itasca Park, Minnesota. It is also recorded from Idaho and Alberta. Strickland records white spruce (*Picea alba*) as a definite host.

TYPE, male, No. 18105 United States National Museum.

Type examined.

\* *sinuatus*, L. (p. part. of *sinuo*)—wavy.

#### *Psylla fibulata*\* Crawford

(Figs. 95, 96)

- 1914 *Psylla fibulata* Crawford, U. S. Nat. Mus., Bull. 85:137, 140.
- 1917 *Psylla fibulata* Van Duzee, Cat. Hemip. N. Am. 805.
- 1932 *Psyllia fibulata* Klyver, Ent. News 43:71.
- 1938 *Psyllia fibulata* (?) Strickland, Can. Ent. 70:204.

Length to tip of folded wings 2.5 to 3 mm.

COLOR: General color whitish green to yellow. Antennae dark apically. Wings more or less whitish.

STRUCTURE: Head small, strongly deflexed. Vertex with shallow discal impressions, roundly bulging anteriorly, slightly over  $\frac{1}{2}$  as long as wide. Genal processes small, slender, divergent, blunt, slightly over  $\frac{1}{2}$  as long as vertex. Antennae small,  $1\frac{1}{3}$  times as long as width of head. Thorax very strongly arched. Legs small, hind tibia with very small tubercle at base. Fore- and hind wings large, greatly exceeding abdomen, membranes thickly set with minute setae. Forewings slightly over  $2\frac{1}{2}$  times as long as wide; venation typical, pterostigma large, long.

GENITALIA: Male proctiger long, slightly curved caudad. Forceps produced caudad basally as rounded lobes, caudal margins then excavate to apices, anterior margins almost straight, apices black, subacute. Female genital segment stout, black-tipped, longer than rest of abdomen; dorsal valve straight, subacute, broad, somewhat "shovel-shaped"; ventral valve shorter, broad, upcurved.

Described from numerous males and females taken at Creede, Colorado, July 14, 1940, on willow (*Salix* sp.); many of the specimens are very teneral and were accompanied by nymphs presumably of the same species. Other specimens at hand bear the label, "Colorado, C. F. Baker."

TYPE, female, No. 18104 United States National Museum.  
Type examined.

#### *Psylla propri†* n. sp.

(Figs. 84, 85)

Length to tip of folded wings 4 mm.

COLOR: General color chocolate brown. Lighter to white along medial suture of vertex, base of genal processes, proximal portion of antennae, caudal half of pronotum, caudal margin of prescutum, longitudinal lines on scutum, margins of scutellum, tibiae, tarsi and margins of abdominal sclerites. Wings hyaline; pterostigma brown.

STRUCTURE: Head strongly deflexed. Vertex about  $\frac{1}{2}$  as long as wide, prominently impressed discally. Genal processes  $\frac{2}{3}$  as long as vertex, not divergent, parallel to plane of vertex, blunt. Antennae  $1\frac{1}{3}$  times as long as width of head. Thorax well arched. Pronotum nearly vertical. Hind tibia with two small basal tubercles. Forewings  $2\frac{1}{2}$  times

\* *fibulatus*, L. (p. part. of *fibulo*—to fasten together)—significance obscure.  
† *proprius* -a -um, L. adj.—peculiar.

as long as wide; marginal cells large, pterostigma large; four radular areas on apical margin. Membrane of both fore- and hind wings set with minute setae.

**GENITALIA:** Male genitalia large. Proctiger very long, twice as long as forceps; in lateral view slender, straight to near apex then sharply flexed caudad. Forceps stout; in lateral view narrow basally, very much enlarged and bent cephalad then narrowed, apices truncate, black, produced on mesal margin; caudo-mesal margins produced caudad basally; in caudal view very broad, straight, lateral margins incurved apically to subacute apices; median portion of each forcep excavate caudally leaving margins raised as sharp ridges, mesal margin produced basally and apically, lateral margin produced above mid-point. Female genital segment as long as rest of abdomen, slender; dorsal valve straight, slender from base, apex blunt; ventral valve shorter than dorsal, slightly concave ventrally in proximal half, abruptly turned dorsad to acute apex.

Described from 8 males and 13 females from Colorado, C. F. Baker, and 1 male from Milford, Utah, April 24, 1934, E. W. Davis. The latter specimen bears a label *C. repand.*

Holotype, allotype, and paratypes in United States National Museum, paratypes in author's collection.

**HOLOTYPE**, male, No. 55176 United States National Museum, Colorado.

*Psylla uncata\** n. sp.

(Figs. 82, 83, 288)

Length to tip of folded wings 3.5 mm.

**COLOR:** General color reddish brown. Abdomen and venter darker. Thorax with more-or-less distinct light stripes. Vertex light-margined. Wings whitish.

**STRUCTURE:** Head strongly deflexed. Vertex  $\frac{1}{2}$  as long as wide, discal impressions very broad, deep. Genal processes small, cone-shaped, subacute, less than  $\frac{2}{3}$  as long as vertex. Antennae about  $1\frac{1}{2}$  times as long as width of head. Vertex and thorax punctate. Thorax moderately arched. Pronotum descending but not vertical. Hind tibia with very small basal spur. Membrane of both fore- and hind wings thickly set with minute setae. Forewings over twice as long as wide; venation typical, pterostigma prominent, dark.

**GENITALIA:** Male proctiger slightly longer than forceps, almost parallel margined, slightly and evenly curved caudad. Forceps heavily pubescent; in lateral view broad basally, caudal margin almost straight, cephalic margin produced in basal half then strongly excavate, apices extending cephalad as a black hook; in caudal view stout, slightly and evenly arched to truncate apices. Female genital segment shorter than rest of abdomen; dorsal valve slightly upcurved, apex blunt; ventral valve but slightly shorter than dorsal, ventral margin evenly upcurved to acute apex, dorsal margin produced dorsad as a large broad lobe midway.

\* *uncatus -a -um*, L. adj.—hooked.

Described from two males and six females from Banff Springs, Alberta, Hubbard and Schwarz. Five other females bearing the same data are probably the same species but are atypical in structure of genitalia.

Holotype, allotype, and paratypes in United States National Museum, paratypes in author's collection.

**HOLOTYPE**, male, No. 55175 United States National Museum.

*Psylla alaskensis\** Ashmead

(Figs. 65, 66, 282)

- 1904 *Psylla alaskensis* Ashmead, Harriman Alaska Exped. 8:137.
- 1913 *Psylla alaskensis* Aulmann, Psy. Cat. 8.
- 1914 *Psylla alaskensis* Crawford, U. S. Nat. Mus., Bull. 85:138, 149.
- 1917 *Psyllia alaskensis* Van Duzee, Cat. Hemip. N. Am. 809.
- 1938 *Arytaina fuscata* Caldwell, Ann. Ent. Soc. Am. 31:443.

Length to tip of folded wings 2.75 to 3 mm.

**COLOR:** General color orange to reddish brown, faint longitudinal stripes on scutum. Forewings with veins dark, prominent, membrane more or less fumate, more heavily apically, sometimes with a white bloom.

**STRUCTURE:** Vertex  $\frac{2}{3}$  as long as wide, with two discal foveae, strongly bulging anteriorly. Genal processes cone-shaped, blunt, about  $\frac{3}{4}$  as long as vertex. Antennae short, pubescent, about  $1\frac{1}{3}$  times as long as width of head. Thorax quite flat for this genus. Hind tibia with slight tubercle at base. Forewings long and slender, over  $2\frac{1}{2}$  times as long as wide, tapering apically to narrowly rounded apices; Rs reaching almost to apex, cells elongate, narrow, cubital larger than medial, pterostigma very long, narrow.

**GENITALIA:** Male subgenital plate large, globose. Proctiger broad, short; in lateral view broad and straight. Forceps in caudal view stout, moderately arched to acute, black apices; in lateral view broad basally, cephalic margin excavate about midway to apex, then strongly narrowed to black apex, apically produced anteriorly as a rather sharp tooth, caudal margin straight to near apex then extending caudad. Female genital segment as long as or longer than rest of abdomen, both valves broad, somewhat shovel-like, dorsal valve straight, much longer than ventral, latter stout, black-tipped.

Described from numerous specimens from Alaska, Colorado, and one specimen bearing the label, "Ks. 2138, C. F. Baker." Ashmead's description of the color seems to have been based on rather teneral specimens. His illustration of the male genitalia is of very little value as the tips of the forceps are not shown.

The type is apparently lost or destroyed. There remain in the United States National Museum but two specimens of the original series, one male from Fox Point and one female from Seldovia, Alaska. The male is here designated as neotype.

\* Adjectival form of Alaska.

In Colorado this species has been taken on *Salix* sp. at altitudes of about 11,000 feet.

A paratype of Caldwell's *Arytaina fuscata* in the collection of the University of Minnesota has been examined, and it is undoubtedly conspecific with the Alaskan specimens at hand. This adds Manitoba to the known range of the species. Numerous additional specimens from Churchill, Manitoba, differ from the type in having broad, short forewings and blunter genal processes.

**TYPE**, male, No. 6274 United States National Museum, Fox Point, Alaska.

Type examined.

Two species of *Psylla* have been described from Greenland by Sulc, *Psylla groenlandica* (Ann. Hist-Nat. Mus. Nat. Hungarici 11: 424, 1913) and *Psylla septentrionalis* (Ann. Mag. Nat. Hist. 4 (ser. 11): 78, 1939). Both of these forms show affinities to *alaskensis*. The Churchill, Manitoba, specimens referred to above appear to be somewhat intermediate between *alaskensis* and *groenlandica*, but until more extensive collections are made in this northern area no conclusions as to the exact relationship of these forms can be drawn.

*Psylla phoradendri\** Tuthill

(Figs. 50, 51, 276)

1939 *Psylla phorodendrae* Tuthill, Ia. St. Coll. Jour. Sci. 13:186.

Length to tip of folded wings 3 mm.

**COLOR:** Green, forewings olive green.

**STRUCTURE:** Head very broad. Genal processes short, not as long as broad, rather blunt. Antennae  $1\frac{1}{2}$  times as long as width of head. Eyes borne on prominent stalklike area of head. Thorax very broad. Wings twice as long as wide; cubital cell larger than medial, latter slender, Rs straight to near apex, sharply turned toward costa, pterostigma large.

**GENITALIA:** Male proctiger narrow in lateral view, straight. Forceps very slender in lateral view, base somewhat enlarged, remainder bent forward, apices blunt, postero-apical margins sharp, black-margined; in caudal view arched, apices touching, a large mesally projecting, black-tipped tooth near base. Apical portion of aedeagus very much enlarged, in dorsal view notched apically, large wing-shaped lateral lobes, two slender, retrorse, medial processes extending caudad. Female genital segment short, about  $\frac{1}{2}$  as long as remainder of abdomen; dorsal valve elongate hood-shaped; ventral valve very short with a large median, transparent, truncate tooth.

In addition to the type specimens from Los Angeles County, California, and Huachuca Mountains, Arizona, specimens are at hand from the Santa Rita Mountains, Arizona. Additional specimens from the Huachuca Mountains bear the host plant label *Phoradendron tomentosum* Olivar.

\* Genitive of *Phoradendron*—the generic name of the host plant.

The original spelling of the name as *phorodendrae* was an error in transcription and is here amended to *phoradendri*.

**TYPE**, female, Huachuca Mountains, Arizona, in the Snow Collection, University of Kansas.

*Psylla annulata\** Fitch

(Figs. 97, 98)

- 1851 *Psylla annulata* Fitch, 4th Rept. N. Y. Sta. Mus. 64.
- 1885 *Psylla annulata* Riley, Proc. Biol. Soc. Wash. 2:70.
- 1910' *Psylla annulata* Smith, Ins. N. J. 109.
- 1912 *Psylla annulata* Patch, Me. Agr. Exp. Sta., Bull. 202:219.
- 1913 *Psylla annulata* Aulmann, Psy. Cat. 10.
- 1914 *Psylla annulata* Crawford, U. S. Nat. Mus., Bull. 85:152.
- 1917 *Psylla annulata* Van Duzee, Cat. Hemip. N. Am. 809.
- 1918 *Psylla annulata* McAtee, Ent. News 29:223.
- 1938 *Psylla annulata* Caldwell, Ohio Biol. Surv., Bull. 34:264.

Length to tip of folded wings 3.5 to 4 mm.

**COLOR:** General color light yellow, abdomen often green. Antennae with dark annulus apically on each segment. Wings whitish.

**STRUCTURE:** Head unusually wide. Vertex short, slightly impressed discally, abrupt anteriorly. Median ocellus far below plane of vertex. Eyes borne on very prominent stalklike areas of head, definitely separated from raised portion of vertex. Genal processes slender, cone-shaped, divergent, blunt, as long as vertex, longer than median length of vertex. Antennae twice as long as vertex. Thorax scarcely arched. Hind tibia with short basal spur. Forewings broad,  $2\frac{1}{2}$  times as long as wide, membrane minutely setate; veins biseriately set with very fine setae; venation typical, pterostigma very broad.

**GENITALIA:** Male genitalia small. Proctiger short, almost straight. Forceps in lateral view straight; in caudal view straight basally then bowed out and arched to sharp black apices. Female genital segment short, shorter than rest of abdomen; dorsal valve slightly longer than ventral, almost straight to rounded apex; ventral valve strongly upcurved.

Described from specimens from the following localities: New York, Massachusetts, New Hampshire, Connecticut, Maine, Michigan, and Iowa. Caldwell records it from Ohio and McAtee from Maryland.

The host is *Acer saccharum* Marsh.

*Psylla negundinis†* Mally

- 1895 *Psylla negundinis* Mally, Proc. Ia. Acad. Sci. 2:155-159.
- 1912 *Psylla negundinis* Patch, Me. Agr. Exp. Sta., Bull. 202:220.
- 1913 *Psylla negundinis* Aulmann, Psy. Cat. 20.
- 1914 *Psylla negundinis* Crawford, U. S. Nat. Mus., Bull. 85:152.
- 1917 *Psylla negundinis* Van Duzee, Cat. Hemip. N. Am. 809.
- 1938 *Psylla negundinis* Caldwell, Ohio Biol. Surv., Bull. 34:265.
- 1938 *Psylla negundinis* Strickland, Can. Ent. 70:205.

Length to tip of folded wings 3.5 to 4 mm.

\* *annulatus -a -um*, L. adj.—ringed.

† Genitive of *Negundo*, the host plant.

Very similar to *annulata* from which it is distinguished chiefly by the lack of annulations on the antennae. Color uniformly green to yellow, except tip of antenna black. The host plant is box elder, *Acer negundo*.

Specimens are at hand from Iowa, Nebraska, Kansas, Minnesota, North Dakota, Manitoba, Colorado, Utah, and Arizona. It is also recorded from Wisconsin, New Mexico, Ohio, and Alberta (Strickland, on *Negundo interius*).

The life cycle is recorded by Mally as follows:

"The eggs are deposited in autumn just as soon as the leaves begin to fall. They are inserted closely around the edge of the buds, but are attached to the twig, so in case the bud is broken off the eggs still remain in place. They hatch in early spring, enter the opening buds and feed by sucking the juices from the young tissue. When the leaves are large and have a long petiole, the young larva may be found anywhere on the under side of the leaf, on the petiole, or more preferably at the axil of the leaf, with head downward, i.e., toward the stem, and crowded as far down as possible for protection. In this position they may be observed for hours, sitting very quietly, only moving the abdomen laterally or vertically occasionally so as to remove the white mass of excreta and the cottony wax secretion. They pass through five stages and emerge as adults about the middle of May or the first of June. The adults live on the trees during the summer months, feeding on the plant juices, pairing, and maturing the eggs till autumn. When the leaves begin to fall and expose the buds, the female begins depositing the little white glistening eggs around the edges of the buds, and their life cycle is complete."

TYPE, male, in the collection of Iowa State College.

#### *Psylla ribis\** Patch

- 1912 *Psylla ribis* Patch, Me. Agr. Exp. Sta., Bull. 202:222.
- 1914 *Psylla ribis* Crawford, U. S. Nat. Mus., Bull. 85:148.
- 1917 *Psylla ribis* Van Duzee, Cat. Hemip. N. Am. 809.

I am unable to place this species as none of Patch's specimens are available. Were it not for the fact that Crawford states definitely that it is not the same as *ribesiae* (a statement based on study of Miss Patch's specimens), I would believe it to be synonymous with that species. Her pictures and his description do not agree perfectly, however, so it remains a mystery until the type specimens are found and its identity established.

#### *Psylla arctica†* (Walker)

- 1852 *Aphalara arctica* Walker, List. Homop. Br. Mus., pt. IV:931-932.
- 1882 *Psylla arctica* Scott, Trans. Ent. Soc. London 1882:459.
- 1885 *Psylla arctica* Riley, Proc. Biol. Soc. Wash. 2:69.
- 1900 *Psylla arctica* Schwarz, Proc. Wash. Acad. Sci. 2:540.
- 1913 *Psylla arctica* Aulmann, Psy. Cat. 10.
- 1917 *Psylla arctica* Van Duzee, Cat. Hemip. N. Am. 808.

\* Genitive of *Ribes*—the generic name of its hosts.

† *arcticus -a -um*, l. adj.—arctic.

Described from three females from St. Martins Falls, Albany River, Hudson Bay. Scott figures the head, wing, and genital segment. This species seems to belong in the *americana* complex. Just which one of the forms in this group it may be I have no idea.

TYPES in British Museum.

#### Genus *Arytaina*\* Förster

- 1804 *Psylla* Latreille [pro parte], Hist. Nat. Crust. Ins. 12:377-382.
- 1848 *Arytaina* Förster, Verh. natur. Ver. preuss. Rhein. 5:67.
- 1872 *Arytaina* Meyer-Dür, Mitt. Sch. Ent. Ges. 3: 380, 404.
- 1876 *Arytaena* Scott, Trans. Ent. Soc. London 1876:528. [non] *Arytaena* Oken, 1817.
- 1877 *Ataenia* Thomson, Opusc. Ent. 8:828 [as a subgenus of *Chermes*].
- 1879 *Arytaena* Löw, Verh. zool.-bot. Ges. Wien 28:586.
- 1896 *Arytaena* Edwards, Hemip.-Homop. Br. Is. 250.
- 1911 *Psyllopa* Crawford, Pcm. Coll. Jour. Ent. 3:628; ibid. 4:684, 1912 [note].
- 1912 *Arytaina* Oshanin, Kat. paläa. Hemip. 128.
- 1913 *Arytaena* Aulmann, Psy. Cat. 32.
- 1914 *Arytaina* Crawford, U. S. Nat. Mus., Bull. 85:122.
- 1914 *Euglyptoneura* Crawford, U. S. Nat. Mus., Bull. 85:125.
- 1914 *Brachypsilla* Crawford (pro parte), U. S. Nat. Mus., Bull. 85:129.
- 1914 *Amblyrhina* Crawford, U. S. Nat. Mus., Bull. 85:130.
- 1917 *Arytaina* Van Duzee, Cat. Hemip. N. Am. 803.
- 1926 *Peripsyllopsis* Enderlein, Ent. Mitt. 15:399.

Head more or less deflexed, narrower to distinctly wider than thorax. Genae produced as rounded, usually short processes, strongly depressed from but parallel to plane of vertex. Antennae moderately long. Thorax arched. Pronotum large, flat, ending in a knoblike swelling laterally. Propleurites equal at juncture with pronotum. Forewings often narrowly rounded apically, usually more or less maculate or fumate, sometimes rugose and somewhat coriaceous, pterostigma present or wanting. Metatibia sometimes with basal spur. Basal segment of metatarsus with two black clawlike spines.

HAPLOTYPE: *Arytaina genistae* (Latreille).

Originally separated from *Psylla* by the lack of a pterostigma in the forewing, a character which is not of sufficient importance in itself to warrant such a distinction. Both Förster and Scott separated the genera on this basis, then with no explanation proceeded to describe species of *Psylla* such as *buxi* in which there is no pterostigma. Thomson used the lack of a pterostigma and the apically narrowed forewing of *genistae* as the chief distinguishing characters. In my opinion the principal characters of this group are those stressed by Crawford, namely, the shape of the prothoracic pleurites, the shape and position of the genal processes, the large flattened pronotum, and the often more-or-less coriaceous forewings.

Enderlein (1926) refers all the North American species back to *Psylla*—apparently without having seen any of them.

\* *Arytaena -ae*, G. f. noun—ladle or dipper (so named because the genus has a sucker or proboscis).

The Committee on Nomenclature, Division of Insect Identification of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, headed by C. F. W. Muesebeck, has recently expressed an opinion concerning the valid name for this genus. It is the conclusion of this committee that the original spelling of the name, *Arytaina*, must be preserved even though Förster should have transcribed the name from the Greek as *Arytaena* (Appendix F of the International Rules). This opinion is in accord with opinion 125 of the International Commission.

#### Key to the Species of *Arytaina*

1. Forewings conspicuously maculate, spotted or entirely dark..... 2.  
Forewings not conspicuously maculate, often more or less evenly fumate..... 7.
2. (1) Forewings with prominent pterostigma..... 6.  
Forewings with pterostigma almost or entirely obsolete..... 3.
3. (2) Forewings hyaline except for brown maculae; head broader than thorax  
genistae p. 505.  
Forewings otherwise; head narrower than thorax..... 4.
4. (3) Forewings entirely dark; male forceps bilobate..... fuscipennis p. 506.  
Forewings white with brown spots or maculae; male forceps not bilobate..... 5.
5. (4) Body and forewings usually pulverulent; media of forewings not sinuate  
robusta p. 506.  
Without white pulverulence; media of forewings sinuate.robusta sinuata p. 507.
6. (2) Prominently pubescent on head and thorax; forewing white, brown  
apically; male proctiger without caudal lobes..... pubescens p. 508.  
Head and thorax not prominently pubescent; forewing semitransparent;  
male proctiger with large caudal lobes..... assimilis p. 509.
7. (1) Genal processes not contiguous basally, very short, rounded..... 8.  
Genal processes contiguous, at least basally..... 11.
8. (7) Pterostigma lacking..... spartiophila p. 509.  
Pterostigma prominent..... 9.
9. (8) Male forceps simple; forewings often somewhat fumate apically  
ceanothi p. 510.  
Male forceps with a large anterior lobe and a shorter caudal one; forewings  
entirely clear or whitish..... 10.
10. (9) Antennae as long as width of head; genae produced as blunt lobate processes  
visible in dorsal view of head..... amorphae p. 511.  
Antennae 1½ times as long as width of head; genae not visible in dorsal  
view of head..... pallida p. 512.
11. (7) Female genital segment enlarged basally, slender, styliform apically  
aculeata p. 513.  
Female genital segment not styliform..... 12.
12. (11) Male forceps deeply bifurcate; proctiger small; female genital segment very  
short, much shorter than abdomen..... chelifera p. 514.  
Male forceps simple; proctiger very large; female genital segment very  
large, stout, longer than rest of abdomen..... 13.
13. (12) Forewings narrowed apically, pterostigma prominent..... minuta p. 514.  
Forewings broadly rounded, pterostigma obsolete..... insolita p. 515.

#### *Arytaina genistae\** (Latreille)

(Figs. 99, 100, 101, 250)

- 1804 *Psylla genistae* Latreille, Hist. Nat. Crust. Ins. 12:382.
- 1835 *Psylla ulicis* Curtis, Brit. Ent. 12:565.
- 1841 *Psylla spartii* Hartig, Germ. Zeitschr. Ent. 3:375.
- 1848 *Arytaina spartii* Förster, Verh. natur. Ver. preuss. Rhein. 5:69.
- 1861 *Psylla spartii* Flor, Bull. Soc. Imp. Nat. Moscou 34:335, 338, 347, 351, 358.
- 1872 *Arytaina spartii* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:405.
- 1876 *Arytaena ulicis* Scott, Trans. Ent. Soc. London 1876:529.
- 1877 *Chermes (Ataenia) genistae* Thomson, Opusc. Ent. 8:828.
- 1879 *Arytaena genistae* Löw, Verh. zool.-bot. Ges. Wien 28:597.
- 1908 *Arytaena genistae* Oshanin, Verz. palae. Hemip. 2:366.
- 1911 *Psyllopa magna* Crawford, Pom. Coll. Jour. Ent. 3:628.
- 1912 *Arytaena genistae* Oshanin, Kat. paläa. Hemip. 128.
- 1913 *Arytaena genistae* Aulmann, Psy. Cat. 32.
- 1914 *Arytaina genistae* Crawford, U. S. Nat. Mus., Bull. 85:125.
- 1917 *Arytaina genistae* Van Duzee, Cat. Hemip. N. Am. 803.
- 1921 *Arytaena genistae* Enderlein, Zool. Anz. 52:120.
- 1935 *Arytaena genistae* Haupt, Tierw. Mittel. 4, 3:241.

Length to tip of folded wings 3 to 4 mm.

COLOR: General color light green to dark brown. More-or-less distinctly striped on dorsum. Forewings with a brown macula between Rs and M, another along posterior margin, following Cu nearly to base of wing.

STRUCTURE: Head large, deflexed, broader than thorax. Vertex nearly plane, over ½ as long as wide, discal impressions slight, anterior margin strongly produced each side of median line as small tubercle, laterally rounded down to genal processes. Eyes very large, protruding, appearing slightly stalked. Genal processes large, heavy, rounded apically, nearly parallel to plane of vertex, not contiguous basally, ½ as long as vertex. Antennae slightly over twice as long as width of head. Thorax broad, moderately arched. Pronotum nearly flat, long. Forewings long, narrowly rounded apically, 2½ times as long as wide; Rs long, slightly sinuate, medial cell larger than cubital, pterostigma lacking. Hind tibia with basal spur.

GENITALIA: Male proctiger short, stout, curved caudad apically. Forceps as long as proctiger, stout; in lateral view bent caudad midway, truncate apically; in caudal view slender, nearly straight to black, bifurcate apices; in dorsal view black-margined, deeply emarginate, caudal tooth stout, sharp, anterior tooth longer, obliquely truncate. Female genital segment longer than rest of abdomen, stout; dorsal valve straight to blunt, slightly upturned apex; ventral valve shorter than dorsal, upturned, acute.

Described from specimens from Europe, determined as *A. genistae* by Franz Löw, in the United States National Museum. Crawford records it from Woods Hole, Massachusetts, on *Spartinum* sp. In Europe its hosts are *Cytisus scoparius* (Scotch broom) and *Ulex europaeus* (gorse) both of which are established in eastern United States. It seems most probable that these same species are the hosts in North America also.

\* Genitive of *genista -ae*, L. f. noun—broom (its host plant).

*Arytaina fuscipennis\** Crawford

(Figs. 102, 103, 104)

- 1914 *Arytaina fuscipennis* Crawford, U. S. Nat. Mus., Bull. 85:123, 125.  
 1914 *Euglyptoneura tristis* Crawford, U. S. Nat. Mus., Bull. 85:125.  
 1917 *Arytaina fuscipennis* Van Duzee, Cat. Hemip. N. Am. 803.  
 1932 *Arytaina fuscipennis* Klyver, Ent. News 43:39.

Length to tip of folded wings 2.5 to 2.75 mm.

**COLOR:** General color brown to black including forewings. Genal processes somewhat lighter, especially in the male.

**STRUCTURE:** Head scarcely deflexed, narrower than thorax. Vertex with very broad discal impressions, nearly twice as wide as long. Genal processes conical, divergent, from blunt to nearly acute,  $\frac{1}{2}$  to  $\frac{2}{3}$  as long as vertex, pubescent. Antennae  $1\frac{1}{2}$  times as long as width of head. Thorax broad, well arched. Pronotum long, straight. Forewings coriaceous, somewhat rugose, twice as long as wide, broadly rounded; veins minutely setate, cubital cell larger than medial, pterostigma very small to obsolete. Hind tibia without basal spur.

**GENITALIA:** Proctiger of male broad, in lateral view broad basally, converging then slender to apex. Forceps narrow, petiolate basally then produced as two divergent, elongate lobes, medial lobe slender, acute, lateral lobe spatulate. Female genital segment short, about  $\frac{1}{2}$  as long as rest of abdomen; dorsal valve longer than ventral, excavate dorsally to slightly upturned, blunt apex; ventral valve deeply excavate mesally.

Described from numerous males and females from Lapine and Bend, Oregon; two from Los Angeles County, California; one from Palomar Mountain, California, and one from Nevada. Klyver records *Ceanothus papillosus* as a definite host. Crawford records specimens as bearing labels of other species of *Ceanothus*.

**TYPE,** male, No. 18101 United States National Museum, Humboldt County, California, H. S. Barber.

Type examined.

*Arytaina robusta†* Crawford

(Figs. 6, 105, 106)

- 1914 *Arytaina robusta* Crawford, U. S. Nat. Mus., Bull. 85:123-124.  
 1917 *Arytaina robusta* Van Duzee, Cat. Hemip. N. Am. 803.  
 1920 *Arytaina montana* Crawford, Ent. News, 31:13-14.  
 1932 *Arytaina robusta* Klyver, Ent. News, 43:39.  
 1932 *Arytaina snowi* Dowell, Jour. Kans. Ent. Soc. 5:93-94.

Length to tip of folded wings 2.5 mm.

**COLOR:** Coloration extremely variable. General color from greenish or yellowish white to dark brown. Dorsum usually light, venter and legs darker. Often with considerable red marking, especially the genal processes. Forewings white with variable brown maculation, usually taking the form of two irregular, diffuse maculae separated by a broad

\* From *fusci*-*pus*, L. adj.—dark + *pennis*, L. irr. noun—wing.  
 † *robustus*—*pus*, L. adj.—strong, solid.

immaculate band across wing beyond tip of clavus; often more or less evenly covered with small brown spots, with seven more-or-less persistent spots on margin. A white pulverulence commonly covers a greater or lesser portion of the insect, especially the forewings.

**STRUCTURE:** Head more or less deflexed, narrower than thorax. Vertex with broad, deep discal impressions, bulging anteriorly each side of anterior ocellus, twice as wide as long, lateral ocelli on slightly raised areas. Genal processes variable from bluntly cone-shaped to broadly rounded, contiguous basally, about  $\frac{2}{3}$  as long as vertex. Antennae somewhat over  $1\frac{1}{2}$  times as long as width of head. Thorax moderately arched. Pronotum deflexed, long. Forewings broad, narrowly rounded apically, slightly more than twice as long as wide (variable); costa very heavy, *Rs* short, sharply turned to costa, cubital cell larger than medial, pterostigma lacking or extremely small. Hind tibia with small basal spur.

**GENITALIA:** Male proctiger rather short, stout, slightly tapered. Forceps simple; in lateral view somewhat enlarged toward apices; in caudal view moderately stout, well arched; apices subacute, turned cephalad somewhat. Female genital segment a little shorter than rest of abdomen; dorsal valve longer than ventral, sharply concave in apical half, upturned apically, subacute, a tuft of long setae on dorsal hump; ventral valve shorter than dorsal, upturned, acute.

This species is very abundant throughout the western United States occurring in large numbers on *Ceanothus fendleri* and perhaps other species of *Ceanothus*. It is extremely variable as is usual in such abundant and widespread species, the coloration and pulverulence being especially erratic. In general the individuals from the southern part of its range have less definite wing maculae. Many specimens are at hand from numerous localities in the following states: Colorado, Wyoming, South Dakota, Montana, Idaho, Washington, Oregon, California, and Arizona. It is also recorded from Utah and British Columbia.

Type in Crawford's collection, apparently a specimen from Colorado, but no specimen so labeled.

Paratypes of both *A. snowi* Dowell and *A. montana* Crawford have been examined, and they are merely *robusta* in which the wing maculation is diffuse.

*Arytaina robusta sinuata\** n. subsp.

(Fig. 289)

Similar to the typical form except as follows: Darker, general color chocolate brown; entirely devoid of pulverulence, including forewings; genal processes generally longer and nearer plane of vertex; veins of forewings more distinctly raised from membrane; *R* shorter, *Rs* therefore longer, *M* strongly sinuate; female genital segment longer, fully as long as rest of abdomen; dorsal valve straight on dorsal margin, attenuate, upcurved to blunt apex; ventral valve almost equalling dorsal.

\* *sinuatus*, L. (p. part., of *sinuo*)—wavy.

This form may represent a distinct species, or it may be merely another variant of *robusta*. As I have only four female specimens I am unwilling to designate it as of specific rank, but it is hoped that by naming it attention may be directed to it and its true taxonomic nature thereby determined.

**HOLOTYPE**, female, Moscow Mountain, Idaho, July 20, 1938, H. M. Harris, in author's collection.

**Paratypes**: Placer County, California, September, Koebele, (*Ceanothus cordulatus*) in United States National Museum; Big Bear Lake, California, July 26, 1932, R. H. Beamer in Snow Collection, University of Kansas; Colo. 2030, in Crawford Collection.

*Arytaina pubescens\** Crawford

(Figs. 107, 108)

1914 *Arytaina pubescens* Crawford, U. S. Nat. Mus., Bull. 85:123, 131-132.

1917 *Arytaina pubescens* Van Duzee, Cat. Hemip. N. Am. 804.

1932 *Arytaina pubescens* Klyver, Ent. News 43:70-71.

Length to tip of folded wings 2 mm.

**COLOR**: General color light brown to red. Head mostly white. Dorsum of thorax more or less marked with white. Abdomen often green. Forewings white to hyaline, maculate with brown apically and along media.

**STRUCTURE**: Head and thorax with prominent white pubescence. Head slightly deflexed, as broad as thorax. Vertex  $\frac{3}{5}$  as long as wide, deeply emarginate anteriorly, lateral ocelli borne on prominently raised portions. Genal processes blunt, divergent, scarcely contiguous basally, slightly over  $\frac{1}{3}$  as long as vertex. Antennae about  $1\frac{1}{2}$  times as long as width of head. Thorax moderately arched, broad. Pronotum slightly descending anteriorly. Forewings short, broadly rounded, about twice as long as wide, somewhat coriaceous; Rs short, marginal cells equal, pterostigma small. Hind tibia with very small basal tubercle.

**GENITALIA**: Male proctiger short, broad basally then narrowed, curved caudad. Forceps short, stout, blunt, a slender black spine arising on mesal margin, as long as base, incurved apically. Female genital segment shorter than rest of abdomen; dorsal valve large basally, very abruptly narrowed to short, straight, subacute, apical portion; ventral valve largely covered by last sternite, a large lobe extending caudad overlapping dorsal valve, apex acute, nearly equalling dorsal valve.

Many specimens of this very distinct little species are at hand from California, Oregon, Nevada, Idaho, and Colorado. The host plant is *Purshia tridentata*.

Type in Crawford's collection (?), no labeled specimen.

\* *pubescens*, L. (pres. part. of *pubescere*)—having hair, pubescent.

*Arytaina assimilis\** Crawford

(Fig. 110)

1914 *Arytaina assimilis* Crawford, U. S. Nat. Mus., Bull. 85:123, 127-128.

1917 *Arytaina assimilis* Van Duzee, Cat. Hemip. N. Am. 804.

1932 *Arytaina assimilis* Klyver, Ent. News, 43:70.

I have seen no specimen of this species which was described from a unique male.

"Length of body 1.9 mm.; length of forewing 2.2; width of head 0.80. General color reddish brown, lighter on dorsum and head. Body rather small, long.

"Head relatively rather small, deflexed quite strongly, about as broad as thorax, punctate; vertex arcuate on posterior margin, with a deep fovea on each side of median line near center, slightly bulging in front on each side of median line, not strongly elevated on postocellar regions; genal cones rather short, contiguous at base, rounded broadly at apex, slightly pubescent. Antennae a little more than twice as long as width of head, slender.

"Thorax arched strongly, robust, punctate. Pronotum rather long, flat on dorsal surface; propleurites short. Wings small, subhyaline, maculate in middle and on hind margin conspicuously so, semitransparent, a little more than twice as long as broad, broadly rounded at apex and apical half of wing distinctly narrowing toward apex; first marginal cell larger than second; radial sector long and curved; pterostigma long, large at base.

"**Genitalia**: Male genitalia segment very large, about half as large as rest of abdomen; forceps moderately long, stout, roundly acute at tip; anal valve very large, larger than forceps, with a large, lobate protuberance on hind margin; pubescence short.

"Described from one male from Claremont, California (Crawford), on *Ceanothus crassifolius*. This form is manifestly distinct from *A. ceanothae*, but was taken on the same tree and together with the specimens of the other species.

"Type in author's collection."—Crawford.

Klyver records this species from several localities in California on species of *Ceanothus*.

*Arytaina spartiophila†* (Förster)

(Figs. 86, 109, 109a, 290)

1843 *Psylla spartii* Guérin, Iconographie du règne animal de G. Cuvier, Part IV:370 [fide Löw 1878].

[non] *Psylla spartii* Hartig, Germ. Zeitschr. Ent. 3:375. 1841.

1848 *Psylla spartiophila* Förster, Verh. natur. Ver. preuss. Rhein. 5:75.

1876 *Psylla spartiophila* Scott, Trans. Ent. Soc. London 1876:533.

1878 *Psylla spartii* Löw, Verh. zool.-bot. Ges. Wien (1877) 27:126-129.

1908 *Psylla spartii* Sulc, Bull. Int. Acad. des Sciences Francois Joseph I (Prague) 12:248-252.

1913 *Psylla spartii* Aulmann, Psy. Cat. 27.

1935 *Psylla spartii* Haupt, Tierw. Mittel. 4, 3:233.

\* *assimilis -e*, L. adj.—similar.

† From *spartius*, Gr. noun—spanish broom + *philos*, Gr. noun—a lover.

Length to tip of folded wings 3 mm.

COLOR: General color light to dark brown. Abdominal segments dark brown except margins. Forewings somewhat yellowish, darker along veins.

STRUCTURE: Head nearly as broad as thorax, scarcely deflexed. Vertex with small discal foveae,  $\frac{3}{5}$  as long as wide, strongly produced anteriorly each side of median suture, lateral ocelli on raised areas. Genae swollen, rounded, nearly vertical, not touching,  $\frac{1}{3}$  as long as vertex. Median ocellus very large. Antennae twice as long as width of head. Thorax weakly arched. Pronotum long, descending anteriorly. Forewings  $2\frac{1}{2}$  times as long as wide, broadly rounded; Rs long, somewhat sinuate, marginal cells equal, pterostigma almost obsolete. Hind tibia with small basal spur.

GENITALIA: Male proctiger long, slender, curved caudad. Forceps long and slender; in lateral view tapering slightly from base, apices black, curved caudad; in caudal view slender, strongly arched to black subacute apices, postero-medial margins densely pubescent. Female genital segment stout, about as long as rest of abdomen; dorsal valve longer than ventral, dorsal margin slightly sinuate, apically attenuate, black, acute, upturned; ventral valve very sharply upturned, truncate, slightly excavate apically.

Described from numerous specimens from Washon Island, Washington, May 1, 1940, W. W. Baker, taken on *Cytisus scoparius*; four female specimens taken at Fort Lewis and Dupont, Washington, July 5, 1935, P. W. Oman and R. H. Beamer.

Heretofore unrecorded from North America, this species has been introduced from Europe, probably with its host, *Cytisus scoparius*, which is well established in the coastal region of the Pacific Northwest.

Guérin first described this species in 1843, naming it *Psylla spartii*. He knew of Hartig's use of the name two years before but since he knew Hartig's species to be a synonym of *P. genistae* Latreille he used the name again, a homonym. In 1848 Förster, unaware of Guérin's work, redescribed the species as *Psylla spartiophila* which name is the correct one for the species. Löw had all these facts in mind but continued the use of *Psylla spartii*. This use of a homonym has continued until the present time.

Host: *Cytisus scoparius*. The name in use at the time of Guérin and Förster was *Spartium scoparium*.

#### *Arytaina ceanothi\** Crawford

(Figs. 111, 112)

1914 *Arytaina ceanothae* Crawford, U. S. Nat. Mus., Bull. 85:123, 130.

1917 *Arytaina ceanothae* Van Duzee, Cat. Hemip. N. Am. 804.

1932 *Arytaina ceanothae* Klyver, Ent. News 43:70.

\* Genitive of *Ceanothus*—generic name of its host plant. (The ending *ae* used by Crawford is evidently a *lapsus calami* and is emended to *i*.)

Length to tip of folded wings 2 mm.

COLOR: Yellowish to brown. Forewings more or less fumate.

STRUCTURE: Head small, narrower than thorax, deflexed. Vertex nearly twice as wide as long, discal impressions broad and deep, rounded anteriorly, emarginate medially. Genae swollen as small lobes, not touching and scarcely extending beyond anterior margin of vertex. Antennae about  $1\frac{1}{2}$  times as long as width of head. Thorax strongly arched. Pronotum descending. Forewings broadly rounded, about twice as long as wide or slightly over; cubital cell slightly larger than medial, pterostigma prominent, somewhat variable in size. Hind tibia without basal spur.

GENITALIA: Male proctiger slender, slightly tapering, curved caudad somewhat. Forceps very slender; in lateral view straight to rounded, black-tipped apices; in caudal view evenly arched. Female genital segment about as long as rest of abdomen; dorsal valve strongly concave, apical portion slender, apex subacute; ventral valve stout, dorsal margin excavate, acute.

Specimens at hand are from Los Angeles County, Siskiyou County, Mt. Shasta County, and Sta. Cruz Mountains, California; Easton, Washington; Haugan, Montana.

Host: *Ceanothus* (Crawford and Klyver).

Type designated as in Crawford Collection, but no specimen so labeled.

#### *Arytaina amorphae\** (Mally)

(Figs. 87, 88)

- 1895 *Psylla amorphae* Mally, Proc. Ia. Acad. Sci. 2:159.  
 1911 *Psyllopa floridensis* Crawford, Pom. Coli. Jour. Ent. 3:629.  
 1911 *Psyllopa ilicis* Crawford, Pom. Coll. Jour. Ent. 3:632.  
 1912 *Psyllopa ilicis* Crawford, Pom. Coll. Jour. Ent. 4:684.  
 1913 *Psylla amorphae* Aulmann, Psy. Cat. 10.  
 1914 *Arytaina amorphae* Crawford, U. S. Nat. Mus., Bull. 85:85.  
 1914 *Amblyrhina fractiforceps* Crawford, U. S. Nat. Mus., Bull. 85:130.  
 1917 *Arytaina amorphae* Van Duzee, Cat. Hemip. N. Am. 804.

Length to tip of folded wings 2.0 to 2.25 mm.

COLOR: General color light green to yellow, white longitudinal lines on thoracic dorsum, irregular white markings on vertex. Forewings more or less yellowish. Antennae dark apically.

STRUCTURE: Head deflexed, slightly narrower than thorax. Vertex with prominent discal impressions, definitely margined anteriorly,  $\frac{3}{5}$  as long as wide. Genae produced as short blunt processes  $1/6$  as long as vertex, not touching, extending forward, visible in dorsal view of vertex, a prominent suture between vertex and genae. Antennae short, about as long as width of head. Thorax well arched longitudinally, quite flat laterally. Pronotum strongly descending. Forewings long,  $2\frac{1}{2}$  times as long as wide; cubital petiole short, cubital cell elongate, larger than medial, pterostigma large. Hind tibia without basal spur.

\* Genitive of *Amorpha*—the generic name of its host.

**GENITALIA:** Male proctiger straight, moderately broad in lateral view, slightly converging toward apex. Subgenital plate elongate, rounded lobe on dorsal margin, apex swollen ventrad, a stout spine on caudal margin, extending dorso-caudad between forceps. Forceps in lateral view of moderate width basally, abruptly enlarged about midway, cephalic lobe much larger than caudal, dorsal margin evenly excavate; in caudal view stout, elbowed near apices to obliquely truncate apex; in dorsal view anterior lobes slightly turned mesad, a heavy truncate median lobe bearing several small stout black spines, a sharper caudal point bearing two black spines. Female genital segment somewhat shorter than rest of abdomen; dorsal valve longer than ventral, sinuate dorsally, apex blunt; ventral valve upcurved, acute.

This species and the following have been confused heretofore. They are very similar and live upon closely related plants, this form on *Amorpha fruticosa* the other on *Amorpha canescens*. Due to the small size of these insects, differences in structure which would be very noticeable in larger forms are easily passed by as of no consequence. In the original description of *amorphae*, Mally recorded the host plant as *A. fruticosa*. Crawford (1914) cites *A. canescens* labels on *amorphae*; these specimens are probably the related species. In June, 1940, large series of both species were taken on the same date and the same general locality, and sufficient difference was apparent in the field that they were kept very carefully separated in order to determine definitely their status. Upon microscopic examination, they have proved to be distinctly different. The most distinctive differences are in the size and shape of the vertex and genal processes and in the length of the antennae. Minor but apparently constant differences occur in the genitalia also.

The cotype series (5 females) is in the Iowa State College Collection. One of the specimens is here designated as lectotype. Other specimens at hand are from various localities in Iowa, Kansas, Texas, Colorado, and Arizona.

Host: *Amorpha fruticosa*.

TYPE, female, I. A. C., 6/12/94, C. W. M., is in the Iowa State College Collection.

#### *Arytaina pallida*\* n. sp.

(Figs. 89, 90, 291)

Length to tip of folded wings 1.75 to 2.25 mm.

COLOR: General color greenish white to yellowish white. Forewings whitish to slightly fumate. Hind wings white. Antennae dark apically.

STRUCTURE: Head slightly deflexed, nearly as wide as thorax. Vertex with broad discal impressions, about  $\frac{1}{2}$  as long as wide, rounding down anteriorly, genae swollen, but scarcely produced; separated by full width of frons, not extending forward beyond anterior margin of vertex, suture between genae and vertex indistinct laterally. Antennae  $1\frac{1}{3}$  times as

\* *pallidus -a -um*, L. adj.—pale.

long as width of head. Thorax well arched. Pronotum descending. Forewings  $2\frac{2}{3}$  times as long as wide; venation as in *amorphae*, pterostigma a little shorter. Hind tibia without basal spur.

**GENITALIA:** Male genitalia similar to *amorphae* but proctiger stouter. Forceps with petiolate base more slender, anterior lobe longer, scarcely produced caudad, dorsal margin strongly sinuate; in caudal view slender basally, enlarged apically, a stout incurving truncate tooth borne at apex; in dorsal view somewhat produced medially with an almost continuous row of black teeth to caudal margin. Female genital segment similar to *amorphae* but dorsal valve less sinuate, apex upturned, subacute, ventral valve more slender.

This species while very similar to *A. amorphae* Mally may be distinguished from it by the shorter and less protruding genal processes, the longer antennae, the upturned tip of the dorsal valve of the female genital segment, and the shape of the male forceps as shown in the figures.

It was taken abundantly on *Amorpha canescens*, its host plant, in June.

HOLOTYPE, male, ALLOTYPE, female, numerous PARATYPES, Turin, Iowa, June 1, 1940, L. D. Tuthill. Other PARATYPES (7) Eureka, Kansas, May 29, 1933, P. W. Oman; (1) Wilson County, Minnesota, July 1, 1922, P. B. Lawson; (4) Oakland, Nebraska, July 5, 1940, W. W. Wirth.

Holotype, allotype, and paratypes in author's collection. Paratypes in United States National Museum, University of Kansas, and University of Minnesota.

#### *Arytaina aculeata*\* Crawford

1914 *Arytaina aculeata* Crawford, U. S. Nat. Mus., Bull. 85:123, 131.

1917 *Arytaina aculeata* Van Duzee, Cat. Hemip. N. Am. 804.

1932 *Arytaina aculeata* Klyver, Ent. News 43:70.

Length to tip of folded wings 2 mm.

COLOR: Light brown with whitish markings on head and thorax. Forewings yellowish.

STRUCTURE: Head small, deflexed, as wide as thorax. Vertex rounded anteriorly, produced each side of median suture,  $\frac{2}{3}$  as long as wide, anterior margin abrupt, discal impressions prominent. Genal processes short, rounded, contiguous basally, less than  $\frac{1}{3}$  as long as vertex, scarcely visible in dorsal view. Antennae  $1\frac{1}{2}$  times as long as width of head. Thorax moderately arched. Forewings narrowed apically, somewhat rhomboidal, slightly coriaceous, about  $2\frac{1}{2}$  times as long as broad; Rs moderately long, straight, marginal cells equal, pterostigma small. Hind tibia without basal spur.

**GENITALIA:** Male unknown. Female genital segment longer than rest of abdomen, enlarged and globose basally, apical portion attenuate, styliform, black; dorsal valve slightly longer than ventral, both acute.

Known only from the female, this rare species has been taken only

\* *aculeatus -a -um*, L. adj.—pointed, sharp.

in California. Four specimens are at hand from Los Angeles County. Klyver records it is taken on *Cercocarpus betuloides*, Napa County, California.

TYPE, female, No. 18103 United States National Museum.

*Arytaina chelifera*\* Crawford

- 1914 *Arytaina chelifera* Crawford, U. S. Nat. Mus., Bull. 85:123, 128-129.  
 1914 *Brachypsylla purshiae* Crawford, U. S. Nat. Mus., Bull. 85:129.  
 1917 *Arytaina chelifer* Van Duzee, Cat. Hemip. N. Am. 804.

Length to tip of folded wings 2 mm.

COLOR: "General color greenish yellow; genitalia, tip of antennae, and venter more or less browned; forewings very slightly fumate, browned a little darker on apical fourth."—Crawford.

STRUCTURE: Head nearly as broad as thorax, moderately deflexed. Vertex swollen and rounded anteriorly each side of median suture,  $\frac{3}{5}$  as long as wide. Genal processes cone-shaped, rounded at apex, divergent,  $\frac{1}{3}$  as long as vertex, depressed much below but parallel to plane of vertex. Antennae about as long as vertex. Thorax moderately arched. Pronotum quite flat. Forewings slightly rugose, hyaline, broadly rounded, somewhat over twice as long as wide; Rs short, slightly sinuate, marginal cells equal, pterostigma very short, but distinct. Hind wings thickly set with minute setae. Hind tibia with prominent basal spur.

GENITALIA: Male proctiger small, straight, about as long as forceps. Forceps in lateral view stout, cephalic margin straight, caudal margin swollen, deeply notched apically, anterior process straight, subacute, not heavily sclerotized, posterior process extending antero-mesally, heavily sclerotized, black, curved, acute; in caudal view broad, black tooth-like processes arising from mesal margins, touching apically. Female genital segment very short; dorsal valve somewhat concave dorsally, apex elongate, acute, with many short setae; ventral valve upturned, acute apically.

Known only from the type series from Williams, Arizona; and American Fork Canyon, Utah. These specimens are now quite faded to a "museum tan." As Crawford notes, the Utah specimens were taken on *Purshia tridentata*, which is probably the host.

TYPE, female, No. 18102 United States National Museum, Williams, Arizona, Barber and Schwarz.

Type examined.

*Arytaina minuta*† Crawford

(Figs. 113, 114)

- 1914 *Arytaina minuta* Crawford, U. S. Nat. Mus., Bull. 85:123, 128.  
 1917 *Arytaina minuta* Van Duzee, Cat. Hemip. N. Am. 804.  
 1932 *Arytaina minuta* Klyver, Ent. News, 43:70.

\* Apparently from *c(h)e*le, Gr. noun—claw + *fer* from L. v. *fero*—bearing.  
 † *minutus* -a -um, L. adj.—small.

Length to tip of folded wings 2 to 2.5 mm.

COLOR: General color light brown, abdomen darker brown. Forewings clear brown, darker apically.

STRUCTURE: Head strongly deflexed, nearly as wide as thorax. Vertex nearly flat, discal impressions shallow, sloping downward anteriorly to genae, nearly twice as wide as long. Genal processes broad, rounded, contiguous,  $\frac{1}{3}$  as long as vertex. Antennae  $1\frac{1}{2}$  times as long as width of head. Thorax well arched. Pronotum descending. Forewings slightly coriaceous, narrowly rounded,  $2\frac{1}{2}$  times as long as wide; Rs long, marginal cells equal in size, pterostigma prominent, slender, long. Hind tibia with small basal spur.

GENITALIA: Male genitalia large. Proctiger triangular, broad at base. Forceps slender in lateral view, slightly sinuate, apices black, subacute; in caudal view moderately broad, arched. Female genital segment very large, longer than rest of abdomen; dorsal valve longer than ventral, sinuate, apex attenuate, slightly upturned, subacute; ventral valve stout, acute.

Several males and females are at hand from Los Angeles County, Mint Canyon, and Del Mar, California. One specimen bears a label *Ceanothus rigidus*. Klyver records *Ceanothus cuneatus* as a definite host.

Crawford records the type as in his collection, but no specimen seems to have been so designated.

*Arytaina insolita*\* n. sp.

(Figs. 141, 142, 292)

Length to tip of folded wings 2.5 to 3 mm.

COLOR: Reddish brown. Forewings yellowish brown, darker along veins, males darker on genae and legs.

STRUCTURE: Head deflexed, narrower than thorax. Vertex nearly flat, bulging anteriorly each side of median suture, slight discal impressions, lateral ocelli borne on prominently raised areas. Genal processes parallel to plane of vertex, rounded apically, contiguous at base,  $\frac{1}{2}$  as long as vertex. Antennae slightly over  $1\frac{1}{2}$  times as long as width of head. Thorax well arched, broad. Pronotum descending. Forewings broadly rounded,  $2\frac{1}{2}$  times as long as wide; Rs of medium length, marginal cells large, equal, pterostigma almost completely lacking. Hind tibia without basal spur.

GENITALIA: Male genitalia very large. Proctiger long, apex slender, rest produced caudad as a large rounded lobe. Forceps in lateral view a little more than  $\frac{1}{2}$  as long as proctiger, slender, tapering apically to blunt, black tips; in caudal view slender, evenly arched to black apices, a dense fringe of setae mesally. Female genital segment very large, stout, longer than rest of abdomen; dorsal valve apically slender and upturned to subacute apex; ventral valve shorter than dorsal, strongly upturned, acute.

\* *insolitus* -a -um, L. adj.—unusual.

**HOLOTYPE**, male, **ALLOTYPE**, female, 3 male and 15 female **PARATYPES** with data: S. of Mt. Shasta Cy, California, June 29, 1935, P. W. Oman. Other **PARATYPES** as follows: 1 male and 2 females, Big Bear Lake, California, July 26, 1932, R. H. Beamer; 2 females, San Jacinto Mountains, California, July 21, 1929, R. H. Beamer; 1 male, Dunsmuir, California, June 29, 1935, R. H. Beamer; 1 female, Strawberry Dam, Utah, July 16, 1935, P. W. Oman; 1 male, Jacumba, and 1 female, Campo, California, May 18, 1941, D. J. and J. N. Knoll.

**HOLOTYPE**, No. 55178 United States National Museum, allotype and paratypes in United States National Museum. Paratypes in University of Kansas, Ohio State University, and author's collections.

#### Genus *Psyllopsis*\* Löw

- 1761 *Chermes* Linnaeus (*pro parte*), Faun. Svec.
- 1764 *Psylla* Geoffroy (*pro parte*), Hist. Abr. des Insectes 1.
- 1848 *Psylla* Förster, (*pro parte*), Verh. natur. Ver. preuss. Rhein. 5:73.
- 1848 *Psylla* Thomson, Opusc. Ent. 8:829 [as subgenus of *Chermes*].
- 1877 *Psyllopsis* Löw, Verh. zool.-bot. Ges. Wien 28:585, 587.
- 1879 *Psyllopsis* Löw, Verh. zool.-bot. Ges. Wien 28:585, 587.
- 1896 *Psyllopsis* Edwards, Hemip.-Homop. Br. Is. 233.
- 1912 *Psyllopsis* Oshannin, Kat. paläa. Hemip. 126 [designates type].
- 1913 *Psyllopsis* Aulmann, Psy. Cat. 71.
- 1914 *Psyllopsis* Crawford, U. S. Nat. Mus., Bull. 85:132.
- 1917 *Psyllopsis* Van Duzee, Cat. Hemip. N. Am. 804.

Head narrower than thorax, deflexed. Vertex rounding smoothly into genae anteriorly. Genae produced as conical processes, more or less divergent, deflexed sharply from plane of vertex. Antennae rather long, distinctly longer than width of head. Eyes hemispherical, of moderate size. Thorax well arched. Pronotum descending anteriorly, rather long. Propleural suture ending medially on lateral margin of pronotum. Forewings membranous, broadly rounded apically, pterostigma present. Metatarsus without basal armature, with a row of small black apical spines. Metatarsus with two black clawlike spines.

Logotype: *Psyllopsis fraxinicola* (Förster)

#### Key to the Species of *Psyllopsis*

1. Unicolorous, including wings ..... *fraxinicola* p. 516.
- Dark brown or black markings on body and forewings ..... 2.
2. Male forceps in lateral view with a caudal lobe, anterior margin nearly straight  
    *fraxini* p. 518.
- Male forceps in lateral view very much enlarged apically, quadrate  
    *discrepans* p. 518.

#### *Psyllopsis fraxinicola*† (Förster)

(Figs. 115, 116, 117, 117a, 249)

- 1848 *Psylla fraxinicola* Förster, Verh. natur. Ver. preuss. Rhein. 5:73.
- 1848 *Psylla viridula* Förster, Verh. natur. Ver. preuss. Rhein. 5:74.

\* *Psylla* + *opsis* -is, Gr. f. noun—the aspect, the appearance.  
† From *Fraxinus*—generic name of the host + *cola*, L.—inhabitant.

- 1861 *Psylla unicolor* Flor, Rynch. Liv. 2:449, 479.
- 1861 *Psylla unicolor* Flor, Bull. Soc. Imp. Nat. Moscou 34:335, 340, 347, 353.
- 1872 *Psylla fraxinicola* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:398.
- 1872 *Psylla chlorogenes* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:399.
- 1872 *Psylla viridula* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:399.
- 1876 *Psylla fraxinicola* Scott, Trans. Ent. Soc. London 1876:544.
- 1877 *Chermes fraxinicola* Thomson, Opusc. Ent. 8:829.
- 1879 *Psyllopsis fraxinicola* Löw, Verh. zool.-bot. Ges. Wien 28:588.
- 1896 *Psyllopsis fraxinicola* Edwards, Hemip.-Homop. Br. Is. 234.
- 1908 *Psyllopsis fraxinicola* Oshannin, Verz. palae. Hemip. 2:348.
- 1910 *Psyllopsis fraxinicola* Smith, Ins. N. J. 108.
- 1912 *Psyllopsis fraxinicola* Oshannin, Kat. paläa. Hemip. 126 [designates type].
- 1913 *Psyllopsis fraxinicola* Aulmann, Psy. Cat. 73.
- 1914 *Psyllopsis fraxinicola* Crawford, U. S. Nat. Mus., Bull. 85:132.
- 1917 *Psyllopsis fraxinicola* Van Duzee, Cat. Hemip. N. Am. 805.
- 1923 *Psyllopsis fraxinicola* Patch, Hemip. Conn. 250.
- 1923 *Psyllopsis fraxinicola* Ferris, Can. Ent. 55:251-254 [figs. nymph].
- 1935 *Psyllopsis fraxinicola* Haupt, Tierw. Mittel. 4, 3:230.

Length to tip of folded wings 3.5 mm.

COLOR: Uniformly greenish yellow except tips of antennae. Wings hyaline.

STRUCTURE: Head deflexed, narrower than thorax. Vertex evenly excavate,  $\frac{2}{3}$  as long as wide, anteriorly rounding down to genae without a visible suture between latter and vertex, discal impressions small, distinct. Genal processes cone-shaped, subacute, somewhat divergent, nearly vertical, less than  $\frac{1}{2}$  as long as vertex. Antennae nearly twice as long as width of head. Thorax strongly arched. Pronotum broad, rather long, descending. Forewings large, very broadly rounded apically, slightly over twice as long as wide, membrane thickly set with minute setae; Rs very long, medial cell elongate, about equal in size to cubital, pterostigma very large. Hind tibia without basal armature.

GENITALIA: Male genitalia large. Subgenital plate elongate, slender. Proctiger curved on cephalic margin, caudally produced in basal half as a triangular lobe. Forceps short with large anterior lobe, narrow at point of origin then enlarged, very broad apically, convexly rounded, caudal portion stout, converging; in caudal view posterior lobes black-tipped, serrate, touching, apices of anterior lobes touching. Female genital segment shorter than rest of abdomen; dorsal valve with a short styliform portion apically, blunt, slightly downcurved; ventral valve in lateral view upcurved, acute, in ventral view broad basally then narrow, deeply and narrowly excavate apically, heavily pubescent.

Specimens are at hand from Washington, D. C.; Atlantic City, New Jersey; Kings County, Nova Scotia; Stanford University, California. It is also recorded from Connecticut and Idaho. Felt (26th Rept. N. Y. Sta. Ent.) reported it from New York, but this is based on a misidentification. It probably does occur in New York and many other states, however. Outside North America its distribution embraces all of Europe in which its host occurs. In Europe it seems to be limited to *Fraxinus excelsior*; in North America it has been recorded also on *Fraxinus dipetala* and *Juglans*.

*Psyllopsis fraxini\** (Linnaeus)

(Fig. 118)

- 1761 *Chermes fraxini* Linnaeus, Faun. Svec. 264.  
 1848 *Psylla fraxini* Förster, Verh. natur. Ver. preuss. Rhein. 5:80.  
 1861 *Psylla fraxini* Flor, Rhynch. Liv. 2:481.  
 1861 *Psylla fraxini* Flor, Bull. Soc. Imp. Nat. Moscou 34:335, 340, 347, 353.  
 1872 *Psylla fraxini* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:395.  
 1876 *Psylla fraxini* Scott, Trans. Ent. Soc. London 1876:545.  
 1877 *Chermes fraxini* Thomson, Opusc. Ent. 8:829.  
 1877 *Chermes sorbi* Thomson (pro parte), Opusc. Ent. 8:829.  
 1879 *Psyllopsis fraxini* Löw, Verh. zool.-bot. Ges. Wien 28:589.  
 1896 *Psyllopsis fraxini* Edwards, Hemip.-Homop. Br. Is. 234, pl. 26, fig. 6.  
 1908 *Psyllopsis fraxini* Oshanin, Verz. palae. Hemip. 2:348.  
 1911 *Psyllopsis fraxinicola* Felt, N. Y. Sta. Mus., Bull. 147:39-40, pls. 15, 16.  
 1913 *Psyllopsis fraxini* Aulmann, Psy. Cat. 72.  
 1935 *Psyllopsis fraxini* Haupt, Tierw. Mittel. 4, 3:230.

Length to tip of folded wings 3.5 mm.

COLOR: General body color yellow with dark brown to black markings as follows: Disc and posterior margin of vertex, two large spots on prescutum, four longitudinal stripes on scutum, abdominal tergites except margins, portions of legs, venter and genitalia. Forewings with a large, irregular, marginal, apical macula, another at apex of clavus.

STRUCTURE: Very similar to *fraxinicola* except wings smaller, pterostigma shorter, Rs shorter, medial cell less elongate, much smaller than cubital.

GENITALIA: Male genitalia large. Subgenital plate slightly elongate. Proctiger produced caudad basally as a bluntly rounded lobe. Forceps erect; in lateral view narrow basally, nearly straight on cephalic margin, produced caudad as a blunt lobe, apices rounded; in caudal view stout, nearly straight, a very small mesal lobe basally. Female genital segment very similar to *fraxinicola*.

This species is represented in the Iowa State College Collection by a series of specimens collected in Buffalo, New York, July, 1886 and 1888, by E. P. Van Duzee. It has not heretofore been recorded from North America. Felt (1911) describes and figures a species occurring on ash which was determined for him as *P. fraxinicola*; it is apparent from his description and figures that *P. fraxini* was the species he had, however. He reported considerable damage to the foliage of ash (*Fraxinus*), its host. Recorded heretofore from all of Europe, including Scandinavia, Russia, Syria, and Palestine.

*Psyllopsis discrepans†* (Flor)

(Fig. 119)

- 1861 *Psylla discrepans* Flor, Bull. Soc. Imp. Nat. Moscou 34:335, 340, 347, 353, 376.  
 1877 *Chermes sorbi* Thomson, Opusc. Ent. 8:829.  
 1879 *Psyllopsis discrepans* Löw, Verh. zool.-bot. Ges. Wien 28:590.  
 1908 *Psyllopsis discrepans* Oshanin, Verz. palae. Hemip. 2:349.  
 1935 *Psyllopsis discrepans* Haupt, Tierw. Mittel. 4, 3:230.

\* Genitive of *Fraxinus*—the generic name of the host.† Pres. part. of *discrepo*, L. v.—to differ.

A single male in the National Museum from Kings County, Nova Scotia, July 1, 1921, is apparently this species. It resembles *P. fraxini* closely except in darker coloration, more extensive maculation of the forewing and in genitalia.

Male genitalia very large. Subgenital plate elongate. Proctiger with rounded caudal lobe as in *fraxini*. Forceps in lateral view erect, narrow basally, abruptly enlarged into a quadrate apical portion, slightly excavate dorsally; in caudal view very heavy, slender and incurved apically, a small basal mesal lobe.

Its recorded distribution is Central Europe and Scandinavia.

Genus *Euphalerus*\* Schwarz

- 1904 *Euphalerus* Schwarz, Proc. Ent. Soc. Wash. 6:238.  
 1913 *Euphalerus* Aulmann, Psy. Cat. 74.  
 1914 *Euphalerus* Crawford, U. S. Nat. Mus., Bull. 85:118.  
 1914 *Cephalopsylla* Crawford, U. S. Nat. Mus., Bull. 85:121, 122.  
 1917 *Euphalerus* Van Duzee, Cat. Hemip. N. Am. 802.  
 1937 *Euphalerus* Tuthill, Jour. Kans. Ent. Soc. 10:69-70.

Head deflexed, broad. Vertex plane or nearly so. Genae produced as large processes, rounded apically, on same plane as vertex, more or less divergent. Antennae short (less than 1½ times width of head). Eyes more or less recessive over propleurites, not elongate. Thorax quite strongly arched. Pronotum not extending far down laterally, terminating in a knoblike swelling. Propleurites equal in length dorsally, suture terminating at middle of lateral margin of pronotum. Forewings membranous or somewhat thickened and rugose, rounded or oblique apically. Metatibia with basal spur. Basal segment of metatarsus with two black clawlike spines.

Orthotype: *Euphalerus nidifex* Schwarz.

Some of the western species of this genus show a marked relationship to *Arytaina*.

Key to the Species of *Euphalerus*

- Forewings not rugose, body and forewings light in color with many minute brown spots..... *nidifex* p. 520.
- Forewings rugose, body and forewings not covered with minute brown spots..... 2.
- Meso and metascutellum produced dorsad, cone-shaped..... 3.
- Meso and metascutellum not at all or scarcely produced..... 4.
- Forewings strongly rhomboidal..... *propinquus* p. 521.
- Forewings rounded apically..... *jugovenosus* p. 521.
- Uniformly red or reddish brown in color; without a tubercle ventrad of antennal insertion; male forceps not simple..... 5.
- Not uniformly reddish in color; with a more or less prominent tubercle ventrad of antennal insertion; male forceps simple..... 6.
- Larger species (3.75 mm. to tip of folded wings); genal processes nearly as long as vertex..... *adustus* p. 522.

\* Apparently from Gr. prefix *eu*—true, very + *phalerus*, Gr. adj.—clear, bright. (application obscure).

- Smaller species (2.5 mm. to tip of folded wings); genal processes  $\frac{2}{3}$  as long as vertex ..... *tantillus* p. 523.  
 6. General color whitish; forewings with at least one dark macula at apex of clavus ..... *vermiculosus* p. 524.  
 General color green (sometimes reddish) with many small white spots; forewings without dark maculae ..... *rugipennis* p. 525.

*Euphalerus nidifex\** Schwarz

(Figs. 120, 121, 122, 256)

- 1904 *Euphalerus nidifex* Schwarz, Proc. Ent. Soc. Wash. 6:238-239 and 153-154.  
 1913 *Euphalerus nidifex* Aulmann, Psy. Cat. 74.  
 1914 *Euphalerus nidifex* Crawford, U. S. Nat. Mus., Bull. 85:119.  
 1914 *Euphalerus ficus* Crawford, U. S. Nat. Mus., Bull. 85:120.  
 1917 *Euphalerus nidifex* Van Duzee, Cat. Hemip. N. Am. 802.  
 1937 *Euphalerus nidifex* Tuthill, Jour. Kans. Ent. Soc. 10:72.

Length to tip of folded wings 2 mm.

COLOR: "Color pale ochre-yellow varying to greenish yellow or reddish yellow, head, thorax, wings, and legs speckled with minute black or brown dots, wings slightly whitish."—Schwarz.

STRUCTURE: Head narrower than thorax, vertical, finely punctate. Vertex  $\frac{3}{5}$  as long as wide, nearly plane, somewhat bulging anteriorly, discal impressions prominent. Genal processes large, on same plane as vertex, rounded apically,  $\frac{2}{3}$  as long as vertex. Antennae slightly longer than width of head. Eyes rounded, recessive. Thorax finely punctate, strongly arched. Pronotum narrow, long, nearly vertical. Forewings not rugose, broadly rounded, membrane thickly set with minute setae, a little more than twice as long as wide; Rs long, nearly straight, cubital cell larger than medial, pterostigma large, unusually broad, not elongate. Hind wings equaling forewings. Hind tibia with small basal spur.

GENITALIA: Male proctiger slender, straight, truncate. Forceps small; in lateral view broad basally, tapered to acute black apices, slightly turned caudad; in caudal view broad, arched to mesally truncate opposing tips. Female genital segment small; dorsal valve straight, slender apically, blunt-tipped; ventral valve nearly as long as dorsal, upcurved, acute.

Described from specimens in the United States National Museum from Key West, Florida. Dr. John Caldwell in a private communication informs me that he has specimens taken on Key Largo, Florida. As the latter is but a stone's throw from the mainland this beautifully spotted species undoubtedly occurs in the southern part of that state. Its host plant is *Piscidia erythrina*. Schwarz reared the nymphs but gives only a few notes concerning its habits, these chiefly concern the nestlike structure in which they live on the ventral side of the leaves.

Known from Cuba and the Virgin Islands in addition to the localities mentioned above.

TYPE, No. 8146 United States National Museum, is missing.

\* From *nidus* -i, L. noun—nest + *fex* (faex)—dregs.

*Euphalerus propinquus\** Crawford

(Fig. 251)

- 1914 *Euphalerus propinquus* Crawford, U. S. Nat. Mus., Bull. 85:119, 122.  
 1914 *Cephalopsylla latifrons* Crawford, U. S. Nat. Mus., Bull. 85:122.  
 1917 *Euphalerus propinquus* Van Duzee, Cat. Hemip. N. Am. 803.  
 1937 *Euphalerus propinquus* Tuthill, Jour. Kans. Ent. Soc. 10:72.

Length to tip of folded wings 3 mm.

COLOR: General color white to light green with red dots and vermiculations on head and thorax. Forewings nearly transparent, dark from clavus to apex, many small brown spots in darkened area, apical margin alternately black and white, small opaque white spots on veins.

STRUCTURE: Head large, broader than thorax, rugose. Vertex broad, twice as wide as long, nearly plane, discal impressions very broad, shallow. Genal processes large, broad, swollen, continuous with vertex, roundly truncate,  $\frac{1}{2}$  as long as vertex, pubescent. Antennae  $1\frac{1}{4}$  times as long as width of head, a small tubercle ventrad of insertion. Thorax rugose, very strongly arched. Pronotum descending anteriorly. Meso and metascutellum conically produced dorsad. Latter with a smaller protuberance on each side. Forewings rhomboidal, rugose; Rs somewhat sinuate, sharply curved to costa, not attaining apex of wing, M somewhat sinuate, marginal cells about equal, pterostigma of moderate size. Hind tibia with small basal spur. Legs heavily pubescent.

GENITALIA: Male proctiger short, stout, straight, parallel-sided, rounded apically. Forceps nearly as long as proctiger, with long pubescence; in lateral view broad, straight, enlarged toward apices, notched apically, anterior portion rounded, blunt, caudal part produced as a long, slender, curving, black tooth, projecting cephalad and mesad, acute; in caudal view stout, curved outward basally then straight to incurving apical portion. Female genital segment about as long as rest of abdomen, with long sparse pubescence; dorsal valve strongly upcurved, subacute; ventral valve shorter than dorsal, thick, strongly upcurved from base, dorsal margin strongly sinuate, apex acute.

Numerous specimens are at hand from the Chiracahua, Huachuca, and Santa Rita Mountains of Arizona, some of which were taken on *Amorpha fruticosa*, some swept from walnut. The type series was taken on *Ceanothus*. The latter is probably the host.

TYPE, female, No. 18100 United States National Museum, Arizona, Morrison.

Type examined.

*Euphalerus jugovenosus†* Tuthill

(Figs. 143, 144, 293)

- 1937 *Euphalerus jugovenosus* Tuthill, Jour. Kans. Ent. Soc. 10:70, 74.

\* *propinquus* -a -um, L. adj.—near.

† From *jugosus* -a -um, L. adj.—mountainous + *venosus* -a -um, L. adj.—veiny.

Length to tip of folded wings 2.5 to 3 mm.

COLOR: Head, pronotum, and prescutum white, with more or less vermiculate red markings; remainder of thorax dark red; legs somewhat lighter. Forewings hyaline except apex dark through cubital cell, latter black, apical margin alternately black and white; veins with rather regular opaque whitish areas and irregular red spots. Abdomen green, male genitalia and tip of female genital segment red.

STRUCTURE: Head, pronotum, and prescutum rugose, rest of body punctate. Head broader than thorax, deflexed. Vertex nearly plane, twice as wide as long, posterior margin almost straight, discal impressions very large. Genal processes large, a little more than  $\frac{1}{2}$  as long as vertex, very broad, somewhat divergent, blunt apically, moderately pubescent. Antennae about as long as width of head, a small tubercle ventrad of insertion. Thorax very strongly arched. Pronotum nearly vertical. Prescutum with a small raised epiphysis on each corner caudally. Meso and metascutellum produced as heavy conical process. Forewings short, narrowly rounded, rugose, twice as long as wide; veins very prominent, marginal cells small, cubital somewhat larger, Rs sinuate, pterostigma moderately broad, very short. Small basal tubercle on hind tibia. Legs moderately pubescent.

GENITALIA: Male proctiger very stout, produced caudad as a broad lobe. Forceps straight, tapering to slender twisted black apices extending mesad, acute, moderately broad in lateral view. Female genital segment shorter than rest of abdomen, large basally, strongly narrowed; dorsal valve sharply upturned, acute apically, a tuft of long setae before slender apical portion; ventral valve shorter than dorsal, upturned, acute.

In addition to the type series from Lockwood and Monterey, California, specimens from Los Angeles County, Alameda County, Santa Cruz Mountain, and Delta in the same state are at hand.

TYPE, male, Lockwood, California, in Snow Collection, University of Kansas.

#### *Euphalerus adustus\** Tuthill

(Figs. 145, 146, 294)

1937 *Euphalerus adustus* Tuthill, Jour. Kans. Ent. Soc. 10:70.

Length to tip of folded wings 3.75 mm.

COLOR: Uniformly yellowish red, often with some white vermiculations on head and thoracic dorsum. Forewings hyaline, yellow. Abdomen sometimes green.

STRUCTURE: Body large, punctate. Head deflexed, as broad as thorax. Vertex plane, pubescent anteriorly, twice as wide as long, discal impressions slight. Genal processes cone-shaped, large, swollen, subacute, divergent, prominently pubescent, as long as vertex medially, on same plane as vertex. Antennae  $1\frac{1}{2}$  times as long as width of head. Thorax

\* *adustus -a -um*, L. adj.—sunburned.

strongly arched. Pronotum moderately long, descending. Forewings long, rugose,  $2\frac{1}{2}$  times as long as wide; Rs somewhat sinuate, marginal cells about equal, pterostigma prominent, short but broad; three prominent radular areas on margin. Hind wings long, nearly equalling forewings. A large spur on base of hind tibia.

GENITALIA: Male proctiger short, straight, stout. Forceps large, almost as long as proctiger; in lateral view very broad, straight, parallel-margined; in caudal view broad basally, narrower apically, slightly arched; anterior margin heavily pubescent to roundly truncate apex, caudo-mesal margin produced as heavy, slightly bifid tooth, extending barely beyond apex. Female genital segment shorter than rest of abdomen; dorsal valve slightly longer than ventral, straight, acute; ventral valve attenuate, strongly upturned, apex black, acute.

Besides the type series from Utah and Colorado, about 20 specimens of both sexes from several localities in Utah are before me. Some of those taken in the Wasatch Mountains by Koebele and accompanied by nymphs bear labels, "Cercocarpus ledifolius."

TYPE, male, in Snow Collection, University of Kansas.

#### *Euphalerus tantillus\** Tuthill

(Figs. 147, 148, 295)

1936 *Euphalerus tantillus* Tuthill, Jour. Kans. Ent. Soc. 10:70, 71.

Length to tip of folded wings 2.5 mm.

COLOR: Uniformly red to brownish red, indistinct lighter markings on head and thorax. Forewings reddish fumate.

STRUCTURE: Head as wide as thorax, strongly deflexed. Vertex twice as wide as long, nearly plane, discal impressions very broad, somewhat bulging anteriorly, slightly pubescent on anterior margin. Genal processes large, conical,  $\frac{2}{3}$  as long as vertex, on nearly same plane as vertex. Antennae slightly longer than width of head. Thorax moderately arched. Pronotum nearly vertical. Forewings somewhat rugose, short, slightly over twice as long as wide, three radular areas on margin; Rs slightly sinuate, marginal cells equal, pterostigma small. Hind wings nearly as long as forewings, thickly set with minute setae. A very small basal spur on hind tibia.

GENITALIA: Male proctiger large, stout, parallel-sided to truncate apex. Forceps about  $\frac{2}{3}$  as long as proctiger; in lateral view broad, enlarged apically; in caudal view broad at base, sharply narrowed, then moderately broad to apices; caudo-mesal margin produced cephalad apically, in dorsal view forceps appear double; heavy pubescence on caudal margin. Female genital segment about as long as rest of abdomen, large basally, suddenly narrowed, acuminate; dorsal valve longer than ventral, acute, styliform portion slightly upcurved, radulate, spines retrorse, basal portion with short even pubescence, a tuft of very long

\* *tantillus -a -um*, L. adj.—so small.

setae at base of styliform portion; ventral valve acute, a tuft of long setae on basal portion.

Known only from the type series from Salt Lake City, Utah.

TYPE, male, in Snow Collection, University of Kansas.

### *Euphalerus vermiculosus\** Crawford

(Figs. 123, 124, 125)

- 1914 *Euphalerus vermiculosus* Crawford, U. S. Nat. Mus., Bull. 85:119, 121.
- 1914 *Cephalopsylla ceanothi* Crawford, U. S. Nat. Mus., Bull. 85:122.
- 1917 *Euphalerus vermiculosus* Van Duzee, Cat. Hemip. N. Am. 803.
- 1932 *Euphyllerus vermiculosus* Klyver, Ent. News. 43:39.
- 1937 *Euphalerus vermiculosus* Tuthill, Jour. Kans. Ent. Soc. 10:72.
- 1937 *Euphalerus beameri* Tuthill, Jour. Kans. Ent. Soc. 10:70, 73.

Length to tip of folded wings 3 mm.

COLOR: General color greenish white to yellow, more or less brown on thoracic dorsum. Forewings hyaline, somewhat yellowish, to whitish opaque, at least one black spot at apex of clavus, usually fumate along apical margin, margin alternately black and white.

STRUCTURE: Head large, as broad as thorax, strongly deflexed, rugose. Vertex somewhat concave, over  $\frac{1}{2}$  as long as wide, discal impressions broad. Genal processes continuous with vertex, large, bluntly conical, swollen basally,  $\frac{3}{4}$  as long as vertex. Antennae less than  $1\frac{1}{2}$  times as long as width of head, a small tubercle ventrad of insertion. Eyes large, strongly recessive. Thorax very strongly arched, both laterally and longitudinally, coarsely granular. Pronotum long, strongly descending, with small raised prominences laterally. Forewings small, slightly over twice as long as wide, broadly rounded, rugose; Rs sinuate, long, marginal cells about equal, pterostigma of moderate size. Hind wings equalling forewings. Hind tibia with basal spur.

GENITALIA: Male proctiger stout, somewhat swollen caudad. Forceps straight, heavily pubescent, especially on caudo-mesal margin; in lateral view moderately slender; in caudal view very slightly arched to apices which are black and sharply curved mesad; black apical tooth extending cephalo-mesad, acute. Female genital segment shorter than rest of abdomen, stout, with long sparse pubescence; dorsal valve sharply upcurved, subacute, a cluster of small setae at apex; ventral valve shorter than dorsal, strongly upcurved, acute, dorsal margin sinuate.

Many specimens of this *Ceanothus*-inhabiting species are at hand from California, Oregon, Idaho, and Montana.

The form described as *E. beameri* is not sufficiently distinct to warrant a specific designation, the chief difference being in the forewings, and intermediate forms have come to light. As a matter of fact it appears that the type specimen of *vermiculosus* is the form called *beameri*.

TYPE, male, mountains near Claremont, California, Baker, in the Crawford Collection.

\* *vermiculosus -a -um*, L. adj.—wormy.

### *Euphalerus rugipennis\** Crawford

(Figs. 126, 127)

- 1914 *Euphalerus rugipennis* Crawford, U. S. Nat. Mus., Bull. 85:119, 120.
- 1914 *Euphalerus rugipennis* var. *immaculatus* Crawford, U. S. Nat. Mus., Bull. 85:121.
- 1914 *Cephalopsylla rugipennis* Crawford, U. S. Nat. Mus., Bull. 85:121.
- 1917 *Euphalerus rugipennis* Van Duzee, Cat. Hemip. N. Am. 803.
- 1917 *Euphalerus rugipennis* var. *immaculatus* Van Duzee, Cat. Hemip. N. Am. 803.
- 1937 *Euphalerus rugipennis* Tuthill, Jour. Kans. Ent. Soc. 10:72.

Length to tip of folded wings 2.5 mm.

COLOR: Usual color uniformly green, more or less completely covered with small white spots, sometimes partly or entirely red.

STRUCTURE: Head coarsely punctate, as broad as thorax, deflexed. Vertex nearly plane, fully twice as wide as long, anterior margin slightly bulging medially, discal impressions shallow. Genal processes large, broad, bluntly rounded, divergent, not contiguous, heavily pubescent,  $\frac{1}{2}$  as long as vertex or more, on same plane as vertex. Antennae  $1\frac{1}{4}$  times as long as width of head, a small tubercle ventrad of insertion. Thorax well arched, coarsely punctate. Pronotum descending anteriorly. Forewings coarsely rugose, thickened, semitransparent, twice as long as wide; Rs sinuate, marginal cells about equal in size, pterostigma rather small, not prominent. Hind wings nearly equalling forewings. Legs short, pubescent. Small basal spur on hind tibia.

GENITALIA: Male proctiger stout, somewhat swollen caudad. Forceps straight, heavily pubescent, especially on caudo-mesal margin; in lateral view moderately slender; in caudal view very slightly arched to apices which are black and sharply curved mesad; black apical tooth extending cephalo-mesad, acute. Female genital segment shorter than rest of abdomen, stout, with long sparse pubescence; dorsal valve sharply upcurved, subacute, a cluster of small setae at apex; ventral valve shorter than dorsal, strongly upcurved, acute, dorsal margin sinuate.

Many specimens of this beautiful little species are at hand from numerous localities in Arizona, California, and Oregon. Numerous specimens from California bear the label *Ceanothus cuneatus* Nutt. One series of teneral specimens and nymphs from Los Angeles County, California, bears a label *Ceanothus rigidus* Nutt. Apparently several species of *Ceanothus* may serve as host.

TYPE, male, No. 18099 United States National Museum, Oracle, Arizona, Hubbard and Schwarz. The type is in poor condition, the head and wings of one side being gone.

Type examined.

The specimen which Crawford described as *E. rugipennis* var. *immaculatus* is in the United States National Museum and according to Oman is merely a teneral specimen.

\* From *rugosus -a -um*, L. adj.—wrinkled + *pennis*, L. irr. noun—wing.

Genus *Euphyllura*\* Förster

- 1839 *Thrips* O. G. Costa (pro parte), Monogr. degl' insetti ospitanti sull' olivo e nelle olive, 2 ed. Napoli 23-25 (larva) [fide Aulmann].  
 1840 *Psylla* Boyer de Fons-Colombe (pro parte), Ann. Soc. Ent. Fr. 9:111.  
 1848 *Euphyllura* Förster, Verh. natur. Ver. preuss. Rhein. 5:93.  
 1861 *Euphyllura* Flor, Bull. Soc. Imp. Nat. Moscou 34:337, 416-422.  
 1872 *Euphyllura* Meyer-Dür, Mitt. Schw. Ent. Ges. 3:380, 403.  
 1879 *Euphyllura* Löw, Verh. zool.-bot. Ges. Wien 28:607.  
 1904 *Euphyllura* Schwarz, Proc. Ent. Soc. Wash. 6:234.  
 1912 *Euphyllura* Oshanin, Kat. paläa. Hemip. 126 [designates type].  
 1913 *Euphyllura* Aulmann, Psy. Cat. 67.  
 1914 *Euphyllura* Crawford, U. S. Nat. Mus., Bull. 85:115.  
 1917 *Euphyllura* Van Duzee, Cat. Hemip. N. Am. 802.  
 1921 *Platystigma* Enderlein, Zool. Anz. 52:116.  
 1921 *Syntomoza* Enderlein, Zool. Anz. 52:117.

Head large, strongly deflexed, not vertical, as broad as thorax or broader. Eyes large, elongate, strongly recessive, extending back over propleurites. Vertex rather flat, more or less notched above, or extending over base of antennae, a tubercle next eye. Genal processes on same plane as vertex, very broad, blunt, usually rectangular, contiguous. Antennae shorter than width of head. Thorax very strongly arched, pronotum strongly descending, extending far down laterad. Forewings rhomboidal, coriaceous, more or less rugose, venation somewhat variable, pterostigma variable from large to obsolete. Hind tibia without basal spur, with several black spines apically. Two black claws on basal segment of metatarsus.

**LOGOTYPE:** *Euphyllura olivina* O. Costa.

Enderlein erected the genus *Platystigma* for those species which have a pterostigma but are without, usually entirely without, cross veins in the pterostigma and with the cubitus of the hind wings not branched. In this group he included all of the North American species, some of which have a pterostigma and some of which do not. As the pterostigma is very weak and variable in the entire group, I think its presence or absence certainly not of sufficient importance to warrant a separate genus. The so-called cross veins in *olivina* are so slight as to be scarcely significant specifically. I do not consider the venation of the hind wings of much significance as the entire wings are somewhat vestigial in some members of the family, and the veins are very weak in almost all.

*Syntomoza* was distinct from *Platystigma* solely in the lack of a pterostigma.

Key to the Species of *Euphyllura*

1. Veins Rs and M (including branches) of forewing very strongly sinuate..... 2.
- Rs and M not or but very slightly sinuate..... 3.
2. Eyes elongate, strongly recessive, extending to mesonotum; forewings brown basally, light apically..... *arbuti* p. 528.
- Eyes rounded, not strongly recessive, not covering prothoracic pleurites; forewings uniformly brown..... *arbuticola* p. 529.

\* Derivation obscure.

3. Unicolorous red to brown to black..... 4.
- Not unicolorous red to black, forewings with white maculae, entirely light or entire body and forewings light with minute brown spots..... 5.
4. Vertex plane, not swollen nor rounded down anteriorly; genal processes on same plane as vertex; antennae  $\frac{2}{3}$  as long as width of head..... *arctostaphyli* p. 529.
- Vertex swollen anteriorly, rounded down to genae; genal processes deflexed from plane of vertex; antennae  $\frac{1}{2}$  as long as width of head..... *separata* p. 532.
5. Forewings red with two transverse white maculae  
  *arctostaphyli* var. *bifasciata* p. 531.
- Forewings unicolorous..... 6.
6. Forewings white or cream, head and thoracic dorsum red..... 7.
- Body and forewings whitish with numerous minute brown dots, evenly scattered over surface; more or less covered with large flaky wax granules..... *pruinosa* p. 531.
7. Forewings with a loose, snowy white pulverulence; female genital segment short, dorsal valve not sinuate, about as long as ventral..... *niveipennis* p. 531.
- Forewings cream, without loose pulverulence; female genital segment long, dorsal valve sinuate, attenuate, longer than ventral..... *bicolor* p. 532.

*Euphyllura olivina*\* (Costa)

(Figs. 128, 129, 130, 257)

- 1839 *Thrips olivinus* O. G. Costa, Monogr. degl'insetti ospitanti sull olivo e nelle olive, 2 ed., Napoli pp. 23-25.—Larve [fide Aulmann].  
 1840 *Psylla oleae* Fons-Colombe, Ann. Soc. Ent. Fr. 9:111.  
 1848 *Euphyllura oleae* Förster, Verh. natur. Ver. preuss. Rhein. 5:93.  
 1857 *Euphyllura olivina* Costa, Degl'insetti che attacano l'olivo, etc. 35-42 [fide Aulmann].  
 1861 *Euphyllura oleae* Flor, Bull. Soc. Imp. Nat. Moscou 34:418, 420, 422.  
 1872 *Euphyllura oleae* Meyer-Dür, Mitt. Schw. Ent. Ges. 3:403.  
 1883 *Euphyllura olivina* Löw, Verh. zool.-bot. Ges. Wien (1882) 32:245.  
 1908 *Euphyllura olivina* Oshanin, Verz. palæa. Hemip. 2:340.  
 1912 *Euphyllura olivina* Oshanin, Kat. palæa. Hemip. 126.  
 1913 *Euphyllura olivina* Aulmann, Psy. Cat. 67.  
 1935 *Euphyllura olivina* Haupt, Tierw. Mittel. 4, 3:227.

Length to tip of folded wings 2 mm.

**COLOR:** General color light green. Dorsum more or less embrowned. Forewings dirty white with small brown spots.

**STRUCTURE:** Dorsum of head and thorax coarsely punctate. Head broader than thorax, strongly deflexed. Vertex plane, twice as wide as long, posterior margin evenly concave, discal impressions shallow. Genae smoothly continuous with vertex, produced as broad, rounded, flattened contiguous lobes. Antennae short,  $\frac{3}{5}$  as long as width of head, arising beneath projecting edge of vertex. Eyes elongate, strongly recessive, extending back to mesonotum. Thorax very strongly arched. Pronotum small, nearly vertical. Forewings twice as long as wide, coriaceous, rugose, opaque, obliquely narrowed to rounded apex, costal margin setate; basal vein (R + M + Cu) short, medio-cubital petiole and stem of R of equal length, Rs long, nearly straight, curved to margin apically, medial cell elongate, flaring at margin, cubital cell small, pterostigma very large, as wide as medial cell, rugosity of membrane strong (the "cross veins" of Enderlein). Membrane of hind wings finely setate. Legs short, stout. Metatibia with several black spines apically. Proximal segment of

\* Adjective from *oliva*, L. f. noun—the olive tree.

metatarsus with two black spines. Metacoxal spurs very small, rounded.

**GENITALIA:** Male proctiger short, stout, straight, slightly swollen on caudal margin, sharply produced caudad apically. Forceps short, about  $\frac{1}{2}$  as long as proctiger, broadly spatulate. Female genital segment longer than rest of abdomen; dorsal valve sinuate on dorsal margin, apex blunt; ventral valve thick, upcurved to acute apex, nearly equalling dorsal.

Redescribed from three specimens from "Syra, Graecia" determined by Löw. Not known to occur in North America, it has been recorded from Spain, France, Italy, Dalmatia, Liguria (Aulmann).

#### *Euphyllura arbuti\** Schwarz

- 1904 *Euphyllura arbuti* Schwarz, Proc. Ent. Soc. Wash. 6:235, 237-238.
- 1913 *Euphyllura arbuti* Aulmann, Psy. Cat. 67.
- 1914 *Euphyllura arbuti* Crawford, U. S. Nat. Mus., Bull. 85:117.
- 1917 *Euphyllura arbuti* Van Duzee, Cat. Hemip. N. Am. 802.
- 1921 *Platystigma arbuti* Enderlein, Zool. Anz. 52:116.
- 1923 *Euphyllura arbuti* Ferris and Hyatt, Can. Ent. 55:88-92 [life history, nymph figured].
- 1928 *Euphyllura arbuti* Ferris, Can. Ent. 60:116.
- 1932 *Euphyllura arbuti* Klyver, Ent. News 43:39.

Length to tip of folded wings 3.25 to 4 mm.

**COLOR:** General color yellow to brown. Darker on vertex and thoracic dorsum. A broad brown macula on forewings extending from base obliquely to anal margin distad of apex of clavus.

**STRUCTURE:** Finely punctate, glabrous, shining. Head broader than thorax, strongly deflexed. Vertex plane, twice as wide as long, posterior margin nearly straight, emarginate anteriorly over antennae, discal impressions very slight. Genae continuous with vertex, produced as truncate, contiguous lobes  $\frac{1}{4}$  as long as vertex. Antennae slender, slightly over  $\frac{2}{3}$  as long as width of head. Eyes slender and very strongly recessive, extending back to mesonotum. Thorax very strongly arched. Pronotum moderately long, straight, nearly vertical. Forewings coriaceous, rugose, semitransparent, obliquely rounded from apex of clavus to rounded apex at costa, twice as long as wide; Rs and M, including branches, very strongly sinuate, medial cell slender, sinuate, cubital small, R<sub>1</sub> extending nearly straight to costa, no pterostigma, a slight notch in costa proximad R<sub>1</sub>. Membrane of hind wings thickly set with minute setae.

**GENITALIA:** Male proctiger straight, longer than forceps. Forceps long, straight; in lateral view moderately slender, apices excavate cephalically leaving a blunt black-tipped tooth. Female genital segment shorter than rest of abdomen; dorsal valve straight, evenly tapered, subacute, longer than ventral; ventral valve straight, tapered to acute apex.

This species is represented in the material at hand by specimens from Jamesburg, Sargent, and Boulder Creek, California, and from Grants Pass and Canyonville, Oregon. Recorded from British Columbia

\* Genitive of *Arbutus*—the generic name of the host plant.

by Klyver. Its host plant is madrone, *Arbutus menziesii*. Ferris and Hyatt discuss the life history and habits in detail. The nymphs live in waxen cells, usually under scales of the bark. Breeding apparently occurs throughout the year.

**TYPE:** male, No. 8145 United States National Museum, Santa Cruz County, California, Koebele.

Type examined.

#### *Euphyllura arbuticola\** Crawford

- 1914 *Euphyllura arbuticola* Crawford, U. S. Nat. Mus., Bull. 85:118.
- 1917 *Euphyllura arbuticola* Van Duzee, Cat. Hemip. N. Am. 802.
- 1921 *Platystigma arbuticola* Enderlein, Zool. Anz. 52:116.

"This species resembles very closely *arbuti* in most respects, including size and general color, but differs in the color of the forewing, being uniformly darker brown and not bicolored, with sometimes a lighter area across the base; the venter is darker than in *arbuti*. Body a little more rugose. Genal lobes shorter, and more squarely truncate; antennae slightly shorter. Head and thorax similar. Wings somewhat larger, thicker, more rugose; veins even more sinuate.

"The chief difference is in the male genitalia; anal valve stouter, relatively shorter; forceps distinctly thicker, without apical emargination on anterior edge, and with a distinct tooth on posterior edge inside about  $\frac{1}{3}$  the length from apex, broadly rounded at apex.

"Described from six males and four females from Chiric Mountains, Arizona (H. G. Hubbard), on *Arbutus arizonica*, in September.

"TYPE No. 18098, United States National Museum."—Crawford.

One female which is apparently this species is at hand from the Huachuca Mountains, Arizona, Aug. 22. From it I add the following: Antennae thicker than in *arbuti*. Eyes much smaller, scarcely recessive, not covering prothorax laterally. Forewing not as elongate and slender apically.

Type examined.

#### *Euphyllura arctostaphyli†* Schwarz

(Figs. 131, 132, 133)

- 1904 *Euphyllura arctostaphyli* Schwarz, Proc. Ent. Soc. Wash. 6:234-236.
- 1913 *Euphyllura arctostaphyli* Aulmann, Psy. Cat. 67.
- 1914 *Euphyllura arctostaphyli* Crawford, U. S. Nat. Mus., Bull. 85:116.
- 1917 *Euphyllura arctostaphyli* Van Duzee, Cat. Hemip. N. Am. 802.
- 1921 *Platystigma arctostaphyli* Enderlein, Zool. Anz. 52:116.
- 1928 *Euphyllura arctostaphyli* Ferris, Can. Ent. 60:116.
- 1930 *Euphyllura arctostaphyli* Klyver, Proc. Ent. Soc. Wash. 32:153-160.
- 1931 *Euphyllura arctostaphyli* Martin, Jour. Kans. Ent. Soc. 4:69.
- 1932 *Euphyllura arctostaphyli* Klyver, Ent. News 43:38.
- 1932 *Euphyllura arctostaphyli* Klyver, Pan-Pac. Ent. 8:15.

\* From *Arbutus*—the host plant + *cola*—inhabitant.

† Genitive of *Arctostaphylos*—the generic name of the host plant.

Length to tip of folded wings 2.0 to 3.5 mm.

COLOR: General color reddish to reddish brown, variable from light to very dark. Legs lighter to yellowish. Forewings generally brownish, veins red. Entire body punctate, with more or less short pubescence.

STRUCTURE: Head large, broad, as broad as thorax or slightly broader, strongly deflexed. Vertex plane, nearly straight-margined posteriorly, very deeply emarginate anteriorly over insertion of antennae, forming a tubercle next the eyes, nearly twice as wide as long, discal impressions slight. Genal processes continuous with vertex, short, very broad, roundly truncate, contiguous. Antennae distinctly shorter than width of head,  $\frac{2}{3}$  as long or more. Thorax broad, very strongly arched. Pronotum sharply descending anteriorly. Forewings about twice as long as wide, thickened, coriaceous, somewhat rugose, surface very rough, somewhat rhomboidal, a more or less prominent notch on costal margin opposite furcation of R; cubital petiole longer than R, Rs moderately long, straight, turned to costa, marginal cells large, medial broadly flaring, branches of media slightly sinuate, R<sub>1</sub> angling, indistinct near costa, no definite pterostigma. Hind wings thickly set with minute setae.

GENITALIA: Male proctiger nearly straight, slightly swollen, apex slightly produced caudad. Forceps nearly as long as proctiger, spatulate, enlarged apically; in caudal view slender, slightly arched, apices touching. Female genital segment shorter than rest of abdomen; dorsal valve slender apically, nearly straight to blunt apex; ventral valve nearly as long as dorsal, upturned, acute.

This species is very abundant on several species of manzanita (*Arctostaphylos*) in the western part of North America. It shows a great deal of variation in most characters. Schwarz (1904) named the variety *niveipennis* which was raised to specific rank by Klyver in 1930 after a detailed study of both forms. He describes and figures the principal differences. Martin in 1931 added two more to the list of named variations. These four forms can be quite easily separated in most instances. I am not convinced that they represent distinct species, however, but I believe it will be less confusing to retain the names until such time as some careful biological work shall determine the status of this complex.

In 1920 Crawford named the color variety *E. arctostaphyli bifasciata* which differs from the typical form solely in color and is evidently a true color variety.

Specimens are at hand from numerous localities in California, Oregon, Washington, Arizona, Colorado, New Mexico, Montana, and Manitoba. It is also recorded from Wyoming by Crawford, and from Nevada and British Columbia by Klyver.

Specimens at hand are from various species of *Arctostaphylos*: *A. pungens* H. B. K., *A. tomentosa* Pur., *A. patula* Greene, *A. montana* East, *A. glauca* Lindl., *A. canescens* East, and *A. viscida* Parry.

TYPE No. 8143 United States National Museum, several specimens on one pin, Placer County, California, Koebele.

Types examined.

*Euphyllura arctostaphyli* var. *bifasciata*\* Crawford

1920 *Euphyllura arctostaphyli* var. *bifasciata* Crawford, Ent. News 31:13.

Similar to species except forewings with two white areas, one a broad band across wing basally, the other more irregular, oblique, near apex, not extending entirely across the wing to anal margin.

From the material at hand this pattern variation seems to occur ubiquitously with the typically colored individuals.

TYPE, female, Placer County, California, August 24, 1917, W. M. Giffard, No. 463 California Academy of Sciences (Crawford).

*Euphyllura niveipennis*† Schwarz

(Fig. 134)

1904 *Euphyllura arctostaphyli niveipennis* Schwarz, Proc. Ent. Soc. Wash. 6:235, 236-237.  
1913 *Euphyllura arctostaphyli niveipennis* Aulmann, Psy. Cat. 67.

1914 *Euphyllura arctostaphyli niveipennis* Crawford, U. S. Nat. Mus., Bull. 85:117.

1917 *Euphyllura arctostaphyli niveipennis* Van Duzee, Cat. Hemip. N. Am. 802.

1930 *Euphyllura niveipennis* Klyver, Proc. Ent. Soc. Wash. 32:153-160.

1931 *Euphyllura niveipennis* Martin, Jour. Kans. Ent. Soc. 4:69.

1932 *Euphyllura niveipennis* Klyver, Ent. News 43:38.

Similar to *E. arctostaphyli*, differing in the following characters: forewings snowy white, pulverulent, due to what appears to be a loose wax deposit (Klyver, 1930, states that it is "small colorless chitinized plates"), often a few bright red spots on margin; female genital segment distinctly shorter, valves equal in length, dorsal valve not slender and attenuate but more nearly acute and slightly downcurved apically, entire segment thickly set with short fine setae of equal length, giving it a very distinctive appearance; male forceps broader from base, not enlarged apically, more tapered apically in lateral view and slightly curved cephalad.

For an exhaustive discussion of the differences between these two forms, see Klyver, 1930. In the large series of *arctostaphyli* at hand the range of size is so great that it includes that of *niveipennis* also.

Specimens are at hand from several localities in California, some of them from *Arctostaphylos viscida* Parry.

TYPES, 12 specimens on 1 pin, No. 8144 United States National Museum, Placer County, California, Koebele.

Types examined.

*Euphyllura pruinosa*† Martin

1931 *Euphyllura pruinosa* Martin, Jour. Kans. Ent. Soc. 4:69.

Similar to *E. arctostaphyli* except as follows: More pubescent, entire body including forewings more or less covered with flaky white wax deposit apparently secreted by the setae which cover the body; general color of body light yellow, with scattered red punctations, medio-anterior

\* From bi, L. prefix—two + fasciatus, L. (p. part of fascio)—banded.

† From niveus -a -um, L. adj.—snowy + pennis, L. irr. noun—wing.

portion of prescutum and four broad longitudinal stripes on scutum brown, forewings white with numerous very small brown spots, slightly more dense apically; female genitalia similar to *arctostaphyli*; male more like *niveipennis*, forceps even broader in lateral view.

Specimens are at hand from numerous localities in California taken on *Arctostaphylos pungens*, H. B. K., *A. glauca* Lindl., and *A. tomentosa* Pur.

It should be noted that although this form is very distinct in appearance from *arctostaphyli* the differences are almost solely in color, greater pubescence, and presence of a prominent waxy deposit.

**TYPE**, male, San Diego County, California, in Snow Collection, University of Kansas.

#### *Euphyllura bicolor\** Martin

1931 *Euphyllura bicolor* Martin, Jour. Kans. Ent. Soc. 4:69, 70.

Similar to *E. arctostaphyli* from which it differs as follows: Larger (3.5 to 4.5 mm. in length); general color yellow, with small red spots, eyes and thoracic dorsum almost entirely red; forewings cream colored, opaque, (not appearing pulverulent as in *niveipennis*, and rugae of wing more apparent); medial cell very large; female genital segment longer, dorsal valve sinuate, attenuate, downcurved to blunt tip, pubescence more as in *niveipennis* but not as thick. Male genitalia as in *niveipennis*.

This form is consistently larger than the preceding three in the material at hand. The female genitalia is its most distinctive feature other than color.

Numerous specimens are before me from various localities in California, from several species of *Arctostaphylos* including *A. glauca* Lindl., *A. manzanita* Parry, *A. zacaensis* East, *A. patula* Greene, and *A. glandulosa* East.

**TYPE**, male, Alpine, California, in Snow Collection, University of Kansas.

#### *Euphyllura separata† n. sp.*

(Figs. 149, 150, 296)

Length to tip of folded wings 2.25 to 2.75 mm.

**COLOR:** General color red to black. Forewings very thickly strown with small brown spots except at tip of clavus.

**STRUCTURE:** Head and thorax punctate. Head and prothorax vertical. Vertex with broad discal impressions, twice as wide as long. swollen anteriorly, rounded down to anterior ocellus, and smoothly to genal processes, produced as a blunt lobe next to eyes. Genal processes very short, quadrate, scarcely contiguous, not deflexed from plane of vertex. Antennae very short, not much over  $\frac{1}{2}$  as long as width of head.

\* From bi-L. prefix—two + color—oris, L. m. noun—color.

† *separatus* —a —um, L. adj.—distinct.

Thorax very strongly arched. Prothorax straight. Prescutum strongly deflexed. Forewings slightly rhomboidal, rounded apically, rugose, thickened, not notched on costal margin, twice as long as wide; Rs straight to near apex then curved to costa, branches of media strongly divergent, straight, medial cell larger than cubital, pterostigma lacking.

**GENITALIA:** Male proctiger long, slightly tapering apically. Forceps spatulate, straight; in lateral view broad, narrowed apically. Female genital segment very large, much longer than rest of abdomen; dorsal valve tapering to acute, upturned apex, dorsal margin sinuate; ventral valve thick, shorter than dorsal, evenly upcurved to acute apex.

Described from 2 females and 8 males bearing the data, "10 miles west of Bend, Oregon, June 21, 1939, Gray and Schuh."

**HOLOTYPE**, female, **ALLOTYPE**, male, and paratypes in the collection of Oregon State College. Paratypes in author's collection.

#### Genus *Pachypsyllea\** Riley

- 1861 *Psylla* Osten-Sacken (pro parte), Ent. Zeit. 22:422.
- 1883 *Pachypsyllea* Riley, Can. Ent. 15:157.
- 1885 *Pachypsyllea* Riley, Proc. Biol. Soc. Wash. 2:71.
- 1885 *Pachypsyllea (Blastophysya)* Riley, Proc. Biol. Soc. Wash. 2:74.
- 1913 *Pachypsyllea* Aulmann, Psy. Cat. 29.
- 1914 *Pachypsyllea* Crawford, U. S. Nat. Mus., Bull. 85:108 [designates type].
- 1917 *Pachypsyllea* Van Duzee, Cat. Hemip. N. Am. 799.

Head small, vertical. Eyes hemispherical, lateral. Ocelli large. Vertex plane or somewhat rounded anteriorly, quadrate, broader anterior to eyes than on posterior margin. Genae produced as short lobate processes, depressed strongly from plane of vertex. Antennae short, about as long as width of head. Thorax large, strongly arched. Forewings more or less rhomboidal, often opaque or semiopaque, rugose, punctate, or covered with disc-shaped cuticular thickenings, M + Cu with common base, marginal cells more or less elongate, pterostigma present, small to moderate size. Hind wings with prominent venation, at least basal vein (R + M + Cu) heavily sclerotized. Hind tibia without basal spur, with several small black spurs apically. Basal segment of metatarsus with two black claws. Metacoxal spurs, large, stout, blunt.

Logotype: *Pachypsyllea venusta* Osten-Sacken.

Riley in 1883 mentioned, in a short article on the galls of *Celtis*, that these insects belonged to a new genus which in a paper he had prepared was called *Pachypsyllea*. He then proceeded to give a short characterization of the genus. The aforementioned paper did not appear until two years later.

The genus is composed entirely of gall-forming species which inhabit *Celtis* spp., the hackberries. It is known only from North America. Boselli (1929b) described the nymph of an unknown species of psyllid forming galls on *Celtis sinensis* in China which may belong to *Pachypsyllea*.

The subgenus *Blastophysya* was erected by Riley for *P. celtidis-*

\* From *pachys*, Gr. adj.—thick, large + *psylla*.

*gemma*. The differences between it and the other species are insufficient to warrant any such distinction, however.

#### Key to the Species of *Pachypsylla*

1. Head and thoracic dorsum with short stiff pubescence, not shining; marginal cells of forewings very elongate; forewings not rugose..... 2.
- Head and thorax appearing glabrous, shining (often with sparse, minute pubescence); marginal cells less elongate, broad; forewings more or less rugose..... 4.
2. Large species (5.5 to 6 mm.)..... *venusta* p. 534.
- Smaller species (4 mm. or less)..... 3.
3. Length to tip of folded wings 3 to 4 mm. .... *celtidis-mamma* p. 536.
- Length to tip of folded wings 2.5 mm. or less..... *celtidis-vesicula* p. 538.
4. Forewings uniformly brown..... *celtidis-gemma* p. 539.
- Forewings maculate..... 5.
5. Branches of media sinuate..... *celtidis-inteneris* p. 540.
- Branches of media not sinuate..... 6.
6. Forewings finely mottled apically..... *dubia* p. 541.
- Forewings with large maculae (sometimes finely mottled also)..... *pallida* p. 541.

#### *Pachypsylla venusta\** (Osten-Sacken)

(Figs. 137, 138, 139, 140).

- 1861 *Psylla venusta* Osten-Sacken, Ent. Zeit. 22:422.  
 1876 *Psylla celtidis-grandis* Riley, Johnson's Univ. Cycl. (gall) [fide Riley].  
 1883 *Pachypsylla venusta* Riley, Can. Ent. 15:157 (gall only).  
 1883 *Psylla venusta* Fyles, Can. Ent. 15:84, 199.  
 1885 *Pachypsylla venusta* Riley, Proc. Biol. Soc. Wash. 2:70, 72 [describes].  
 1885 *Pachypsylla venusta* Riley, 5th Rept. U. S. Ent. Comm. 615-617.  
 1894 *Pachypsylla venusta* Mally, Proc. Ia. Acad. Sci., 1, 4:137.  
 1895 *Pachypsylla venusta* Mally, Proc. Ia. Acad. Sci. 2:153.  
 1912 *Pachypsylla tridentata* Patch, Me. Agr. Exp. Sta., Bull. 202:224.  
 1913 *Pachypsylla venusta* Aulmann, Psy. Cat. 30.  
 1914 *Pachypsylla venusta* Crawford, U. S. Nat. Mus., Bull. 85:109.  
 1917 *Pachypsylla venusta* Van Duzee, Cat. Hemip. N. Am. 799.  
 1923 *Pachypsylla venusta* Patch, Hemip. Conn. 247.  
 1926 *Pachypsylla venusta* Ferris, Can. Ent. 58:13-15 [describes and figs. nymph].  
 1929 *Pachypsylla venusta* Boselli, Boll. Lab. Zool. Gen. e Agr. Port. 22:204-218.  
 1932 *Pachypsylla venusta* Klyver, Ent. News 43:38.  
 1938 *Pachypsylla venusta* Brimley, Ins. N. C. 104.  
 1938 *Pachypsylla venusta* Caldwell, Ohio Biol. Surv., Bull. 34:255.

Length to tip of folded wings 5 to 5.5 mm.

COLOR: General color tawny with numerous black markings, latter often so extensive that general color black, markings tawny would be more accurate. Dorsum of thorax longitudinally striped. Forewings whitish, maculate in well-colored specimens with black as follows: a broad band of small spots across apical third becoming more dense apically, a clear rectangular area on margin between the apices of each pair of veins; small single maculae at base of pterostigma, along basal vein and R, at furcation of M and Cu and two or three on anal margin. Antennae with dark annulus on apex of each segment.

STRUCTURE: Entire body punctate, head coarsely. Head much narrower than thorax, vertical. Eyes large, hemispherical. Vertex plane,

quadrate, emarginate posteriorly, rounded to genae anteriorly,  $\frac{3}{4}$  as long as wide, discal impressions small, foveate. Genal processes lobate, strongly divergent, heavily pubescent, about  $\frac{1}{3}$  as long as vertex, much depressed from plane of vertex but parallel to it. Antennae slightly longer than width of head. Thorax very strongly arched, very short sparse pubescence dorsally. Pronotum strongly descending, nearly vertical, long. Prescutum large, descending anteriorly. Forewings large, hyaline, rhomboidal, slightly over  $2\frac{1}{2}$  times as long as wide, membrane thickly set with minute setae, veins biserrately set with small setae; Rs long, slightly sinuate, marginal cells elongate, cubital larger than medial, M + Cu  $\frac{1}{2}$  as long as R, pterostigma of moderate size. Hind wings nearly equalling forewings, thickly set with minute setae, venation prominent, R + M + Cu heavily sclerotized. Legs large, heavily pubescent, hind tibia with small basal tubercle.

GENITALIA: Male proctiger short, stout, roundly produced caudad, near apex sharply emarginate, apical epiphysis thus formed sharply flexed caudad. Forceps in lateral view broad basally, strongly narrowed then slightly tapering to subacute apices; in caudal view moderately broad basally, tapering to incurved subacute tips. Female genital segment very large, longer than rest of abdomen; dorsal valve straight, apical third slender, roughened, apex acute, upturned; ventral valve roughened toward apex, gently upturned, acute.

Baron Osten-Sacken in an article on the Galls of North America describes the galls he found on the leaf petioles of *Celtis occidentalis* and then says, "I reared therefrom a beautiful large *Psylla*, (*P. venusta* n. sp.) with black-flecked wings. The peculiar form of the apex of the metasternum and of the wing veins will no doubt make it necessary to erect a new genus for this species." Since this mention of the insect constitutes a description under the rules of nomenclature it is fortunate that he was dealing with this species since the gall is quite typical in this instance.

The galls are large (ave. 1 to 1.5 cm. in diameter), more or less spherical, not completely closed on one side and form on the leaf petioles. They remain attached to the tree usually, the mature insects emerging in the spring when the temperature becomes sufficiently high. They may be brought out during the winter by bringing them into a warm room. The last stadium nymph crawls from the gall and emerges as the adult very shortly thereafter. The galls are polythalamous.

Known from Iowa, Kansas, Colorado, Texas, New Mexico, Ohio, Mississippi, Tennessee, North Carolina, New Jersey, and Connecticut. It is undoubtedly much more widespread throughout the range of its host.

\**Venustus* -a -m, L. adj.—beautiful.

*Pachypsylla celtidis-mamma\** (Fletcher)

(Fig. 258)

- 1876 *Psylla celtidis-mamma* Riley, Johnson's Univ. Cycl. (gall) [fide Riley, Can. Ent. 15:157].  
 1883 *Psylla celtidis-mamma* Fletcher, Rept. Ent. Soc. Ont. 1882, 13th:79-80 [reprint of Riley 1876 and describes insect].  
 1883 *Psylla celtidis-mamma* Fletcher, Can. Ent. 15:40.  
 1883 *Pachypsylla celtidis-mamma* Riley, Can. Ent. 15:157-158 [gall].  
 1883 *P. celtidis-mamma* Fyles, Can. Ent. 15:199.  
 1885 *Pachypsylla celtidis-mamma* Riley, Proc. Biol. Soc. Wash. 2:73 [detailed desc.].  
 1890 *Pachypsylla c. mamma* Riley, 5th Rept. U. S. Ent. Comm. 615, 616, 619.  
 1894 *Pachypsylla celtidis-mamma* Mally, Proc. Ia. Acad. Sci. 1, 4:131-137.  
 1895 *Pachypsylla celtidis-mamma* Mally, Proc. Ia. Acad. Sci. 2:154.  
 1910 *Pachypsylla rohweri* Cockerell, Ent. News 21:180.  
 1910 *Pachypsylla celtidis-mammae* Stough, Kans. Univ. Sci. Bull. 5, No. 9:121-165, pl. XXVI-XXXV [morphology].  
 1913 *Pachypsylla celtidis-mamma* Aulmann, Psy. Cat. 30.  
 1914 *Pachypsylla c. -mamma* Crawford, U. S. Nat. Mus., Bull. 85:110.  
 1917 *Pachypsylla celtidis-mamma* Van Duzee, Cat. Hemip. N. Am. 800.  
 1923 *Pachypsylla celtidis-mamma* Patch, Hemip. Conn. 247.  
 1929 *Pachypsylla celtidis-mamma* Boselli, Boll. Lab. Zool. Gen. e Agr. Port. 22:204-218.  
 1932 *Pachypsylla c.-mamma* Klyver, Ent. News 43:38.  
 1938 *Pachypsylla celtidis-mamma* Caldwell, Ohio Biol. Surv., Bull. 34:257.

Length to tip of folded wings 3 to 4 mm.

**COLOR:** General color dull brownish yellow with many variable black and brown markings. Antennae with dark annulus apically on each segment. Forewings white with numerous small round brown spots usually more or less fused each side of an oblique subapical band almost free of them. Markings extremely variable, especially on the forewing. Very commonly a large irregular macula appears centrally, occasionally this is very sharp and dark with the remainder of the wing almost immaculate.

**STRUCTURE:** Entire body punctate with short pubescence, most prominently on head and thoracic dorsum. Head narrower than thorax, vertical. Vertex plane, nearly quadrate,  $\frac{2}{3}$  as long as wide, discal impressions broad, shallow. Genal processes depressed from plane of vertex but parallel to it, short, strongly divergent, bluntly rounded,  $\frac{1}{3}$  as long as vertex, heavily pubescent. Antennae about 4/5 as long as width of head, arising far down on head. Thorax strongly arched. Pronotum nearly vertical. Prescutum large. Forewings  $2\frac{1}{2}$  times as long as wide, very slightly rhomboidal, surface covered with minute circular plates, veins very prominent, biseriately setate; Rs long, somewhat sinuate, marginal cells very elongate, equal in length, medial broader, M + Cu very short,  $\frac{1}{3}$  as long as R, pterostigma large, yellowish. Legs long.

**GENITALIA:** Entire genital segment of male heavily pubescent. Proctiger stout, slightly enlarged from base to near apex then sharply emarginate on caudal margin, a large apical epiphysis thus formed, flexed

\* Genitive of *Celtis* the generic name of its host plant + *mamma -ae*, L. f. noun—breast (a reference to the shape of the galls formed by this insect). The form of this and the following three names is extremely poor. They are basically trinomial; however, as they were used as binomials, they must stand.

caudad. Forceps stout; in lateral view anterior margin somewhat sinuate, narrowed apically to subacute apices; in caudal view moderately stout basally, arched and tapered to acute apices. Female genital segment shorter than rest of abdomen, slender; dorsal valve straight, attenuate apically, tip acute; ventral valve shorter than dorsal, slightly, evenly, upcurved to acute apex.

The galls formed by this species occur on the leaves of hackberry, developing into a more or less mammiform growth on the underside of the leaf. On the upper surface of the leaf a depression forms, cupping down into the gall. The shape of the gall itself is quite variable, often with a nipple-like tip, sometimes conical, glabrous or pubescent, etc. Usually they are monothalamous.

The adults emerge in the fall, overwinter in crevices of bark, etc.; early in the spring they fly to the twigs, and after mating, the females begin to deposit eggs about as soon as the leaves begin to appear. The nymphs feed on the lower side of the leaves and are soon enclosed in the gall. There is but one generation per year, the nymphs reaching maturity in September.

In 1876 Riley in an article on "Galls" in Johnson's Universal Cyclopaedia (which I have not seen) discussed the gall formation of this entire group in a very general way. Fletcher (1883) purports to "reproduce this in full," but his excerpt does not contain the name *celtidis-mamma* at all. However, Riley (1883) credits the use of the name to that article. Fletcher in the above-mentioned article unfortunately proceeds to discuss the coloration and some of the structure of the insect and thus becomes the author of the species since Riley's original use of the name is an utter *nomen nudum*, and his detailed description which he headed "n. sp." did not appear until 1885. Fletcher mentions no specific specimens and undoubtedly kept none, so Riley's designated types in the United States National Museum stand as the type specimens. There are numerous cotypes in the series on four pins, the type number being 657.

The type of *Pachypsylla rohweri* Cockerell (No. 18476) is in the National Museum and is in my opinion identical with *celtidis-mamma*.

The variation in this species is quite marked, especially the coloration, most markedly the wing pattern, so much so that when first encountered it appears that several species must be present. Fortunately, the insect is very abundant throughout its range and thus almost all of those who have dabbled in the group have come to the conclusion that the variants are so numerous and diverse that they are indistinguishable and inconstant.

Riley, apparently assuming that the shape of a gall was an extremely accurate and highly constant specific character (even more so than the structure of the insect) proposed names for a species of *Pachypsylla* for each different shape of gall that he found. With these names he described the galls in detail but made no mention whatsoever of the insects. In a preliminary statement, however, he said "the yet undescribed species are all so closely allied to *P. c-mamma* that they can only

be distinguished with difficulty." Elsewhere (Can. Ent. 15:158) he says of one of them "*P. c-mamma* so closely resembles another species (*P. c-cucurbita* M. S. mihi), however, that without the galls it would be difficult, if not impossible to separate them—a not uncommon occurrence among gall-making species." Anyone rearing these insects from the galls and not blinded by the above assumption of infallible gall specificity must soon come to the conclusions reached by Mally (1849) that, "the shape and size of the gall is not at all constant . . . It was found that *P. c.-mamma* occurred in all the different variations, thus showing that these variations are not of specific importance." Fortunately, the series of names proposed by Riley stand as *nomina nuda*. Some few of them have cluttered up the literature of galls, however, and do until the present time.

This species frequently becomes a nuisance in the house in autumn when seeking hibernation quarters. Large numbers often collect on the screens, which barrier they readily penetrate and move into the household to hide for the winter. Typically, they seek shelter in the rough bark of the hackberry and other trees.

I have seen specimens of this very abundant animal from, or definite records are available of its occurrence in, the following states and provinces: Colorado, Texas, Arizona, Utah, Oklahoma, Kansas, Nebraska, Iowa, Minnesota, Illinois, Indiana, Ohio, North Carolina, New Jersey, New York, Connecticut, and Ontario.

It undoubtedly occurs, however, throughout the range of its host species, hackberry (*Celtis occidentalis* L.).

#### *Pachypsylia celtidis-vesicula\** Crawford

- 1890 *Pachypsylia celtidis-vesiculum* Riley, 5th Rept. U. S. Ent. Comm. 618 [gall].
- 1895 *Pachypsylia celtidis-vesiculum* Mally, Proc. Ia. Acad. Sci. 2:154 [lists].
- 1913 *Pachypsylia celtidis-vesiculum* Aulmann, Psy. Cat. 30 [lists].
- 1914 *Pachypsylia c.-vesiculum* Crawford, U. S. Nat. Mus., Bull. 85:112 [describes].
- 1917 *Pachypsylia celtidis-vesiculum* Van Duzee, Cat. Hemip. N. Am. 801.
- 1923 *Pachypsylia celtidis-vesiculum* Patch, Hemip. Conn. 247.
- 1938 *Pachypsylia celtidis-vesiculum* Caldwell, Ohio Biol. Surv., Bull. 34:259.

Length to tip of folded wings 2 to 2.5 mm.

This form is very similar to *celtidis-mamma* but seems to be a distinct species. It is distinctly smaller; the wing pattern is often more or less diffuse. Other minor differences have been noted by Crawford and Caldwell, none of which will hold when a large series from various localities is studied. The sudden narrowing midway of the ventral valve of the female genital segment is the most constant of these.

The gall formed on the leaves of the hackberry is of a quite different type from that of *celtidis-mamma*; it is blister-like and more prominent on the upper than on the lower surface. Very many galls are frequently found on the same leaf, and they are found on the same leaf

\* *vesicula -ae*, L. f. noun—little blister (the improper ending used by Riley and others is here corrected).

with *celtidis-mamma* galls. This species is extremely abundant. It overwinters in the adult stage as does its relative and in company with it sometimes becomes a household nuisance in the fall.

All uses of the name *cestidis-vesiculum* until 1914 are *nomina nuda*. Although the gall was often described, no one mentioned the insect until Crawford discussed it briefly in his monograph.

It is known from Iowa, Nebraska, Kansas, Oklahoma, Arizona, Louisiana, Ohio, New York, New Jersey, and Connecticut. It doubtlessly occurs throughout the range of its host (*Celtis*).

No type has ever been designated; the cotypic series is presumably in Crawford's collection.

#### *Pachypsylia celtidis-gemma\** Riley

(Fig. 259)

- 1885 *Pachypsylia (Blastophysa) c.-gemma* Riley, Proc. Biol. Soc. Wash. 2:74-75.
- 1890 *Pachypsylia c.-gemma* Riley, 5th Rept. U. S. Ent. Comm. 615, 616, 618.
- 1894 *Pachypsylia c.-gemma* Mally, Proc. Ia. Acad. Sci. 1, 4:138.
- 1895 *Pachypsylia (Blastophysa) celtidis-gemma* Mally, Proc. Ia. Acad. Sci. 2:154.
- 1913 *Pachypsylia (Blastophysa) celtidis-gemma* Aulmann, Psy. Cat. 30.
- 1914 *Pachypsylia c.-gemma* Crawford, U. S. Nat. Mus. Bull. 85:112.
- 1917 *Pachypsylia celtidis-gemma* Van Duzee, Cat. Hemip. N. Am. 801.
- 1921 *Pachypsylia celtidis-gemma*, Weiss, Can. Ent. 53:19-21.
- 1923 *Pachypsylia celtidis-gemma* Patch, Hemip. Conn. 247.
- 1938 *Pachypsylia celtidis-gemma* Caldwell, Ohio Biol. Surv., Bull. 34:255.
- 1938 *Pachypsylia celtidis-gemma* Brimley, Ins. N. C. 104.

Length to tip of folded wings 3 to 3.5 mm.

COLOR: General color brownish yellow, vertex and legs darker, forewings evenly brown, opaque.

STRUCTURE: Head much narrower than thorax, vertical, coarsely punctate, shining. Vertex straight on posterior margin, quadrate, rounded down to genal processes anteriorly,  $\frac{2}{3}$  as long as wide, discal impressions small, foveate. Genal processes short, rounded, strongly divergent,  $\frac{1}{3}$  as long as vertex, pubescent, much depressed from plane of vertex but on nearly parallel plane. Antennae a little longer than width of head. Thorax large, very strongly arched, shining, glabrous. Pronotum nearly vertical. Prescutum large. Forewings slightly over twice as long as wide, narrowly rounded apically, costal margin slightly concave at pterostigma, rugoso-punctate, strongly convex, veins scarcely raised from surface except basally; Rs short, nearly straight, marginal cells of moderate size, equal, not extremely elongate,  $M_1$  slightly sinuate, R nearly twice as long as  $M + Cu$ , pterostigma very small. Hind wings nearly equalling forewings, thickly set with minute setae, venation prominent. Legs long, heavily pubescent.

GENITALIA: Male proctiger stout, roundly swollen caudad, with a prominent epiphysis. Forceps short; in lateral view straight, broadest basally, apically tapered to subacute tips; in caudal view stout, strongly

\* From *gemma -ae*, L. f. noun—bud (of the plant), in reference to the position of the gall.

arched to acute apices. Female genital segment slender, shorter than rest of abdomen; dorsal valve slightly upcurved, tip subacute; ventral valve evenly upcurved to acute apex, nearly as long as dorsal.

The shining head and thorax of this species and those following readily distinguish them from the preceding forms. The adults appear in the spring (April and May in Iowa), having overwintered as nymphs in the galls. The galls are formed from the axillary buds on the twigs, usually they are polythalamous. Weiss (1921) gives a detailed account of the life history.

Specimens are at hand from Maryland, New Jersey, St. Catharine's Island, Georgia, Iowa, Nebraska, Kansas, Oklahoma, and Louisiana. It is also recorded from Virginia, District of Columbia, New York, Connecticut, Ohio, and Missouri.

Numerous COTYPES (galls, nymphs, and adults), No. 658, United States National Museum.

*Pachypsylla celtidis-inteneris*\* Mally

(Fig. 260)

- 1894 *Pachypsylla c.-inteneris* Mally, Proc. Ia. Acad. Sci. 1, 4:138.
- 1895 *Pachypsylla celtidis-inteneris* Mally, Proc. Ia. Acad. Sci. 2:154.
- 1913 *Pachypsylla celtidis-inteneris* Aulmann, Psy. Cat. 30.
- 1914 *Pachypsylla inteneris* Crawford, U. S. Nat. Mus., Bull. 85:113.
- 1917 *Pachypsylla inteneris* Van Duzee, Cat. Hemip. N. Am. 801.
- 1938 *Pachypsylla ungulata* Caldwell, Ohio Biol. Surv., Bull. 34:255, 256-257.

Length to tip of folded wings 3.5 to 4 mm.

COLOR: General color dark brown to black. Vertex and thoracic dorsum with more or less yellow, sometimes entirely yellow. Forewings hyaline except for an irregular macula usually as follows: black along pterostigma becoming dark brown and continuing around apex as a broad band onto tip of clavus, extending along Cu and basal vein, sometimes across to costa, leaving an isolated clear area medially, or entire basal  $\frac{2}{3}$  dark.

STRUCTURE: Head narrower than thorax, vertical. Vertex coarsely punctate, shining, with sparse minute pubescence, quadrate, strongly rounded down anteriorly, posterior margin straight,  $\frac{2}{3}$  as long as wide, discal foveae very small. Genal processes short, blunt, scarcely divergent,  $\frac{1}{3}$  as long as vertex, sparsely pubescent, strongly depressed from plane of vertex. Antennae stout, slightly longer than width of head. Thorax strongly arched, shining. Pronotum descending but not vertical. Forewings somewhat rugose (less so than in *celtidis-gemma*), shining,  $2\frac{1}{2}$  times as long as wide, rounded apically; Rs nearly straight, long, marginal cells large, equal, branches of M sinuate,  $M_1$  more strongly so, pterostigma small. Hind wings thickly set with minute setae, venation prominent. Legs large, heavily pubescent.

GENITALIA: Male proctiger in lateral view stout, straight, slightly swollen caudally, with a prominent epiphysis apically. Forceps in lateral

\* Possibly from in, a negative particle + tener -era -erum, L. adj.—tender.

view moderately broad, basally enlarged, then tapered to apices; in caudal view broad basally, arched, narrowed on lateral margins in apical  $\frac{1}{3}$  to acute apices. Female genital segment slender, shorter than rest of abdomen; dorsal valve straight, apical portion slender to subacute apex; ventral valve shorter, suddenly narrowed  $\frac{2}{3}$  of way to apex, acute.

This species is quite similar to *celtidis-gemma* from which it can be distinguished by the maculate forewings and the venation, chiefly the sinuate branches of media. The adults emerge in the spring from the galls which are located beneath the bark on the twigs or bases of the larger limbs.

The type series, three females, is in the Iowa State College Collection. A female bearing Mally's type label, reared from a gall by him, at Ames, is designated as the lectotype. When Caldwell was working with this genus in Ohio, he inquired as to the whereabouts of the type of this species. At that time Mally's specimens were hidden away where they had gone unnoticed apparently since his departure from Ames, and Caldwell was informed that none of Mally's specimens were here; he therefore proceeded with his description of *P. ungulata*. I have at hand a specimen of *ungulata*, and it is without doubt *inteneris* although much better colored than any of the types which are all somewhat teneral.

Known from Iowa, Illinois, and Ohio.

*Pachypsylla dubia*\* Patch

- 1912 *Pachypsylla dubia* Patch, Me. Agr. Exp. Sta., Bull. 202:224.
- 1914 *Pachypsylla dubia* Crawford, U. S. Nat. Mus., Bull. 85:113.
- 1917 *Pachypsylla dubia* Van Duzee, Cat. Hemip. N. Am. 801.

Crawford, who saw the types of this species, has the following to say concerning it: "I have examined a paratype of this and the following species (*pallida*), and both seem to be distinct from *c.-gemma* though closely related. The chief difference is in the mottled appearance of the forewing instead of being uniformly brown."

"Seven paratypes in the collection of Cornell University, but the locality is not given for any of them."

Miss Patch in her original description says no more—rather a little less—as she apparently had no specimens of *c.-gemma*.

There are no further records of the occurrence of this form.

*Pachypsylla pallida*† Patch

- 1912 *Pachypsylla pallida* Patch, Me. Agr. Exp. Sta., Bull. 202:225.
- 1914 *Pachypsylla pallida* Crawford, U. S. Nat. Mus., Bull. 85:113.
- 1917 *Pachypsylla pallida* Van Duzee, Cat. Hemip. N. Am. 801.

Length to tip of folded wings 3.5 mm.

COLOR: General color greenish yellow to yellowish brown. Prescutum especially of a green cast. Forewings hyaline or somewhat whitish except

\* *dubius* -a -um, L. adj.—uncertain, doubtful.  
† *pallidus* -a -um, L. adj.—pale.

for dark maculae as follows: three broad transverse bands, one apical, one crossing base of medial cell, the third arising at costal angle, extending obliquely to apex of clavus, all three converging on anal margin at tip of clavus, latter two quite irregular. Pterostigma dark.

**STRUCTURE:** Head narrower than thorax, vertical. Vertex plane, coarsely punctate, shining, somewhat rounded down anteriorly, over  $\frac{1}{2}$  as long as wide, discal foveae small, prominent. Genal processes elongate, blunt, slightly pubescent, somewhat divergent, about  $\frac{1}{3}$  as long as vertex. Antennae a little longer than width of head. Thorax well arched. Pronotum nearly vertical. Prescutum large. Forewings broad, a little over twice as long as wide, finely rugose, set with minute setae, at least basally, broadly rounded; Rs short, slightly sinuate, marginal cells equal, broad, R over twice as long as M + Cu, pterostigma small, costal margin slightly concave. Hind wings thickly set with minute setae. Legs heavily pubescent.

**GENITALIA:** Male genitalia very similar to *celtidis-inteneris*. Proctiger somewhat swollen caudally, with a caudally flexed epiphysis. Forceps enlarging from moderately narrow base, then converging to subacute apices; in caudal view strongly arched, tapered to acute apices. Female genital segment long, slender, upcurved; dorsal valve slender, evenly upcurved, attenuate in apical half, apex subacute; ventral valve long but shorter than dorsal, evenly upcurved to slender, acute tip.

Numerous specimens are at hand from several localities in Arizona and New Mexico which seem undoubtedly to be this species. Two of them, from Organ Mountains, New Mexico, are accompanied by galls. The latter are on the twigs and appear to be very densely pubescent; on closer examination this pubescence seems to be a dense growth of sporangio-phores of a white fungus, completely covering the galls. There is no evidence to indicate whether this is accidental or whether there is some significance to this association.

#### Genus *Tetragonocephala*\* Crawford

1914 *Tetragonocephala* Crawford, U. S. Nat. Mus., Bull. 85:108.  
1917 *Tetragonocephala* Van Duzee, Cat. Hemip. N. Am. 799.

Head narrower than thorax, vertical. Vertex quadrate, smooth, rounded down anteriorly. Genae produced as lobate processes, parallel to plane of vertex. Thorax very strongly arched. Pronotum long, vertical. Wings submembranous, elongate-ovate, marginal cells elongate, pterostigma lacking, M and Cu petiolate. A small tubercle on base of metatibia, basal segment of metatarsus without black spines. Metacoxal spurs long, straight, slender.

Orthotype: *Tetragonocephala flava* Crawford.

Placed in the subfamily *Psyllinae* by Crawford, this genus seems to be related to *Pachypsylla*. One of the cardinal characters of this subfamily

is, however, lacking. The basal segment of the metatarsus is without spines. At least for the present, however, it is left in this subfamily.

#### *Tetragonocephala flava*\* Crawford

(Figs. 135, 136, 151, 152)

1914 *Tetragonocephala flava* Crawford, U. S. Nat. Mus., Bull. 85:108.  
1917 *Tetragonocephala flava* Van Duzee, Cat. Hemip. N. Am. 799.

1926 *Tetragonocephala flava* (?) Ferris, Can. Ent. 58:16 [describes nymph of un-known sp.].

Length to tip of folded wings 3.75 to 4.25 mm.

**COLOR:** General color of newly emerged individuals green, more mature specimens yellow to brown, darkest dorsally. Six round black spots on scutum, one on scutellum. Membrane of wings milky, veins yellow.

**STRUCTURE:** Head vertical. Vertex flat, rectangular. Genal processes large, blunt,  $\frac{1}{2}$  as long as vertex. Antennae slender,  $1\frac{1}{4}$  times as long as width of head. Thorax strongly arched. Pronotum large, almost vertical, extending down laterally beyond antennal insertion. Forewings rounded, tapering somewhat apically, about  $2\frac{1}{2}$  times as long as wide; no pterostigma, furcation of media about even with furcation of cubitus, medial cell very long. Legs long. Proximal segment of metatarsus without claws. Small tubercle at base of hind tibia.

**GENITALIA:** Male proctiger long and slender, almost twice as long as forceps, slightly swollen in lateral view, anus borne on long, prominent epiphysis. Forceps in lateral view broad basally, narrowed and curved caudad to blunt, black-tipped apices; in caudal view broad, strongly arched to convergent, sharp, black apices; tips in dorsal view seem to be broad and flattened. Female genital segment short; ventral valve very small, broadly produced apically; dorsal valve large, deeply concave caudally as if collapsed (six females are at hand and all present this same peculiar appearance), margins of depression with many long, curling, hairlike setae; ovipositor pointing ventrad.

Described from one male and four females from Brownsville, Texas, one female from the Santa Rita Mountains, Arizona, and a pair from Mexico intercepted at Brownsville on incoming produce. The type specimen is a female rather than a male as stated by Crawford. The male from Brownsville, Texas, collected June 29, 1938, R. H. Beamer, is designated the allotype. It is deposited in the Snow Collection at the University of Kansas.

**TYPE**, female, No. 18096 United States National Museum, Brownsville, Texas.

Type examined.

\* *flavus -a -um*, L. adj.—yellow.

\* From *tetragonon -i*, Gr. n. noun—quadrangle + *cephala -ae*, Gr. f. noun—head.

Genus *Spanioneura*\* Förster

- 1848 *Spanioneura* Förster, Verh. natur. Ver. preuss. Rhein. 5:94.  
 1876 *Spanioneura* Scott, Trans. Ent. Soc. London 1876:527, 550.  
 1878 *Spanioneura* Löw, Verh. zool.-bot. Ges. Wien 28:608.  
 1912 *Spanioneura* Oshanin, Kat. paläa. Hemip. 128.  
 1913 *Spanioneura* Aulmann, Psy. Cat. 32.  
 1935 *Spanioneura* Haupt, Tierw. Mittel 4, 3:231.

The principal points of distinction between this genus and *Psylla* are the shape of the forewings and the recessive eyes. The forewings are strongly narrowed apically, almost rhomboidal, *Rs* terminating at apex.

Haplotype: *Spanioneura fonscolombii* Förster.

*Spanioneura fonscolombii*<sup>†</sup> Förster

(Fig. 261)

- 1848 *Spanioneura fonscolombii* Förster, Verh. natur. Ver. preuss. Rhein. 5:94.  
 1872 *Spanioneura fonscolombei* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:403.  
 1876 *Spanioneura fonscolombei* Scott, Trans. Ent. Soc. London 1876:550.  
 1908 *Spanioneura fonscolombei* Oshanin, Verz. palae. Hemip. 2:365.  
 1913 *Spanioneura fonscolombii* Aulmann, Psy. Cat. 32.  
 1916 *Spanioneura fonscolombii* Britton, Conn. Agr. Exp. Sta., Rept. 39:186.  
 1923 *Spanioneura fonscolombii* Patch, Hemip. Conn. 247.  
 1935 *Spanioneura fonscolombei* Haupt, Tierw. Mittel. 4, 3:240.

Length to tip of folded wings 3.5 mm.

STRUCTURE: Head somewhat narrower than thorax. Vertex  $\frac{2}{3}$  as long as wide, posterior margin excavate. Genal processes long, conical, scarcely divergent, as long as vertex. Antennae slender, slightly longer than width of head. Thorax moderately arched. Forewings long, nearly 3 times as long as wide, strongly narrowed apically; *Rs* long, curved, extending to apex, marginal cells large, elongate, prominent radular areas on margin in cubital cell, between  $M_4$  and  $Cu_1$ , in medial cell and between *Rs* and  $M_1$ , pterostigma prominent. Hind wings nearly equalling forewings. Legs stout. Hind tibia with small basal spur.

GENITALIA: Female genital segment as long as rest of abdomen, straight; dorsal valve somewhat attenuate, radulate apically, apex sharp dorsally, curved ventrally; ventral valve much shorter than dorsal, slightly upturned apically, apex acute.

This species was reported by Britton (1916) as occurring on Box (*Buxus*), its host plant, in Connecticut. Four specimens (2 males, 2 females) from this series are in the Maine Agricultural Experiment Station Collection. These I have seen. They are mounted in balsam so that a complete description is impossible. No further records of its occurrence in North America are known. No adequate description and only fragmentary drawings are available in the literature.

Outside of North America it has been reported from France, Germany, and England.

\* \* \*

## SUBFAMILY TRIOZINAE LÖW

- 1879 *Triozinae* Löw, Verh. zool.-bot. Ges. Wien 28:605, 609.  
 1886 *Triozaria* Puton, Cat. Hém. Faune Palea. 93.  
 1896 *Trioziidae* Edwards, Hemip.-Homop. Br. Is. 227, 251.  
 1908 *Triozinae* Kuwayama, Trans. Sapp. Nat. Hist. Soc. 3:53.  
 1910 *Triozaria* Oshanin, Verz. palae. Hemip. 2:369.  
 1911 *Triozinae* Crawford, Pom. Coll. Jour. Ent. 2:228.  
 1912 *Triozinae* Crawford, Pom. Coll. Jour. Ent. 3:347, 422.  
 1913 *Triozinae* Oshanin, Kat. paläa. Hemip. 128.  
 1914 *Triozinae* Crawford, U. S. Nat. Mus., Bull. 85:18, 64.  
 1917 *Triczinæ* Van Duzee, Cat. Hemip. N. Am. 791.

Head more or less deflexed, usually small and narrower than thorax. Vertex usually sharply margined, not flat. Genae produced as usually conical processes or somewhat swollen, more or less pubescent. Frons covered by genae except small portion bearing median ocellus. Eyes hemispherical. Antennae ten-segmented, slender. Thorax strongly arched usually (not in *Leuronota*). Forewings membranous, hyaline, typically angulate apically, sometimes narrowly rounded, radius, media and cubitus arising from basal vein (*R + M + Cu*) at same point or very nearly so (*Hemitriozia* and *Ceropsylla*), no pterostigma, usually with three radular areas on margin, between branches of *M*, between  $M_4$  and  $Cu_1$  and between branches of *Cu*. Caudal metacoxal spurs present, anteriorly metacoxa often developed as spinose or flattened process. Metatibia usually with basal spur or serrate carina, with three or four apical spines, one on outer (lateral) margin and either two or three on inner (mesal) margin. Basal segment of metatarsus without black spines. Male proctiger usually with caudal lobes.

Type genus: *Trioza* Förster.

This subfamily is characterized chiefly by the shape of the forewings, the absence of a medial-cubital petiole, and the lack of clawlike spines on the basal segment of the metatarsus.

A few of the species are gall-forming, but the majority are free-living and somewhat active as nymphs. The latter secrete more or less wax and honeydew. They are characterized by a fringe of wax-secreting setae (sectasetae) on the margin and by the shape of the wing pads, the margins of which are almost continuous with those of the head and abdomen.

Secretion of wax is not entirely limited to the nymphal stages as many of the adults produce small quantities. This is often quite noticeable as a white band on the first abdominal tergite; this white band is very marked in some species, *Trioza rubra* and *Paratriozia cockerelli*, for example.

\* From *spanios*, Gr. adj.—scarce + *neuron* -i, Gr. n. noun—nerve.

† Named in honor of de Fons-Colombe, a French entomologist.

KEY TO THE GENERA OF *Trioziinae*

1. Radius, media, and cubitus arising from basal vein at same point..... 2.
- Radius, media, and cubitus not arising at same point, radius and media or media and cubitus with a short common petiole..... 8.
2. Thorax scarcely arched; pronotum long, flat, a prominent medial epiphysis on cephalic margin..... *Leuronota* p. 598.
- Thorax well arched; pronotum shorter, descending cephalad, usually depressed below vertex and prescutum, without an epiphysis..... 3.
3. Head narrower than thorax..... 4.
- Head as broad as thorax or broader..... 7.
4. Vertex smooth, rounded, no anterior margin..... *Levidea* p. 604.
- Vertex not perfectly smooth and rounded, anterior margin more or less abrupt..... 5.
5. Genae produced as usually conical processes at least moderately long (usually  $\frac{1}{2}$  as long as vertex or longer)..... *Trioza* p. 546.
- Genal processes, if present, very short, conical or padlike, sometimes lacking, or genae smoothly, spherically swollen..... 6.
6. Vertex distinctly margined; genae produced as small conical or padlike processes or not swollen at all..... *Paratrioza* p. 584.
- Vertex not distinctly margined anteriorly, rounded down; genae spherically swollen..... *Kuwayama* p. 592.
7. Genae produced as long, slender, closely appressed processes; vertex not deeply concave between eyes..... *Neotriozaella* p. 593.
- Genal processes short, divergent; vertex deeply concave between eyes..... *Metatrioza* p. 597.
8. Radius and media petiolate; basal vein ( $R + M + Cu$ ) very long; antennal insertions anterior..... *Ceropsylla* p. 600.
- Media and cubitus petiolate; basal vein not unusually long; antennal insertions lateral..... *Hemitriozia* p. 602.

Genus *Trioza*\* Förster

- 1848 *Trioza* Förster, Verh. natur. Ver. preuss. Rhein. 5:67.  
 1851 *Psylla* Fitch (pro parte), 4th Rept. N. Y. St. Mus. 64.  
 1861 *Trioza* Flor, Bull. Soc. Imp. Nat. Moscou 34:335, 336, 337-409.  
 1876 *Trioza* Scott, Trans. Ent. Soc. London 1876:551.  
 1879 *Trioza* Löw, Verh. zool.-bot. Ges. Wien 28:609.  
 1896 *Trioza* Edwards, Hemip.-Homop. Br. Is. 253-261.  
 1910 *Trioza* Crawford, Pom. Coll. Jour. Ent. 2:229.  
 1911 *Trioza* Crawford, Pom. Coll. Jour. Ent. 3:423.  
 1911 *Allotriozida* Crawford (pro parte), Pom. Coll. Jour. Ent. 3:423, 442.  
 1911 *Triozoidea* Crawford (pro parte), Pom. Coll. Jour. Ent. 3:493.  
 1912 *Trioza* Oshanin, Kat. paläa. Hemip. 128 [designates type].  
 1913 *Trioza* Aulmann, Psy. Cat. 37.  
 1914 *Trioza* Crawford, U. S. Nat. Mus., Bull. 85:74.  
 1914 *Ceropsylla* Crawford (pro parte), U. S. Nat. Mus., Bull. 85:102.  
 1917 *Trioza* Van Duzee, Cat. Hemip. N. Am. 792.  
 1917 *Ceropsylla* Van Duzee (pro parte), Cat. Hemip. N. Am. 798.  
 1926 *Spanioza* Enderlein, Ent. Mitt. 15:400.  
 1926 *Colopelma* Enderlein, Ent. Mitt. 15:400.  
 1926 *Phyllopecta* Ferris, Can. Ent. 58:16.  
 1938 *Phyllopecta* Caldwell, Ohio Biol. Surv., Bull. 34:248.

Head usually narrower than thorax, sometimes as wide, somewhat deflexed. Vertex much broader than long, usually deeply impressed distally, more or less emarginate medially in front. Genae produced as processes of varying length and shape, more or less divergent, depressed

from plane of vertex and usually deflexed more or less. Antennae slender, variable in length from about as long as width of head to  $2\frac{1}{2}$  times as long. Eyes hemispherical. Thorax usually strongly arched. Pronotum short, descending cephalad, often depressed below plane of head. Propleurites not equal, suture not extending to middle of pronotum. Prescutum usually about as long as broad, sometimes longer. Forewings membranous, hyaline, typically acutely angled apically, sometimes rounded; radius, media, and cubitus arising from basal vein ( $R + M + Cu$ ) at same point, no pterostigma. Metatibia often with basal spur or carina, one outer and either two or three inner apical spines. Metatarsus without spines. Metacoxa often developed anteriorly as flat plate or spur.

Logotype: *Trioza urticae* (Linnaeus).

In 1884 Riley (Proc. Am. Assoc. Adv. Sci. 1883, 32:319) used the name *Phylloplecta tripunctata* with no characterization or indication, leaving it a *nomen nudum*. Subsequently (1885), he lists all of the species "actually described" (18 in all) from North America and makes no mention of *Phylloplecta*. In this paper he refers *Psylla tripunctata* Fitch to *Trioza*. Mally (1894), in a footnote, points out that Riley used the name *Phylloplecta* without any description and raises the question as to whether it was meant to be the same as *Trioza tripunctata* (Fitch) or some other species.

The next use of the name was by Zacher in 1913 (Ent. Mitt. 2:148). In indicating omissions from Aulmann's catalogue, he lists "Phylloplecta für *Trioza tripunctata* Fitch, cf. Riley, 1883." This was not a proposal of the name *Phylloplecta* for *Trioza tripunctata* by Zacher but a reference to Riley's *nomen nudum*. Ferris (1926) considers this as the designation of a type for a new genus, *Phylloplecta* Zacher. It is my opinion, however, that this listing of a *nomen nudum* does not constitute the proposal of a new genus with *tripunctata* as the type. Ferris misspells the name and so actually establishes the genus *Phyllopecta* Ferris. Caldwell (1938a) resurrects *Phylloplecta* Riley, refusing to recognize it as a *nomen nudum*. He likewise credits Zacher with *Phyllopecta*, apparently following Ferris' reference.

The cephalically projecting spurs on the metacoxae of this species (*tripunctata*) have apparently been the chief basis on which the genus *Phylloplecta* has been maintained. The presence of these spines has been considered by a number of workers to be of more importance than I believe is valid. As Caldwell (1938a) recognizes, many species of *Trioziinae* exhibit a pair of spurs or an apparent tendency toward such processes between the hind legs. *Trioza minuta*, *Trioza maura*, *Trioza rubra*, to mention a few, have short but distinctly developed processes in this position. In the genus *Paratrioza* these spurs are well developed in most of the species, especially in *P. arbolensis* and *P. cockerelli*. These spurs may even be found on members of other subfamilies, in the genus *Rhinosylla* for example. I fail to agree, therefore, that the mere presence of such a spur is of generic importance and so consider *Phyllopecta* and *Phylloplecta* as synonyms of *Trioza*.

\* From *triozos*, Gr. adj.—with three branches.

The genus *Megatrioza* was established by Crawford (1915) for a Philippine species. Subsequently (1919), he referred the North American species *Trioza diospyri* (Ashmead) to this genus where it seems to belong on the basis of his characterization and figures of the genus. *Megatrioza* seems to be a natural group of species, but I am somewhat doubtful of its being of generic rank. The characters given for the genus are all apparently extremely variable within the group with the exception of the number of inner apical spines and the presence of "a small or large spur at base" of hind tibia, the presence of a pair of spiniform processes projecting cephalad on the metacoxae, and the reduction in size of the hind wings. Since I have seen few specimens of *Megatrioza* other than *diospyri*, I am unwilling to abolish it, but I feel that it is probably worthy of no more than subgeneric rank.

Ferris (1926) considered *Megatrioza* a synonym of *Phylloplecta*, stating that *diospyri* and *tripunctata* are "actually congeneric, all of the characters given by Crawford for *Megatrioza* being equally well developed in both, if not even more strongly in *tripunctata*." This is not true, as *tripunctata* has only two inner spines at the apex of the tibia (a character hardly of generic significance, however), the anterior metacoxal spines while present are small while the caudal metacoxal spines are unusually small for the *Triozinae*. Large basal tibial spurs are present in *tripunctata*, but this character occurs in some species of most of the genera with which I am familiar. They are entirely lacking in *diospyri*. Furthermore, the head is quite different, as is the wing venation, the latter being as distinct in the two species as in any of the North American *Triozinae*. If these two species are congeneric, it must be within the genus *Trioza*, which contains other species more similar to *tripunctata* than *diospyri*.

Enderlein's genera *Spanioza* and *Colopelma* were based on characters which are too minor to be valid.

Crawford considered *Petalolyma* Scott a synonym of *Trioza*. There is nothing in Scott's description to distinguish the two, but his figure of the wing does not appear to be that of a species of *Trioza*.

#### Key to the Species of *Trioza*

1. Hind tibiae with two inner apical spines..... 2.
- Hind tibiae with three inner apical spines..... 21.
2. (1) Forewings not maculate, hyaline or evenly infuscated (except radular areas). 3.  
Forewings distinctly maculate..... 18.
3. (2) Genal processes longer than vertex..... *pulla* p. 552.  
Genal processes not longer than vertex (usually distinctly shorter)..... 4.
4. (3) Antennae at least twice as long as width of head..... 5.  
Antennae less than twice as long as width of head (rarely over 1 3/4 times as long)..... 8.
5. (4) Antennae 2 1/2 times as long as width of head; Rs very short, arcuate to costa; small species, 2.5 to 2.75 mm..... *viridis* p. 552.  
Antennae twice as long as width of head; Rs long, slightly sinuate or straight; large species, 3.25 to 4.5 mm..... 6.
6. (5) Prescutum longer than wide..... *magnoliae* p. 553.  
Prescutum wider than long..... 7.

7. (6) Head almost as wide as thorax..... *singularis* p. 554.  
Head much narrower than thorax..... *longicornis* p. 554.
8. (4) Genal processes not over 1/2 as long as vertex..... 9.  
Genal processes over 1/2 (usually 2/3) as long as vertex..... 11.
9. (8) Genal processes strongly divergent, acute; wings short..... 10.  
Genal processes contiguous or very slightly divergent, blunt; wings long and slender..... 12.
10. (9) Rs more than 1/2 as long as entire forewing; green species..... *stygma* p. 556.  
Rs less than 1/2 as long as entire forewing; brown species..... *shepherdiae* p. 557.
11. (8) Marginal cells of forewing very small; female genital segment over 1/2 as long as rest of abdomen..... 12.  
Marginal cells of forewing typical size for *Trioza*; female genital segment less than 1/2 as long as rest of abdomen..... 14.
12. (11) Genal processes 2/3 as long as vertex; forewings 2 1/2 times as long as wide; female genital segment 2/3 to fully as long as rest of abdomen; male forceps acute apically..... 13.  
Genal processes slightly over 1/2 as long as vertex; forewings short (scarcely more than twice as long as wide); male forceps much enlarged apically..... *stylifera* p. 557.
13. (12) Dorsal valve of female genital segment straight and acute apically..... *occidentalis* p. 558.  
Dorsal valve of female genital segment upturned and blunt apically..... *rubicola* p. 559.
14. (11) Antennae 1 1/2 times as long as width of head..... 15.  
Antennae at least 1 3/4 times as long as width of head..... 17.
15. (14) General color black; female genital segment straight and acute..... *incerta* p. 564.  
General color green to orange, head often black; female genital segment shorter, strongly curved ventrad..... 16.
16. (15) Vertex strongly bulging anteriorly; caudal lobes of male proctiger short, only 1/2 as long as axial portion..... *minuta* p. 562.  
Vertex not strongly bulging; caudal lobes of male proctiger as long as axial portion..... 17.
17. (14) Body unicolorous, red to almost black..... *aura* p. 560.  
Body black with extensive yellow to red markings including longitudinal stripes on dorsum of thorax..... *varians* p. 564.
18. (2) Dorsum of head and thorax pubescent (sparsely); maculation of forewings extensive, maculae brown with many small darker brown spots..... *lobata* p. 566.  
Dorsum of head and thorax not pubescent; maculation less extensive, maculae not spotted..... 19.
19. (18) Marginal cells of forewing small, extremely short but wide; brown maculae along cubitus, media and apical portion of Rs, more or less continuous along margin..... *tripunctata* p. 567.  
Marginal cells normal; maculation otherwise..... 20.
20. (19) Entire posterior margin of forewing brown; Rs long, sinuate..... *arizonae* p. 563.  
Basal vein (R+M+Cu), R<sub>1</sub> and posterior margin of clavus, brown; Rs short, arched to costa..... *californica* p. 568.
21. (1) Antennae no longer than width of head..... 22.  
Antennae distinctly longer than width of head..... 24.
22. (21) Small species (2.75 mm.), not pubescent, uniformly yellow in color..... *phoradendri* p. 569.  
Large species (4 to 4.5 mm.), sometimes pubescent..... 23.
23. (22) Light colored species, vertex and thoracic dorsum more or less pubescent..... *bakeri* p. 570.
24. (21) Vertex and thoracic dorsum with long conspicuous pubescence..... 25.  
Vertex and thoracic dorsum not conspicuously pubescent..... 26.

25. (24) Black; medial cell of forewing much larger than cubital. .... *diospyri* p. 571.  
Light colored; cubital cell of forewing larger than medial. .... *beamери* p. 573.
26. (24) Genal processes as long as vertex. .... 27.  
Genal processes shorter than vertex. .... 28.
27. (26) Antennae twice as long as width of head; genal processes divergent  
..... *chlorae* p. 573.  
Antennae  $1\frac{1}{2}$  times as long as width of head; genal processes contiguous or  
nearly so. .... *phoradendri acuminata* p. 569.
28. (26) Genal processes very short, about  $\frac{1}{2}$  as long as vertex or less, scarcely  
divergent; pronotum not depressed below plane of vertex; female genital  
segment elongate, styliform. .... 29.  
Genal processes more than  $\frac{1}{2}$  as long as vertex, about  $\frac{2}{3}$  as long or longer;  
pronotum depressed below plane of vertex; female genital segment not  
unusually long and styliform. .... 31.
29. (28) Female genital segment  $\frac{3}{4}$  as long as rest of body; smaller species (3 to 3.5  
mm.). .... *proximata* p. 574.  
Female genital segment  $\frac{1}{2}$  as long as rest of body; larger species (4 to  
4.5 mm.). .... 30.
30. (29) Female genital segment with a prominent ventral hump on basal portion  
..... *collaris* p. 574.  
Female genital segment without ventral hump. .... *longistylus* p. 575.
31. (28) Anterior margin of vertex smoothly rounded down to genal processes;  
female genital segment with a short styliform projection; male proctiger  
arcuate posteriorly, without a caudal lobe. .... *mexicana minor* p. 576.  
Anterior margin of vertex abrupt. .... 32.
32. (31) Thorax very strongly arched; male proctiger arcuate caudad but not  
produced into an extended lobe; both valves of female genital segment  
straight, about equal in length, ventral valve not upcurved to meet dorsal  
valve. .... 33.  
Thorax moderately arched; male proctiger with a prominent caudal lobe  
(either apical or basal); female genital segment with at least the ventral  
valve strongly upcurved (*Amelanchier* inhabiting species except possibly  
*sembla*). .... 34.
33. (32) Forewings with four dark spots on posterior margin. .... *quadripunctata* p. 576.  
Forewings immaculate. .... *albifrons* p. 577.
34. (32) Apex of male forceps produced cephalad, rounded caudally. .... *sembla* p. 579.  
Male forceps otherwise. .... 35.
35. (34) Female genital segment short, lateral aspect subglobose. .... 36.  
Female genital segment usually elongate (not styliform), lateral aspect  
not globose. .... 37.
36. (35) Male proctiger with very long caudal lobe; forceps touching most of their  
length. .... *mira* p. 581.  
Caudal lobes of male proctiger much shorter; forceps not incurved and  
touching. .... *mira curta* p. 582.
37. (35) Male proctiger with caudal lobes as long or nearly as long as axial portion,  
lobe never entirely basal. .... 38.  
Caudal lobe of male proctiger much shorter than axial portion, lobe  
basal in origin. .... *inversa* p. 582.
38. (37) Caudal lobes of male proctiger in lateral view very broad, dorsal margin  
straight. .... 39.  
Caudal lobes of male proctiger slender, upcurved. .... 40.
39. (38) Forceps of male in lateral view parallel-sided, not enlarged apically, smaller  
species (3 mm.). .... *sulcata* p. 580.  
Forceps of male in lateral view slender basally, enlarged apically, larger  
species (3.5 mm.). .... *frontalis* p. 579.
40. (38) Caudal lobes of male proctiger very long and slender, with a very prominent  
tuft of large setae apically. .... *aylmeriae* p. 583.  
Caudal lobes of proctiger shorter, without such a tuft of setae. .... *obtusa* p. 582.

*Trioza urticae\** (Linn.)

(Figs. 163, 164, 165, 262)

- 1758 *Chermes urticae* Linnaeus, Syst. Nat. 10:454.  
1761 *Chermes urticae* Linnaeus, Fauna Svec. 263.  
1841 *Psylla urticae* Hartig, Germ. Zeitschr. Ent. 3:374.  
1841 *Psylla eupoda* Hartig, Germ. Zeitschr. Ent. 3:374.  
1848 *Trioza urticae* Förster, Verh. natur. Ver. preuss. Rhein. 5:82.  
1848 *Trioza eupoda* Förster, ibid. 82.  
1848 *Trioza protensa* Förster, ibid. 82.  
1848 *Trioza forcipata* Förster, ibid. 84.  
1848 *Trioza crassinervis* Förster, ibid. 83.  
1861 *Trioza urticae* Flor, Rhynch. Liv. 2:505-508.  
1861 *Trioza urticae* Flor, Bull. Soc. Imp. Nat. Moscou 34:383, 387, 392.  
1872 *Trioza urticae* Meyer-Dür, Mitt. Schw. Ent. Ges. 3:386.  
1872 *Trioza crassinervis* Meyer-Dür, ibid. 387.  
1872 *Trioza eupoda* Meyer-Dür, ibid. 389.  
1872 *Trioza protensa* Meyer-Dür, ibid. 389.  
1872 *Trioza forcipata* Meyer-Dür, ibid. 389.  
1872 *Trioza bicolor* Meyer-Dür, ibid. 389, 391.  
1876 *Trioza urticae* Scott, Trans. Ent. Soc. London 1876:553.  
1877 *Trioza urticae* Thomson, Opusc. Ent. 8:827.  
1878 *Trioza urticae* Löw, Verh. zool.-bot. Ges. Wien 27:141.  
1896 *Trioza urticae* Edwards, Hemip.-Homop. Br. Is. 254, 256.  
1908 *Trioza urticae* Oshannan, Verz. palae. Hemip. 2:375.  
1912 *Trioza urticae* Oshannan, Kat. paläa. Hemip. 129.  
1925 *Trioza urticae* Ferris, Can. Ent. 57:47 (nymph).  
1930 *Trioza urticae* Klyver, Can. Ent. 62:169.

Length to tip of folded wings 3.5 to 3.75 mm.

COLOR: General color greenish yellow to light brown. Genal processes black or brown-tipped. Tip of legs, antennae, and margins of abdominal and thoracic sclerites more or less embrowned. Wings hyaline, clear to slightly yellowish.

STRUCTURE: Head small, narrower than thorax. Vertex depressed discally, roundly protruding anteriorly. Genal processes acute, divergent, extending anteriorly,  $\frac{2}{3}$  as long as vertex. Antennae nearly twice as long as width of head. Thorax strongly arched. Pronotum depressed below plane of vertex. Forewings rounded apically; R<sub>5</sub> long, nearly straight, M evenly curved, marginal cells small. Legs long, slender. Hind tibia without basal armature, with one outer and three inner apical spines.

GENITALIA: Male proctiger small, broadly produced caudad. Forceps longer than proctiger; in lateral view narrow, enlarged apically then narrowed to subacute apices, latter hooked cephalad (see fig. 164). Female genital segment  $\frac{1}{2}$  to  $\frac{2}{3}$  as long as rest of abdomen, valves nearly equal in length, straight to acute apices.

This species, the type of the genus, does not occur in North America although a very closely related form (*T. albifrons*) is very abundant. It has been recorded from all of Europe including Scandinavia, Russia, Transcaucasia, and Siberia. The above description is from eight specimens from Europe and Reshadieh, Turkey. As the name indicates, its host plant is *Urtica*—nettle. Ferris (1925) figures the nymph.

\* Genitive of *Urtica*—the generic name of the host plant.

*Trioza pulla*\* Tuthill

(Figs. 153, 154, 297)

1939 *Trioza pulla* Tuthill, Ia. St. Coll. Jour. Sci. 13:184.

Length to tip of folded wings 3.5 mm.

COLOR: Head, thorax, femora, and apical half of antennae fuscous. Remainder of legs and antennae pale. Abdomen green. Wings milky. Females lighter, vertex and thoracic dorsum fusco-testaceous.

STRUCTURE: Head broad. Vertex quite flat for *Trioza*. Antennae long, almost twice as long as width of head. Genal processes slender, acute, slightly longer than head, projecting downward, straight, not touching at all. Genal processes, legs, and genitalia very pubescent. Thoracic dorsum not very strongly arched. Hind tibia with large serrate basal carina, two inner apical spines. Anterior portion of metacoxa weakly developed. Forewings large,  $2\frac{1}{2}$  times as long as wide, narrowly rounded apically; Rs long.

GENITALIA: Male genitalia small. Proctiger with long, blunt, caudal lobes. Forceps quite broad at base, sharply narrowed midway, then tapering to truncate apices with small anterior tooth. Female genital segment about  $\frac{1}{3}$  as long as remainder of abdomen; dorsal valve rounding down to acute black apex; ventral valve shorter.

Known only from the type series from Washington and Oregon.

HOLOTYPE, male, No. 55179 United States National Museum.

*Trioza viridis*† Crawford

(Figs. 166, 167, 264)

- 1910 *Trioza viridis* Crawford, Pom. Coll. Jour. Ent. 2:230, 350.  
 1911 *Allotrioza viridis* Crawford, Pom. Coll. Jour. Ent. 3:444, 446.  
 1913 *Trioza viridis* Aulmann, Psy. Cat. 57.  
 1914 *Trioza viridis* Crawford, U. S. Nat. Mus., Bull. 85:95.  
 1917 *Trioza viridis* Van Duzee, Cat. Hemip. N. Am. 797.  
 1925 *Trioza viridis* Crawford, Proc. Haw. Ent. Soc. 6, 1:30.  
 1926 *Spanioza viridis* Enderlein, Ent. Mitt. 15:400.

Length to tip of folded wings 2.5 to 2.75 mm.

COLOR: Greenish yellow, except apical  $\frac{2}{3}$  of antennae and tip of female genital segment, black.

STRUCTURE: Head large, not deflexed. Vertex long, with two longitudinal sulcate impressions. Genal processes large, blunt, extending forward, almost on same plane as vertex, slightly over  $\frac{1}{2}$  as long as vertex. Antennae slender, almost  $2\frac{1}{2}$  times as long as width of head. Thorax rather flat and broad. Pronotum long and flat, somewhat below plane of vertex. Forewings acute,  $2\frac{1}{2}$  times as long as wide; Rs very short, arched. Hind tibia with two inner apical spines.

GENITALIA: Male proctiger long, almost parallel-sided, slightly pro-

duced caudad. Forceps shorter than proctiger; in lateral view broad basally, slightly narrowed and flexed caudad in apical  $\frac{2}{3}$ ; in caudal view slender, almost straight to black, truncate apices. Female genital segment large, about as long as rest of abdomen; ventral valve straight to acute black apex; dorsal valve longer than ventral, basal portion swollen, distal portion acuminate and upcurved, black.

Six specimens from Monrovia and one from Claremont, California, are at hand. These are the only specimens reported besides the type series (3), one female from Los Angeles and one female taken on Mt. San Antonio, California. Type locality Claremont, California.

TYPE in Crawford Collection, Mountains near Claremont, California, Baker.

*Trioza magnoliae*\* (Ashmead)

(Figs. 168, 169)

- 1881 *Psylla magnoliae* Ashmead, Can. Ent. 13:224.  
 1885 *Trioza magnoliae* Riley, Proc. Biol. Soc. Wash. 2:70.  
 1911 *Allotrioza magnoliae* Crawford, Pom. Coll. Jour. Ent. 3:444, 445.  
 1913 *Psylla magnoliae* Aulmann, Psy. Cat. 19.  
 1914 *Trioza magnoliae* Crawford, U. S. Nat. Mus., Bull. 85:96.  
 1917 *Trioza magnoliae* Van Duzee, Cat. Hemip. N. Am. 797.  
 1919 *Trioza magnoliae* Barber, Proc. Ent. Soc. Wash. 21:59.

Length to tip of folded wings 3.5 to 4.5 mm.

COLOR: General color green to light brown with brown stripes on thoracic dorsum. Tips of antennae dark. Eyes reddish. Wings hyaline.

STRUCTURE: Head large, as broad as thorax, scarcely deflexed. Vertex large, flat except for discal impressions, medial suture prominent. Genal processes short, blunt, divergent, about  $\frac{1}{2}$  as long as vertex. Antennae twice as long as width of head. Vertex and dorsum of thorax often with sparse short pubescence, most apparent near eyes. Thorax somewhat arched, long. Prothorax not depressed below plane of vertex, caudal margin upcurved, carinate. Prescutum distinctly longer than wide, anterior angle very sharp and abrupt. Forewings large, straight, sharply angulate, almost 3 times as long as wide. Hind tibia with large, serrate, basal carina, two inner apical spines.

GENITALIA: Male proctiger small, arcuate posteriorly from near apex. Forceps slightly longer than proctiger; in lateral view broad, somewhat pyriform, anterior margin strongly curved caudad, apices blunt, black, in line with posterior margin; in caudal view almost straight, slightly arcuate, apices touching. Female genital segment large,  $\frac{2}{3}$  as long as rest of abdomen, valves almost equal in length, acute.

Ashmead described this gall-forming species from *Magnolia glauca*, a synonym of *M. virginiana* L., the "laurel magnolia" or "sweet bay."

Specimens are at hand collected by E. A. Schwarz on *Persea carolinensis*, a synonym of *P. borbonia* (L.), "red bay," a member of the laurel family. Three specimens from Orlando, Florida, bear the label *Tamala*

\* *pullus -a -um*, L. adj.—dark colored.

† *viridis -e*, L. adj.—green.

\* Genitive of *Magnolia*—a genus of plants, presumed to be the host.

*borbonia*. I am unfamiliar with these trees, but it would seem that there has been some error in the determination of the host plant (see Barber, 1919).

Specimens are before me from several localities in Florida and from Mobile, Alabama. It is also recorded from southern Georgia.

Ashmead gives a brief account of the biology, including a description of the galls and nymphs. He remarks that the nymphs do not have the fringe of hairs on the body which most *Trioza* do have; cast skins accompanying some of the specimens at hand do bear such setae although they are quite short.

TYPE, female, No. 14819 United States National Museum, is a very poor, teneral specimen.

Type examined.

*Trioza singularis\** n. sp.

(Figs. 155, 155a, 298)

Length to tip of folded wings 3.5 mm.

COLOR: General color of body black. Tibiae, abdominal sternites, antennae (except tips and segments I and II) white.

STRUCTURE: Head large, almost as broad as thorax. Vertex strongly bulging and overhanging anteriorly each side of median line, discal impressions large. Genal processes blunt, divergent from base,  $\frac{2}{3}$  as long as vertex. Antennae about twice as long as width of head. Thorax strongly arched, coarsely punctate. Pronotum much depressed below plane of vertex. Forewings sharply angulate, almost 3 times as long as wide, venation typical. Hind tibia with 2 inner apical spines. Anterior portion of metacoxa broadly produced, truncate.

GENITALIA: Male proctiger very short, produced on each side into long blunt caudal lobe, no anal epiphysis. Forceps longer than proctiger; in lateral view broad basally, constricted midway, slightly curving cephalad to acute apices; in caudal view broad and divergent basally, at about  $\frac{1}{2}$  their length suddenly narrowed and directed dorsad to acute apices, with a sharp lateral hook near apex, appearing almost T-shaped.

Described from a unique male collected in Cheboygan County, Michigan, by H. B. Hungerford, July 23, 1931. Type in Snow Collection, University of Kansas, Lawrence, Kansas.

*Trioza longicornis†* Crawford

- 1910 *Trioza longicornis* Crawford, Pom. Coll. Jour. Ent. 2:231, 359.
- 1911 *Trioza longicornis* Crawford, Pom. Coll. Jour. Ent. 3:425, 427.
- 1912 *Trioza dubia* Patch, Me. Agr. Exp. Sta., Bull. 202:226.
- 1912 *Trioza forcipula* Patch, Me. Agr. Exp. Sta., Bull. 202:227.
- 1913 *Trioza longicornis* Aulmann, Psy. Cat. 48.
- 1914 *Trioza longicornis* Crawford, U. S. Nat. Mus., Bull. 85:92.
- 1917 *Trioza longicornis* Van Duzee, Cat. Hemip. N. Am. 797.
- 1926 *Spanioza forcipula*, Enderlein, Ent. Mitt. 15:400.
- 1928 *Trioza forcipula* Leonard, Ins. N. Y. 183.

\* singularis -e, L. adj.—remarkable, unique.

† From longus -a -um, L. adj.—long + cornu -us, L. n. noun—horn.

Length to tip of folded wings 3.75 mm.

COLOR: Described as greenish yellow, now faded to a uniform tan.

STRUCTURE: Head narrower than thorax. Vertex plane, edges raised, platelike, discal impressions and medial suture prominent. Genal processes subacute, about as long as vertex. Antennae twice as long as width of head. Thorax strongly arched. Pronotum depressed below plane of vertex. Forewings hyaline,  $2\frac{1}{3}$  times as long as wide, apex scarcely angulate. Hind tibia with two inner apical spines.

GENITALIA: Female genital segment with ventral valve as long as preceding sternite, straight; "dorsal valve longer than ventral"—Crawford.

The dorsal valve of the type and only specimen is apparently broken off. I have examined the TYPE (No. 18089 United States National Museum).

Crawford (1914) refers *Trioza dubia* to *minuta*, but from Miss Patch's picture of the female genital segment, I think it more probable that it belongs here. It is quite possible that *Trioza incerta* is synonymous with *dubia* or *forcipula* or both, but as no specimens of these species have been available I am unwilling to further confuse the literature by resurrecting these names.

*Trioza alacris\** Flor

(Figs. 170, 171)

- 1861 *Trioza alacris* Flor, Bull. Soc. Imp. Nat. Moscou 34:335, 380, 386, 398-400.
- 1879 *Trioza lauri* Targioni, Res. Soc. Ent. Ital. 19-20.
- 1908 *Trioza alacris* Oshanin, Verz. palae. Hemip. 2: 372.
- 1912 *Trioza alacris* Oshanin, Kat. paläa. Hemip. 129.
- 1912 *Trioza alacris* Crawford, Calif. Comm. Hort. Mon., Bull. 1:86-87.
- 1913 *Trioza alacris* Aulmann, Psy. Cat. 38.
- 1914 *Trioza alacris* Crawford, U. S. Nat. Mus., Bull. 85:94.
- 1917 *Trioza alacris* Weiss, Ent. News 28:96.
- 1917 *Trioza alacris* Weiss, Can. Ent. 49:73-75.
- 1917 *Trioza alacris* Essig, Jour. Ec. Ent. 10:439-444.
- 1917 *Trioza alacris* Van Duzee, Cat. Hemip. N. Am. 797.
- 1918 *Trioza alacris* Weiss and Dickerson, Psyche 25:59-63.
- 1926 *Spanioza alacris* Enderlein, Ent. Mitt. 15:400.
- 1932 *Trioza alacris* Klyver, Ent. News 43:37.
- 1935 *Trioza alacris* Haupt, Tierw. Mittel. 4, 3:251.

Length to tip of folded wings 4 mm.

COLOR: General color of specimen at hand yellow-white, brown markings on abdomen and dorsum of thorax, latter forming longitudinal stripes. Lighter specimens "greenish yellow to light brown." Tip of antennae black. Wings hyaline.

STRUCTURE: Head large, almost as broad as thorax. Vertex with two very prominent discal foveae. Genal processes projecting forward, blunt,  $\frac{1}{2}$  as long as vertex. Antennae about  $1\frac{1}{3}$  times as long as width of head. Thorax rather flat for genus. Pronotum not at all depressed below vertex. Forewings long and slender, acute, almost 3 times as long as broad;

\* alacer -cris -e, L. adj.—quick, active.

Rs short. Hind tibia with two inner apical spines. Metacoxa with short, broad, anterior process.

**GENITALIA:** "Male anal valve (proctiger) a little longer than forceps, hind margin arcuate, with long pubescence; forceps rather stout, sides almost parallel (from side), terminating in a subacute, black point at apex."—Crawford.

Female genital segment about  $\frac{1}{2}$  as long as rest of abdomen ("nearly as long as"—Crawford); valves subequal in length, dorsal valve slightly excavate.

This species apparently occurs in North America only on bay trees (*Laurus nobilis*). It was recorded from California in 1912 by Crawford. Essig subsequently (1917) discusses it in some detail, gives life history notes and figures. Weiss and Dickerson record the occurrence of this insect in New Jersey, give notes on its life history there and describe the immature stages.

Outside of North America it is recorded from France, Spain, Portugal, Italy, Dalmatia, Hungary, and Germany.

#### *Trioza stygma*\* Tuthill

(Figs. 156, 157, 299)

1939 *Trioza stygma* Tuthill, Ia. St. Coll. Jour. Sci. 13:183.

Length to tip of folded wings 2.5 mm.

**COLOR:** General color green. Eyes, antennae, distal portions of leg segments, etc., light fulvous. Forewings slightly infuscated.

**STRUCTURE:** Head almost as wide as thorax. Vertex with two prominent foveae, very strongly protruded in front on each side of medial sulcus, overhanging the short genal processes, latter  $\frac{1}{2}$  as long as vertex. Antennae  $1\frac{1}{4}$  times as long as width of head. Thorax not strongly arched. Pronotum short, depressed below plane of vertex. Forewings rounded at apex,  $2\frac{1}{2}$  times as long as wide; venation typical. Hind tibia with two inner apical spines and basal carina.

**GENITALIA:** Male genitalia small. Proctiger short, somewhat produced caudally. Forceps very short and broad in lateral view, apices rounded and bearing a large, medially projecting, black-pointed tooth. Female genital segment short, valves subequal in length, dorsal straight, ventral concave dorsally.

Known only from the type series from California. Host plant unknown.

The name was originally spelled *stugma*, an error of transliteration.  
HOLOTYPE, male, No. 55180 United States National Museum.

\* From *stygmus* Gr. adj.—that produces grief.

#### *Trioza shepherdiae*\* Tuthill

(Figs. 158, 159, 300)

1938 *Trioza shepherdiae* Tuthill, Ent. News 49:243.  
1939 *Phylloplecta multidubia breviradia* Caldwell, Can. Ent. 71:211.  
1939 *Phylloplecta multidubia breviradia* Strickland, Can. Ent. 71:214.  
1940 *Phylloplecta minuta breviradia* Caldwell, Ohio Jour. Sci. 40:50.

Length to tip of folded wings 2.5 mm.

**COLOR:** General color of head, thoracic dorsum and legs light testaceous to fulvous. Vertex light except discal impressions. Genal processes, eyes, distal half of antennae dark. Prescutum with a pair of brown stripes on cephalic half. Scutum with two inverted, V-shaped, brown marks. Wing membranes slightly fumate; veins brown. Abdomen brown to black.

**STRUCTURE:** Head and thoracic dorsum coarsely granular. Head of medium size, narrower than thorax. Vertex decidedly emarginate in front, with very prominent discal impressions, postero-lateral angles, which bear ocelli, raised. Genal processes short, about  $\frac{1}{2}$  as long as vertex, conical, almost parallel to plane of vertex. Antennae about  $1\frac{1}{2}$  times as long as width of head. Pronotum depressed below plane of vertex. Prescutum strongly arched. Forewings  $2\frac{1}{2}$  times as long as wide, membrane rather thick, slightly rugose; venation typical. Hind wings more rugose than forewings. Legs of medium length. Hind tibia with serrate basal carina, two inner apical spines. Anterior portion of metacoxa bluntly produced.

**GENITALIA:** Male genital segment small. Proctiger as long as forceps, almost right-triangular in lateral view, posterior lobe of medium length. Forceps slender, irregularly narrowed to sharp apices, with medium pubescence. Female genital segment short, dorsal valve decidedly longer than ventral, terminating in a heavy, black, upcurved hook, usually exceeded by partially extended ovipositor sheath.

The type series from Lake City, Colorado, and additional specimens from Wolf Creek Pass, Colorado, are at hand. Examination of paratypes of Caldwell's *Trioza multidubia breviradia* prove it to be synonymous with *shepherdiae*. Host, *Shepherdia canadensis* (L.) Nutt.

TYPE, female, in author's collection.

#### *Trioza stylifera*† Patch

(Fig. 172)

1912 *Trioza stylifera* Patch, Me. Agr. Exp. Sta., Bull. 202:229.  
1914 *Trioza stylifera* Crawford, U. S. Nat. Mus., Bull. 85:93.  
1917 *Trioza stylifera* Van Duzee, Cat. Hemip. N. Am. 797.

Length to tip of folded wings 2.75 mm.

**COLOR:** General color dark brown. Margins of vertex, median line on scutum, legs, and venter, lighter. Forewings somewhat yellowish.

**STRUCTURE:** Head narrower than thorax. Vertex broad, margins

\* Genitive of *Shepherdia*—the generic name of the host.

† From *stylus* -i, L. m. noun—style + *fer* (from *fero*) L.—bearing.

raised. Genal processes slightly over  $\frac{1}{2}$  as long as vertex, somewhat divergent, blunt. "Antennae about one and one-half times as long as width of head" (Crawford). Pronotum strongly descending cephalad, depressed below plane of vertex. Dorsum of thorax punctate. Forewings short, slightly over twice as long as wide, very slightly and broadly angulate, costal margin strongly arched; Rs slightly sinuate, short, medial cell somewhat smaller than cubital. Hind tibia with two inner apical spines, serrate basal carina.

**GENITALIA:** Male genital segment large. Proctiger short, bearing on each side a swollen bladder-like caudal lobe which extends dorsad, equalling axial portion. Forceps heavy; in lateral view large basally, a blunt tooth on caudal edge, narrowed and sharply curved cephalad at  $\frac{1}{3}$  their length, apical third much enlarged, apices roundly truncate, anterior margin of enlarged portion straight to apex, there produced as a small tooth; in caudal view stout, broad basally, produced into a blunt tooth both mesad and laterad, narrowed somewhat, swollen apically, apices truncate and flatly produced mesad. "The female cauda is relatively long and acutely pointed. The upper plate extends a bit beyond the ovipositor and is slender at tip." (Patch).

Described from one rather poor male specimen in the collection of the University of Minnesota collected at Herchmer, Manitoba, August 1, 1937, by D. G. Denning. The peculiar male forceps make the determination of this male almost certain, although I have seen none of Patch's specimens. Her type series was from Brockville, Ontario.

#### *Trioza occidentalis\** Tuthill

(Figs. 160, 173, 173a, 301)

1939 *Trioza occidentalis* Tuthill, Ia. St. Coll. Jour. Sci. 13:184.

Length to tip of folded wings 4 mm.

**COLOR:** Males dark on head and thoracic dorsum. Females uniformly golden brown (?).

**STRUCTURE:** Head narrower than thorax. Vertex plane, raised. Genal processes large, thick, conical,  $\frac{2}{3}$  as long as vertex. Antennae  $1\frac{3}{4}$  times as long as width of head. Thorax very strongly arched. Pronotum moderately long, strongly descending anteriorly, not depressed below plane of vertex. Prescutum very abrupt anteriorly. Forewings broad, rounded,  $2\frac{1}{2}$  times as long as wide; Rs slightly sinuate; marginal cells small, equal. Hind tibia with small serrate basal carina, two inner apical spines.

**GENITALIA:** Male genitalia of medium size. Proctiger swollen in appearance, produced caudad as two large lateral lobes as figured; in dorsal view lobes broad, nearly contiguous basally. Forceps shorter than proctiger; in lateral view broad basally, narrowed in apical half, evenly curved cephalad, apices acute; in caudal view slightly arched, broad

\* *occidentalis* -e, L. adj.—western.

basally, suddenly narrowed on medial margin about  $\frac{1}{2}$  distance from base. Female genital segment nearly as long as rest of abdomen; dorsal valve straight to acute tip; ventral valve almost as long as dorsal, straight, or ventral margin somewhat sinuate, apex acute.

A series of nine males and seven females is at hand from Puyallup, Washington, collected July 10, 1934, by W. W. Baker. These are the only specimens known besides the two females from which the species was originally described, one from Marin Co., California, the other Kaslo Creek, British Columbia. With these additional specimens for study it is evident that the resemblance of this species to *T. tripunctata* is more than superficial. The metacoxae are produced anteriorly but not to as marked an extent as in the latter species. As these specimens were taken on *Rubus parviflorus* and many of them are teneral, it appears that the host plants of the two forms are very close as *tripunctata* develops on other species of *Rubus*. One of the males from this series is designated as ALLOTYPE and is in the United States National Museum.

**HOLOTYPE**, female, No. 55181 United States National Museum, Marin County, California.

#### *Trioza rubicola\** n. sp.

(Figs. 174, 175, 175a)

Length to tip of folded wings 3.5 mm.

**COLOR:** Undeterminable as specimens have been preserved in alcohol. Males quite dark on dorsum of head and thorax. Females unicolorous.

**STRUCTURE:** Head narrower than thorax. Posterior and lateral margins of vertex carinate. Genal processes conical, stout, not divergent,  $\frac{2}{3}$  as long as vertex. Antennae slightly over  $1\frac{3}{4}$  times as long as width of head. Thorax strongly arched. Pronotum broad laterally, narrower medially, nearly vertical medially, not depressed below plane of vertex. Anterior margin of prescutum vertical. Forewings membranous, slightly rugose, broad, almost  $2\frac{1}{2}$  times as long as wide; costa strongly curved, Rs sinuate, marginal cells small, about equal. Hind tibia with serrate basal carina, two inner apical spines.

**GENITALIA:** Male genitalia of medium size. Proctiger very similar to *occidentalis*. Forceps in lateral view stout basally, narrowed and sharply bent cephalad near base, nearly straight to near apices, apices tapered to acute tips, hooked cephalad; in caudal view nearly straight, lateral margins straight, medial margins sharply excavate near base. Female genital segment as long as rest of abdomen; dorsal valve straight, apex flattened, rounded and upturned; ventral valve slightly sinuate ventrally, straight, acute, shorter than dorsal.

Described from a series of eleven males and eight females collected at Tacoma, Washington, July 10, 1940, W. W. Baker, on *Rubus leucodermis*, which is apparently the host plant as many of the specimens are

\* From *Rubus*—generic name of host plant + *cola*, L.—inhabitant.

quite teneral. This species may be distinguished from *T. occidentalis*, which it resembles very closely, by its smaller size, smaller head, more deeply impressed vertex, and the genitalia. The tip of the dorsal valve of the female genital segment serves to distinguish the two forms very readily, the less strongly curved forceps of the male will serve to separate the specimens of that sex.

**HOLOTYPE**, female, No. 55177 United States National Museum. Holotype, allotype, and paratypes in United States National Museum, paratypes in author's collection.

*Trioza maura*\* Förster

(Figs. 176, 177)

- 1848 *Trioza maura* Förster, Verh. natur. Ver. preuss. Rhein. 5:94.
- 1872 *Trioza maura* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:387.
- 1872 *Trioza helvetica* Meyer-Dür, Mitt. Sch. Ent. Ges. 3:388, 391.
- 1908 *Trioza maura* Oshanin, Verz. palae. Hemip. 2:376.
- 1910 *Trioza nigrifrons* Crawford, Pom. Coll. Jour. Ent. 2:230.
- 1910 *Trioza fulvida* Crawford, Pom. Coll. Jour. Ent. 2:231, 358.
- 1910 *Trioza fulvida similis* Crawford, Pom. Coll. Jour. Ent. 2:231, 359.
- 1910 *Trioza aurantiaca* Crawford, Pom. Coll. Jour. Ent. 2:231, 360.
- 1911 *Trioza aurantiaca* Crawford, Pom. Coll. Jour. Ent. 3:628.
- 1912 *Trioza maura* Patch, Me. Agr. Exp. Sta. Bull. 202:228.
- 1912 *Trioza maura* Oshanin, Kat. paläa. Hemip. 129.
- 1913 *Trioza maura* Aulmann, Psy. Cat. 49.
- 1913 *Trioza aurantiaca* Aulmann, Psy. Cat. 39.
- 1913 *Trioza fulvida* Aulmann, Psy. Cat. 46.
- 1913 *Trioza nigrifrons* Aulmann, Psy. Cat. 50.
- 1914 *Trioza maura* Crawford, U. S. Nat. Mus., Bull. 85:89.
- 1914 *Trioza saliciperda* Crawford, U. S. Nat. Mus., Bull. 85:89.
- 1917 *Trioza maura* Van Duzee, Cat. Hemip. N. Am. 795.
- 1925 *Trioza maura* Crawford, Proc. Haw. Ent. Soc. 6, 1:30.
- 1928 *Trioza maura* Leonard, Ins. N. Y. 183.
- 1932 *Trioza maura* Klyver, Pan-Pac. Ent. 8:14.
- 1932 *Trioza maura* Klyver, Ent. News 43:37.
- 1935 *Trioza maura* Haupt, Tierw. Mittel. 4, 3:247.
- 1938 *Trioza maura* Strickland, Can. Ent. 70:204.

Length to tip of folded wings 3.5 to 4 mm.

**COLOR:** Color extremely variable, most typical coloration reddish brown, but often darker. Head testaceous to black. Genal processes vary from almost white to black. Antennae white basally, dark distad. Abdomen usually darker than thorax but often white ventrad, entire abdomen frequently green. Forewings sometimes fumose.

**STRUCTURE:** Head narrower than thorax, somewhat deflexed. Vertex somewhat platelike, discal impressions from very shallow to prominent, anterior margin abrupt, scarcely bulging. Genal processes broad basally, acute, divergent, about  $\frac{2}{3}$  as long as vertex. Antennae about 1½ times as long as width of head. Thorax strongly arched. Pronotum depressed below plane of vertex. Forewings variable in length, from 2½ to almost 3 times as long as wide, roundly angulate. Hind tibia with basal spur, two inner apical spines. Anterior portion of metacoxae bluntly produced.

**GENITALIA:** Male genitalia small. Proctiger short, produced into two

long lobes, as long as or longer than vertical axis of proctiger, blunt. Forceps in lateral view slender, curved cephalad distally, apices acute; in caudal view swollen basally, distal half very slender, arched apices touching. Female genital segment typically shorter than preceding abdominal sternite; ventral valve somewhat upcurved, with acute black tip; dorsal valve longer, curved ventrad, black at apex, acute.

This, one of the few holarctic species of psyllids, was described from Europe. As can be judged from the foregoing description, most of the characters are quite variable, as one would expect in such an abundant and widespread species. Like the three following species, it lives upon *Salix* spp.

All four of these *Salix*-inhabiting species are very closely related and somewhat difficult to distinguish one from another. *Trioza minuta* is very much like *maura*; in fact they seem to intergrade, but until their identicalness is established by biological evidence I am unwilling to abolish *minuta*. The female genitalia are almost indistinguishable. In typical specimens of *minuta* the anterior margin of the vertex is swollen and the genal processes are shorter than in *maura*. The male genitalia of typical specimens of the two are also sufficiently different to be readily separated. The color and markings of *varians* and *incerta* make them quite distinct from the other two species. In addition the male genitalia of *varians* are easily distinguished; the female genital segment, however, is much like *maura* in structure; the larger size and more rounded wings (almost as round as a *Psylla* wing) are quite distinct. The male genitalia of *incerta* are very similar to *maura*, but the female genital segment is distinctive; also the genal processes are more slender and placed farther back under the head.

Many of these distinguishing characters are largely differences in degree and are therefore difficult to describe and even to figure. If typical specimens of the different species are at hand, they can be quite readily separated. It is possible that these species hybridize with one another, thus causing much of the difficulty of separating them. It would not be strange if they did hybridize, as they occur on the same host plants and in enormous numbers. The chief difficulty in explaining some of the variations that occur as being a result of hybridization is that several short distinct series of what appear to be intermediates are at hand.

While collecting on willow near Creede, Colorado, I noted two forms of psyllids that I thought to be distinct, one red with a green abdomen occurring in enormous numbers on *Salix longifolia*, another yellowish, abundant on a broad-leaved, yellow-stemmed willow. I can, however, find no significant structural differences between the two forms; both are apparently *maura*. Patch, noting the same color variations, concluded that the lighter forms were teneral, but this is not the case. Much the same sort of variation has been noted by Caldwell in *minuta*.

Specimens of *maura* are at hand from the following states and provinces: California, Oregon, Washington, British Columbia, Alaska, Mon-

\* From *mauros*, Gr. adj.—dark.

tana, Idaho, Utah, Nevada, Wyoming, Colorado, New Mexico, and Minnesota. It is also recorded from Alberta, Illinois, and New York.

*Trioza minuta\** Crawford

(Figs. 178, 179)

- 1895 *Trioza salicis* Mally, Proc. Ia. Acad. Sci. (1894) 2:161.  
 [non] *Trioza salicis* Löw, Verh. zool.-bot. Ges. Wien 32:249. 1883.  
 1910 *Trioza salicis* Crawford, Pom. Coll. Jour. Ent. 2:232.  
 1910 *Trioza nigra* Crawford, Pom. Coll. Jour. Ent. 2:232, 358.  
 [non] *Trioza nigra* Kuw., Trans. Sap. Nat. Hist. Soc. 3:57. 1910.  
 1910 *Trioza minuta* Crawford, Pom. Coll. Jour. Ent. 2:232.  
 1910 *Trioza assimilis* Crawford, Pom. Coll. Jour. Ent. 2:233.  
 1910 *Trioza assimilis* Flor, Bull. Soc. Imp. Nat. Moscou 34:480. 1861.  
 1911 *Trioza minuta* Crawford, Pom. Coll. Jour. Ent. 3:425, 427, 432.  
 1911 *Trioza minuta similis* Crawford, Pom. Coll. Jour. Ent. 3:425, 427, 432.  
 1911 *Trioza assimilis* Crawford, Pom. Coll. Jour. Ent. 3:426, 429, 438.  
 1911 *Trioza nigra* Crawford, Pom. Coll. Jour. Ent. 3:427, 428.  
 1911 *Trioza salicis* Crawford, Pom. Coll. Jour. Ent. 3:426, 428, 432.  
 1911 *Trioza flori* Crawford, Pom. Coll. Jour. Ent. 3:503 (n. n. for *assimilis*).  
 1911 *Trioza nigrella* Crawford, Pom. Coll. Jour. Ent. 3:503 (n. n. for *nigra*).  
 1912 *Trioza louisianae* Aulmann, Ent. Rund. 22 (n. n. for *nigra*).  
 1912 *Trioza pomonae* Aulmann, Ent. Rund. 22 (n. n. for *assimilis*).  
 1913 *Trioza louisianae* Aulmann, Psy. Cat. 48.  
 1913 *Trioza minuta* Aulmann, Psy. Cat. 49.  
 1913 *Trioza pomonae* Aulmann, Psy. Cat. 51.  
 1913 *Trioza salicis* Aulmann, Psy. Cat. 53.  
 1914 *Trioza salicis* Crawford, U. S. Nat. Mus., Bull. 85:91.  
 1917 *Trioza nigrella* Van Duzee, Cat. Hemip. N. Am. 796.  
 1918 *Trioza salicis* McAtee, Ent. News 29:223.  
 1922 *Trioza nigrella* Osborn, N. Y. St. Coll. For., Tech. Pub. 16:53.  
 1932 *Trioza salicis* Klyver, Ent. News 43:37.  
 1938 *Phylloplecta salicis* Caldwell, Ohio Biol. Surv., Bull. 34:250.  
 1939 *Phylloplecta multidubia* Caldwell, Can. Ent. 71:211.  
 1939 *Phylloplecta multidubia* Strickland, Can. Ent. 71:214.  
 1940 *Phylloplecta minuta* Caldwell, Ohio Jour. Sci. 40:50.

Length to tip of folded wings 3 to 3.5 mm.

COLOR: Head usually black, or orange with some black markings. Genal processes sometimes white. Thorax orange, often with black markings. Abdomen typically green but frequently dark orange brown. Females lighter colored than males.

STRUCTURE: Head small, narrower than thorax. Vertex with discal impressions shallow, strongly bulging in front, overhanging median ocellus. Genal processes short, acute, divergent from base,  $\frac{3}{5}$  as long as vertex. Antennae about  $1\frac{1}{2}$  times as long as width of head. Thorax strongly arched, pronotum depressed below plane of vertex. Forewings slender, angulate, almost 3 times as long as wide. Hind tibia with two inner apical spines, serrate basal carina. Metacoxa somewhat produced anteriorly.

GENITALIA: Male proctiger shorter than forceps, caudal lobes only  $\frac{1}{2}$  as long as axial portion. Forceps in lateral view slender, tapering from base to acute apices, apical third slightly flexed cephalad; in caudal view broad basally, slightly arched to acute apices. Female genital segment

\* *minutus -a -um*, L. adj.—small.

short; ventral valve upcurved, scarcely sharp at apex; dorsal valve strongly downcurved, longer than ventral, blunt.

This willow-inhabiting form was described by Mally in 1895 from specimens taken at Ames, Iowa, and named *Trioza salicis*. This name is preoccupied, however, by Löw's use of the name in 1882. Crawford in 1910 proposed three new names, *nigra*, *assimilis*, and *minuta*, for variants of the same species. In 1911 he changed the name *nigra* to *nigrilla* and *assimilis* to *flori* as these names were both preoccupied; subsequently (1914) he suppressed all of these names as synonyms of *Trioza salicis* Mally. As *salicis* is preoccupied, this leaves *minuta* as the oldest available name which has been applied to the species and therefore the name by which it must be designated.

Caldwell in 1938 referred the species to the genus *Phylloplecta* and erroneously resurrected the homonym *salicis*; this error was corrected in 1939, but he added another name *multidubia*, to the already long list of synonyms which this species carries. Subsequently (1940), he correctly attributed the name *minuta* to the species.

Specimens are at hand from the following localities: Iowa, Illinois, Maryland, Louisiana, Oklahoma, Colorado, Arizona, California, Utah, Oregon, Washington, Idaho, and Montana. Caldwell records it from Ohio, gives the life history, and describes the immature stages. It is also recorded from New York and doubtlessly occurs over most of North America.

The type of *minuta* is assumed to be in the Crawford collection. The type of *T. salicis* Mally, female, Ames, Iowa, September 8, 1894, is in the Iowa State College Collection at Ames, Iowa.

The types of Crawford's various synonymous species are also assumed to be in his collection if they were ever selected.

*Trioza minuta* var. *arizonae\** Aulmann

(Fig. 263)

- 1910 *Trioza marginata* Crawford, Pom. Coll. Jour. Ent. 2:232, 356.  
 [non] *Trioza marginata* Löw, Verh. zool.-bot. Ges. Wien 32:242, 1882.  
 1911 *Trioza marginata* Crawford, Pom. Coll. Jour. Ent. 3:424, 427.  
 1912 *Trioza marginata* Patch, Me. Agr. Exp. Sta., Bull. 202:228.  
 1912 *Trioza arizonae* Aulmann, Ent. Rund. Heft 22 [fide Aulmann, 1913].  
 1913 *Trioza arizonae* Aulmann, Psy. Cat. 39.  
 1914 *Trioza arizonae* Crawford, U. S. Nat. Mus., Bull. 85:88.  
 1917 *Trioza arizonae* Van Duzee, Cat. Hemip. N. Am. 795.

The brown posterior margin of the forewing is the character separating this variety from the typical form. This band, while quite distinctive, is hardly of specific value. Specimens are at hand from Arizona and from Oklahoma.

TYPE, female, No. 18087 United States National Museum, has all the wings broken off.

Type examined.

\* Genitive of Arizona.

*Trioza varians\** Crawford

(Figs. 180, 181, 265)

- 1910 *Trioza varians*, Crawford, Pom. Coll. Jour. Ent. 2:231, 361.  
 1911 *Trioza varians* Crawford, Pom. Coll. Jour. Ent. 3:425, 427.  
 1913 *Trioza varians* Aulmann, Psy. Cat. 57.  
 1917 *Trioza varians* Van Duzee, Cat. Hemip. N. Am. 796.  
 1938 *Trioza varians* Strickland, Can. Ent. 70:204.  
 1939 *Trioza varians* Strickland, Can. Ent. 71:214.

Length to tip of folded wings 4 to 4.25 mm.

**COLOR:** General color black. Tibiae, first tarsal segment, segment III of antennae, broad subapical band on dorsal valve of female genital segment, yellow. Vertex and dorsum of thorax with extensive testaceous markings. Vertex testaceous on margins and usually along median sulcus. Pronotum, posterior margin and mid-line of prescutum, longitudinal stripes on mesoscutum, scutellum, testaceous. Veins of forewings black.

**STRUCTURE:** Head narrow. Vertex raised, platelike, discal impressions prominent. Eyes appearing slightly stalked. Genal processes long, slender, acute, somewhat divergent,  $\frac{4}{5}$  as long as vertex. Antennae 1 $\frac{3}{4}$  times as long as width of head. Thorax strongly arched. Pronotum entirely depressed below plane of vertex. Forewings about 2 $\frac{1}{2}$  times as long as wide, very large, almost twice as long as body, apices rounded; Rs long and sinuate. Hind tibia with two inner apical spines, prominent, serrate, basal carina. Metacoxa moderately produced anteriorly.

**GENITALIA:** Male proctiger shorter than forceps, caudal lobes large, almost as long as vertical portion. Forceps in lateral view long, slender, sinuate, evenly tapering to rounded apices; in caudal view very broad basally, constricted and incurved midway, thence straight to apices. Female genital segment short; ventral valve straight, apex produced as a large tooth; dorsal valve twice as long as ventral, terminating as a blunt tooth.

Numerous specimens of this beautiful species are at hand from Colorado where it seems to be limited in distribution to altitudes of about 11,000 feet or more. In addition to these specimens, I have one from California and one from Ungava Bay, H. B. T. It is also recorded from Utah and Alberta.

**TYPE:** female, Colorado, C. F. Baker, No. 18088 United States National Museum.

Type examined.

*Trioza incerta† n. sp.*

(Figs. 161, 162, 302)

Length to tip of folded wings 3.25 to 3.5 mm.

**COLOR:** Color very much like *varians*. General color black. Mark-\* Part. adj. of *vario*, L. v.—varied.† *incertus* -a -um, L. adj.—unsettled.

ings orange red, almost identical pattern as *varians*. Females generally lighter. Male forceps apparently always white.

**STRUCTURE:** Head narrower than thorax, deflexed. Vertex with margins raised, platelike, discal impressions shallow. Genal processes about  $\frac{2}{3}$  as long as vertex, straight, divergent, acute. Antennae about 1 $\frac{1}{2}$  times as long as width of head. Thorax strongly arched. Pronotum depressed below plane of vertex. Forewings about 2 $\frac{1}{2}$  times as long as wide. Hind tibia with two inner apical spines, serrate carina basally. Metacoxa somewhat produced anteriorly.

**GENITALIA:** Male proctiger short, caudal lobes as long as vertical portion. Forceps longer than proctiger; in lateral view slender, evenly narrowed from base to acute apices, very strongly curved cephalad; in caudal view very large basally, constricted, then straight to apices. Female genital segment as long as rest of abdomen; ventral valve swollen basally, slender apical portion  $\frac{3}{4}$  as long as base; dorsal valve longer than ventral, somewhat attenuate apically, blunt.

This form, while much like *varians* in coloration, is smaller, less robust, and has genitalia quite distinct from the latter species. It occurs on willow at quite high altitudes (10,000 ft.) in southern Colorado. Specimens are also at hand from California, Oregon, Washington, British Columbia, and Alaska.

**HOLOTYPE**, female, and **ALLOTYPE**, male, Spring Creek Pass, Colorado, June 29, 1937, L. D. Tuthill. Numerous **PARATYPES** with the same data and also from the localities listed above. Holotype, allotype, and paratypes in author's collection; paratypes in United States National Museum and Snow Collection, University of Kansas.

*Trioza rubra\** Tuthill

(Figs. 212, 213, 213a, 303)

1939 *Trioza rubra* Tuthill, Ia. St. Coll. Jour. Sci. 13:185.

Length to tip of folded wings 3.75 mm.

**COLOR:** General color red to almost black, males darker in general. Distal portions of legs lighter. Antennae white except distal third black.

**STRUCTURE:** Vertex almost plane, bulging in front, medial suture prominent. Genal processes large, divergent, blunt,  $\frac{2}{3}$  as long as vertex. Antennae almost twice as long as width of head, basal portion somewhat swollen. Thorax weakly arched. Pronotum short, depressed below plane of vertex. Forewings rather bluntly angled, almost 3 times as long as wide. Hind tibia with large serrate carina basally, two inner apical spines. Metacoxa developed anteriorly as blunt process.

**GENITALIA:** Male proctiger with rather sharp caudally projecting lobes, surrounding forceps. Forceps large at base, tapering to long slender black-tipped apices, curving cephalad throughout their length; in caudal view broad basally, lateral margins straight, mesal margins bearing

\* *rubrus* -a -um, L. adj.—red.

a triangular tooth midway, apices acute. Female genital segment short, about  $\frac{1}{3}$  as long as rest of abdomen, dorsal valve somewhat concave, black apically, slightly longer than ventral.

Specimens are at hand from Colorado, New Mexico, Arizona, and Oregon.

TYPE, female, Creede, Colorado, in author's collection.

*Trioza lobata\** Crawford

(Figs. 182, 183, 253)

1914 *Trioza lobata* Crawford, U. S. Nat. Mus., Bull. 85:76, 86.

1917 *Trioza lobata* Van Duzee, Cat. Hemip. N. Am. 795.

1931 *Trioza lobata* Klyver, Pan-Pac. Ent. 7:143.

Length to tip of folded wings 3.25 to 3.5 mm.

COLOR: General color yellow to yellowish brown. Abdomen green ventrally. Tip of each antennal segment dark. Forewings with irregular brown maculae as follows: a broad vitta extending from anal margin between apex of clavus and  $Cu_2$  obliquely to basal angle of costa, another following margin from center of cubital cell across apex, a third arising at tip of  $Rs$  extending to cubital cell. Maculae with darker brown dots.

STRUCTURE: Head broad, somewhat deflexed, narrower than thorax, with hairlike pubescence. Vertex flat with two prominent discal im-pressions, produced anteriorly each side of median ocellus. Genal pro-cesses short, very strongly divergent, rounded, parallel with and not much below plane vertex,  $\frac{1}{2}$  as long as vertex including antero-lateral portion. Antennae slightly less than twice as long as width of head. Thorax strongly arched, sparsely pubescent. Pronotum depressed below plane of vertex. Forewings short and broad, less than  $2\frac{1}{2}$  times as long as broad, bluntly angulate. Hind tibia with serrate basal carina, two inner apical spines. Metacoxa with stout spiniform process anteriorly.

GENITALIA: Male genital segment small. Proctiger short, produced into two long attenuate lobes. Forceps about as long as proctiger; in lateral view rather broad basally, constricted midway, apices enlarged; in caudal view broad at base, tapering and arched to acute apices. Female genital segment short; ventral valve very short, apically produced as a large black tooth; dorsal valve strongly curved downward, apex black, beak-like.

Crawford records the type series of this very distinctive species as taken on "a species of *Ceanothus*." Klyver lists one specimen from *Chrysothamnus*. Specimens are at hand from Mojave, Mint Canyon, Tehachapi, and Los Angeles, California; Santa Rita Mountains, Arizona; Organ, New Mexico, and Rattlesnake Buttes in eastern Colorado.

TYPE, male, No. 18086 United States National Museum.

Type examined.

*Trioza tripunctata\** (Fitch)

(Figs. 184, 185, 267)

- 1851 *Psylla tripunctata* Fitch, 4th Rept. N. Y. Mus. 64.  
 1869 *Psylla rubi* Walsh and Riley, Am. Ent. 1:225.  
 1879 *Psylla rubi* Thomas, 8th Rept. St. Ent. Ill., 3:17-18.  
 1880 *Psylla tripunctata* Fuller and Riley, Am. Ent. 3:62.  
 1885 *Trioza tripunctata* Riley, Proc. Biol. Soc. Wash. 2:70.  
 1893 *Psylla tripunctata* Fitch, (Reprinted in Lintner's 46th report, N. Y. State Museum, p. 404).  
 1894 *Trioza tripunctata* Mally, Proc. Ia. Acad. Sci. 2:154.  
 1910 *Trioza tripunctata* Crawford, Pom. Coll. Jour. Ent. 2:231, 232.  
 1910 *Trioza tripunctata* Smith, Ins. N. J. 110.  
 1911 *Trioza tripunctata* Crawford, Pom. Coll. Jour. Ent. 3:424, 429, 430.  
 1912 *Trioza tripunctata* Patch, Me. Agr. Exp. Sta., Bull. 202:230.  
 1913 *Trioza tripunctata* Aulmann, Psy. Cat. 55.  
 1914 *Trioza tripunctata* Crawford, U. S. Nat. Mus., Bull. 85:87.  
 1917 *Trioza tripunctata* Van Duzee, Cat. Hemip. N. Am. 795.  
 1918 *Trioza tripunctata* McAtee, Ent. News 29:223.  
 1920 *Trioza tripunctata* Crawford, Ent. News 31:70.  
 1923 *Trioza tripunctata* Patch, Hemip. Conn. 245.  
 1923 *Trioza tripunctata* Peterson, N. J. Agr. Exp. Sta., Bull. 378 (Bibliog.).  
 1926 *Phylloplecta tripunctata* Ferris, Can. Ent. 58:18.  
 1938 *Trioza tripunctata* Brimley, Ins. N. C. 103.  
 1938 *Phylloplecta tripunctata* Caldwell, Ohio Biol. Surv., Bull. 34:248.

Length to tip of folded wings 3.5 to 4 mm.

COLOR: General color yellow to brown. Tip of antennae dark. Forewings marked with brown vittae as follows: along distal half of  $Rs$ , along  $M$  and including cell  $M_2$ , along  $Cu$  and including cell  $Cu_1$ , latter two continuous at margin, also a spot on anal vein.

STRUCTURE: Head large, somewhat deflexed. Vertex platelike with very broad shallow discal im-pressions. Genal processes large, subacute, parallel to plane of vertex, between  $\frac{1}{2}$  and  $\frac{2}{3}$  as long as vertex. Antennae about  $1\frac{1}{2}$  times as long as width of head. Thorax broad, strongly arched. Pronotum depressed below plane of vertex. Forewings broad, about  $2\frac{1}{4}$  times as long as wide, angulate;  $Rs$  long, sinuate, marginal cells very short and broad. Hind tibia with basal spur, two inner apical spines. Metacoxa with anterior portion produced as blunt process.

GENITALIA: Male genital segment of medium size. Proctiger short, produced into two, long, distally rounded lobes. Forceps as long as proctiger, evenly narrowed to acute apices curved cephalad, scarcely arched. Female genital segment about  $\frac{1}{2}$  as long as rest of abdomen; dorsal valve excavate on dorsal margin, somewhat longer than ventral, latter straight, both acute, black-tipped.

One of the first species of psyllids to receive attention in North America was this "bramble flea-louse" or "blackberry psyllid." It has attracted considerable attention in the eastern part of the United States as a pest on blackberries. Peterson's paper (1923) is a most complete account of the damage, life history, and control. It includes figures of the various stages and a complete bibliography up to 1923. The common blackberry (*Rubus*) is the summer host, and Peterson apparently proved

\* From *lobus -i*, Gr. noun—lobe; adjectival form—lobed.

\* From *tri-*, L. prefix—three + *punctatus*, L. (p. part. of *pungo*)—punctured.

that coniferous trees are an essential host for the overwintering females. There is but one generation per year. Specimens are at hand from South Carolina, Maryland, New Hampshire, and Minnesota. It has also been recorded as occurring in Virginia, District of Columbia, New York, Connecticut, Maine, New Jersey, Ontario, Florida, North Carolina, Ohio, Michigan, and probably occurs throughout all the eastern portion of North America wherever *Rubus* and conifers occur together.

**TYPE.** No. 1345 United States National Museum, male and female on one pin.

Types examined.

*Trioza californica\** Crawford

(Fig. 269)

- 1910 *Trioza californica* Crawford, Pom. Coll. Jour. Ent. 2:232, 234.
- 1911 *Triozoida californica* Crawford, Pom. Coll. Jour. Ent. 3:492.
- 1913 *Trioza californica* Aulmann, Psy. Cat. 40.
- 1914 *Ceropsylla californica* Crawford, U. S. Nat. Mus., Bull. 85:102.
- 1914 *Trioza ichneumonia* Crawford, U. S. Nat. Mus., Bull. 85:103.
- 1917 *Ceropsylla californica* Van Duzee, Cat. Hemip. N. Am. 798.

Length to tip of folded wings 4 mm.

**COLOR:** General body color orange to brown. Head darker, especially genal processes almost black. Abdominal sternites, basal third of antennae, distal portions of legs light. Veins R + M + Cu, R, anal margin basally, and adjacent membranes heavily embrowned.

**STRUCTURE:** Head of medium size, narrower than thorax. Vertex plane with broad discal impressions. Genal processes large, straight, subacute, only slightly divergent, barely shorter than vertex. Antennae slightly less than twice as long as width of head. Eyes protruding rather more than usual. Thorax strongly arched. Anterior margin of pronotum depressed below plane of vertex. Forewings about  $2\frac{1}{2}$  times as long as wide, acute at apex; Rs short. Hind tibia with two inner apical spines, large serrate basal spur. Anterior portion of metacoxa slightly produced.

**GENITALIA:** Male genital segment small. Proctiger short, with long, blunt posterior lobes. Forceps large at base, slender and laterally flattened abruptly at about half their length, apical third curved cephalad, apices acute. Female genital segment very short, dorsal valve slightly longer than ventral, acute.

This species is represented in the material before me by several specimens from Southern California and one from Gila County, Arizona. Crawford also records it from Colorado on *Salix*. He placed this species in the genus *Ceropsylla* on the basis of a tendency toward a petiolate condition of M and Cu in the forewings. This petiole is very slight or entirely wanting in the specimens I have examined. It is quite unlike *C. sideroxyli* in head and thoracic characters, and even in wing venation it is more typically triozine; hence, I am referring it back to *Trioza*.

**TYPE,** male, mountains near Claremont, California, Baker, is in the Crawford Collection.

\* Adjectival form of California.

*Trioza phoradendri\** Tuthill

(Figs. 214, 215, 304)

1939 *Trioza phorodendrae* Tuthill, Ia. St. Coll. Jour. Sci. 13:182.

Length to tip of folded wings 2.5 mm.

**COLOR:** Uniformly yellow except eyes, tip of female genital segment, ovipositor and margins of male forceps, black. Forewings yellowish, veins yellow.

**STRUCTURE:** Vertex somewhat rounding. Genal processes acute, slightly divergent,  $\frac{2}{3}$  as long as vertex, pubescent. Antennae about as long as width of head. Thorax scarcely arched. Pronotum moderately long, depressed below plane of vertex. Legs short. Hind tibia with large basal spur, three inner apical spines. Forewings small, narrowly rounded apically, almost 3 times as long as wide; marginal cells small, Rs very long.

**GENITALIA:** Male proctiger quite broad, posterior margin curved, anterior margin straight. Forceps in lateral view curving cephalad; "folded" so as to appear double in apical half from caudal view, lateral folds evenly narrowed to apices, medial folds with heavy, black, truncate apices, bearing many, very heavy, medially projecting setae basally. Female genital segment as long as rest of abdomen, rounded, produced at apex into a brown styliform portion, at least tip of ovipositor protruding.

Known only from the type series and one additional female all from Mesa Verde National Park, Colorado. Host *Phoradendron juniperinum* Engelm. The original spelling of the name as *phorodendrae* was an error of transcription and should be *phoradendri*, as above.

**TYPE,** male, in author's collection.

*Trioza phoradendri acuminata†* n. subsp.

Similar to typical subspecies but apparently greenish in color (the specimen at hand is old and therefore quite faded). Head smaller and narrower proportionately. Genal processes fully as long as vertex, slightly divergent, acute. Antennae  $1\frac{1}{3}$  times as long as width of head. Male genitalia similar.

**HOLOTYPE,** male, Los Angeles County, California, May, collected on "*Phorodendron pubescens*," No. 55182 United States National Museum.

The genitalia are somewhat obscured on the one specimen at hand but seem to be very much like the typical form. This may be a distinct species, but until more material is available to certify such an opinion I prefer to consider it as a subspecies.

\* Genitive of *Phoradendron*—the generic name of the host.  
† *acuminatus*, L. (p. part. of *acumino*)—sharpened.

*Trioza bakeri\** Crawford

(Figs. 186, 187, 252)

- 1910 *Trioza bakeri* Crawford, Pom. Coll. Jour. Ent. 2:230, 235.  
 1911 *Trioza bakeri* Crawford, Pom. Coll. Jour. Ent. 3:424, 428.  
 1911 *Trioza montana* Crawford, Pom. Coll. Jour. Ent. 3:631.  
 1913 *Trioza bakeri* Aulmann, Psy. Cat. 39.  
 1914 *Trioza bakeri* Crawford, U. S. Nat. Mus., Bull. 85:77.  
 1914 *Trioza puberula* Crawford, U. S. Nat. Mus., Bull. 85:78.  
 1917 *Trioza bakeri* Van Duzee, Cat. Hemip. N. Am. 792.  
 1932 *Trioza bakeri* Klyver, Ent. News 43:35.

Length to tip of folded wings 4 to 4.5 mm.

COLOR: Variable from yellow to brown, tip of antennae black, abdomen of female green when alive. Variable brown markings on dorsum. Wings hyaline.

STRUCTURE: Head large, almost as broad as thorax. Vertex plane, rectangular, discal foveae and medial suture prominent. Genal processes on approximately same plane as vertex. Antennae about as long as width of head. Thorax broad and flat for genus. Pronotum large, not depressed below vertex. Forewings about  $2\frac{2}{3}$  times as long as wide, acutely angled; Rs long and sinuate. Hind tibia with serrate basal tubercle, three inner apical spines. Metacoxa with short, stout, anterior process.

GENITALIA: Proctiger of male produced caudad as a blunt triangle, widest basally, with truncate apex. Forceps shorter than proctiger; in lateral view almost straight; in caudal view arched to black-margined apices, posterior edge produced as blunt tooth. Female genital segment large,  $\frac{1}{2}$  as long as rest of abdomen in fresh specimens, about as long as rest of abdomen in dried specimens, valves straight, equal in length.

Described and recorded heretofore only from California, this species has been taken on *Pinus abies*, *Arctostaphylos*, pear. In 1938 (July 19) I swept numerous specimens from *Rhamnus smithii* Green near Pagosa Springs, Colorado. Since the bushes upon which they occurred were quite isolated and teneral specimens occur in the series, I believe this shrub to be the host plant. Unfortunately, I did not determine whether or not nymphs were present.

TYPE, male, Claremont, California, Baker, in Crawford Collection. Colorado specimens compared with type.

*Trioza breviantennata†* Crawford

- 1914 *Trioza breviantennata* Crawford, U. S. Nat. Mus., Bull. 85:75, 78.  
 1917 *Trioza breviantennata* Van Duzee, Cat. Hemip. N. Am. 792.  
 1932 *Trioza breviantennata* Klyver, Ent. News 43:35.

Crawford describes this species as similar to *Trioza bakeri* but differing in color, pubescence, punctuation, and in minor details of structure. I do not believe that these differences are of specific value as Crawford describes them, but as I have seen none of the specimens on which the

species was based, I hesitate to throw it into synonymy. His description follows:

"Very similar in size and general proportions to *T. bakeri*; wings relatively a little shorter. General color light to dark brown, often very dark; legs and antennae lighter, except latter black at tip; in light forms the vertex is dark brown to black. Vertex and dorsum not pubescent as in *bakeri*, but very coarsely punctate.

"Similar in many respects to *bakeri*, but vertex very conspicuously bulging on each side of median line; genal cones relatively shorter; antennae a little shorter, scarcely as long as width of head. Thorax as in *bakeri*, but not pubescent. Hind tibiae with three apical spines within. Wings large, resembling *bakeri*.

"Genitalia: Male—Anal valve as in *bakeri*, but base of triangle shorter; forceps similar, subacute at apex, sides almost parallel. Female—Genital segment similar, but dorsal valve a little longer than ventral.

"Described from two males and one female from Claremont, California (mountains), collected by C. F. Baker, no data with them."

TYPE in Crawford Collection.

*Trioza (Megatrioza)\* diospyri†* (Ashmead)

(Figs. 188, 189, 254)

- 1881 *Psylla diospyri* Ashmead, Can. Ent. 13:222.  
 1885 *Trioza diospyri* Riley, Proc. Biol. Soc. Wash. 2:70.  
 1910 *Trioza latipennis* Crawford, Pom. Coll. Jour. Ent. 2:230.  
 1910 *Trioza diospyri* Crawford, Pom. Coll. Jour. Ent. 2:352.  
 1911 *Trioza diospyri* Crawford, Pom. Coll. Jour. Ent. 3:424, 428.  
 1912 *Trioza diospyri* Patch, Me. Agr. Exp. Sta., Bull. 202:226.  
 1913 *Psylla diospyri* Aulmann, Psy. Cat. 14.  
 1914 *Trioza diospyri* Crawford, U. S. Nat. Mus., Bull. 85:78.  
 1917 *Trioza diospyri* Van Duzee, Cat. Hemip. N. Am. 792.  
 1918 *Trioza diospyri* McAtee, Ent. News 29:223.  
 1919 *Megatrioza diospyri* Crawford, Phil. Jour. Sci. 15:193.  
 1926 *Spanioza diospyri* Enderlein, Ent. Mitt. 15:400.  
 1926 *Phylloplecta diospyri* Ferris, Can. Ent. 58:16.  
 1928 *Trioza diospyri* Leonard, Ins. N. Y. 183.  
 1928 *Phylloplecta diospyri* Ferris, Can. Ent. 60:245.  
 1938 *Trioza diospyri* Brimley, Ins. N. C. 103.  
 1938 *Phylloplecta diospyri* Caldwell, Ohio Biol. Surv., Bull. 34:249.

Length to tip of folded wings 4.5 mm.

COLOR: General color shining black. Meso- and metatibiae, all tarsi, genal processes and antennae except tip, whitish.

STRUCTURE: Entire body sparsely clothed with long hairlike setae. Head broad but narrower than thorax. Vertex plane, with slight discal impressions. Genal processes short, about  $\frac{1}{2}$  as long as vertex, rounded, slightly divergent. Antennae about  $1\frac{1}{2}$  times as long as width of head. Thorax strongly arched. Pronotum strongly depressed, entirely below level of vertex. Forewings very large, almost twice as long as body, about

\* From *megas*, Gr. adj.—great, large + *trioza*.

† Genitive of *Diospyros*—the generic name of the host.

\* Named in honor of C. F. Baker.

† From *brevis* -e, L. adj.—short + adjectival form of *antenna*.

$\frac{2}{3}$  times as long as wide, acutely angled at apex; marginal cells unusually large, especially medial, Rs short, less than  $\frac{1}{2}$  total length of wing, straight. Hind wings very small, less than  $\frac{1}{2}$  as long as forewings. Legs longer than in most species. Hind tibia with three inner apical spines, without basal spur or carina. Posterior metacoxal spur large, curved. Anterior margin of metacoxa produced into spur, larger than posterior one.

**GENITALIA:** Male genital segment small. Proctiger somewhat longer than forceps, produced caudad as large blunt lobes, anus borne on a prominent epiphysis. Forceps almost straight in lateral view; in caudal view broad, basal  $\frac{2}{3}$  straight, apical  $\frac{1}{3}$  curved inward, apices with several small black teeth. Female genital segment of medium size, about  $\frac{1}{2}$  as long as rest of abdomen, valves acute, ventral upcurved to meet dorsal, latter longer, entire segment usually pointing ventrad.

This species is quite distinct in many respects from other North American *Trioza*. It is abundant throughout the range of the common persimmon, *Diospyros virginiana* L., which is its host. Specimens are at hand from the following states: Florida, Georgia, Alabama, Mississippi, Louisiana, Texas, Oklahoma, Kentucky, Tennessee, New Jersey, Iowa. It is also recorded from Missouri, Virginia, North Carolina, Ohio, New York.

Ashmead gives the life history in Florida in some detail:

"By the middle of April this is found in considerable numbers on the leaves of the young trees, with beaks inserted, almost standing on their heads, and swaying from side to side like the motion of a vessel in a stormy sea. This motion is evidently intended to assist either in inserting the beak or in pumping up the juices of the tree.

"At this time they are also caught copulating, soon after which the female begins depositing her eggs. These are very minute, 0.01 inch in length, elongate ovate, pale greenish in color, with a wavy beak beneath at thick end, and a long filament at tip of smaller end, nearly the length of the egg, and extending backwards over it. These are laid along the margin of the leaf, without regard to regularity, the female first preparing for their reception by secreting a threadlike, transparent, gummy substance along the extreme edge of the leaf; she then fastens them in place by the beak, which adheres securely to the gummy substance.

"These hatch in from 5 to 6 days (actual observation) and the leaf from their punctures curls completely over them; under this they reside until just before the final transformation. The pupa then comes forth, attaches itself to a leaf or a twig, and changes into the perfect fly, escaping through a longitudinal slit in the head and thorax. The young take from four to five weeks to mature and breed throughout the whole summer.

"Like the Fig Psylla, the fall brood probably lay their eggs in crevices of the bark and twigs; these hatch at the first breath of spring, feed on the tender new shoots and leaves, and are those found fully matured by the first and second week in April."

The fifth stadium nymph has been described and figured by Ferris (1926).

**TYPE**, female, No. 14820 United States National Museum, is moldy and in poor condition, but is unmistakable.

Type examined.

### *Trioza beameri\** Tuthill

(Figs. 216, 217, 305)

1939 *Trioza beameri* Tuthill, Ia. St. Coll. Jour. Sci. 13:182.

Length to tip of folded wings 5 mm.

**COLOR:** General color whitish-yellow except eyes and tips of antennae dark.

**STRUCTURE:** Entire body pubescent, least prominently on abdomen. Vertex rather flat with two prominent sulcate depressions. Antennae about  $1\frac{1}{3}$  times as long as width of head. Genal processes large, extending forward,  $\frac{3}{4}$  as long as vertex. Thorax not very strongly arched. Pronotum very long, scarcely depressed. Forewings very large, twice as long as body, acute, almost 3 times as broad; cubital cell larger than medial. Posterior tibia with serrate carina basally, three inner apical spines. Anterior process of metacoxa scarcely developed.

**GENITALIA:** Male proctiger in lateral view broad in basal  $\frac{1}{2}$ , then obliquely truncate to apex. Forceps in lateral view almost straight to apices, latter produced caudad as blunt black teeth; caudal view broadest at base, bowed out, evenly narrowed to apices. Female genital segment about as long as rest of abdomen, valves straight to acute apices, dorsal slightly longer than ventral, very pubescent.

Known only from the type series from the San Jacinto Mountains, California.

**TYPE**, male, in Snow Collection, University of Kansas.

### *Trioza chlorat†* Tuthill

(Figs. 218, 219, 306)

1938 *Trioza chlorata* Tuthill, Ent. News 49:244.

Length to tip of folded wings 3.25 to 3.50 mm.

**COLOR:** General color white to yellow except eyes and apical  $\frac{2}{3}$  of antennae black. Thoracic dorsum and vertex deeper yellow to orange. Wings hyaline.

**STRUCTURE:** Head medium in size, post-ocular occipital region very large giving the eyes the appearance of projecting forward. Vertex somewhat rounding, rather deeply emarginate in front, extending forward over front ocellus. Genal processes vertical, about as long as vertex, rather acute. Antennae twice as long as width of head. Thorax strongly arched. Pronotum short, descending, depressed below plane of vertex. Forewings almost 3 times as long as broad, sharply angled; venation typical triozine. Hind tibia with large basal spur, three inner apical spines.

\* Named in honor of R. H. Beamer.

† From *chloros*, Gr. adj.—pale.

**GENITALIA:** Male genitalia small. Proctiger broad at base, tapered to slightly produced apex, bearing a black spine at base on each side. Forceps slightly shorter than proctiger; in lateral view broad, anterior margin almost straight, posterior margin slightly curved, apices roundly truncate and slightly produced anteriorly, apical margin brown. Female genital segment shorter than rest of abdomen, basal portion subglobular, apex a short, brown, styliform elongation; dorsal valve slightly longer than ventral.

**HOLOTYPE** and **ALLOTYPE** in the Snow Collection, University of Kansas, are from Arizona and are the only known specimens.

*Trioza proximata\** Crawford

(Figs. 190, 191)

- 1911 *Trioza proximata* Crawford, Pom. Coll. Jour. Ent. 3:424, 429, 435.  
1914 *Trioza proximata* Crawford, U. S. Nat. Mus., Bull. 85:81.

Length to tip of folded wings 3 to 3.5 mm.

**COLOR:** Testaceous to almost white, perhaps greenish when fresh. Tips of antennae and styliform portion of female genital segment black.

**STRUCTURE:** Head narrower than thorax. Occiput large, posterior margin of eyes opposite lateral ocelli. Vertex with two discal sulci, medial suture deep. Genal processes short, heavy, blunt,  $\frac{1}{2}$  as long as vertex. Antennae twice as long as width of head. Thorax broad, quite strongly arched. Pronotum strongly descending but not at all depressed below plane of vertex. Forewings almost 3 times as long as wide, rounded apically. Hind tibia with large serrate basal tubercle, three inner apical spines.

**GENITALIA:** Male proctiger long, caudal margin arcuately produced, a prominent epiphysis at apex. Forceps long; in lateral view moderately broad, curved cephalad, tapering, apices black, with small black tooth; in caudal view almost straight-sided, slightly arched, a prominent row of setae on inner margins. Female genital segment very long,  $\frac{3}{4}$  as long as remainder of body, proximal  $\frac{1}{3}$  large, tapering distal portion of valves very slender, acuminate and appressed to ovipositor, latter extending somewhat beyond valves; dorsal valve longer than ventral.

A number of specimens are at hand from Ramsey Canyon, Huachuca Mountains, Arizona, October 30, 1937, collected by P. W. Oman, which seem undoubtedly to be this species described from southwestern Mexico. No host plant data are available.

**TYPE** in Crawford Collection.

*Trioza collaris†* Crawford

(Figs. 192, 193)

- 1910 *Trioza collaris* Crawford, Pom. Coll. Jour. Ent. 2:229, 347.  
1911 *Trioza collaris* Crawford, Pom. Coll. Jour. Ent. 3:424, 429.

\* Apparently from *proximus* -a -um, L. adj.—nearest.

† *collaris* -e, L. adj.—pertaining to the neck.

- 1912 *Trioza collaris* Patch, Me. Agr. Exp. Sta., Bull. 202:225.  
1913 *Trioza collaris* Aulmann, Psy. Cat. 44.  
1914 *Trioza collaris* Crawford, U. S. Nat. Mus., Bull. 85:81.  
1917 *Trioza collaris* Van Duzee, Cat. Hemip. N. Am. 793.  
1932 *Trioza collaris* Klyver, Ent. News 43:35.

Length to tip of folded wings 4 to 4.5 mm.

**COLOR:** General color green to yellowish green, occasionally with some darker markings on dorsum of thorax. Tips of antennae, styliform portion of female genitalia, and apices of male forceps, dark.

**STRUCTURE:** Head large, only slightly narrower than thorax. Vertex scarcely plane, discal impressions prominent. Genal processes short, not over  $\frac{1}{2}$  as long as vertex, appressed, blunt to acute. Antennae twice as long as width of head. Thorax large, flat. Pronotum long, strongly descending cephalad, not depressed below vertex. Forewings large, angular at apex, almost 3 times as long as wide. Hind tibia with basal tubercle bearing two small spines, with three inner apical spines. Anterior portion of metacoxa short, stout.

**GENITALIA:** Male proctiger slightly, roundingly produced on caudal margin. Forceps about as long as proctiger, slender, bent cephalad, slightly bowed, apices sharp, black. Female genital segment large, about twice as long as rest of abdomen, about half as long as remainder of body, consisting of a large basal portion and a styliform projection, latter about as long as base, black; basal portion produced ventrally just before constriction.

This species is apparently quite common in California and neighboring states. Klyver gives data indicating *Baccharis* spp. as the probable host. Numerous specimens are at hand from California, Arizona, New Mexico, and El Paso, Texas. Some of these specimens bear labels "collected on *Baccharis viminea*."

**TYPE** in Crawford Collection.

*Trioza longistylus\** Crawford

- 1910 *Trioza longistylus* Crawford, Pom. Coll. Jour. Ent. 2:233.  
1911 *Trioza longistylus* Crawford, Pom. Coll. Jour. Ent. 3:424, 429, 434.  
1912 *Trioza longistylus* Patch, Me. Agr. Exp. Sta., Bull. 202:227.  
1913 *Trioza longistylus* Aulmann, Psy. Cat. 48.  
1914 *Trioza longistylus* Crawford, U. S. Nat. Mus., Bull. 85:82.  
1917 *Trioza longistylus* Van Duzee, Cat. Hemip. N. Am. 793.

An examination of the type (No. 18083 United States National Museum), a female, fails to show any apparently significant difference between this form and *collaris* except that the ventral hump present on the genital segment of the female of *collaris* is lacking. That this is a distinct species is extremely doubtful, but it is retained pending further collection in the type locality.

\* From *longus* -a -um, L. adj.—long + *stylus* -i, L. m. noun—style.

*Trioza mexicana\** *minor\*\* n. n.*

(Figs. 194, 195)

- 1911 *Trioza mexicana minuta* Crawford, Pom. Coll. Jour. Ent. 3:424, 429, 440.  
 1914 *Trioza mexicana minuta* Crawford, U. S. Nat. Mus., Bull. 85:80.

Length to tip of folded wings 2.75 to 3.0 mm.

COLOR: General color red. Abdomen darker. Legs and genal processes testaceous.

STRUCTURE: Head large but narrower than thorax. Vertex with medial suture prominent, discal impressions very shallow, rounding in front to genal processes. Latter straight, slender, acute, scarcely divergent,  $\frac{2}{3}$  as long as vertex. Antennae about  $1\frac{1}{4}$  times as long as width of head. Thorax broad, well arched, with very short, sparse pubescence, scarcely visible. Pronotum long, scarcely depressed below vertex. Forewings broad, rounded apically, slightly less than  $2\frac{1}{2}$  times as long as wide, finely punctate. Hind tibia with large basal spur, three inner apical spines.

GENITALIA: Male proctiger roundly produced caudad, with very distinct apical epiphysis. Forceps in lateral view rather broad to near apex then curved cephalad, apices broad, black; in caudal view broad, almost straight, apices incurved, touching, postero-mesal margins with a row of very large heavy setae. Female genital segment longer than rest of abdomen, basal portion large, swollen, apices of valves acuminate, black; prominent short setae on all of basal portion, a tuft of very long setae on dorsal valve at base of acuminate portion.

This insect was described by Crawford from Mexico. Numerous specimens are at hand from southern Arizona and have been compared with the type. Although this subspecies is like the typical form except for slight differences in the genal processes, it is so consistently smaller that it is maintained. The name *minor* is proposed to replace the name *minuta* which is preoccupied by *Trioza minuta* Crawford. Crawford records the typical form as taken on *Rhus* sp.

TYPE (type of *Trioza mexicana minuta* Crawford) in Crawford Collection.

*Trioza quadripunctata† Crawford*

(Figs. 196, 266)

- 1910 *Trioza quadripunctata* Crawford, Pom. Coll. Jour. Ent. 2:233.  
 1911 *Trioza quadripunctata* Crawford, Pom. Coll. Jour. Ent. 3:425, 429, 433.  
 1912 *Trioza quadripunctata* Patch, Me. Agr. Exp. Sta., Bull. 202:229.  
 1913 *Trioza quadripunctata* Aulmann, Psy. Cat. 51.  
 1914 *Trioza quadripunctata* Crawford, U. S. Nat. Mus., Bull. 85:82.  
 1917 *Trioza quadripunctata* Van Duzee, Cat. Hemip. N. Am. 793.  
 1926 *Spanioza quadripunctata* Enderlein, Ent. Mitt. 15:400.  
 1928 *Trioza quadripunctata* Leonard, Ins. N. Y. 183.

\* *mexicana*—the adjectival form of Mexico.

\*\* *minor -us*, L. adj. (comp. of *parvus*)—smaller.

† From *quadri*, L. comb. form—four + *punctatus*, L. (p. part. of *pungo*)—punctured.

- 1938 *Trioza quadripunctata* Caldwell, Ohio Biol. Surv., Bull. 34:247.

- 1938 *Trioza quadripunctata* Strickland, Can. Ent. 70:204.

- 1939 *Trioza quadripunctata* Strickland, Can. Ent. 71:214.

Length to tip of folded wings 4 mm.

COLOR: General color of summer form greenish-white to yellowish, winter form darker, brownish. Apical  $\frac{1}{2}$  of antennae and tips of tarsi black. Hind margin of forewing with four black spots, three distal ones coinciding with radular areas typical for genus, remainder of wing hyaline or somewhat milky.

STRUCTURE: Head small, narrower than thorax. Vertex with prominent discal impressions, anterior margin produced, overhanging. Genal processes short, stout, divergent, about  $\frac{1}{2}$  as long as vertex. Antennae twice as long as width of head. Thorax strongly arched. Pronotum long, anterior margin below plane of vertex. Forewings short, slightly less than  $2\frac{1}{2}$  times as long as wide, costal margin rounded, apex scarcely angulate, R<sub>s</sub> short, straight. Hind tibia without basal armature, with three inner apical spines.

GENITALIA: Male proctiger arcuately produced caudad, an apical epiphysis. Forceps long, slender; in lateral view straight; in caudal view strongly arched to acute black apices. Female genital segment  $\frac{2}{3}$  as long as rest of abdomen, valves straight, acute, dorsal slightly longer than ventral, black-tipped.

Numerous specimens of this nettle- (*Urtica*) inhabiting species are at hand from the following localities: Minnesota, Iowa, Missouri, Kansas, Colorado, and Wyoming. It is also recorded from California, Montana, Alberta, Ohio, and New York. It is very much like *albifrons* but can readily be distinguished from it by the dark maculae in the forewings. This may be simply a variety of *albifrons*, but it seems doubtful from collecting and distributional data. I have swept great numbers of *albifrons* in Colorado and Minnesota without finding a single specimen of *quadripunctata*; in Iowa pure populations of *quadripunctata* have been observed.

TYPE, male, No. 18084 United States National Museum.

Type examined.

*Trioza albifrons\** Crawford

(Figs. 3, 197, 198)

- 1910 *Trioza albifrons* Crawford, Pom. Coll. Jour. Ent. 2:231, 355.  
 1910 *Trioza rotundipennis* Crawford, Pom. Coll. Jour. Ent. 2:231, 236.  
 1910 *Trioza similis* Crawford, Pom. Coll. Jour. Ent. 2:231, 352.  
 1910 *Trioza fovealis* Crawford, Pom. Coll. Jour. Ent. 2:233.  
 1911 *Trioza albifrons* Crawford, Pom. Coll. Jour. Ent. 3:426, 429, 438.  
 1911 *Trioza rotundipennis* Crawford, Pom. Coll. Jour. Ent. 3:425, 427.  
 1911 *Trioza similis* Crawford, Pom. Coll. Jour. Ent. 3:426, 428.  
 1911 *Trioza fovealis* Crawford, Pom. Coll. Jour. Ent. 3:426, 428, 438.  
 1913 *Trioza albifrons* Aulmann, Psy. Cat. 39.  
 1913 *Trioza fovealis* Aulmann, Psy. Cat. 46.  
 1913 *Trioza rotundipennis* Aulmann, Psy. Cat. 52.

\* From *albus -a -um*, L. adj.—white + *frons* frontis, L. f. noun—forehead.

- 1913 *Trioza similis* Aulmann, Psy. Cat. 55.  
 1914 *Trioza albifrons* Crawford, U. S. Nat. Mus., Bull. 85:83.  
 1917 *Trioza albifrons* Van Duzee, Cat. Hemip. N. Am. 793.  
 1930 *Trioza albifrons* Klyver, Can. Ent. 62:169.  
 1932 *Trioza albifrons* Klyver, Ent. News 43:36.  
 1938 *Trioza similis* Strickland, Can. Ent. 70:204.

Length to tip of folded wings 3 to 3.5 mm.

COLOR: General color from green to light yellow through brown to black. In lighter forms only eyes, distal  $\frac{1}{2}$  of antennae, and last segment of tarsi, dark. In dark forms, rim of vertex, male genitalia and usually legs, light. (Between these extremes all variations in color occur.)

STRUCTURE: Head small, narrower than thorax. Disc of vertex depressed, edges carinate, protruding in front. Genal processes acute, divergent, on approximately parallel plane to vertex, about  $\frac{2}{3}$  as long as vertex. Antennae  $1\frac{1}{2}$  times as long as width of head. Thorax strongly arched. Pronotum depressed below plane of vertex. Forewings varying from angular to round apically; Rs rather short to long. Hind tibia without basal armature, with three inner apical spines.

GENITALIA: Male proctiger slightly longer than forceps, basal  $\frac{3}{4}$  roundly produced. Forceps stout, arched to heavy, apparently black-tipped apices (see Klyver, 1930), anterior margins excavate near apices. Female genital segment  $\frac{1}{2}$  to  $\frac{2}{3}$  as long as rest of abdomen, valves approximately equal in length, almost straight to usually sharp apices, somewhat rounded in some specimens.

Crawford states that there are sometimes only two inner apical spines on the hind tibia instead of three. I have examined several hundred specimens from various localities and have seen this condition on only two specimens, one collected by Crawford at Stanford University and one other. In both these specimens one tibia bears three spines and the other only two. This condition I believe to be only an aberration of such infrequent occurrence as to be of no significance.

I have examined Crawford's types (?) of *similis* and *rotundipennis* which are in the National Museum (specimens with red labels) and find them to be *albifrons*. The type of *similis fovealis* is a malformed specimen.

This is apparently a widely distributed species of western North America. Numerous specimens have been examined from the following localities: California, Oregon, Washington, British Columbia, Alaska, Idaho, Utah, Montana, Colorado, Arizona, New Mexico, and Minnesota. Strickland records it (*similis*) from Alberta. It occurs in large numbers on various species of *Urtica*. As would be expected in such a widespread species, there is considerable minor variation in characters.

TYPE, a male from Claremont, California, is in the Crawford Collection.

Crawford (1914) gives a general description of the egg and nymph together with some biological notes. Klyver (1930) compares *albifrons* with *urticae* in detail, describes and figures the nymph of the former.

### *Trioza sembla*\* Caldwell

(Fig. 220)

- 1940 *Trioza sembla* Caldwell, Ohio Jour. Sci. 40: 49.

"Length to tip of forewing 2.7 mm.; forewing 2.2 mm.

"Color: Light orange except for black eyes, black antennae beyond second segment, brown tarsi, and yellow margin around vertex.

"Head as broad as thorax, both finely pubescent. Genal cones  $\frac{2}{3}$  as long as vertex, acute, slightly divergent. Antennae a little longer than width of head. Forewings little over twice as long as broad; apices subacute.

"Proctiger of male with large caudal lobes. Forceps shorter than proctiger. In lateral aspect: Caudal margin practically straight, cephalic margin slightly produced cephalad, apices slightly rounded rather than truncate. In caudal aspect: thick basally, slightly bowed, narrowed evenly to apices.

"Male holotype, Painted Desert, Arizona, VI-25, D. J. and J. N. Knoll, collectors, is in the Ohio State University Collection."—Caldwell.

I have not seen the specimen on which this species is based. Caldwell has supplied me with the additional information that there are three inner apical spines on the hind tibia.

### *Trioza frontalis*† Crawford

(Figs. 199, 200, 201, 271)

- 1910 *Trioza frontalis* Crawford, Pom. Coll. Jour. Ent. 2:230, 353.  
 1911 *Trioza frontalis* Crawford, Pom. Coll. Jour. Ent. 3:426, 429, 436.  
 1913 *Trioza frontalis* Aulmann, Psy. Cat. 46.  
 1914 *Trioza frontalis* Crawford, U. S. Nat. Mus., Bull. 85:84.  
 1917 *Trioza frontalis* Van Duzee, Cat. Hemip. N. Am. 794.  
 1926 *Spanioza frontalis* Enderlein, Ent. Mitt. 15:400.  
 1932 *Trioza frontalis* Klyver, Pan-Pac. Ent. 8:14.  
 1932 *Trioza frontalis* Klyver, Ent. News 43:36.  
 1939 *Trioza frontalis* Strickland, Can. Ent. 71:214.

Length to tip of folded wings 3.5 mm.

COLOR: General color orange red to brown. Antennae, genal processes, and abdomen darker.

STRUCTURE: Head large, deflexed. Vertex broad, discal foveae and medial suture prominent, front margin abrupt. Genal processes acute, divergent,  $\frac{2}{3}$  as long as vertex at middle, on parallel plane with vertex. Antennae rather heavy,  $1\frac{1}{2}$  times as long as width of head. Thorax not very strongly arched. Pronotum narrow, depressed. Forewings about  $2\frac{1}{2}$  times as long as wide, apices subacute. Hind tibia with small serrate carina basally, three inner apical spines. Metacoxa only slightly produced anteriorly.

GENITALIA: Male genitalia large. Proctiger longer than forceps, produced caudad as large lobes with dorsal margins slightly upcurved,

\* A barbaric name.

† Apparently based on the latin *frons*—forehead.

apices blunt. Forceps large; in lateral view stalk slender, straight, apical portion evenly enlarged; in caudal view slightly arched; apices excavate on mesal margins, anterior portion more or less of a truncate tooth. Female genital segment large, almost as long as rest of abdomen; ventral valve upcurved, acute; dorsal valve longer than ventral, apical portion attenuate, blunt.

This species is quite typical of a number of *Amelanchier*-inhabiting forms all of which have quite massive heads, large bodies, and are more or less powdered with a waxy bloom as adults.

Specimens are at hand from the following localities: California, British Columbia, Manitoba, Minnesota, North Dakota, South Dakota, and Colorado. It has also been recorded from Nevada.

Many of the California specimens (including nymphs) bear the label *Amelanchier alnifolia* which Klyver also records as the host. The California specimens show some variation from those taken in Colorado but not a significant difference.

TYPE, male, No. 18085 United States National Museum.

Type examined.

*Trioza sulcata\** Crawford

(Figs. 221, 222, 307)

- 1910 *Trioza sulcata* Crawford, Pom. Coll. Jour. Ent. 2:233.
- 1910 *Trioza sulcata similis* Crawford, Pom. Coll. Jour. Ent. 2:233.
- 1911 *Trioza frontalis sulcata* Crawford, Pom. Coll. Jour. Ent. 3:426, 429, 436.
- 1913 *Trioza sulcata* Aulmann, Psy. Cat. 55.
- 1913 *Trioza sulcata similis* Aulmann, Psy. Cat. 55.
- 1914 *Trioza frontalis sulcata* Crawford, U. S. Nat. Mus., Bull. 85:85.
- 1917 *Trioza frontalis sulcata* Van Duzee, Cat. Hemip. N. Am. 794.
- 1938 *Trioza frontalis sulcata* Strickland, Can. Ent. 70:203.

Length to tip of folded wings 3 mm.

COLOR: General color most typically orange with black tarsi and antennae. Often much darker with brown markings on vertex and thorax, abdomen, femora, etc., dark. Frequently with a wax bloom.

STRUCTURE: Head large, almost as wide as thorax. Vertex with two sulcate impressions. Genal processes slender, straight, acute, divergent from base, about  $\frac{4}{5}$  as long as vertex. Antennae about  $1\frac{1}{2}$  times as long as width of head. Thorax strongly arched, often with short sparse pubescence. Pronotum depressed below plane of vertex. Forewings slender,  $2\frac{3}{4}$  times as long as wide. Hind tibia with small serrate carina basally, three inner apical spines. Anterior portion of metacoxa enlarged, prominent.

GENITALIA: Male genitalia large. Proctiger produced caudally from base to apex, dorsal margin straight, crenellated, ventral margin upcurved. Forceps in lateral view very broad, parallel-sided, apically curved cephalad, apices with a slight notch; in caudal view straight, broad basally, tapered to sharp apices. Female genital segment short, about  $\frac{1}{2}$  as long

\* *sulcatus*, L. (p. part. of *sulco*)—furrowed.

as abdomen; ventral valve strongly upcurved, acute; dorsal valve slightly longer, blunt.

Crawford originally separated this species from *frontalis* because of the more divergent genal processes and the deeper sulci on the vertex. Subsequently, he decided these differences were insufficient to constitute a species and maintained it as a variety chiefly on color. Unfortunately he had no males, the genitalia of which are quite distinct from *frontalis*. The type specimen is a dark-colored individual, but a majority of the specimens at hand are of an orange-red color. They were taken on *Amelanchier* sp. in the arid portions of southwestern Colorado.

Specimens are at hand from the following localities: Durango and Mesa Verde, Colorado; Arizona; Utah; Nevada; California; Oregon. Strickland records it from Alberta (?).

HOLOTYPE, female, Colorado, C. F. Baker, No. 55183 United States National Museum. ALLOTYPE, male, Durango, Colorado, July 4, 1937, L. D. Tuthill, in the United States National Museum.

Type examined.

*Trioza mira\** n. n.

(Figs. 223, 224)

- 1939 *Trioza forcipula* Tuthill, Ia. St. Coll. Jour. Sci. 13:183.  
[non] *Trioza forcipula* Patch, Me. Agr. Exp. Sta., Bull. 202:227. 1912.

Length to tip of folded wings 3 mm.

COLOR: Dorsum orange-red except center of abdominal tergites, two incomplete lines on thorax, discal foveae and medial suture of vertex and antennae black. Venter black except tip of genal processes and tibiae.

STRUCTURE: Head wide, almost as wide as thorax. Discal foveae and medial suture of vertex prominent. Genal processes  $\frac{2}{3}$  as long as vertex. Antennae slightly over  $1\frac{1}{4}$  times as long as width of head. Thorax weakly arched. Pronotum short, strongly descending, depressed below plane of vertex. Forewings a little more than twice as long as wide, rather bluntly angled. Hind tibia with very small basal spur, three inner apical spines. Metacoxa slightly produced anteriorly as very broad flat process.

GENITALIA: Proctiger of male with very long, upcurved, posterior lobes, with a prominent apical tuft of spines. Forceps bent forward and also inward, touching most of their length, apices deeply notched, anterior tooth larger. Female genital segment short, almost globose in lateral aspect, apices of valves black; dorsal valve slightly produced; ventral valve truncate and concave about ovipositor.

In addition to the type series from Colorado and Washington, additional specimens are at hand from scattered points in Colorado and Utah. As do the foregoing and following species, this form inhabits *Amelanchier*.

TYPE, male, in author's collection.

\* *mirus -a -um*, L. adj.—extraordinary.

*Trioza mira curta\** n. subsp.

Similar to species except male genitalia. Caudal lobes on proctiger much shorter, forceps not incurved and touching, apical notch much shallower. Female genitalia similar to typical subspecies.

Described from seven specimens from Placer and Nevada Counties, California, September, collected by A. Koebele, all of which are somewhat teneral and are faded, the thoracic markings of the typical subspecies show faintly, however.

**HOLOTYPE**, male, **ALLOTYPE**, female, (same mount) No. 55184 United States National Museum, Lake Tahoe, Placer County, California, September 30, 1885; five female **PARATYPES**, one additional male (doubtful) Placer and Nevada Counties, California; one of the paratypes bears the label *Amelanchier alnifolia* Nutt. Holotype, allotype, and paratypes in the United States National Museum; paratypes in author's collection.

*Trioza inversa† Tuthill*

(Figs. 225, 226, 308)

1939 *Trioza inversa* Tuthill, Ia. St. Coll. Jour. Sci. 13:185.

Length to tip of folded wings 3 mm.

**COLOR:** General color of dorsum ferruginous with a pair of fuscous markings on vertex, a pair on scutum, another pair on scutellum. Venter, femora, and antennae fuscous, remainder fulvous. Wings hyaline.

**STRUCTURE:** Head broad, almost as wide as thorax. Genal processes long, quite sharp, projecting downward,  $\frac{4}{5}$  as long as vertex. Antennae  $1\frac{1}{3}$  times as long as width of head. Thorax moderately arched. Pronotum short, not depressed below plane of vertex. Forewings only slightly angulate, almost 3 times as long as wide. Hind tibia with small basal spur, three inner apical spines. Metacoxa with anterior process moderately developed.

**GENITALIA:** Proctiger with a basal caudal projection, apex very narrow. Forceps in lateral view large at base, narrowed to spatulate apices; in caudal view broad at base, laterally concave to apices, touching most of their length. Female genital segment about  $\frac{1}{2}$  as long as remainder of abdomen, acute, dorsal valve slightly longer than ventral.

This *Amelanchier*-inhabiting species was described from specimens from Colorado, Utah, and British Columbia and is no doubt much more widespread in distribution.

TYPE, male, in author's collection.

*Trioza obtusa‡ Patch*

(Figs. 202, 203)

1911 *Trioza obtusa* Patch, Me. Agr. Exp. Sta., Bull. 187:18.1914 *Trioza obtusa* Crawford, U. S. Nat. Mus., Bull. 85:85.\* *curtus -a -um*, L. adj.—short.† *inversus -a -um*, L. adj.—turned inside out.‡ *obtusus -a -um*, L. adj.—blunt, obtuse.1917 *Trioza obtusa* Van Duzee, Cat. Hemip. N. Am. 795.1918 *Trioza obtusa* McAtee, Ent. News 29:223.1932 *Trioza obtusa* Klyver, Ent. News 43:36.1938 *Trioza obtusa* Brimley, Ins. of N. C. 103.

Length to tip of folded wings 4 mm.

**COLOR:** General color ranging from green in newly emerged adults to red and reddish brown. Typically colored individuals, orange-red, antennae, genal processes, femora, and genitalia darker, often with antero-lateral margins of prescutum dark. Wings from transparent to brownish opaque.

**STRUCTURE:** Head large, almost as wide as thorax. Vertex with medial suture prominent and very deep discal foveae, posterior margin raised. Genal processes heavy, sharp,  $\frac{2}{3}$  as long as vertex, apices divergent. Antennae short, about  $1\frac{1}{3}$  times as long as width of head. Thorax broad, well arched. Pronotum depressed below plane of vertex. Forewings very bluntly angulate,  $2\frac{1}{2}$  times as long as wide; Rs very long. Hind tibia with prominent, serrate, basal carina, three inner apical spines. Metacoxa somewhat produced anteriorly.

**GENITALIA:** Male genital segment of medium size. Proctiger with large caudal lobes, latter as long as axial portion, ventral margin of lobes almost straight, apices narrow but blunt, setae prominent, especially on dorsal margin of lobes. Forceps shorter than proctiger, very heavy; in lateral view enlarged at apices, apices notched on mesal margin to form two black tooth-like lobes. Female genital segment large, about as long as rest of abdomen; ventral valve upcurved to black, acute apex; dorsal valve longer than ventral, attenuate, tip blunt.

This form, while much like *Trioza frontalis*, is even more robust of head and body, the forewings are more rounded apically and are more or less brown, in hibernating forms very dark.

Specimens are at hand from the following localities: Raquette Lake and White Face Mountain, New York; Washington, D. C.; Maryland; Alabama (taken on pine in February, Schwarz); Park Rapids, Minnesota. The Minnesota specimens (including nymphs) were taken from *Amelanchier* sp. in company with *Trioza frontalis* (August 1), apparently the ranges of the two species overlap in this region. Additional records are Maine, Nova Scotia, and North Carolina.

Host *Amelanchier* sp.

TYPES (lost?), Orono, Maine.

Miss Patch briefly described the nymphs and gave a few life history notes.

*Trioza aylmeriae\** Patch1912 *Trioza aylmeriae* Patch, Me. Agr. Exp. Sta., Bull. 202:225.1914 *Trioza aylmeriae* Crawford, U. S. Nat. Mus., Bull. 85:93.1914 *Trioza amelanchieris* Crawford, U. S. Nat. Mus., Bull. 85:86.1917 *Trioza aylmeriae* Van Duzee, Cat. Hemip. N. Am. 797.

\* Genitive of Aylmer, name of a town in Ontario—the point of collection of the originally described specimens.

- 1918 *Trioza aylmeriae* McAtee, Ent. News 29:223.  
 1938 *Neotriozella virginiana* Caldwell, Ohio Biol. Surv., Bull. 34:254.  
 1939 *Neotriozella virginiana* Tuthill, Bull. Brooklyn Ent. Soc. 34:53.

Length to tip of folded wings, 4 mm.

Very closely related to *Trioza obtusa*, but wings are larger, marginal cells larger, Rs straighter. Caudal lobe of male proctiger much more elongate and upcurved, bearing prominent tuft of large setae at apex. Female genital segment similar but more slender in lateral view.

One pair from Maryland and one pair without locality data in the United States National Museum are apparently this species. Described by Miss Patch from Aylmer, Ontario, on "Billberry."

The collection of a male of *Neotriozella virginiana* shows it to be identical with *aylmeriae*.

#### Genus *Paratrioza*\* Crawford

- 1909 *Trioza Sulc* (*pro parte*), Acta Soc. Ent. Bohemicae 6:102-108 [fide Crawford].  
 1910 *Paratrioza* Crawford, Pom. Coll. Jour. Ent. 2:228, 229.  
 1911 *Allotriozella* Crawford (*pro parte*), Pom. Coll. Jour. Ent. 3:423, 442.  
 1911 *Paratrioza* Crawford, Pom. Coll. Jour. Ent. 3:423, 446 [designates type].  
 1914 *Paratrioza* Crawford, U. S. Nat. Mus., Bull. 85:70.  
 1917 *Paratrioza* Van Duzee, Cat. Hemip. N. Am. 791.

Head narrower than thorax, scarcely deflexed. Vertex very distinctly margined, anterior margin usually slightly overhanging. Genae usually produced as short, rather broad padlike processes, sometimes conical, sometimes entirely without processes, not spherically swollen. Clypeus visible from anterior view. Antennae slender, variable in length. Thorax moderately arched. Pronotum short, descending anteriorly. Proepisternum strongly produced laterad. Forewings membranous, elongate, acutely angled to somewhat rounded apically, venation triozine. Hind wings much shorter than forewings. Metatibia with basal spur, two inner and one outer apical spines. Metacoxa often with anteriorly projecting process.

Logotype: *Paratrioza cockerelli* (Sulc).

This genus, while exhibiting distinctive characters of its own, seems to represent an intermediate between *Trioza* and *Rhinopsylla*, the latter belonging to the *Carsidarinae* of Crawford. *P. dorsalis* shows a very great similarity to *Rhinopsylla antennata* in all characters except the head which is slightly cleft in *antennata*.

*Kuwayama* Crawford is quite similar to *Paratrioza* but is distinct enough in head characters and type of genitalia to be distinguished. Of the species of the latter, *dubia* n. sp. is most like *Kuwayama*; *dorsalis* is very typically paratriozine except that the genae are utterly devoid of any processes, they are not even swollen as in *Kuwayama*.

#### Key to the Species of *Paratrioza*

1. Genae produced as small but distinct conical processes..... 2.  
   Genae very slightly produced as padlike lobes if at all..... 4.
2. Small species (3 mm. to tip of folded wings); forewings hyaline..... *cockerelli* p. 585.  
   Larger species (3.5 mm. or more to tip of folded wings)..... 3.
3. Forewings maculate..... *maculipennis* p. 588.  
   Forewings not maculate..... *arbolensis* p. 589.
4. Rs of forewings short, not reaching furcation of media..... *dorsalis* p. 589.  
   Rs of forewings longer, extending at least to furcation of media, more or less sinuate..... 5.
5. Ventral valve of female genital segment produced as a large blunt tooth; caudal lobes of male proctiger perpendicular to axial portion..... *lavaterae* p. 590.  
   Ventral valve of female genital segment not produced apically; caudal lobes of male proctiger slanting ventrad, touching subgenital plate..... *dubia* p. 591.

#### *Paratrioza cockerelli*\* (Sulc)

(Figs. 204, 205, 206, 272)

- 1909 *Trioza cockerelli* Sulc, Acta Soc. Ent. Bohemicae 6:102-108 [fide Crawford, 1914b].  
 1910 *Paratrioza ocellata* Crawford, Pom. Coll. Jour. Ent. 2:229.  
 1910 *Paratrioza pulchella* Crawford, Pom. Coll. Jour. Ent. 2:229.  
 1910 *Paratrioza pulchella flava* Crawford, Pom. Coll. Jour. Ent. 2:229.  
 1911 *Paratrioza cockerelli* Crawford, Pom. Coll. Jour. Ent. 3:446, 448.  
 1911 *Paratrioza ocellata* Crawford, Pom. Coll. Jour. Ent. 3:447.  
 1911 *Paratrioza ocellata nigra* Crawford, Pom. Coll. Jour. Ent. 3:447, 448.  
 1911 *Paratrioza ocellata flava* Crawford, Pom. Coll. Jour. Ent. 3:447, 448.  
 1912 *Paratrioza cockerelli* Patch, Me. Agr. Exp. Sta., Bull. 202:231.  
 1913 *Trioza cockerelli* Aulmann, Psy. Cat. 44.  
 1914 *Paratrioza cockerelli* Crawford, U. S. Nat. Mus., Bull. 85:71.  
 1917 *Paratrioza cockerelli* Essig, Jour. Ec. Ent. 10:434-439.  
 1917 *Paratrioza cockerelli* Van Duzee, Cat. Hemip. N. Am. 792.  
 1925 *Paratrioza cockerelli* Ferris, Can. Ent. 57:47-48 [desc. and figs. nymph].  
 1931 *Paratrioza cockerelli* Klyver, Pan-Pac. Ent. 7:142.  
 1931 *Paratrioza cockerelli* Knowlton and Janes, Ann. Ent. Soc. Am. 24:283-290 [life history].  
 1932 *Paratrioza cockerelli* Klyver, Ent. News 43:34.  
 1933 *Paratrioza cockerelli* Richards and Blood, Jour. Agr. Res. 46:189-216.  
 1934 *Paratrioza cockerelli* Knowlton and Thomas, Jour. Ec. Ent. 27:547.  
 1934 *Paratrioza cockerelli* Knowlton, Utah Agr. Exp. Sta., Leaflet 36.  
 1938 *Paratrioza cockerelli* Strickland, Can. Ent. 70:200.  
 1939 *Paratrioza cockerelli* Milliron, Ins. Pest Surv., Bull. 19, 9:564.  
 1939 *Paratrioza cockerelli* Strickland, Can. Ent. 71:213.

Length to tip of folded wings 3 mm.

COLOR: General color black typically, with lighter markings varying from white to red. Vertex black except margin and transverse discal area light, dorsum of thorax with light longitudinal stripes. At least posterior portion of pronotum light. Prescutum with a medial longitudinal band and a horseshoe-shaped macula on each side, light. Scutum with a pair of broad medial stripes, a narrow one laterad, lateral margins, light. Posterior margins of abdominal tergites white, first one most prominently so. Extent of pattern somewhat variable, often appearing as dark markings on light ground color. Genal processes and legs usually light. Apices of antennal segments black. Wings hyaline.

\* From *para*, Gr. prep.—near + *trioza*.

\* Named in honor of T. D. A. Cockerell.

**STRUCTURE:** Head of moderate size, narrower than thorax. Margins of vertex raised and abrupt; vertex discally impressed, median suture prominent. Genal processes very small but distinct, divergent, acute. Clypeus visible from anterior or lateral view. Antennae  $1\frac{1}{2}$  times as long as width of head. Thorax strongly arched. Pronotum strongly descending cephalad but not entirely depressed below plane of vertex. Forewings straight, roundingly angular, about  $2\frac{1}{2}$  times as long as wide; venation typical triozine, Rs long and sinuate. Hind tibia with two inner apical spines, large basal spur. Caudal spur of metacoxa small, erect, straight, an anterior one of about the same size but flattened.

**GENITALIA:** Male proctiger in lateral view produced caudad as a lobe of variable size and shape, from slender to almost triangular, length through lobe not greater than that of vertical axis, with distinct apical epiphysis. Forceps as long as proctiger in lateral view, slightly curved cephalad apically to acute apices, flattened and somewhat incurved apically; in caudal view straight, narrow. Female genital segment short, about as long as last abdominal sternite; dorsal valve downcurved, black-tipped, acute, anal pore  $\frac{1}{2}$  total length; ventral valve shorter, black and acute apically, slightly produced.

This species is quite variable in color and to a lesser extent in other characters. I have at hand a series of specimens sent to me by Mr. J. R. Eyer of the New Mexico State Agricultural College in which two quite distinct, color "phases" occur. In addition to the typical black individuals, there are numerous specimens so light in color that the general color appears to be yellow. Mr. Eyer reports that these yellow forms occur over the states of New Mexico and Arizona on potatoes in conjunction with the typical ones. He adds that he can find no difference in the nymphs nor in the effect that they have on the potato plants. It is my opinion after examination of the specimens that they do not constitute a species but simply a color variant such as is found in other species of psyllids (*Trioza minuta*, for example). It is possible but improbable that they are merely teneral forms, but as the specimens at hand are mounted on slides or are in alcohol this is difficult to determine. As Knowlton and Janes have pointed out, for 2 or 3 days after emerging, the adults are greenish or amber-colored, subsequently attaining the typical black coloration.

This is the widely known "potato psyllid" or "tomato psyllid" which has developed into one of the most important potato and tomato insects in the western part of North America. The feeding of the nymphs causes the diseased condition known as "psyllid yellows." Numerous solanaceous plants have been recorded as definite hosts supporting the nymphal stages as well as the adult. The adults have been taken on several other plants (see Knowlton, 1933).

The life history has been worked out in detail by Knowlton and Janes (loc. cit.) in Utah. The following brief account is taken from Knowlton (1934):

"The winter is passed in the adult stage, the psyllids finding shelter over winter in the various favorable places which are available. Lack of

excess moisture is important to successful survival. As the early spring host plants, such as matrimony vine, begin to produce their first leaves, the adult potato psyllids congregate upon them, beginning to lay eggs when the leaves are only  $\frac{1}{4}$  to  $\frac{1}{2}$  developed. A part of the first generation usually is matured before the last of the early potato crop has sprouted from the ground. Where breeding plants are not available, adult psyllids will survive for several weeks, feeding upon conifers, grasses, or upon almost any other succulent plant until the potato crop is available. The average number of eggs laid by an individual female is between 300 and 400, most of which hatch under favorable conditions. The eggs of the potato psyllid hatch in from 3 to 9 days in warm weather but may require a longer time if the weather is cool. Upon hatching, the nymph crawls from the egg, creeps down the pedicel supporting the egg, and soon settles down to feeding. Under favorable conditions each nymph passes through 5 molts and instars, or growth periods, requiring from 12 to 19 days for completion. If conditions for growth are unfavorable, the number of molts may vary from four to six; the developmental period may also be longer. No pupal or rest stage occurs in the development of this insect, the winged adult developing directly from the last nymphal stage or instar. Newly emerged adults are usually pale green or light amber in color, darkening to brown and then to blackish-brown during the first 2 or 3 days. The proportion of developing adults is approximately 50 per cent females and 50 per cent males . . .

"Males of the potato psyllid seldom live longer than 1 month; however, 1 female which was under observation lived for more than 6 months, depositing 1,352 eggs over a period of 179 days. Females usually begin laying eggs in from 5 to 12 days after becoming winged; on the average, they continue to lay eggs for the next three weeks, usually depositing from 5 to 50 eggs per day. In northern Utah, 3 to 4 generations develop in 1 season, depending both upon the host sequence available and the length of the season."

For a discussion of "psyllid yellows," the condition caused by feeding of the nymphs, *Psyllid yellows of the Potato*, Richards and Blood (1933), should be consulted.

Numerous specimens are at hand from many localities in Colorado, New Mexico, Arizona, and California. Mr. Oman records the following additional localities from the material in the United States National Museum: Utah, Texas (Winter Garden section of the Rio Grande Valley), Oklahoma (Stillwater), Nebraska (Lincoln, Scottsbluff), South Dakota (Brookings). It has also been recorded from Nevada, Idaho, Montana, Wyoming, Alberta, and Minnesota. As can be judged from these distributional records, it occurs throughout the western portions of North America wherever the winters are neither too cold nor too damp.

*Paratrioza maculipennis\** (Crawford)

(Fig. 270)

- 1910 *Trioza maculipennis* Crawford, Pom. Coll. Jour. Ent. 2:230, 237.  
 1911 *Paratrioza maculipennis* Crawford, Pom. Coll. Jour. Ent. 3:446, 450.  
 1913 *Trioza maculipennis* Aulmann, Psy. Cat. 48.  
 1914 *Paratrioza maculipennis* Crawford, U. S. Nat. Mus., Bull. 85:73.  
 1917 *Paratrioza maculipennis* Van Duzee, Cat. Hemip. N. Am. 792.  
 1932 *Paratrioza maculipennis* Klyver, Ent. News 43:35.

Length to tip of folded wings 3.5 mm.

COLOR: General color brown, darkest on abdomen and thoracic dorsum. Antennae black-tipped, apices of segments dark. Thoracic dorsum more or less prominently striped. Wings somewhat milky. Forewings with prominent brown maculae as follows: A narrow irregular one along anal margin from apex to cubital cell; another including most of cubital cell, more or less continuous across wing to furcation of R; an oblique one at tip of Rs; several small ones in clavus.

STRUCTURE: Head large, narrower than thorax. Eyes large. Vertex pubescent, almost flat, two discal foveae, margins prominent. Genal processes well developed but small, parallel to plane of vertex, divergent, less than  $\frac{1}{2}$  as long as vertex. Clypeus visible from front. Antennae about twice as long as width of head, first segment unusually large. Thorax moderately arched, pubescent. Pronotum depressed below plane of vertex. Prescutum broad. Forewings acutely angled,  $2\frac{3}{5}$  times as long as wide; Rs very short, slightly arcuate to costa, media strongly curved, marginal cells somewhat flattened, cubital larger than medial. Hind tibia with two inner apical spines, a prominent tubercle at base, scarcely a spur. Metacoxa with caudal spur of moderate size, anterior process well developed.

GENITALIA: Male proctiger short, with long sloping caudal lobes surrounding forceps, axis through lobes longer than axial portion. Forceps in lateral view broad, curved cephalad to acute apices; in caudal view broad basally, narrowed and arched, apices touching. Female genital segment about as long as preceding sternite; ventral valve produced as a broad truncate tooth; dorsal valve longer than ventral, downcurved, acute, black-tipped.

This beautifully marked species is easily distinguished from other members of the genus by the maculate wings. Specimens are at hand from Anaheim, Sargent, and Strawberry, California. Originally described from California, it has been recorded from numerous localities in that state but from nowhere else. It has been taken on numerous plants, but the host is still unknown.

TYPE, male, San Mateo County, California, Baker, in Crawford Collection.

\* From *macula* -ae, L. f. noun—spot + *pennis*, L.—wing.

*Paratrioza arbolensis\** Crawford

(Fig. 207, 208, 273)

- 1910 *Paratrioza arbolensis* Crawford, Pom. Coll. Jour. Ent. 2:229.  
 1911 *Allotriozia arbolensis* Crawford, Pom. Coll. Jour. Ent. 3:442, 444.  
 1912 *Allotriozia arbolensis* Patch, Me. Agr. Exp. Sta., Bull. 202:231.  
 1914 *Paratrioza arbolensis* Crawford, U. S. Nat. Mus., Bull. 85:72.  
 1917 *Paratrioza arbolensis* Van Duzee, Cat. Hemip. N. Am. 792.

Length to tip of folded wings 4 to 4.5 mm.

COLOR: General color light green to greenish gray. Abdomen darker green to brown. Vertex with anterior band and discal spots typical of genus, dark. Thoracic dorsum with brown longitudinal stripes. Portions of pleurae, ventral side of head and femora brown. Antennae black at tip and at apices of segments. Wings hyaline.

STRUCTURE: Head large, narrower than thorax, not deflexed, flat. Vertex broadly excavate, anterior margin abrupt, medial suture prominent, two very prominent discal sulci. Genal processes definite but very short, projecting forward, strongly divergent. Clypeus large, easily visible from in front. Antennae from  $2\frac{1}{4}$  to  $2\frac{1}{2}$  times as long as width of head. Thorax broad, not strongly arched. Pronotum long, weakly descending cephalad, not depressed below plane of vertex. Forewings large, acutely angled, almost 3 times as long as wide, costal margin arched; Rs moderately long, reaching furcation of media, slightly sinuate, cubital cell very large and long. Legs very large. Hind tibia with two inner apical spines, prominent basal spur. Tarsal segments very long, claws unusually large. Caudal metacoxal processes small, anterior pair larger.

GENITALIA: Male proctiger very short with broad irregularly margined caudal lobes, no epiphysis. Forceps longer than proctiger, flattened; in lateral view broad, apices curved cephalad, beaklike, very sharp-pointed, apical margins black; in caudal view broad at base, narrowed apically. Female genital segment longer than preceding sternite; ventral valve broad, with sharp black median tooth; dorsal valve longer than ventral, narrowed in apical  $\frac{1}{2}$ , dorsal margin almost straight, apex sharp, slender, black, upcurved.

I have a long series of this species, including nymphs, collected on *Shepherdia argentea* Nutt. near Durango, Colorado, July 17, 1938. Other specimens are at hand from various points in Colorado; Green River, Wyoming; and Poplar, Montana.

Host *Shepherdia argentea* Nutt.

TYPE, female, Arboles, Colorado, C. F. Baker, in Crawford Collection.

*Paratrioza dorsalis†* (Crawford)

(Figs. 227, 228, 309)

- 1914 *Kuwayama dorsalis* Crawford, U. S. Nat. Mus., Bull. 85:67.  
 1917 *Kuwayama dorsalis* Van Duzee, Cat. Hemip. N. Am. 791.

\* Adjectival form of *Arboles*—a small town in Colorado near which the original collection was made.

† This appears to be a misspelling of *dorsalis* -e, L. adj.—dorsal; no derivation was given by the author.

Length to tip of folded wings 3.5 to 3.75 mm.

**COLOR:** Male shining deep brown on head, dorsum of thorax and dorsum of abdomen; venter of abdomen lighter to green, pleurae and venter of thorax brownish to yellow; antennae light, segments black-tipped; margin of first abdominal tergite prominently white; proctiger and forceps white; wings hyaline. Female dark brown only on dorsum of abdomen, remainder of body reddish, legs lighter, with brown reticulate markings on prescutum, scutum, and scutellum, pattern much as on *Paratrioza cockerelli*.

**STRUCTURE:** Head narrower than thorax, short. Vertex twice as wide as long, somewhat flattened, discal impressions shallow, margins somewhat sharp, sparsely pubescent. Genae scarcely swollen beneath antennae. Clypeus small, visible from front. Antennae slender, slightly over twice as long as width of head. Thorax moderately arched. Pronotum short and depressed below plane of vertex. Prescutum broad, rounding anteriorly. Forewings 2½ times as long as wide, angulate, costal margin strongly arched; Rs short, almost straight, not reaching fork of media. Legs sturdy. Hind tibia with double basal spur, two inner apical spines. Metacoxa with caudal spur small, erect, with small one anteriorly.

**GENITALIA:** Male proctiger with broad caudally projecting lobes reaching almost to base of forceps, axis through lobe as long as axial portion, prominent epiphysis apically. Forceps in lateral view almost parallel-margined to near apices then strongly curved cephalad to acute apices; in caudal view broad in basal half then narrower to apices, slightly arched. Female genital segment short; ventral valve shorter than preceding sternite, broad, broadly excavate apically with a median tooth; dorsal valve longer, narrow, overhanging, "hood-shaped," apex acute, black.

Described from one male from Cochise County, Arizona, which was compared with the male type by Mr. Oman, and from four females. One of the females bears the same data as the male and is designated as the **ALLOTYPE**, Cochise County, Arizona, July 29, 1927, R. H. Beamer. Allotype in Snow Collection, University of Kansas. The three paratypes bear data as follows: Chiricahua Mountains, Arizona, July 8, 1932, R. H. Beamer (1); Arizona, A. Koebele (2). The latter are in the United States National Museum, the former in the author's collection.

**TYPE**, male, No. 18080 United States National Museum.

Type examined.

#### *Paratrioza lavaterae\** (Van Duzee)

1925 *Kuwayama lavaterae* Van Duzee, Pan-Pac. Ent. 1:22.  
1932 *Kuwayama lavaterae* Klyver, Ent. News 43:33.

Length to tip of folded wings 3.25 to 3.75 mm.

**COLOR:** "Male mostly black; edge of vertex, antennae, frontal cones

\* Genitive of *Lavatera*—the generic name of the host.

(genae), clypeus, lateral tubercle of pronotum, some marks at base of wings, hind margin of tergal segments one and six and legs, whitish; apical segment of antennae, tips of four preceding and base of first, and the hind femora, except apex, black; anterior and intermediate femora with a brown cloud above; tarsal claws black; wings clear, veins pale, the marginal scarcely darker. Sometimes the mesonotum shows four longitudinal vittae, and there may be one on the prescutum. Female paler, yellowish fulvous to brown, more or less variegated with darker; antennae as in male." —Van Duzee.

**STRUCTURE:** Head and thorax sparsely pubescent. Head narrower than thorax. Vertex sharply margined, "plate-like," slightly less than twice as wide as long, discal impressions prominent. Genae produced as small tubercles or pads, not conical. Antennae slender, twice as long as width of head. Thorax strongly arched, prominently punctate. Pronotum strongly descending, short. Prescutum acute anteriorly. Forewings rounding apically, barely angulate, somewhat over 2½ times as long as wide; Rs long, sinuate, exceeding point of furcation of media, medial cell somewhat larger than cubital. Hind tibia with small basal spur, two inner apical spines. Small anterior metacoxal process.

**GENITALIA:** Male proctiger short, with large caudal lobes, latter broad basally then attenuate and overlapping, longer than axial portion. Forceps in lateral view narrow basally, slightly enlarged, then narrowed to acute apices, slightly curving cephalad; in caudal view fairly stout, parallel-margined, somewhat incurved apically. Female genital segment about as long as 2 preceding segments; ventral valve produced as large, blunt, black tooth; dorsal valve exceeding ventral, slender apically, blunt, black-tipped.

Described from a pair of paratypes. This species was described by Van Duzee from specimens taken on its host plant *Lavatera assurgentiflora* from San Francisco, California. Known only from California.

**TYPE**, male, No. 1592, Museum of the California Academy of Sciences.

#### *Paratrioza dubia\** n. sp.

(Figs. 229, 230, 310)

Length to tip of folded wings 3.5 to 3.75 mm.

**COLOR:** General color of head and thorax whitish with orange to brown markings. Vertex light with a narrow band anteriorly and a short transverse band posteriorly, latter often broken. Genae light. Antennae white, apices of segments dark. Thoracic dorsum with somewhat variable longitudinal stripes. Legs light. Dorsum of abdomen chocolate brown, margin of first tergite white. Venter lighter. Genitalia light. Wings smoky.

**STRUCTURE:** Head narrower than thorax. Vertex almost twice as wide as long, margins sharply raised, discally strongly depressed, 2 foveae

\* *dubius -a -um*, L. adj.—doubtful.

near caudal margin, medial suture prominent. Genae slightly swollen, padlike, not conical. Antennae twice as long as width of head. Thorax well arched. Pronotum short, depressed below plane of vertex. Prescutum acute anteriorly. Forewings large, straight, angular,  $1\frac{3}{4}$  times as long as wide; Rs long, sinuate, reaching point of furcation of media, marginal cells about equal. Legs large. Hind tibia with small basal spur, two inner apical spines. Metacoxa with caudal spur of moderate size, small anterior one.

**GENITALIA:** Male proctiger with large slanting caudal lobes, axis through lobes longer than axial portion, lobes enclosing forceps, anus on an oblique epiphysis. Forceps shorter than proctiger; in lateral view slender, very strongly curved cephalad to sharp apices; in caudal view broad basally then slender, slightly arched to apices. Female genital segment short, ventral valve quite flat, rounded and dark apically; dorsal valve narrower, hood-shaped, overhanging, apex black.

**HOLOTYPE**, male, **ALLOTYPE**, female, Patagonia, Arizona, June 24, 1933, R. H. Beamer; four **PARATYPES** same data, two male, three female; **PARATYPES** same data collected by P. W. Oman; one male and two female **PARATYPES** Tubac, Arizona, June 24, 1933, P. W. Oman.

Holotype, allotype, and paratypes in Snow Collection, University of Kansas, paratypes in United States National Museum and author's collection. One male and one female are also at hand from California which are probably this species.

This species resembles both *cockerelli* and *lavaterae* but is distinct, as judged by available specimens.

#### Genus *Kuwayama*\*

- 1911 *Epitriozza* Crawford, Pom. Coll. Jour. Ent. 3:423, 452.  
[non] *Epitriozza* Kuwayama, 1910.
- 1911 *Kuwayama* Crawford, Pom. Coll. Jour. Ent. 3:503.
- 1914 *Kuwayama* Crawford, U. S. Nat. Mus., Bull. 85:65.
- 1917 *Kuwayama* Van Duzee, Cat. Hemip. N. Am. 791.

Head narrower than thorax, scarcely deflexed. Vertex not distinctly margined, rounded anteriorly. Genae spherically swollen, prominent. Clypeus visible from anterior view. Antennae slender, moderately long. Thorax not strongly arched. Pronotum short, descending anteriorly. Forewings membranous, elongate, acute to subacute apically, venation triozine. Hind wings slender. Metatibia with basal spur, two inner and one outer apical spines.

**Orthotype:** *Kuwayama medicaginis* (Crawford)

Although this genus is quite similar to *Paratriozza* in many respects it is distinct in the structure of the vertex and genae and in the type of genitalia, both male and female. The type species apparently represents the northernmost member of a natural group, as its congenors are found in Mexico and on various Pacific Islands.

\* The name of Kuwayama, a Japanese entomologist.

The species *dorsalis* Crawford and *lavaterae* Van Duzee have been referred to *Paratriozza* as they show much more relationship to the species of that genus than to *medicaginis*.

#### *Kuwayama medicaginis*\* (Crawford)

(Figs. 209, 210, 211, 268)

- 1910 *Paratriozza medicaginis* Crawford, Pom. Coll. Jour. Ent. 2:229.
- 1911 *Epitriozza medicaginis* Crawford, *ibid.* 3:452.
- 1914 *Kuwayama medicaginis* Crawford, U. S. Nat. Mus., Bull. 85:66.
- 1917 *Kuwayama medicaginis* Van Duzee, Cat. Hemip. N. Am. 791.
- 1932 *Kuwayama medicaginis* Klyver, Ent. News 43:12.

Length to tip of folded wings 3 mm.

**COLOR:** General color sordid white to yellowish. Flavous markings on vertex and thorax, latter forming incomplete longitudinal stripes. Distal tarsal segments and apical  $\frac{2}{3}$  of antennae fuscous. (Crawford records the color as "yellowish green throughout." This is possibly the color of living specimens.)

**STRUCTURE:** Head narrower than thorax. Vertex long, discal impressions very deep; anterior margin overhanging median ocellus, somewhat rounded down. Genae swollen ventrally (rarely with any suggestion of a cone-shaped projection), not touching. Clypeus plainly visible from front. Antennae about  $1\frac{1}{3}$  times as long as width of head. Thorax moderately arched. Pronotum not depressed below plane of vertex. Forewings slender, straight, angulate, almost 3 times as long as broad; Rs long, sinuate. Hind tibia with two inner apical spines, prominent basal spur.

**GENITALIA:** Male proctiger short, curved caudad, caudal margin roundly produced, narrow apical epiphysis. Forceps almost as long as proctiger, broad basally, narrowed to obliquely truncate apices; flattened apically, apical margin heavy, crenate, black; a prominent, acute, antero-lateral projection shorter than principal portion; base heavily pubescent. Female genital segment almost as long as rest of abdomen; apical portion of ventral valve very slender, acute, dark; dorsal valve longer, roundly blunt, black apically.

Numerous specimens are at hand from various localities in Arizona, New Mexico, and Texas. Originally described from Colorado (?) and subsequently recorded from California by Crawford.

Judging from the material at hand it appears that this species occurs in large numbers. Whether alfalfa (*Medicago sativa*) is a true host or not is undetermined.

**TYPE**, male and female on same point, in Crawford Collection, no locality label.

#### Genus *Neotriozella*† Crawford

- 1884 *Trioza* Forbes (*pro parte*), 14th Rept. Sta. Ent. Ill. 98.
- 1911 *Neotriozza* Crawford, Pom. Coll. Jour. Ent. 3:423, 450.  
[non] *Neotriozza* Kieffer, Ann. Soc. Sci. Brux. 29:32, 1904-05 [fide Aulmann].

\* Apparently intended as the genitive of *Medicago*, the supposed host plant.

† From *neos*, Gr.—new + *triozella*—a diminutive form of *trioza*.

- 1911 *Neotriozella* Crawford, Pom. Coll. Jour. Ent. 3:503.  
 1914 *Neotriozella* Crawford, U. S. Nat. Mus., Bull. 85:98.  
 1917 *Neotriozella* Van Duzee, Cat. Hemip. N. Am. 798.  
 1939 *Neotriozella* Tuthill, Bull. Brooklyn Ent. Soc. 34:51.

Head as broad as or broader than thorax, deflexed. Vertex nearly plane, lateral ocelli borne on raised portions of vertex. Genae produced as elongate, slender, vertical processes, contiguous throughout their length or nearly so. Antennae moderately long. Body small, slender. Thorax very strongly arched. Pronotum short, very strongly descending cephalad. Proepisternum strongly produced laterad as flat plate behind eyes. Forewings membranous, long, acutely pointed, venation triozine. Hind wings slender, much shorter than forewings. Metatibia with one or more basal spurs, two or three inner and one outer apical spines.

Orthotype: *Neotriozella pyrifolii* (Forbes).

#### Key to the Species of *Neotriozella*

1. Genal processes white..... 2.
- Genal processes black..... 3.
2. Body glabrous, red to brown in color..... *pyrifolii* p. 594.
- Body pubescent, very light colored..... *hirsuta* p. 595.
3. Genal processes longer than vertex..... *sculptoconus* p. 596.
- Genal processes shorter than vertex..... *laticeps* p. 596.

#### *Neotriozella pyrifolii\** (Forbes)

(Figs. 236, 237, 274)

- 1884 *Trioza pyrifoliae* Forbes, 14th Rept. Sta. Ent. Ill. 98-99.  
 1910 *Trioza immaculata* Crawford, Pom. Coll. Jour. Ent. 2:233.  
 1911 *Neotriozella immaculata* Crawford, Pom. Coll. Jour. Ent. 3:450.  
 1912 *Neotriozella ottawanensis* Patch, Me. Agr. Exp. Sta., Bull. 202:231.  
 1914 *Neotriozella immaculata* Crawford, U. S. Nat. Mus., Bull. 85:98.  
 1914 *Trioza proboscidea* Crawford, U. S. Nat. Mus., Bull. 85:99.  
 1917 *Neotriozella immaculata* Van Duzee, Cat. Hemip. N. Am. 798.  
 1918 *Neotriozella immaculata* McAtee, Ent. News 29:223.  
 1927 *Trioza pyrifoliae* Frison, Ill. Nat. Hist. Surv., Bull. 16:154 [lectotype designated].  
 1938 *Neotriozella immaculata* Caldwell, Ohio Biol. Surv., Bull. 34:253.  
 1939 *Neotriozella pyrifolii* Tuthill, Bull. Brooklyn Ent. Soc. 34:51.

Length to tip of folded wings 3.5 mm.

COLOR: General color of thorax orange red, head and abdomen brown. Vertex brown to black discally, white to orange on margins. Genal processes white, sometimes brown apically. Antennae black. Pronotum light. Scutum with more or less distinct brown stripes. Legs light to brown.

STRUCTURE: Body slender. Head large, about as broad as thorax. Disc of vertex almost flat. Lateral ocelli very prominently raised, medial suture very prominent. Vertex and pronotum sparsely pubescent. Genal processes slender, attenuate, vertical to retrorse, as long as vertex, or longer. Post-ocular portion of occiput swollen, prominent. Antennae

slender, not quite twice as long as width of head. Thorax strongly arched. Pronotum short, depressed below plane of vertex. Forewings long, slender, blunt, about 3 times as long as wide; Rs very long, sinuate. Hind wings very long, twice as long as abdomen. Legs slender. Hind tibia with three inner apical spines, with two basal spurs.

GENITALIA: Male genitalia small. Proctiger pyriform, longer than forceps. Forceps short, broad, spatulate in lateral view; in caudal view slender, straight. Female genital segment almost as long as rest of abdomen; ventral valve slender, acute, dark at apex; dorsal valve longer than ventral, attenuate, not as sharp as ventral.

Originally described from Illinois by Forbes, this species has also been recorded from Iowa (Ames), District of Columbia, Ontario, and Nova Scotia. Specimens are at hand from all the above localities and from Tallulah, Louisiana. The latter series was taken in airplane traps by P. Glick.

TYPE, male, in Illinois Natural History Survey Museum.  
 Male paratype examined.

#### *Neotriozella hirsuta\** Tuthill

(Figs. 231, 311)

- 1939 *Neotriozella hirsuta* Tuthill, Bull. Brooklyn Ent. Soc. 34:52.

Length to tip of folded wings 3 mm.

COLOR: General color yellowish white. Eyes, lower edge of margin of vertex, tips of antennal segments and tarsi dark. Prescutum and scutum with yellow stripes. Wings hyaline.

STRUCTURE: Head, thoracic dorsum, legs and genital segments with sparse, rather long, silky pubescence. Head large, as wide as thorax. Anterior margin of vertex very abrupt and protruding, disc distinctly concave. Genal processes longer than vertex, closely appressed, rather thick, moderately acute at apex. Antennae slightly over 1½ times as long as width of head. Thorax strongly arched. Forewings about 3 times as long as wide, veins setaceous. Hind wings long, prominently punctate. Hind tibia with one very large basal spur, two inner apical spines.

GENITALIA: Male genitalia moderate in size, covered with very long, fine pubescence. Proctiger greatly produced caudad into enveloping posterior lobes. Forceps as long as proctiger; in lateral view broadest at base, strongly curved caudad to acute black apices; in caudal view evenly incurved, broadest before apex, inner anterior margin produced medially into a blunt, black-margined tooth. Female genital segment rather short, quite suddenly narrowed to black tip; dorsal valve longer than ventral, apices of valves broad and flat.

Known only from the type pair from Arizona.

TYPE, male, in Snow Collection, University of Kansas.

\* Apparently from *Pyrus*—the pear + genitive of *folium* -ii, L. n. noun—leaf (heretofore used with the incorrect ending -ae).

\* *hirsutus* -a -um, L. adj.—hairy.

*Neotriozella sculptoconus\** Crawford

- 1914 *Neotriozella sculptoconus* Crawford, U. S. Nat. Mus., Bull. 85:99.  
 1914 *Trioza frontalis* Crawford, U. S. Nat. Mus., Bull. 85:100.  
 1917 *Neotriozella sculptoconus* Van Duzee, Cat. Hemip. N. Am. 798.  
 1939 *Neotriozella sculptoconus* Tuthill, Bull. Brooklyn Ent. Soc. 34:52 [female described].

Length to tip of folded wings 3 mm.

COLOR: Thorax orange to red. Abdomen brownish, lighter beneath. Disc of vertex reddish brown, margin light. Antennae and genal processes black. Pro- and mesotibiae and tarsi dark. Wings hyaline.

STRUCTURE: Head about as wide as thorax. Disc of vertex depressed leaving raised margins except medially in front, pubescent. Genal processes large, acute, contiguous throughout, as long as vertex or a little longer, parallel to plane of vertex. Antennae thick, especially basally, slightly over twice as long as width of head. Thorax slender, very strongly arched. Pronotum depressed, with sparse pubescence. Very short sparse pubescence on remainder of thorax. Forewings long, slender, angulate, 3 times as long as wide; Rs shorter than in *pyrifolii*. Hind wings long, greatly exceeding abdomen. Hind tibia with three inner apical spines, two basal spurs. Metacoxa somewhat produced anteriorly, not spiniform.

GENITALIA: "Male genitalia resemble those of *immaculata*; anal valve relatively longer and produced more into a posterior lobe; forceps broadest subapically, flattened at apex."—Crawford.

Female genitalia similar to *pyrifolii*, almost as long as rest of abdomen, slender; ventral valve narrowed to acute apex; dorsal valve longer than ventral, attenuate, not as sharp, black-tipped.

Known only from three specimens, all from California; two males from Placer and Nevada Counties collected in September by Koebele, one female from Big Bear Lake, July 26, 1932, R. H. Beamer. The above description is from the female allotype.

TYPE, male, No. 18091 United States National Museum.

Type examined.

*Neotriozella laticeps†* (Crawford)

- 1910 *Trioza laticeps* Crawford, Pom. Coll. Jour. Ent. 2:233.  
 1911 *Neotriozella laticeps* Crawford, Pom. Coll. Jour. Ent. 3:451.  
 1914 *Neotriozella laticeps* Crawford, U. S. Nat. Mus., Bull. 85:100.  
 1917 *Neotriozella laticeps* Van Duzee, Cat. Hemip. N. Am. 798.  
 1932 *Neotriozella laticeps* Klyver, Ent. News 43:38.  
 1939 *Neotriozella laticeps* Tuthill, Bull. Brooklyn Ent. Soc. 34:53.

Crawford's description of this species is as follows:

"Length of body 1.6 mm.; length of forewing 2.7; width of head 0.62. General color dark brown, thorax lighter; head and genal cones black.

"Head strongly deflexed, distinctly broader than thorax, slightly

\* From *sculptus*, L. (p. part. of *sculpo*—to carve, grave) + *conus* -i, L. m. noun—cone.

† From *latus* -a -um, L. adj.—broad + *ceps* a combining form of *caput*, L. n. noun—head.

punctate; vertex rather sharply defined on margin, scarcely impressed discally, slightly emarginate over front ocellus; genal cones not longer than vertex, acute, more abruptly converging to apex than in *immaculata*, vertical or retrorse, slightly pubescent. Antennae very slender.

"Thorax arched, narrow, punctate, slightly pubescent. Wings hyaline, narrower than in *immaculata*, relatively longer usually, subacute at apex.

"Genitalia: Female genital segment almost as long as rest of abdomen, very acute at apex; dorsal valve longer and larger than ventral, very acute.

"Described from one female collected by G. R. Pilate in Louisiana. This is very close in many respects to *immaculata*."

TYPE, female, No. 18092 United States National Museum.  
 Type examined.

Genus *Metatrioza*\* Tuthill

- 1939 *Metatrioza* Tuthill, Bull. Brooklyn Ent. Soc. 34:53.

Head large, at least as broad as thorax. Vertex with sharp anterior and posterior margins, strongly concave between eyes, medial suture prominent. Genal processes not contiguous. Clypeus very small. Dorsum of thorax rather broad and flat, pronotum not depressed below head. Forewings with typical triozine venation, except cubital cell which is unusually large. Metatibia with large basal spur, one outer and two inner apical spines.

Orthotype: *Metatrioza pubescens* Tuthill.

*Metatrioza pubescens*† Tuthill

(Figs. 232, 233, 238, 312)

- 1939 *Metatrioza pubescens* Tuthill, Bull. Brooklyn Ent. Soc. 34:53.

Length to tip of folded wings 4 mm.

COLOR: General color reddish brown. Genal processes, pronotum and posterior portion of vertex yellow. Venter and antennae dark. Forewings hyaline, hind wings more or less white.

STRUCTURE: Body finely punctate, clothed with short, fine pubescence, including veins of forewings, pubescence most prominent on genital segments, legs, and antennae. Head very large, as wide as thorax, 3 times as wide as long in dorsal view, strongly deflexed. Vertex as long as wide, sharply margined both anteriorly and posteriorly, deeply excavate, medial suture prominent. Anterior ocellus large, beneath overhanging margin of vertex. Frons visible as a distinct sclerite, not covered by genal processes, latter not contiguous, short,  $\frac{1}{2}$  as long as disc of vertex, slightly divergent, rather blunt. Clypeus very small, entirely invisible from front.

\* meta, Gr. prep.—in company with + *trioza*.

† *pubescens*, L. (pres. part. of *pubescere*)—pubescent, having hair.

Antennae slightly over twice as long as width of head. Pronotum not depressed below level of head, episterna strongly produced. Prescutum not very strongly arched, about  $1\frac{1}{3}$  times as wide as long. Forewings acute at apex, 3 times as long as wide; veins prominently pubescent, marginal cells large, cubital larger than medial, Rs very long, curved. Venation of hind wings unusually prominent. Hind tibia with very prominent basal spur, two inner and one outer apical spines.

**GENITALIA:** Male genitalia of moderate size. Proctiger longer than forceps, almost equilaterally triangular in outline, broadest near base, truncate at apex. Forceps simple; in caudal view somewhat broader at base, slightly bowed, apices blunt, with very small medial black tooth. Female genital segment quite large, about  $\frac{3}{4}$  as long as rest of abdomen; dorsal valve longer than ventral.

Known only from the type series from the Baboquivari Mountains, Arizona. Host plant unknown.

**TYPE,** male, in Snow Collection, University of Kansas.

#### Genus *Leuronota*\* Crawford

- 1910 *Trioza* Crawford (*pro parte*), Pom. Coll. Jour. Ent. 2:230, 349.
- 1911 *Allotrioza* Crawford (*pro parte*), Pom. Coll. Jour. Ent. 3:423, 442.
- 1914 *Leuronota* Crawford, U. S. Nat. Mus., Bull. 85:67.
- 1917 *Leuronota* Van Duzee, Cat. Hemip. N. Am. 791.
- 1920 *Leuronota* Crawford, Proc. Haw. Ent. Soc. 4:374.
- 1928 *Leuronota* Ferris, Can. Ent. 60:240.

Head narrower than thorax, scarcely or not at all deflexed. Genae produced as conical processes, porrect. Antennae slender, long. Eyes hemispherical. Thorax scarcely arched. Pronotum flat, long, on same plane as vertex and prescutum, produced cephalad medially as blunt epiphysis, very narrow. Proepisterna very large, visible in dorsal view as prominent quadrate lateral processes. Prescutum flat with a small median anterior epiphysis. Mesopleurites strongly developed. Forewings long, slender, angulate, venation triozine. Legs long. Metatibia with basal spur, two or three inner, one outer apical spines.

**Orthotype:** *Leuronota maculata* (Crawford).

A total of nine species has been referred to this genus, only two of which occur north of Mexico. Three of the nine were originally described in *Cerotrioza* by Crawford and subsequently (1920) placed in *Leuronota* by him. From his descriptions of these latter species it seems unlikely that they are congenors of *maculata*, but as I have seen no specimens of any of the three, no other disposition can be made at this time.

The nymphs apparently produce galls or semi-galls on their host plants.

\* From *leuros*, Gr. Adj.—flat + *noton* —i, Gr. m. noun—back.

#### Key to the Species of *Leuronota*

1. Antennae  $2\frac{1}{2}$  times as long as width of head; genal processes somewhat descending ..... *maculata* p. 599.
- Antennae 3 times as long as width of head; genal processes extending forward on same plane as vertex ..... *longipennis* p. 599.

#### *Leuronota maculata*\* (Crawford)

(Figs. 239, 240, 241, 275)

- 1910 *Trioza maculata* Crawford, Pom. Coll. Jour. Ent. 2:230, 349.
- 1911 *Allotrioza maculata* Crawford, Pom. Coll. Jour. Ent. 3:444, 446.
- 1913 *Trioza maculata* Aulmann, Psy. Cat. 48.
- 1914 *Leuronota maculata* Crawford, U. S. Nat. Mus., Bull. 85:68.
- 1917 *Leuronota maculata* Van Duzee, Cat. Hemip. N. Am. 791.
- 1928 *Leuronota maculata* Ferris, Can. Ent. 60:240.
- 1932 *Leuronota maculata* Klyver, Ent. News 43:34.

Length to tip of folded wings 3.25 to 4 mm.

**COLOR:** General color dirty white to brown, abdomen darker. Forewings with numerous small brown dots forming maculae as figured, amount of maculation quite variable.

**STRUCTURE:** Entire body more or less pubescent. Head narrower than thorax, not deflexed. Vertex almost plane, discal foveae more or less prominent. Genal processes short, blunt, divergent apically, about  $\frac{1}{2}$  as long as vertex, somewhat deflexed from plane of vertex. Antennae slender,  $2\frac{1}{2}$  times as long as width of head. Clypeus large, visible in cephalic view. Thorax scarcely arched. Pronotum flat, above plane of vertex, acute epiphysis medially on anterior margin fitting into excavate posterior margin of vertex. Prescutum broad, lateral margins long. Forewings slender, 3 times as long as wide or slightly over, roundingly angulate; Rs straight then arched to costal margin, cubital cell larger than medial. Hind tibia with three inner apical spines.

**GENITALIA:** Male proctiger of medium length, rather stout, straight, anal pore opening antero-dorsally. Forceps very short; in lateral view broad, produced dorso-cephalicly as long, acute lobes; in dorso-caudal view broad, flattened, arched to black-tipped apices. Female genital segment about  $\frac{1}{2}$  as long as rest of abdomen, thick dorso-ventrally; dorsal valve somewhat hood-shaped, exceeding ventral, ventral margin of latter straight for about  $\frac{1}{2}$  its length then sharply upturned to acute apex.

Ferris gives *Celtis iguanea* as a definite host, having taken both nymphs and adults on this plant. Many specimens are at hand from Arizona taken on *Celtis pallidis* Torr.

**TYPE,** female, Arizona 2315, in Crawford Collection.

#### *Leuronota longipennis*† Crawford

- 1914 *Leuronota longipennis* Crawford, U. S. Nat. Mus., Bull. 85:68, 69.
- 1917 *Leuronota longipennis* Van Duzee, Cat. Hemip. N. Am. 791.

\* *maculatus*, L. (p. part. of *maculare*)—spotted.

† From *longus* —a —um, L. adj.—long + *pennis*, L. f. noun—wing.

Crawford's description of this species is as follows:

"Length of body 2.8 mm.; length of forewing 3.1; width of head 0.68.

"General color brown; genal cones, anterior margin of pronotum, part of sternum, legs, antennae except terminal segment very light brown; antennal segments tipped with brown.

"Head small, flattened, not deflexed, not as broad as thorax; vertex flat, with a broad, shallow depression on each side of median line, smooth; genal cones about  $\frac{2}{3}$  as long as vertex, extending forward in same plane with vertex, divergent, subacute at apex, slightly pubescent. Clypeus far back, with a conspicuous cavity in front of it between genae. Antennae more than 3 times as long as width of head, slender.

"Thorax not arched, flat, narrow; pronotum moderately long, anterior epiphysis smaller than in two preceding species [*maculata* and *crawfordi*]. Legs slender. Wings nearly 4 times as long as broad, very narrow, narrowly rounded at apex, apical third brown, basal  $\frac{2}{3}$  transparent, membrane coarsely punctate; first marginal cell larger than second; radial sector long.

"GENITALIA: Male genital segment small; anal valve much longer than forceps, fusiform, narrow at apex, with processes; forceps small, short, slender, acute at tip, strongly arcuate; pubescence short.

"Described from 1 male from Palm Beach, Florida (H. G. Dyar), no data.

"TYPE, Cat. No. 18081, United States National Museum.

"This species bears some resemblance to members of the European genus *Floria*."

Type examined.

#### Genus *Ceropsylla*\* Riley

- 1885 *Ceropsylla* Riley, Proc. Biol. Soc. Wash. 2:76.
- 1910 *Ceropsylla* Crawford, Pom. Coll. Jour. Ent. 2:229.
- 1911 *Ceropsylla* Crawford, Pom. Coll. Jour. Ent. 3:423.
- 1911 *Trioza* (pro parte) Crawford, Pom. Coll. Jour. Ent. 3:493.
- 1913 *Ceropsylla* Aulmann, Psy. Cat. 59.
- 1914 *Ceropsylla* Crawford, U. S. Nat. Mus., Bull. 85:100.
- 1917 *Ceropsylla* Van Duzee, Cat. Hemip. N. Am. 798.

Head narrower than thorax. Vertex smooth, somewhat rounded, portion bearing lateral ocelli very strongly raised, next eyes rounding evenly into genae, medially overhanging median ocellus. Genae produced as short, blunt processes extending somewhat forward, a second pair of small rounded processes next eyes, below antennal insertions. Antennae slender, long, arising close together and far down on genae, largely on genal processes. Eyes hemispherical, very large. Thorax strongly arched. Pronotum very short, vertical, depressed below vertex and prescutum. Proepisternum produced laterad, platelike. Prescutum as long as wide, very strongly arched. Mesopleurites strongly developed, episternum very large, swollen. Forewings large, membranous, angulate apically,

basal vein ( $R + M + Cu$ ) very long, parallel to costa, cubitus arising separately, radius and media with a short petiole,  $R$  very short,  $R_1$  long,  $Rs$  very short, no pterostigma. Hind wings much shorter than forewings. Metatibia with basal spur, one outer and two inner apical spines.

Haplotype: *Ceropsylla sideroxyli* Riley.

This genus is most peculiar in the characters of the head and venation of the wings. The position of the antennal insertion is unique, in the North American Psyllidae at least. The extremely long basal vein of the forewings is very distinctive as is the very short base of  $R$  and short  $Rs$ . Cubitus arises separately from the basal vein leaving radius and media with a short common base as described by Riley, not cubitus and media on a common petiole as Crawford states. This character I do not consider to be of the importance that Crawford attached to it.

Crawford synonymized his *Trioza* with *Ceropsylla*; from his descriptions and figures of *johsonii* it would seem to be congeneric with *sideroxyli* except for the disparity in wing venation. As no specimens of *johsonii* have been seen, it is left in this genus for the present. The other species placed here by Crawford, *californica*, is referred back to *Trioza*.

#### *Ceropsylla sideroxyli*\* Riley

(Figs. 242, 243)

- 1885 *Ceropsylla sideroxyli* Riley, Proc. Biol. Soc. Wash. 2:76.
- 1910 *Ceropsylla sideroxyli* Crawford, Pom. Coll. Jour. Ent. 2:229.
- 1911 *Ceropsylla sideroxyli* Crawford, Pom. Coll. Jour. Ent. 3:423.
- 1913 *Ceropsylla sideroxyli* Aulmann, Psy. Cat. 59.
- 1914 *Ceropsylla sideroxyli* Crawford, U. S. Nat. Mus., Bull. 85:101.
- 1917 *Ceropsylla sideroxyli* Van Duzee, Cat. Hemip. N. Am. 798.
- 1923 *Ceropsylla sideroxyli* Ferris, Can. Ent. 55:254 [nymph].
- 1928 *Ceropsylla sideroxyli* Ferris, Can. Ent. 60:245.

Length to tip of folded wings 4 mm.

COLOR: General color green to yellow. Front of head, between antennae, including genal processes, anterior  $\frac{2}{3}$  of prescutum and two broad stripes on scutum, dark brown. Antennae dark apically. Wings hyaline.

STRUCTURE: Dorsum with short sparse pubescence. Head small, narrower than thorax. Vertex very small, rounded downward both posteriorly and anteriorly, except over median ocellus. Eyes very large. Lateral ocelli on raised prominences, far forward, almost midway of eyes. Genae separated medially to above bases of antennae, below antennae genae produced into short, bluntly rounded processes. Antennae  $1\frac{1}{2}$  times as long as width of head, arising far down on genae, and close together. Thorax strongly arched. Pronotum depressed below plane of vertex. Prescutum large, rounded anteriorly, as long as wide. Mesopleurites very large, swollen. Forewings long, slender, acutely angled, 3 times as long as wide; basal vein ( $R + M + Cu$ ) very long;  $R$  and  $M$  with a short common stem;  $Rs$  very short, straight; cubital cell larger than medial. Hind tibia with small basal spur, one outer and two inner apical

\* Genitive of *Sideroxylum*—the generic name of the host.

\* From *ceros* -ou, Gr. m. noun—wax + *psylla*.

spines. Metacoxa with posterior spur of moderate size, anteriorly somewhat produced but not spiniform.

**GENITALIA:** Male proctiger produced caudad as a broad rounded lobe. Forceps shorter than proctiger; in lateral view slender, slightly curved cephalad, a short, slender, curved process near base on anterior margin; in caudal view slender to spatulate apices. Female genital segment longer than preceding sternite; ventral valve very broad, slightly sinuate to a medial, broad, truncate tooth; dorsal valve exceeding ventral, narrower, blunt.

Described from specimens from Lake Worth, Florida (E. A. Schwarz) in the United States National Museum. According to Riley this species forms galls on the leaves of "*Sideroxylon masticodendron*," evidently the mastic, the name of which as given by Sargent is *Sideroxylum foetidissimum* Jacq.

Ferris describes and figures the nymph which is apparently even more strikingly distinct than the adult. He also records it from Mexico, the only record of its occurrence outside of Florida.

**TYPE:** No. 695 United States National Museum (6 cotypes).

Types examined.

#### Genus *Hemitrioza*\* Crawford

1914 *Hemitrioza* Crawford, U. S. Nat. Mus., Bull. 85:104.  
1917 *Hemitrioza* Van Duzee, Cat. Hemip. N. Am. 798.

Head much narrower than thorax, deflexed. Vertex without abrupt margins. Genal processes short, strongly divergent. Clypeus small. Antennae moderately long. Eyes very small, hemispherical. Thorax broad, moderately arched. Pronotum short, depressed, strongly descending cephalad. Forewings short, membranous, bluntly angulate, usually media and cubitus with a short common basal petiole, sometimes none (varying on wings of individual), basal vein long. Hind wings much smaller than forewings. Metatibia without basal armature, one outer and three or four inner apical spines. Metatarsus without claws on basal segment.

**Orthotype:** *Hemitrioza sonchi* Crawford.

As Crawford notes, this genus while distinctly triozine in general, shows some psylline characteristics.

Klyver's species *washingtonia* appears from his figures to be congeneric with *sonchi* although it differs from the latter markedly in some respects, notably the very short antennae, the longer and less angulate wings, and the venation.

\* From *hemi*, Gr. prefix—half + *trioza*.

#### Key to the Species of *Hemitrioza*

1. Costal margin of forewings strongly arched, Rs arched to costa, short, not reaching furcation of media; general color red, antennae, tibiae and tarsi white, forewings maculate. .... *sonchi* p. 603.
- Costal margin of forewings not strongly arched, Rs long, straight, extending beyond furcation of media; general color brown, forewings immaculate  
*washingtonia* p. 604.

#### *Hemitrioza sonchi*\* Crawford

(Figs. 244, 245)

1884 *Trioza sonchi* Riley, Proc. A.A.S. 32:319 [nomen nudum].  
1913 *Trioza sonchi* Aulmann, Psy. Cat. 55 [nomen nudum].  
1914 *Hemitrioza sonchi* Crawford, U. S. Nat. Mus., Bull. 85:104.  
1917 *Hemitrioza sonchi* Van Duzee, Cat. Hemip. N. Am. 798.

Length to tip of folded wings 2.5 to 3 mm.

**COLOR:** General color red. Tibiae, tarsi, and antennae white, latter black-tipped. Wings hyaline except a broad band across middle and three or four spots on posterior margin, brown.

**STRUCTURE:** Head small. Vertex with deep discal foveae, rounding down in front, deeply emarginate. Eyes very small. Genal processes stout, strongly divergent, acute, about  $\frac{1}{2}$  as long as vertex. Antennae rather short, stout, slightly over twice as long as width of head, segment III thicker than distal segments. Thorax proportionately very broad, weakly arched. Pronotum almost as wide as head, above plane of vertex. Forewings short, slightly over twice as long as wide, narrowly rounded apically, membrane thickly set with minute setae. Costal margin strongly arched; media and cubitus with a short common petiole, length somewhat variable; Rs short, arched to costa. Hind wings very small, thickly set with minute setae. Hind tibia with three inner apical spines.

**GENITALIA:** Male genitalia described by Crawford as follows: "Forceps about  $\frac{1}{2}$  as long as anal valve, [proctiger] thick at base and converging to apex to a sharp toothlike point, arcuate somewhat; anal valve rather large, elliptical (from side view), broadest at middle; forceps and anal valve quite densely pubescent." Female genital segment longer than preceding sternite, ventral valve rounded apically, dorsal valve longer, blunt.

This species is represented in the material at hand by two females from the District of Columbia. It was described from Virginia, District of Columbia, and Atlanta, Georgia. It is recorded from *Sonchus arvensis* (Riley's specimens). Crawford mentions the nymph but gives no host plant data.

**TYPE:** female, No. 18094 United States National Museum.

Type examined.

\* Genitive of *Sonchus*—the generic name of the supposed host.

*Hemitrioza washingtonia\** Klyver

(Figs. 246, 247)

1932 *Hemitrioza washingtonia* Klyver, Pan-Pac. Ent. 8:14-15.

"Length of body on slide, 2.0 mm.; length of forewing, 1.8 mm.; width of head, .6 mm. General color of entire body uniform medium brown. Eyes dark brown. Genae lighter than the general color. Tip of antenna black. Wings uniform brown (including veins), semi-opaque, shiny; hind wings iridescent. Agreeing fairly well with the characters of the genus as defined by Crawford except that the head is not much narrower than the thorax, the eyes are not proportionately very small, and the hind tibia has 4 instead of 3 apical spines or teeth on the inner aspect."

"Head strongly deflexed. Antenna ten-segmented with the third segment nearly as long as segments 4, 5, 6, and 7 combined; antennal sensoria obscure; antenna scarcely as long as width of head."

"Thorax moderately arched; without pubescence. Posterior tibia with 1 large black tooth and a comb of setae on the outer aspect and with 4 black teeth, 2 of them large and 2 distinctly smaller, on the inner aspect. Forewing semi-opaque and punctate throughout with a suggestion of alar radulae in the 2 marginal cells and between  $Cu_1$  and  $M_3 + 4$ ; . . . with irregular venation, in the same individual . . . Posterior wing distinctly brown, with the venation . . . , developed for the most part as little more than streaks of brown along which the punctations that beset the entire wing membrane are arranged in more or less definite but irregular rows."

"Abdomen with the tergites and sternites uniformly and equally chitinized; with small pleurites at the lateral extremities of tergites 4, 5, 6, and 7. Male genitalia relatively small; the proctiger oval in lateral view, with sparse pubescence; the clasper simple in structure, with the distal end directed anteriorly."—Klyver.

This species was described from one male from Toppenish, Washington.

TYPE in Klyver's collection.

Genus *Levidea†* Tuthill1938 *Levidea* Tuthill, Ent. News 49:245.

Head small, much narrower than thorax, deflexed. Vertex perpendicular, rounded, smooth, median suture lacking or at least apparent only above front ocellus, no discal impressions. Genae somewhat swollen below antennae, almost touching. Clypeus large and globose, visible from front. Antennae slender, of moderate length, longer than width of head. Eyes small, hemispherical. Thorax moderately arched. Pronotum nearly vertical, broad. Proepisternum produced laterad, plate-like around posterior of eye. Forewings long, pointed apically, somewhat coriaceous,

\* An adjectival form of Washington.

† From *levis* -e, L. adj.—smooth + *idea* -ae, L. f. noun—form.

radius, media and cubitus arising from basal vein ( $R + M + Cu$ ) at same point, no pterostigma. Metatibia with basal spur, one outer and two inner apical spines. Metatarsus without claws on basal segment.

Orthotype: *Levidea lineata* Tuthill.

This genus is included in the *Triozinae* chiefly on the venation of the forewings. The head is quite unlike any other members of this subfamily. It perhaps is more closely related to some other genera with which I am unfamiliar.

*Levidea lineata\** Tuthill

(Figs. 234, 235, 248, 313)

1938 *Levidea lineata* Tuthill, Ent. News 49:245.

Length to tip of folded wings, 3 to 3.5 mm.

COLOR: General body color, including legs, stramineous. Vertex and genae light, antennae darker. Eyes dark. Two brown lines extending across prescutum, sometimes incomplete, continuing on scutum as a diverging pair of lines. Membrane of forewings with small brown spots, very thick at anal margin to sparse on costal margin, the veins unspotted except at marginal cells, thus giving general appearance of stripes.

STRUCTURE: Head very small, strongly deflexed. Vertex slightly swollen in appearance, perfectly smooth except for two very small foveae near occipital margin and remnant of medial suture above front ocellus. Genae slightly swollen. Clypeus very large, visible from front or side. Antennae twice as long as width of head. Thorax moderately arched. Pronotum developed out and around the occiput. Forewings slightly more than twice as long as wide, without pterostigma or cubital petiole, marginal cells about equal. Metatibia with stout basal spur, one outer, two inner apical spines.

GENITALIA: Male genitalia large, proctiger triangular in outline, broad at base, slightly longer than forceps which are simple, tapering from base to acute apices, quite strongly arched, apices touching, pubescent on posterior margins. Female genital segment large with rather dense, silky pubescence; dorsal valve very large, hood-shaped; ventral valve smaller, sharply pointed.

Known only from the type series from Arizona. The probable host is *Parthenium incanum*, "wild rubber."

HOLOTYPE, female, No. 55185 United States National Museum.

\* Adjectival form of *linea*, L.—line.

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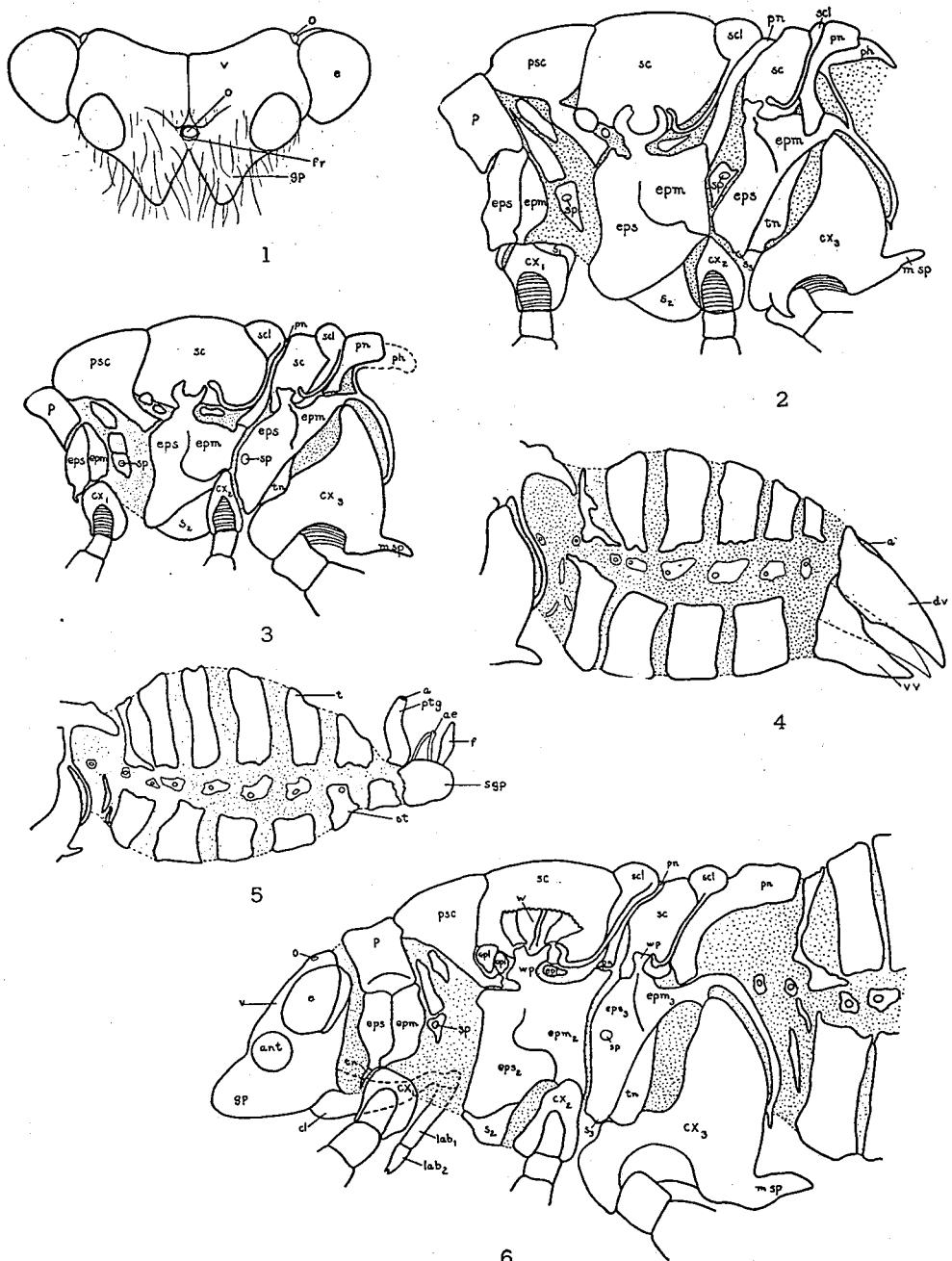
**EXPLANATION OF PLATES**

**LIST OF ABBREVIATIONS**

|                                           |                                            |
|-------------------------------------------|--------------------------------------------|
| a—anus                                    | ph—phragma                                 |
| ae—aedeagus                               | pn—postnotum                               |
| ant—antenna                               | psc—prescutum                              |
| cl—clypeus                                | ptg—proctiger                              |
| cx—coxa                                   | s—sternum                                  |
| dv—dorsal valve of female genital segment | sc—scutum                                  |
| e—eye                                     | scl—scutellum                              |
| epl—epipleurite                           | sgp—subgenital plate                       |
| epm—epimeron                              | sp—spiracle                                |
| eps—episternum                            | st—sternite                                |
| f—forceps                                 | t—tergite                                  |
| fr—frons                                  | tn—trochantin                              |
| gp—genal process                          | v—vertex                                   |
| lab—labium                                | vv—ventral valve of female genital segment |
| m sp—metacoxal spur                       | w—wing                                     |
| o—ocellus                                 | wp—wing process                            |
| p—pronotum                                |                                            |

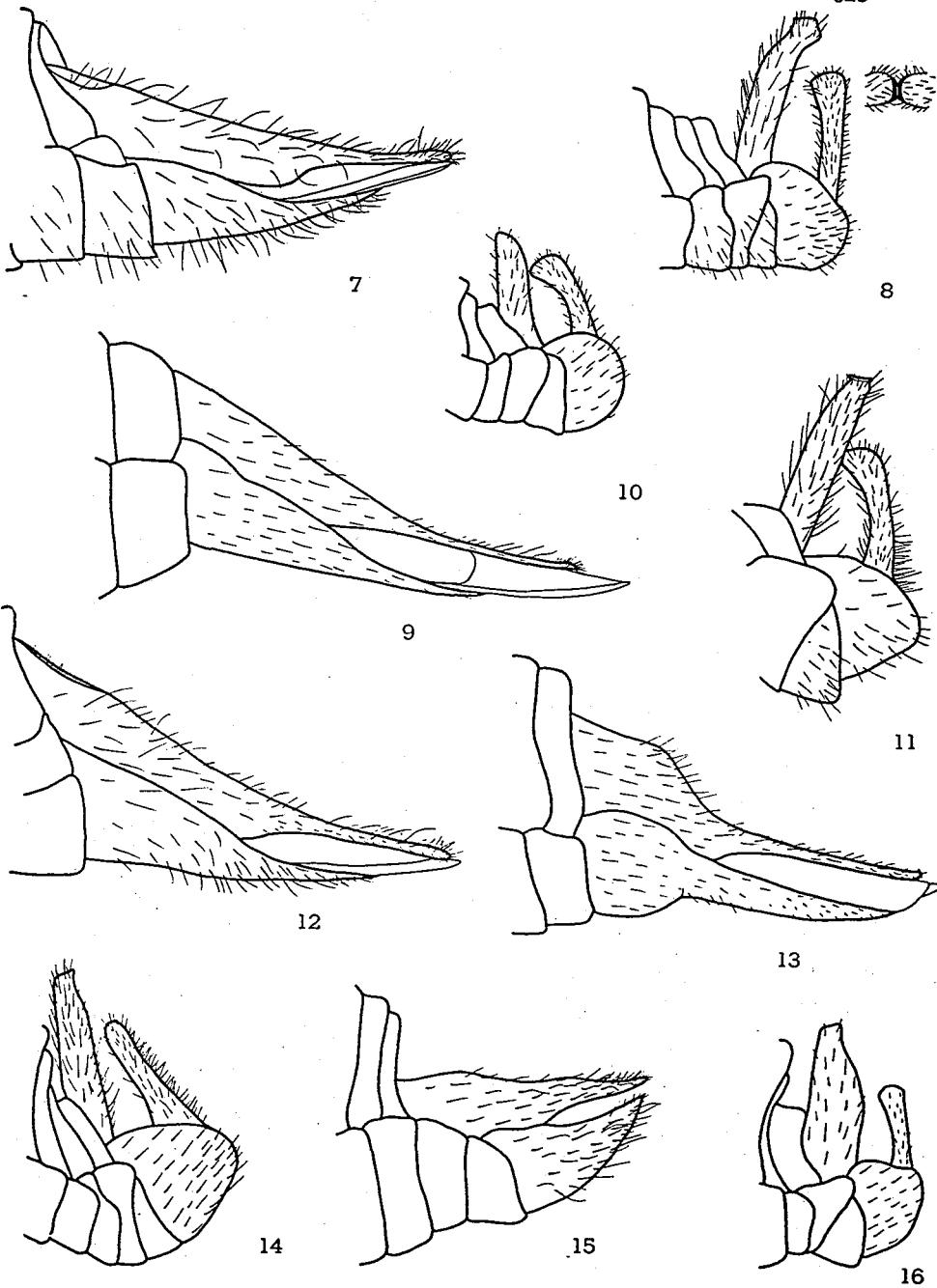
## PLATE I

- FIG. 1. *Psylla alni*—frontal aspect of head.  
 2. *Psylla alni*—lateral aspect of thorax (Crawf.).  
 3. *Trioza albifrons*—lateral aspect of thorax (Crawf.).  
 4. *Psylla pyricola*—lateral aspect of abdomen of female (Crawf.).  
 5. *Psylla pyricola*—lateral aspect of abdomen of male (Crawf.).  
 6. *Arytaina robusta*—lateral aspect of head and thorax (Crawf.).



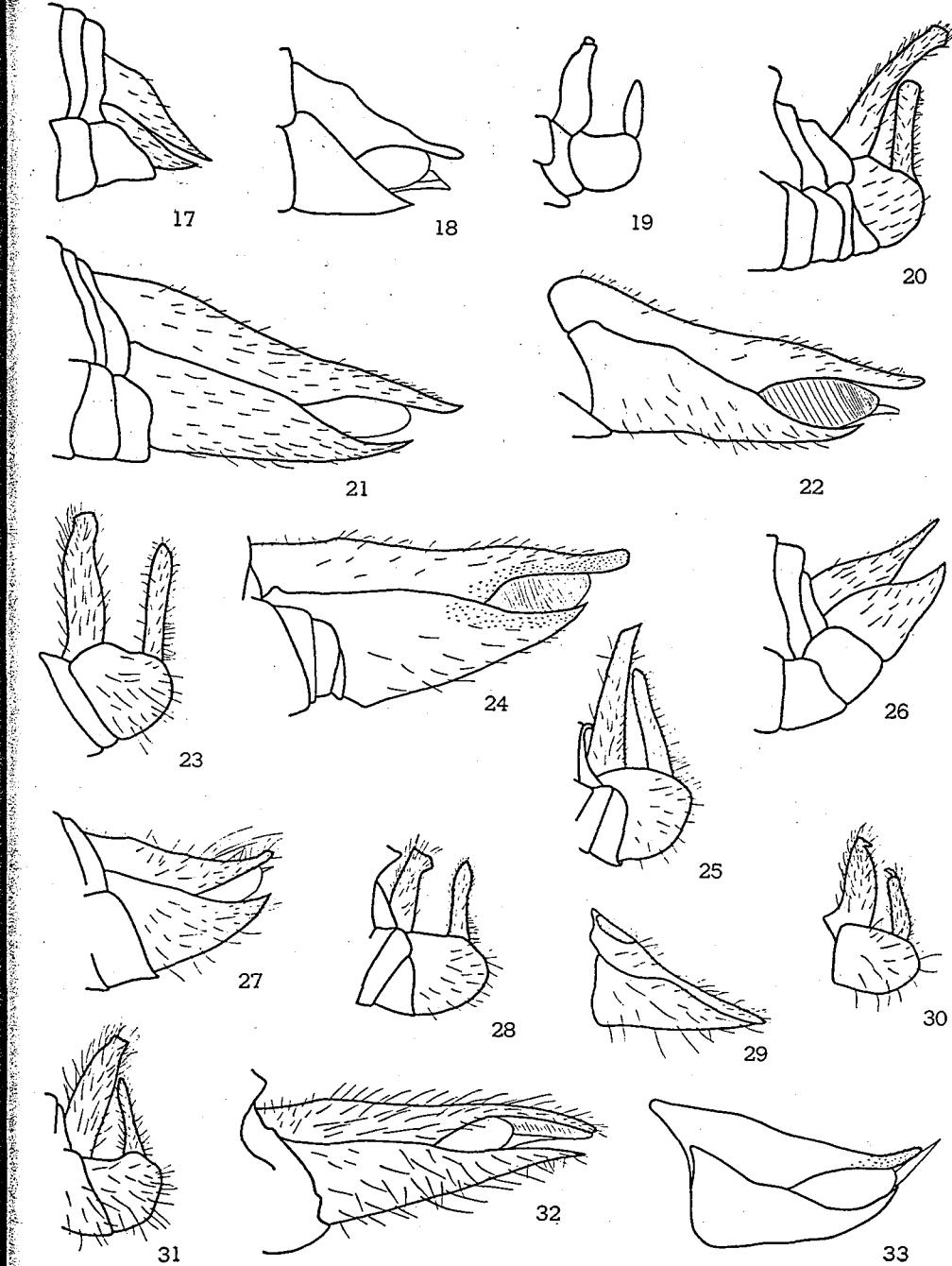
## PLATE II

- FIG. 7. *Psylla alni*—female cauda (Crawf.).  
 8. *Psylla alni*—male cauda (Crawf.).  
 9. *Psylla caudata*—female cauda (Crawf.).  
 10. *Psylla caudata*—male cauda.  
 11. *Psylla galeiformis*—male cauda.  
 12. *Psylla galeiformis*—female cauda.  
 13. *Psylla floccosa*—female cauda (Crawf. mod.).  
 14. *Psylla floccosa*—male cauda (Crawf. mod.).  
 15. *Psylla trimaculata*—female cauda (Crawf.).  
 16. *Psylla trimaculata*—male cauda (Crawf.).



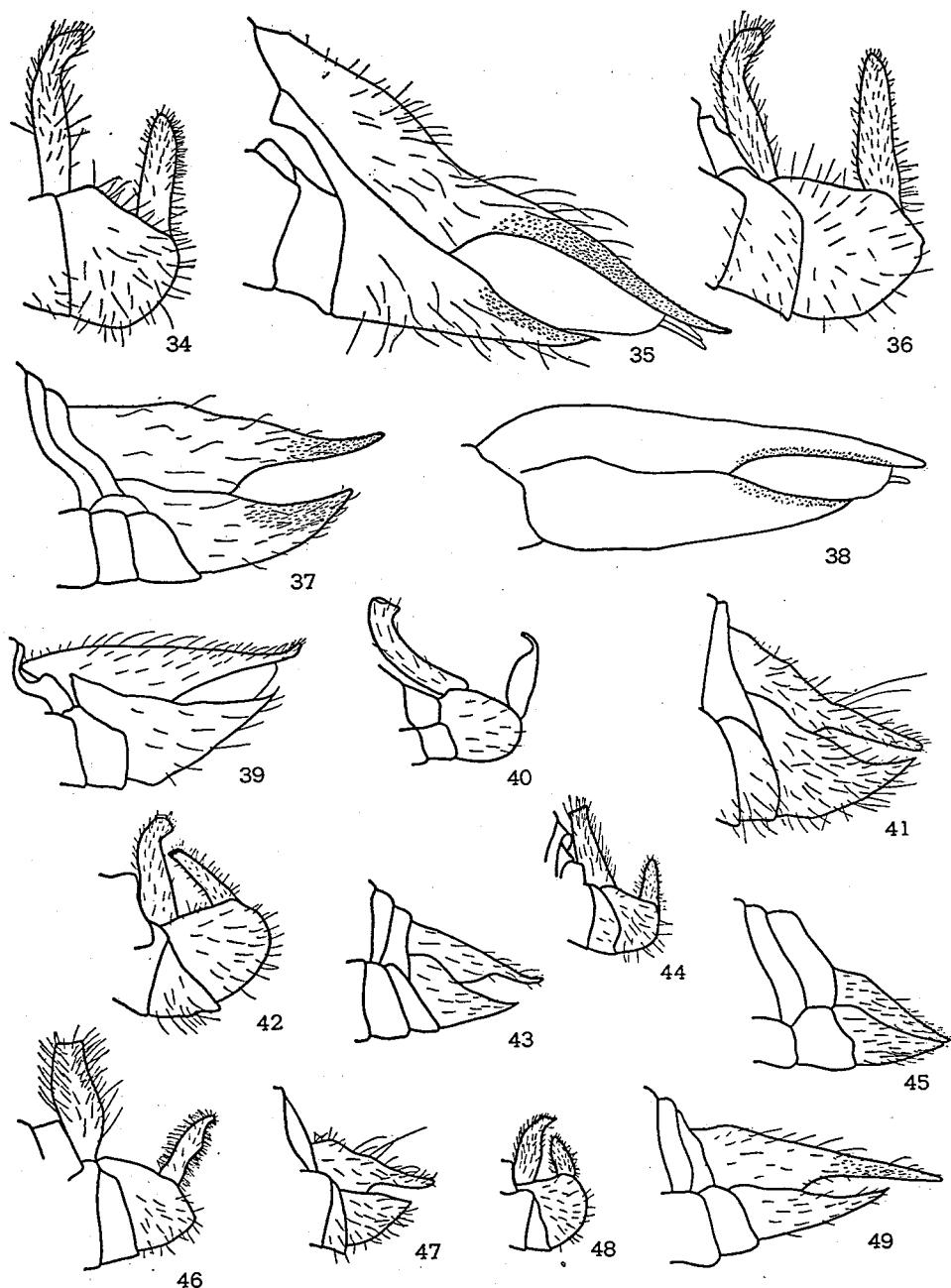
## PLATE III

- FIG. 17. *Psylla maculata*—female cauda (Crawf.).  
 18. *Psylla albagena*—female cauda (Cald.).  
 19. *Psylla albagena*—male cauda (Cald.).  
 20. *Psylla carpinicola*—male cauda (Crawf.).  
 21. *Psylla carpinicola*—female cauda (Crawf.).  
 22. *Psylla dilonchi*—female cauda (Cald. mod.).  
 23. *Psylla dilonchi*—male cauda (Cald. mod.).  
 24. *Psylla striata*—female cauda.  
 25. *Psylla striata*—male cauda.  
 26. *Psylla minuta*—female cauda (Crawf. mod.).  
 27. *Psylla brevistigmata*—female cauda.  
 28. *Psylla brevistigmata*—male cauda.  
 29. *Psylla difficilis*—female cauda.  
 30. *Psylla difficilis*—male cauda.  
 31. *Psylla hartigii*—male cauda.  
 32. *Psylla hartigii*—female cauda.  
 33. *Psylla tuthilli*—female cauda (Cald.).



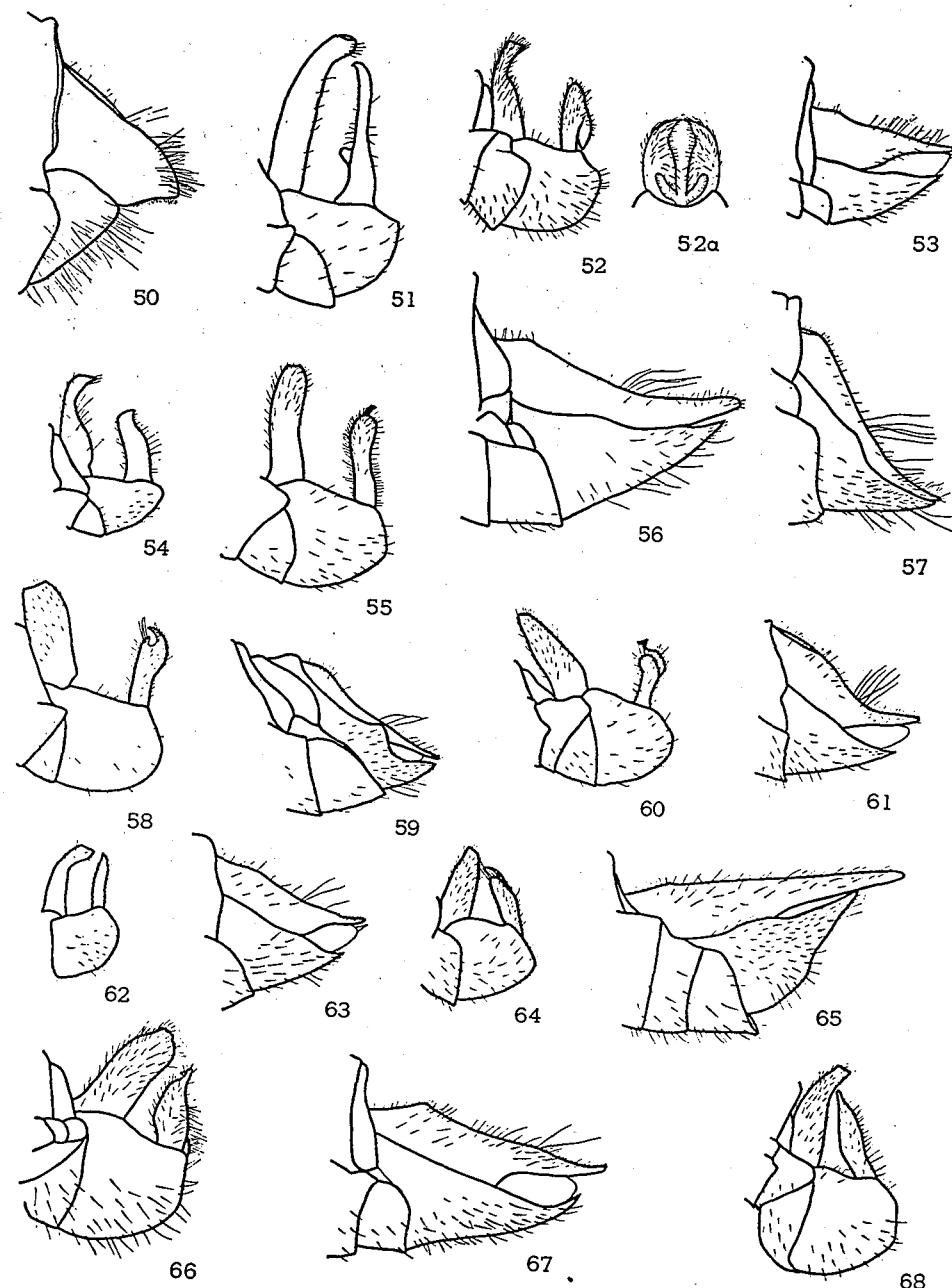
## PLATE IV

- FIG. 34. *Psylla stricklandi*—male cauda.  
 35. *Psylla stricklandi*—female cauda.  
 36. *Psylla magnicauda*—male cauda.  
 37. *Psylla magnicauda*—female cauda (Crawf.).  
 38. *Psylla buxi*—female cauda (Cald.).  
 39. *Psylla breviata*—female cauda.  
 40. *Psylla breviata*—male cauda (Crawf.).  
 41. *Psylla mali*—female cauda.  
 42. *Psylla mali*—male cauda.  
 43. *Psylla alba*—female cauda (Crawf.).  
 44. *Psylla alba*—male cauda.  
 45. *Psylla ribesiae*—female cauda (Crawf.).  
 46. *Psylla ribesiae*—male cauda.  
 47. *Psylla pyricola*—female cauda.  
 48. *Psylla pyricola*—male cauda.  
 49. *Psylla americana*—female cauda (Crawf.).



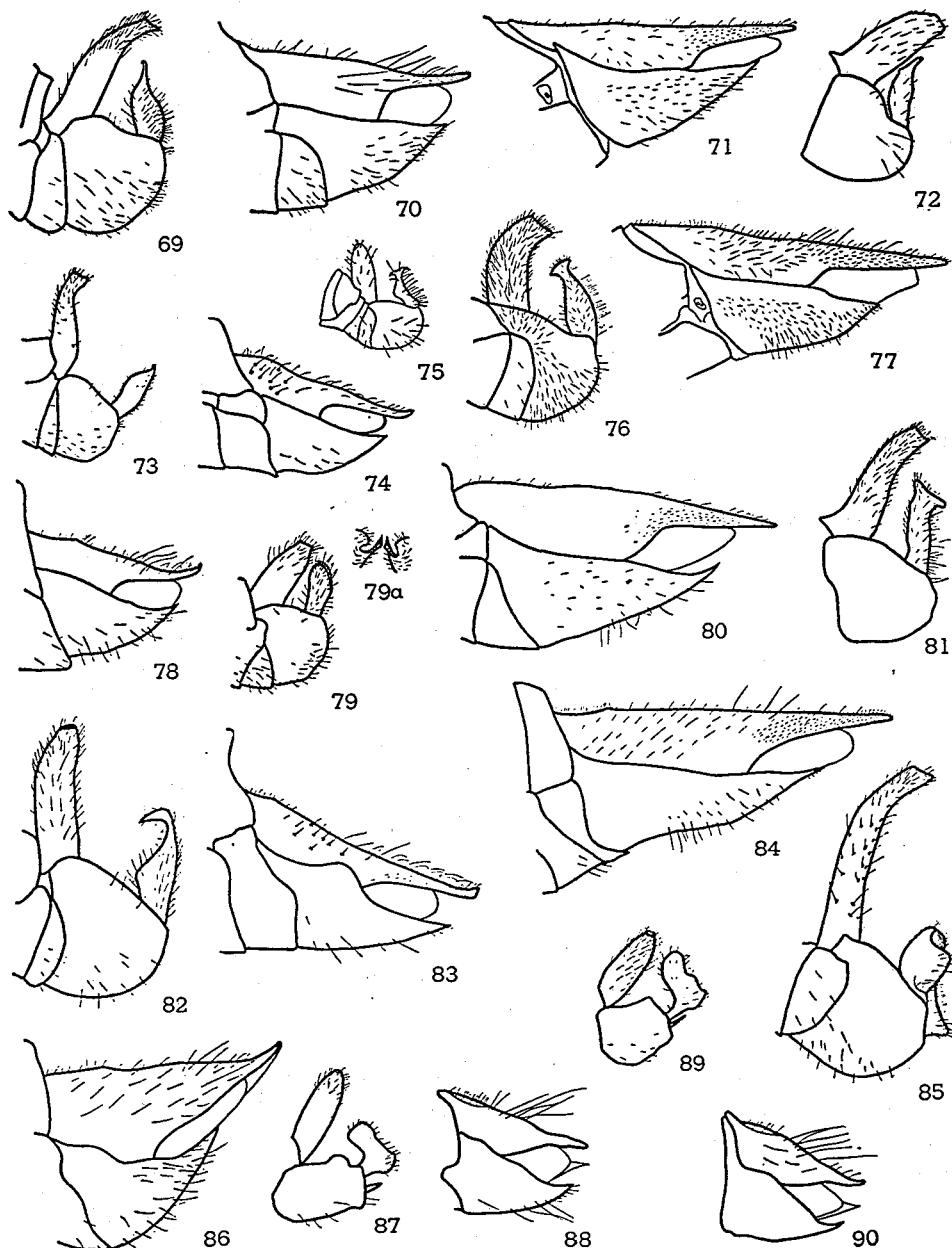
## PLATE V

- FIG. 50. *Psylla phoradendri*—female cauda.  
 51. *Psylla phoradendri*—male cauda.  
 52. *Psylla maculata*—male cauda, lateral aspect.  
 52a. *Psylla maculata*—caudal aspect of forceps.  
 53. *Psylla nana*—female cauda.  
 54. *Psylla nana*—male cauda.  
 55. *Psylla insignita*—male cauda.  
 56. *Psylla insignita*—female cauda.  
 57. *Psylla magna*—female cauda.  
 58. *Psylla magna*—male cauda.  
 59. *Psylla omani*—female cauda.  
 60. *Psylla omani*—male cauda.  
 61. *Psylla hirsuta*—female cauda.  
 62. *Psylla hirsuta*—male cauda.  
 63. *Psylla media*—female cauda.  
 64. *Psylla media*—male cauda.  
 65. *Psylla alaskensis*—female cauda.  
 66. *Psylla alaskensis*—male cauda.  
 67. *Psylla bulbosa*—female cauda.  
 68. *Psylla bulbosa*—male cauda.



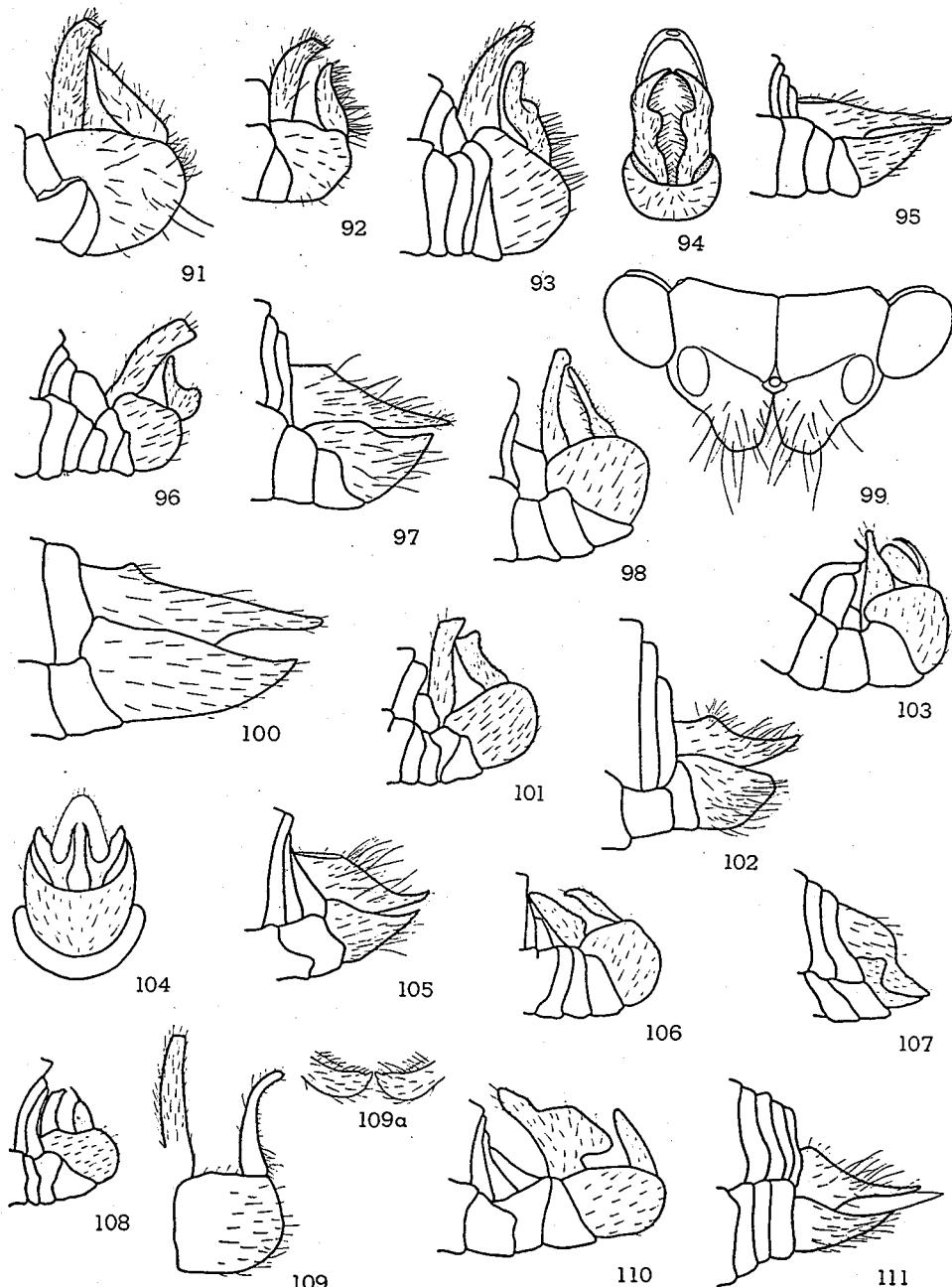
## PLATE VI

- FIG. 69. *Psylla manisi*—male cauda.  
 70. *Psylla manisi*—female cauda.  
 71. *Psylla quadrilineata*—female cauda.  
 72. *Psylla quadrilineata*—male cauda.  
 73. *Psylla confusa*—male cauda.  
 74. *Psylla confusa*—female cauda.  
 75. *Psylla parallela*—male cauda.  
 76. *Psylla minor*—male cauda.  
 77. *Psylla minor*—female cauda.  
 78. *Psylla usitata*—female cauda.  
 79. *Psylla usitata*—male cauda.  
 79a. *Psylla usitata*—tip of forceps.  
 80. *Psylla latiforceps*—female cauda.  
 81. *Psylla latiforceps*—male cauda.  
 82. *Psylla uncata*—male cauda.  
 83. *Psylla uncata*—female cauda.  
 84. *Psylla propria*—female cauda.  
 85. *Psylla propria*—male cauda.  
 86. *Arytaina spartiophila*—female cauda.  
 87. *Arytaina amorphae*—male cauda.  
 88. *Arytaina amorphae*—female cauda.  
 89. *Arytaina pallida*—male cauda.  
 90. *Arytaina pallida*—female cauda.



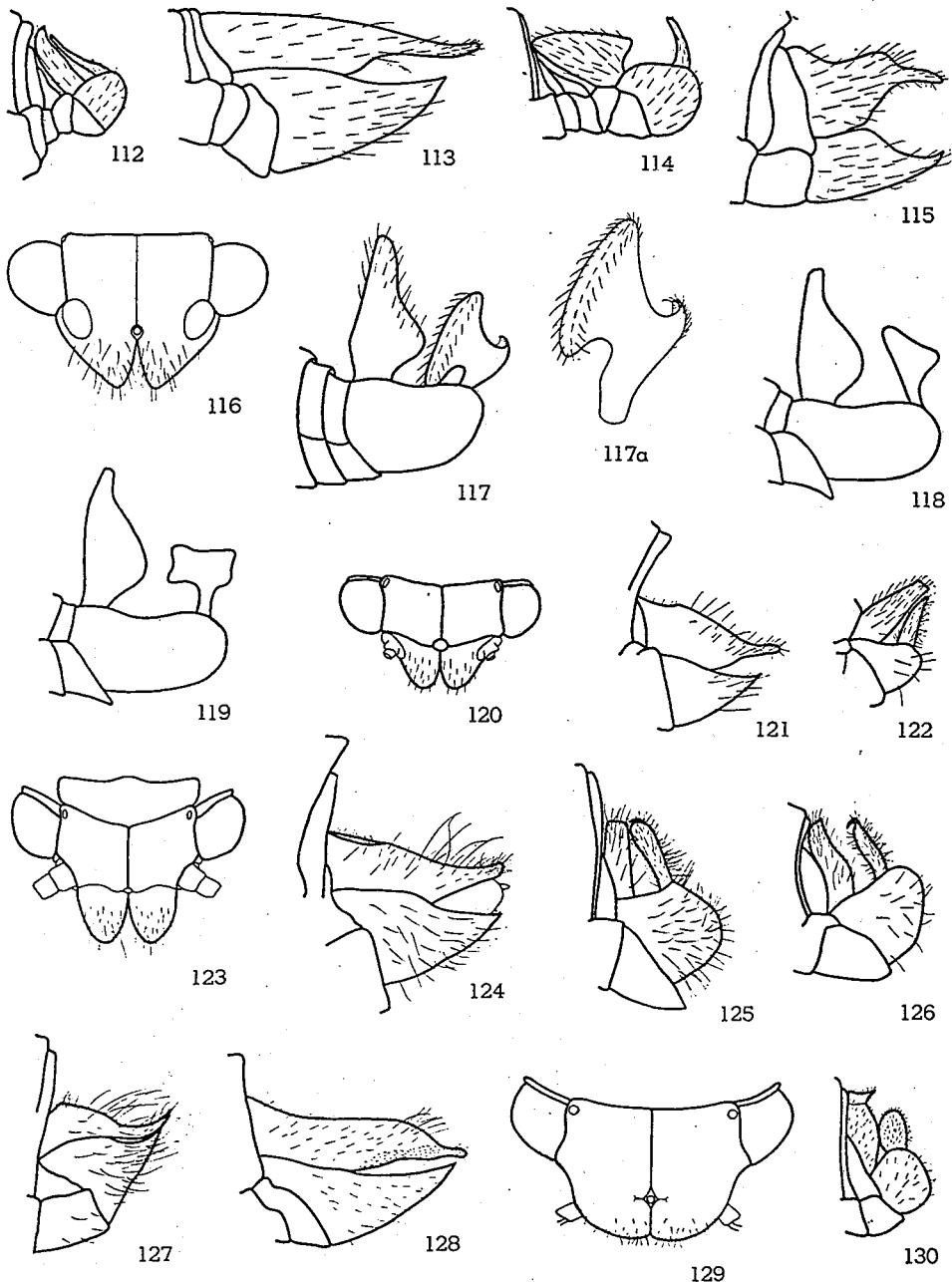
## PLATE VII

- FIG. 91. *Psylla americana*—male cauda.  
 92. *Psylla americana curta*—male cauda.  
 93. *Psylla sinuata*—male cauda, lateral aspect (Crawf.).  
 94. *Psylla sinuata*—male cauda, caudal aspect (Crawf.).  
 95. *Psylla fibulata*—female cauda (Crawf.).  
 96. *Psylla fibulata*—male cauda (Crawf.).  
 97. *Psylla annulata*—female cauda (Crawf.).  
 98. *Psylla annulata*—male cauda (Crawf.).  
 99. *Arytaina genistae*—head.  
 100. *Arytaina genistae*—female cauda (Crawf.).  
 101. *Arytaina genistae*—male cauda (Crawf.).  
 102. *Arytaina fuscipennis*—female cauda (Crawf.).  
 103. *Arytaina fuscipennis*—male cauda, lateral aspect (Crawf.).  
 104. *Arytaina fuscipennis*—male cauda, caudal aspect (Crawf.).  
 105. *Arytaina robusta*—female cauda (Crawf.).  
 106. *Arytaina robusta*—male cauda (Crawf.).  
 107. *Arytaina pubescens*—female cauda (Crawf.).  
 108. *Arytaina pubescens*—male cauda (Crawf.).  
 109. *Arytaina spartiophila*—male cauda (Sulc.).  
 109a. *Arytaina spartiophila*—tip of forceps (Sulc.).  
 110. *Arytaina assimilis*—male cauda (Crawf.).  
 111. *Arytaina ceanothi*—female cauda (Crawf.).



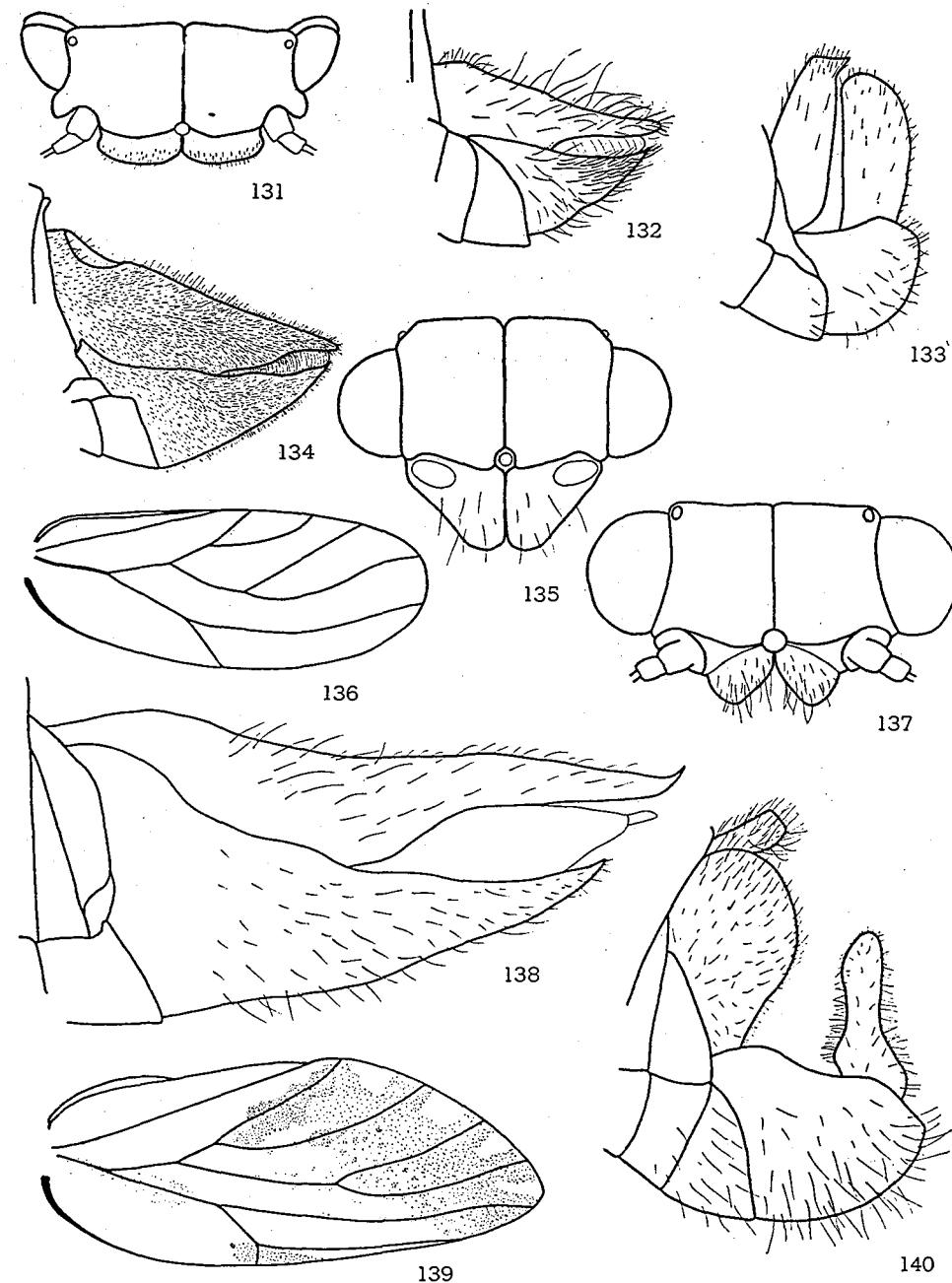
## PLATE VIII

- FIG. 112. *Arytaina ceanothi*—male cauda (Crawf.).  
 113. *Arytaina minuta*—female cauda (Crawf.).  
 114. *Arytaina minuta*—male cauda (Crawf.).  
 115. *Psyllopsis fraxinicola*—female cauda (Crawf.).  
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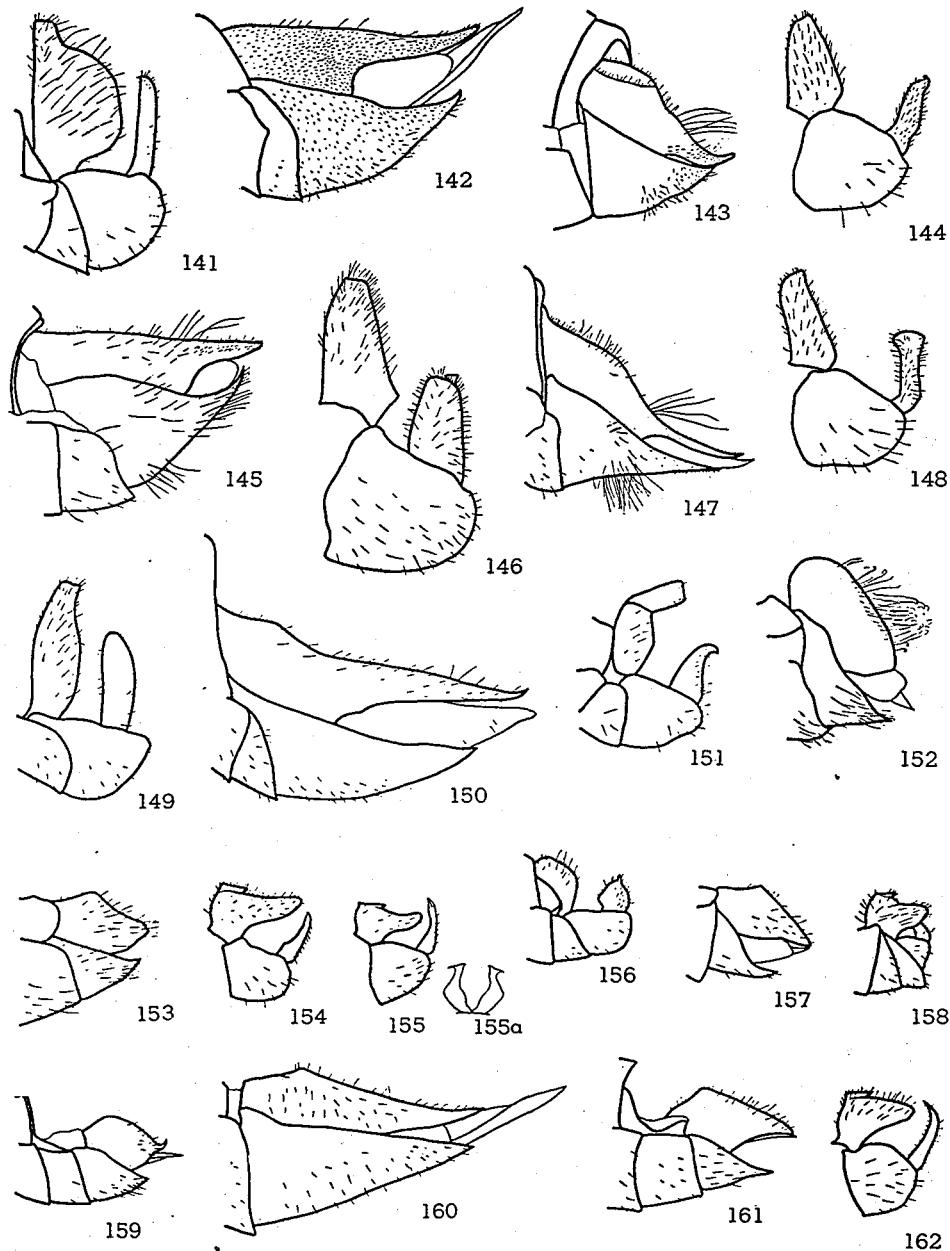
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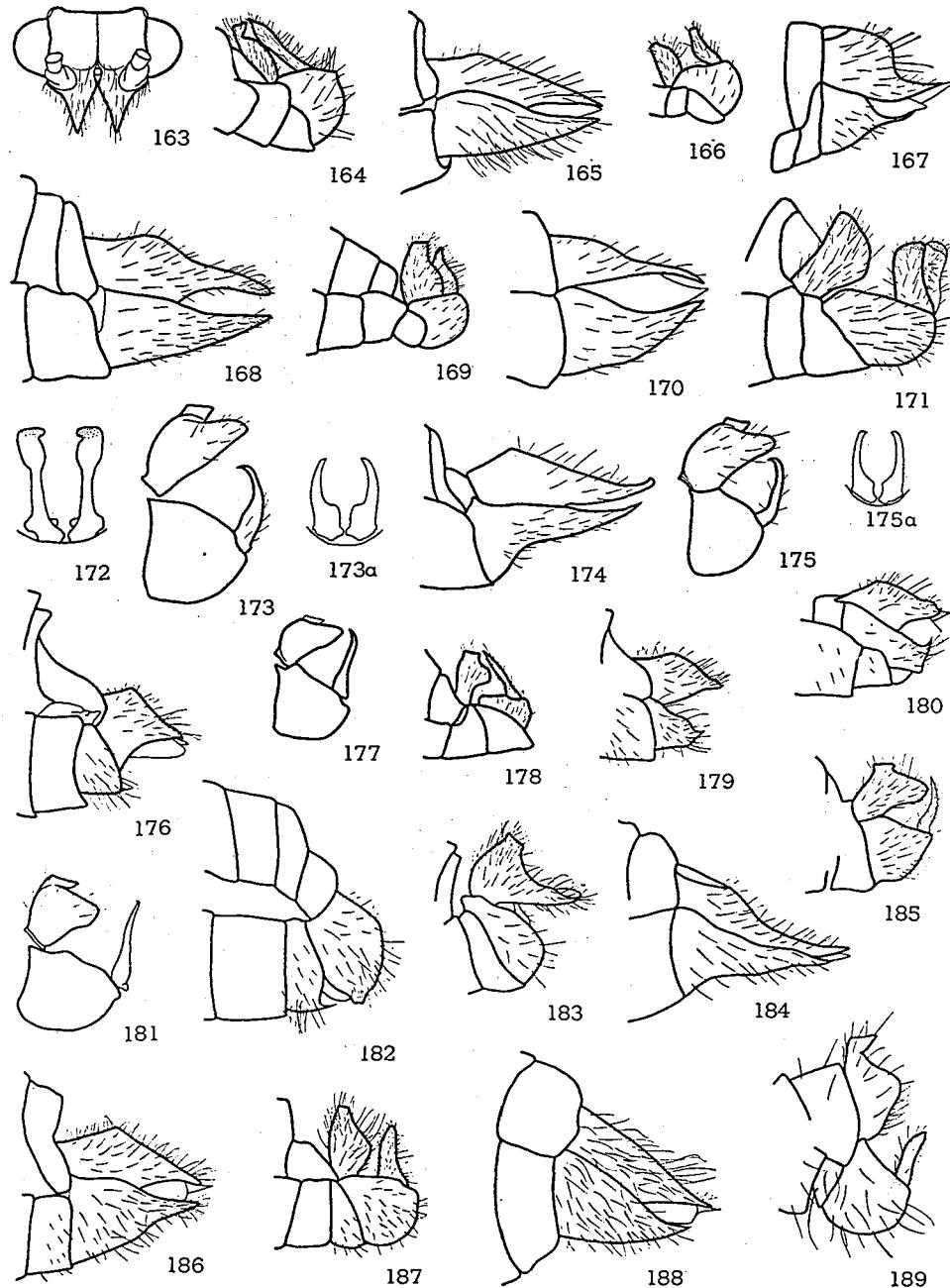
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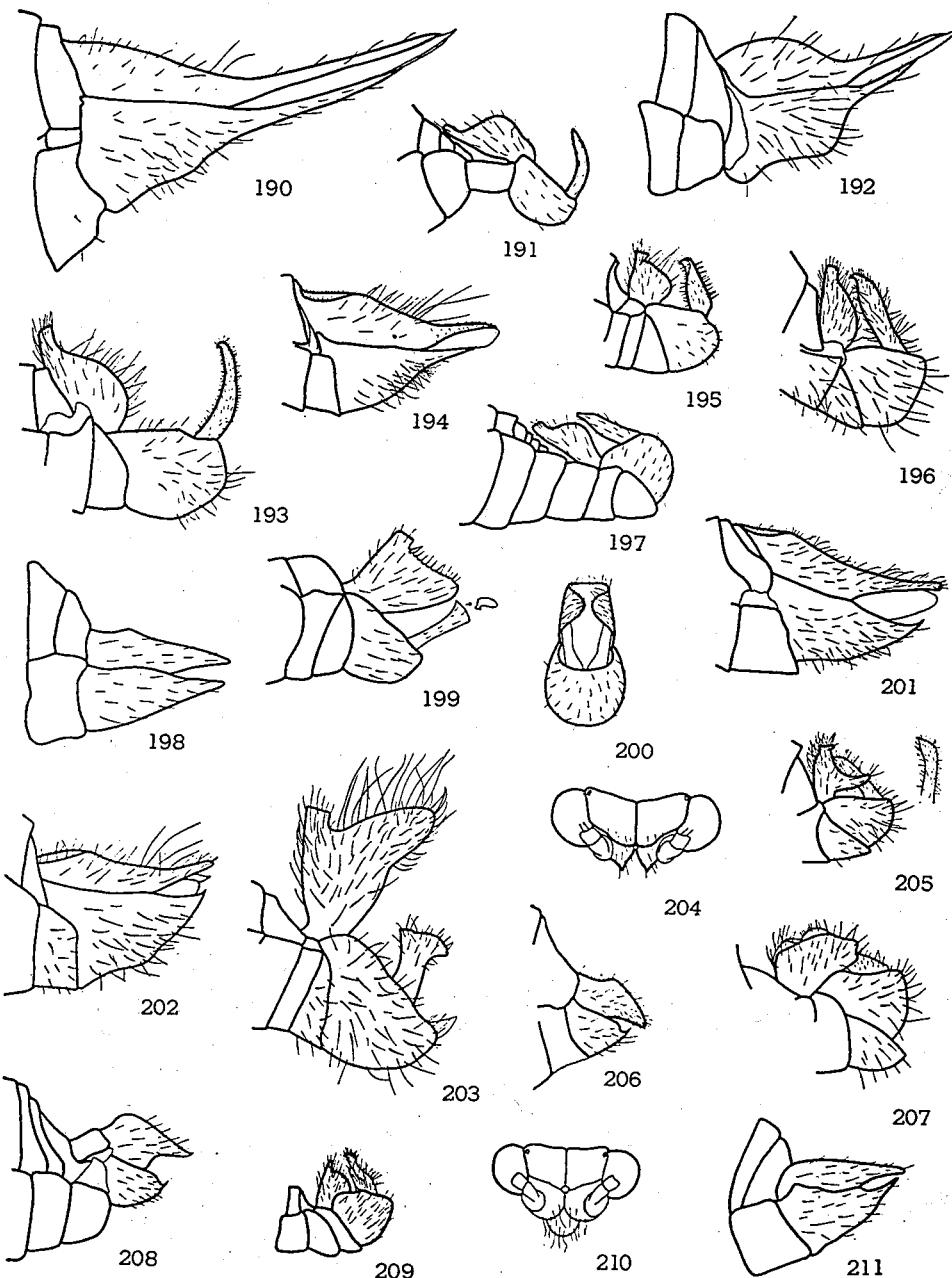
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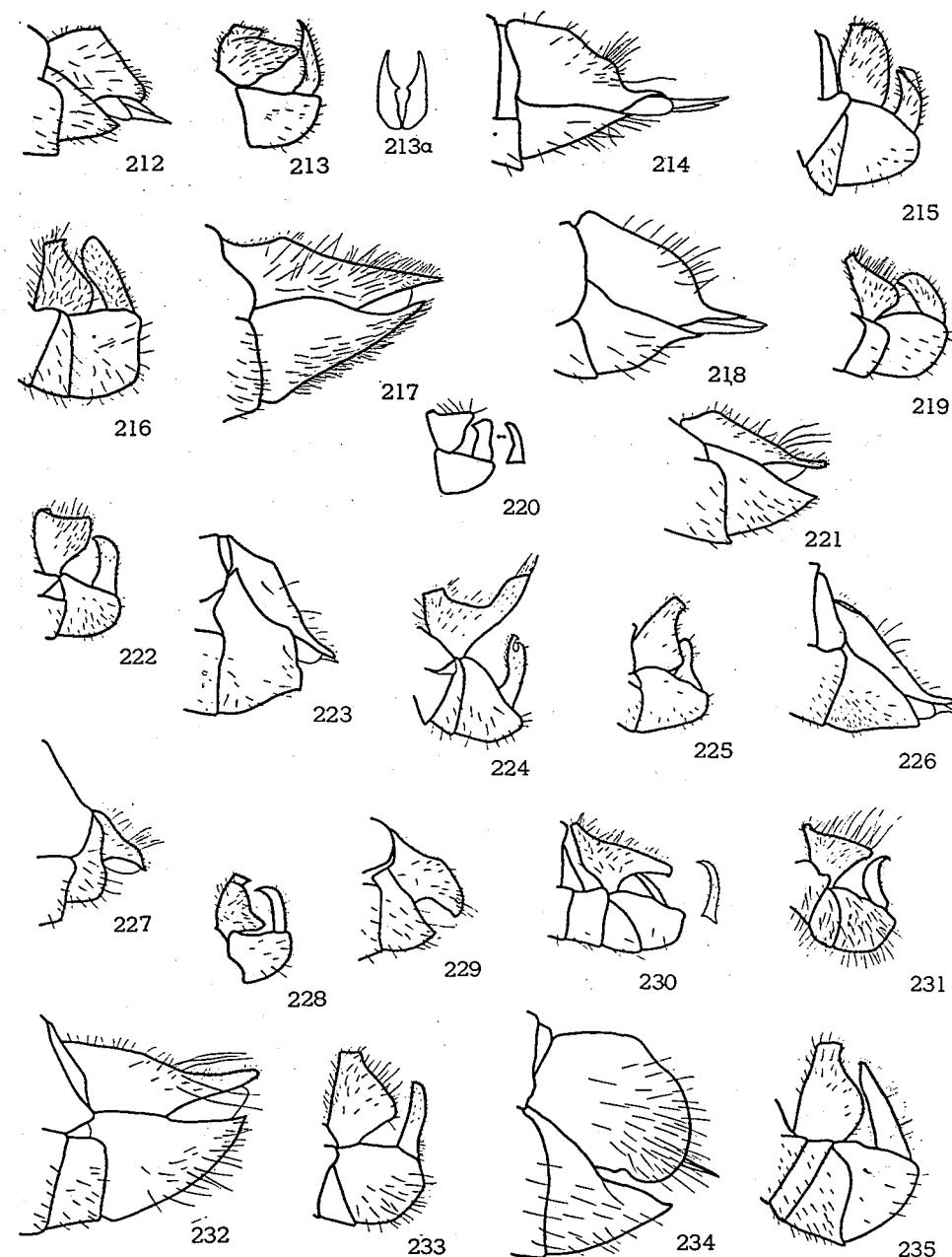
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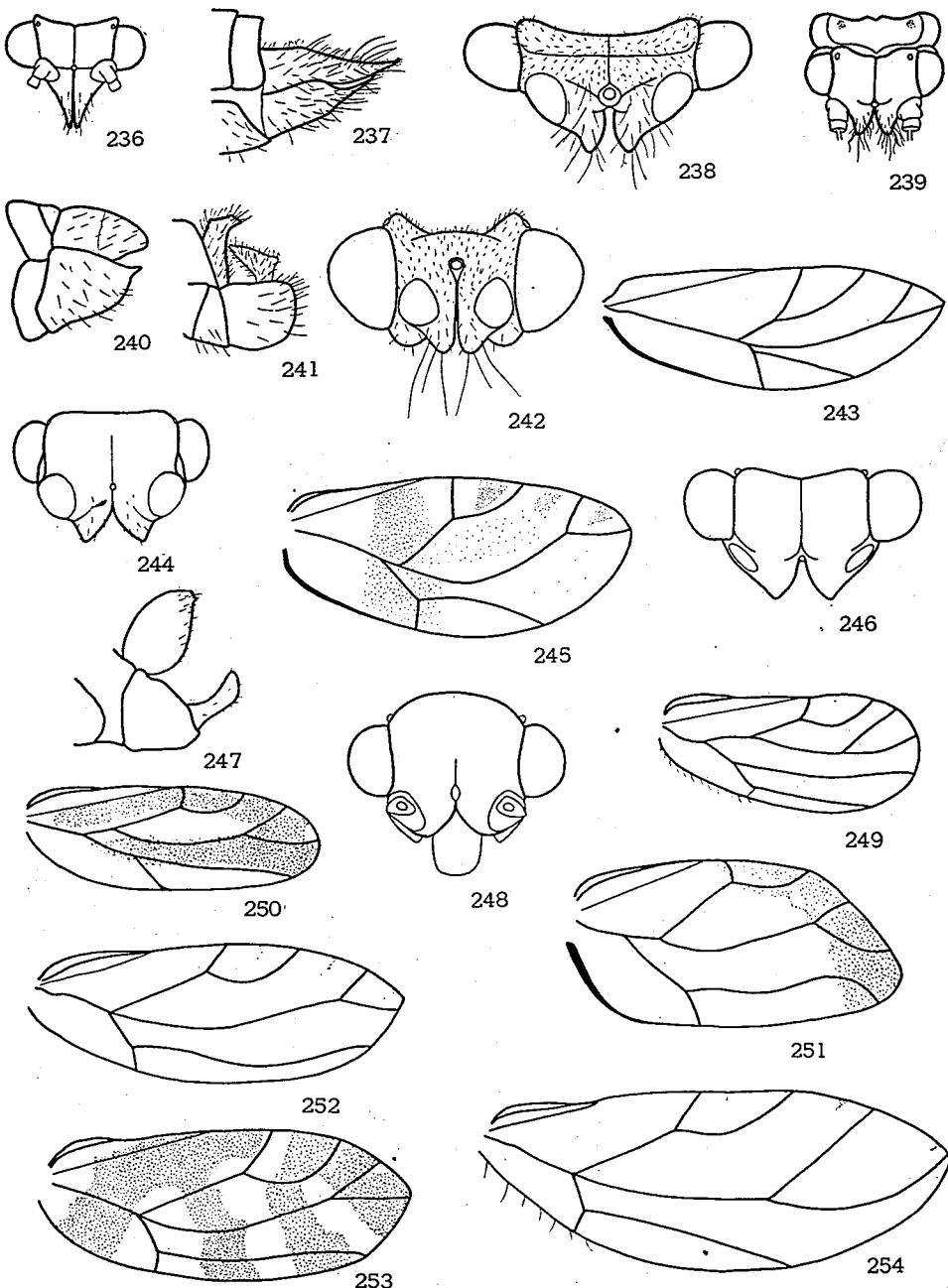
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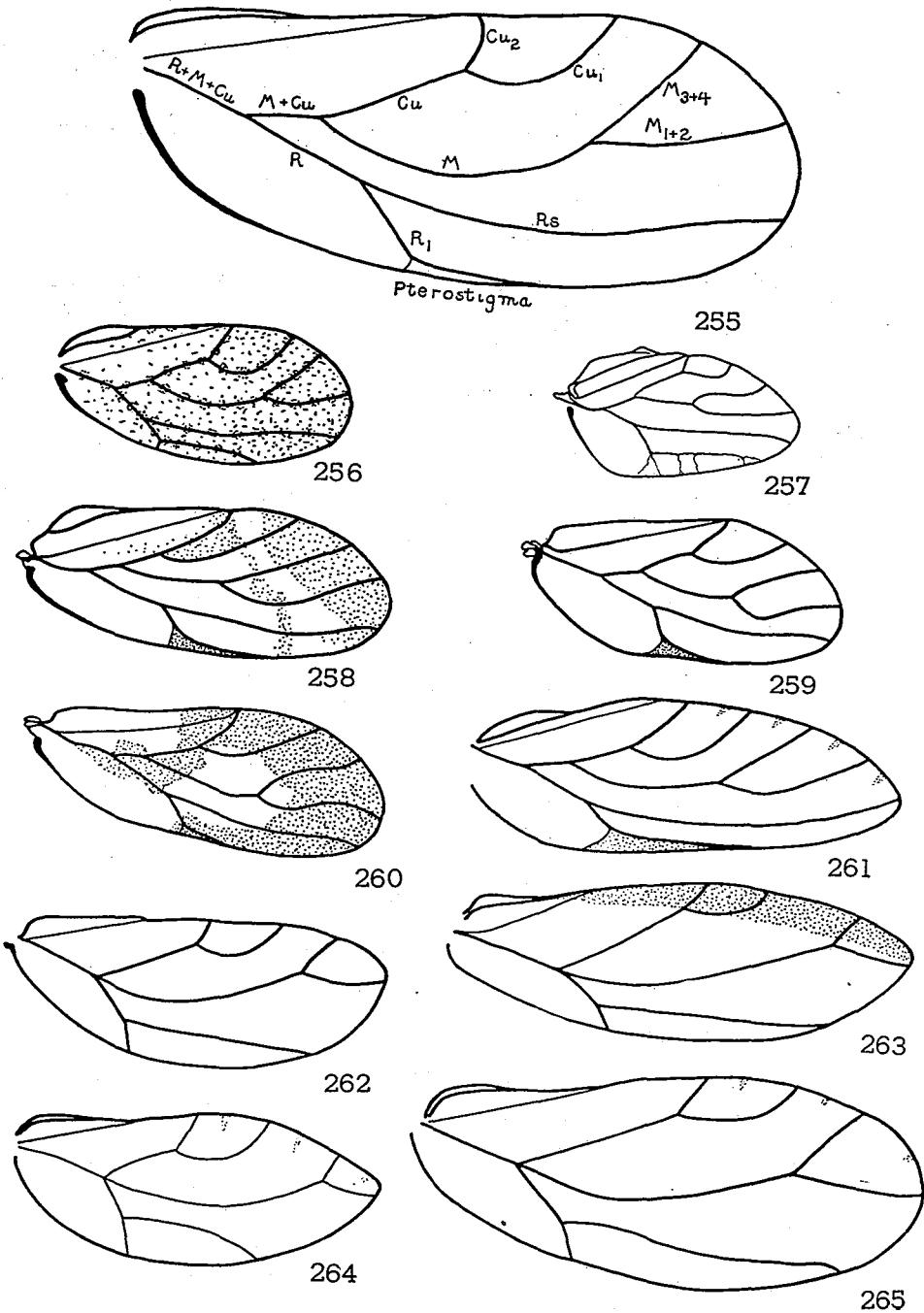
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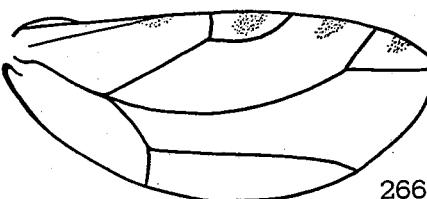
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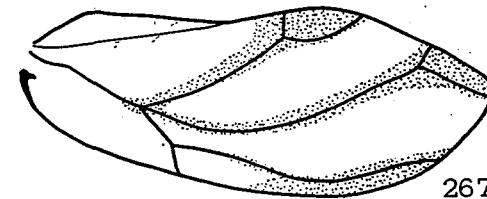


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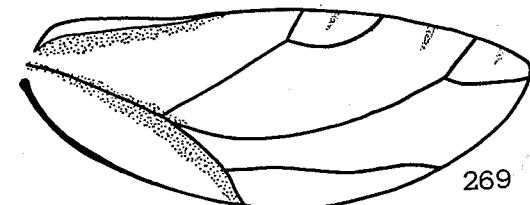
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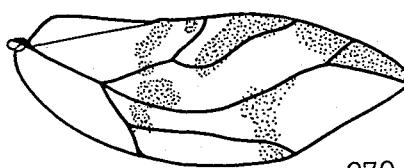
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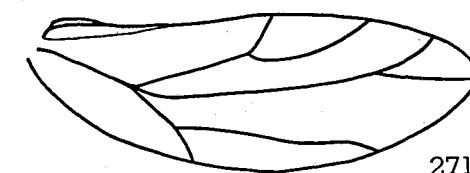
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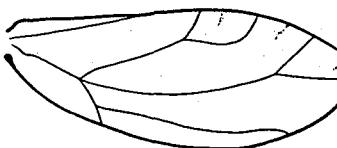
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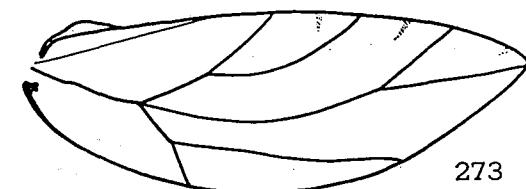
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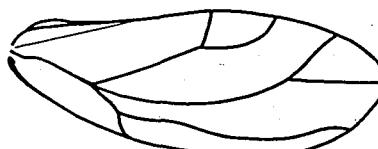
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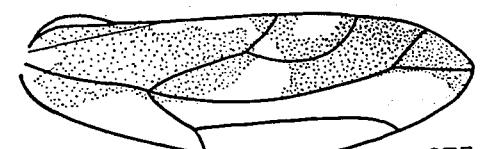
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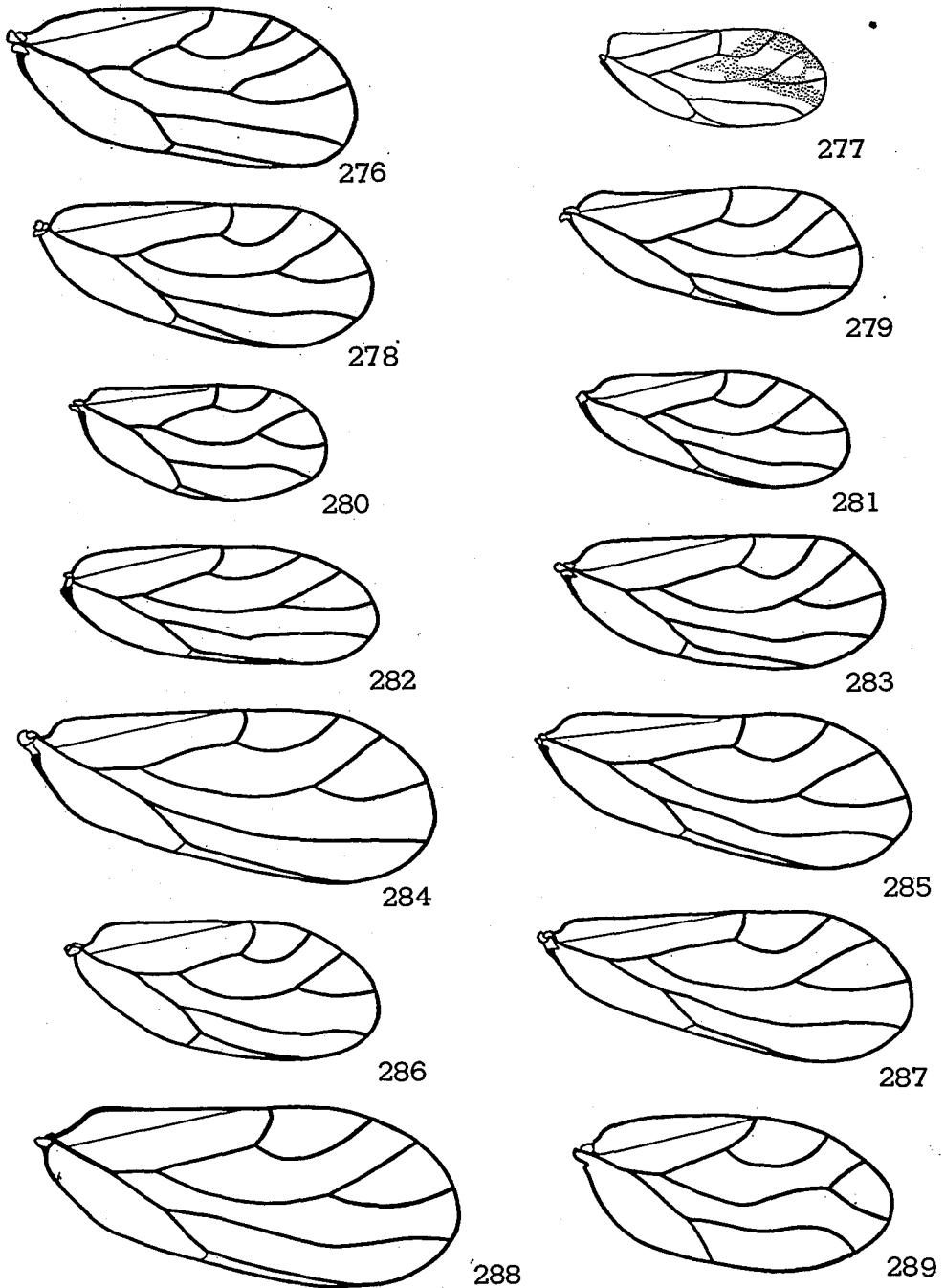
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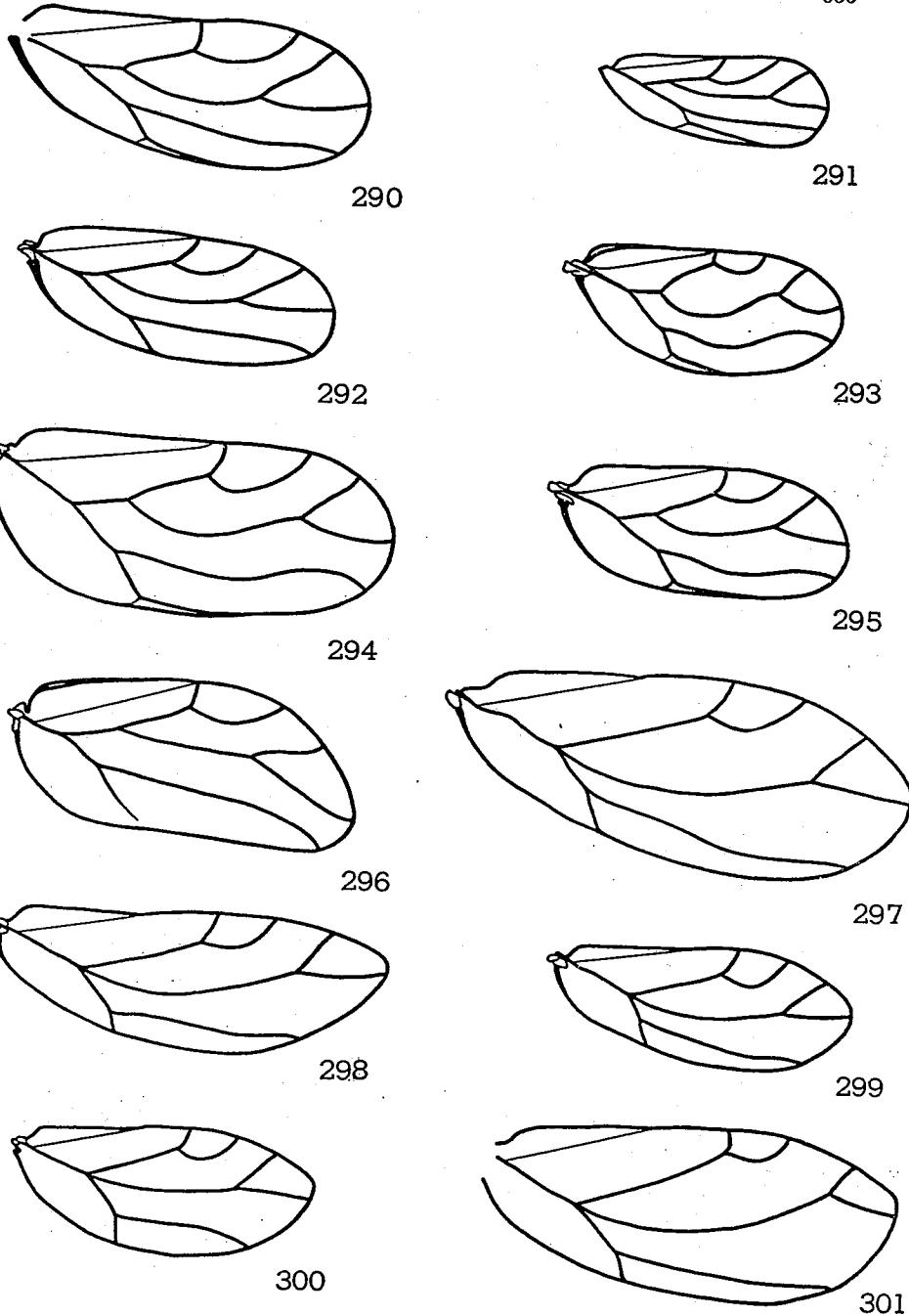
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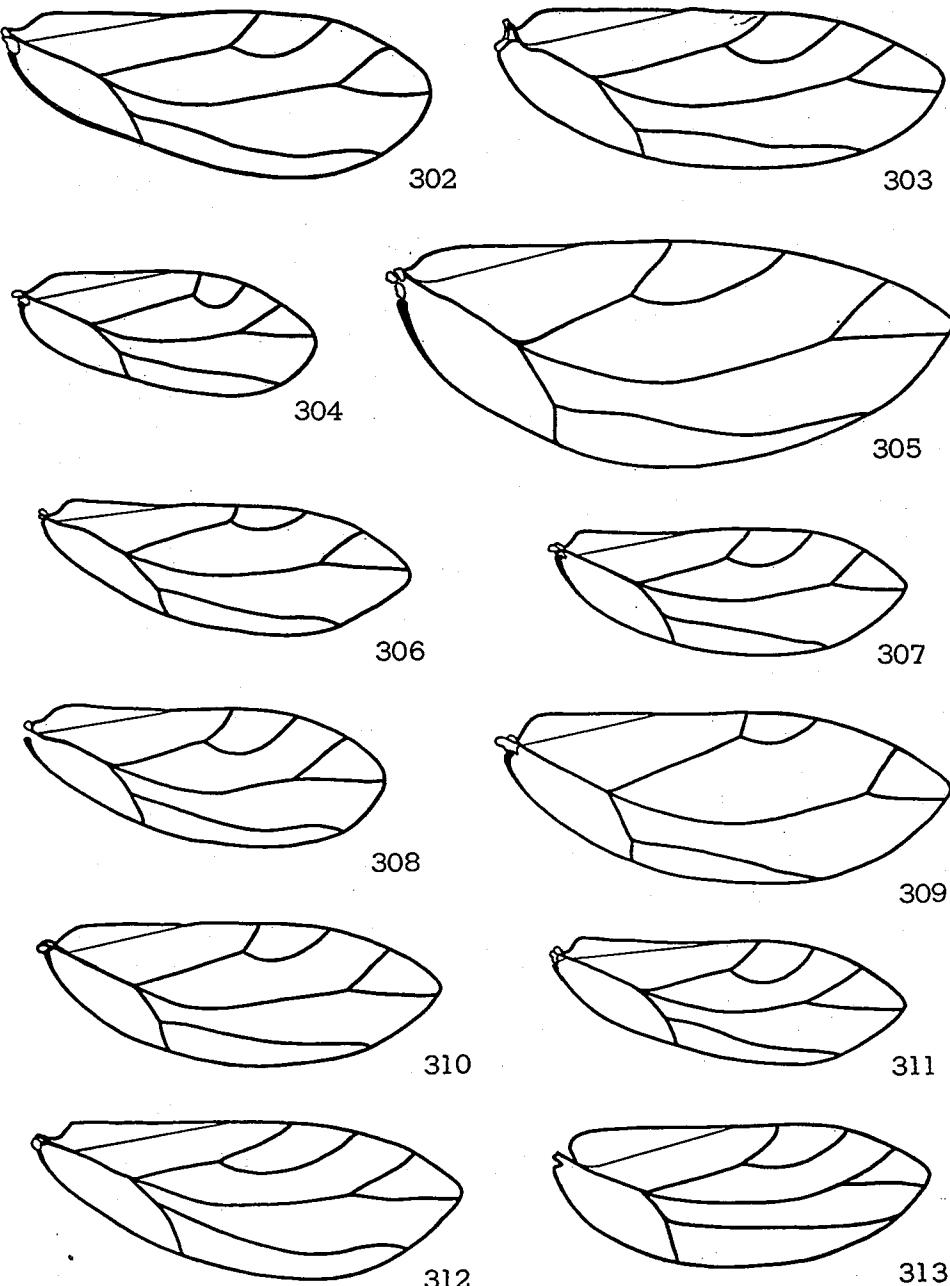
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