

## AMERICAN LEAF-HOPPERS OF THE SUBFAMILY TYPHLOCYBINAE.

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THIS subfamily comprises the lowest, and also the most beautiful and fragile, of the species included in the family Jassidae of the order Hemiptera. On account of the very small size of most of the species and the difficulty with which they are preserved in suitable condition for study, the group has been much neglected by students of entomology in this country. Mr. Van Duzee, in his Catalogue of the Described Jassoidæ of North America, lists thirty-five species in this subfamily, and Berg, in Hemiptera Argentina, described three species from South America, while Doctor L. Meliebar, in Cicadinen von Mittel-Europa, lists seventy-three species. Although the present paper fully doubles the number of species known to occur in the Americas, it is evident that the study of the Typhlocybinæ on this side of the Atlantic is only fairly begun.

The attempt is here made to get together the scattered descriptions of American species, to give a fairly complete bibliography of American literature on the group, to straighten out the synonymy among the species, and to describe such new forms as have come to hand, so that others may be helped in working up such material as they possess. No attempt has been made to give a complete bibliography of other than American writings, but in every case all references are given that have come to my notice.

*Classification.*—It will be noticed that certain genera recognized by late European writers are not recognized in this paper. *Erythria* is united with *Dieraneura*, and *Zygina* and *Zyginella* with *Typhlocyba*, because the characters separating these genera seem to me not to be of generic importance. *Chlorita* and *Kybos* are put under *Empoasca* because *Empoasca* has precedence and covers both of the former, and because the characters separating the genera are not constant. Among the species described in this paper there can be found every possible gradation between the *Chlorita* and *Kybos* type of vertex, and the difference in elytral venation is often found in a single species and even in single individuals.

*Important characters.*—The characters in the Typhlocybinae are fewer and less constant than those of higher forms. The most constant seem to be those of the form of the face and vertex and genital pieces, and of the form and venation of the wings and elytra.

*Acknowledgments.*—Although I shall mention, in connection with each species, the names of those who have sent me specimens, I feel that special mention should be made of the large number of specimens sent me for study by the United States National Museum, by the Illinois State Laboratory of Natural History, and by Cornell University. Special acknowledgments are also due Mr. E. P. Van Duzee, who has sent me much American material and who kindly loaned me his private collection of European species.

#### CHARACTERS DISTINGUISHING THE TYPHLOCYBINAÆ.

The Typhlocybinae are readily separated from all other Jassoidea by the four longitudinal veins or sectors of the elytra, which run to the cross-nervures forming the apical cells without branching, so that there are no anteapical cells, and by the lack of supernumerary cells in the posterior wings.

#### ANALYTICAL KEY TO THE AMERICAN GENERA OF TYPHLOCYBINAÆ.

- A. Sectors of posterior wings ending in a marginal vein.
  - B. Elytra with an appendix, beyond the clavus.....*Alebra*.
  - BB. Elytra without appendix.
    - C. Two apical cells in posterior wing .....*Dicranoura*.
    - CC. One apical cell in posterior wing .....*Empoasca*.
- AA. Sectors of posterior wings ending in wing margin, no marginal vein.
  - Sectors 1 and 2 uniting so that only three veins extend to the margin...*Typhlocyba*.
  - All four sectors extending to the wing margin.....*Eupteryx*.

#### Genus ALEBRA Fieber.

#### ANALYTICAL KEY TO THE AMERICAN SPECIES OF THE GENUS ALEBRA.

- A. Vertex broadly rounded, hardly at all produced.
  - B. Entirely yellow, or whitish and yellow.....*albostrigata*.
  - BB. Yellow, with a broad dorsal stripe blackish.
    - C. Face broader than long.....*dorsalis*.
    - CC. Face longer than broad.....*fumida*.
  - BBB. Elytra deep smoky, marked with red.....*robusta*.
- AA. Vertex much produced.
  - B. Color light yellow, three dark spots on inner margins of elytra....*trimaculata*.
  - BB. Color yellow, two broad transverse black bands on elytra.....*bifasciata*.
  - BBB. Light yellow, marked above with white and golden yellow, the latter margined with black on elytra.....*curvilinea*.

#### ALEBRA CURVILINEA, new species.

General color pale yellow, marked above with white and golden, the latter, upon the elytra, margined with black. Length, 3 mm.

Face very long and narrow, one-third longer than broad; clypeus

exceeding the genae by about one-third its length. color sordid white. Vertex rather strongly produced. whitish in color, very narrow between the eyes, which are large. Pronotum a little broader than the head, strongly produced anteriorly, yellow on the anterior and white on the posterior half. Scutellum yellowish brown, paler across the middle. The extreme bases of the elytra are white, just beyond the white base of either elytron is an oblique golden-yellow stripe margined with a narrow black line posteriorly; following this is a rather broad milky white line which rises on the inner margin near the base of the elytron and forms two arcs, the first extending to the costal margin and returning to the inner margin at the tip of the clavus, the second arising at tip of the clavus, extending to near the costal margin and returning to the inner margin near the tip of the elytron. Within the large arc is a large golden area, palest at the center: another smaller spot of the same color lies in the angle formed by the union of the two arcs. Abdomen above and below yellow. Feet entirely yellow. (See Fig. 1.)

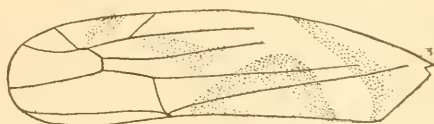


FIG. 1.—ELYTRON OF ALEBRA CURVILINEA.

Described from one male and one female, the former taken in January and the latter in April by Mr. H. H. Smith at Chapada, Brazil.

#### ALEBRA BIFASCIATA, new species.

Color yellow, with two broad transverse bands of black on the elytra. Length, 3 mm.

Face light yellow, unicolorous; clypeus long and considerably exceeding the genae, entire length of face exceeding the breadth by about one-third of the latter. Head small, distinctly narrower than the pronotum; vertex yellow, without markings, strongly produced, eyes large and black. Pronotum entirely yellow and but little longer than the vertex. Scutellum entirely black, except the extreme apex, which, in three examples, is whitish. Elytra yellowish, with a broad black or smoky band at their base and another at the cross-veins; extreme tips hyaline or nearly so. (See Fig. 2.) Abdomen entirely yellow, or with the terminal segments of the tergum black. Last ventral segment of female moderately produced and entire. Legs entirely pale yellow.



FIG. 2.—ELYTRON OF ALEBRA BIFASCIATA.

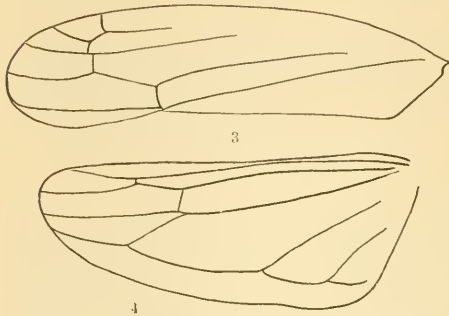
In two of the males the dark basal band of the elytra does not quite reach the costal margins.

Described from four males and one female taken by Mr. H. H. Smith at Chapada, Brazil.

## ALEBRA TRIMACULATA, new species.

Color light yellow, three dark spots on the inner margins of the elytra. Length, 3.25 mm.

Face pale yellow, unicolorous, length about once and a half the breadth; clypeus very long, much exceeding the genae. Head, thorax, and pronotum yellow, immaculate; compound eyes dusky, with a greenish tinge; vertex rather strongly produced; head distinctly narrower than the pronotum. The dark spots on the elytra are arranged as follows: The first is on the inner margin of the clavus and about one-third of the length of the clavus from its base, the second is also on the inner margin just before the inner cross-nervure and opposite the tip of the clavus, and the third,



FIGS. 3 and 4.—ELYTRON AND WING OF ALEBRA TRIMACULATA.

which is not as dark as the others, lies just beyond the outer cross-nervure near the apex of the elytron. Abdomen and all beneath pale yellow. Last ventral segment with the posterior angles broadly rounded and with a slight scoop-shaped tooth on the middle of the posterior margin. (See Figs. 3 and 4 for wing venation.)

Described from a single female taken by Mr. H. H. Smith in April at Chapada, Brazil.

## ALEBRA ROBUSTA, new species.

Beneath yellow; vertex and pronotum yellow marked with red; elytra deep smoky marked with red. Length, 3.25 mm.

Face very pale yellow, almost white; length about five-fourths of the breadth; clypeus moderate in length but considerably exceeding the genae. Vertex pale yellow, with three red spots, one at the extreme apex and two back of this between the compound eyes, but little produced, narrow; compound eyes large. Pronotum hardly broader than the head and marked with four red lines, one on either side extending back from the compound eyes, and two parallel ones upon the dorsum. Scutellum reddish brown, indistinctly marked with whitish lines and spots, blackish near the apex, but the extreme apex light yellow. Elytra deep smoky, with a broken yellowish oblique line on the clavus, a similar reddish line on the inner sector, and a broad outer margin to the first cross-nervure varied with blotches of reddish yellow and reddish brown. Abdomen blood-brown above, pale yellow beneath. Legs entirely pale yellow. (For form of vertex and pronotum and for venation of elytron, see Figs. 5 and 6.)



FIG. 5.—VERTEX AND PRONOTUM OF ALEBRA ROBUSTA.

Described from a single male taken by Mr. H. H. Smith in the month of April at Chapada, Brazil.

**ALEBRA DORSALIS**, new species.

Entirely yellow beneath, mostly deep smoky or blackish above back of the vertex. Length, 4 mm.

Face remarkably short and broad, the breadth exceeding the length by about one-sixth of the latter; the clypeus broadly rounded below, and hardly exceeding the genae, broader near the apex than at the base. Vertex broadly rounded, slightly produced, yellow, with a slight dusky coloration posteriorly. Pronotum short and broad, a little narrower than the head, deep smoky or blackish in color, except at the sides back of the compound eyes where it is yellow. Scutellum concolorous with the pronotum, and without markings except the extreme apex, which is yellowish. Elytra yellowish hyaline on the outer half,

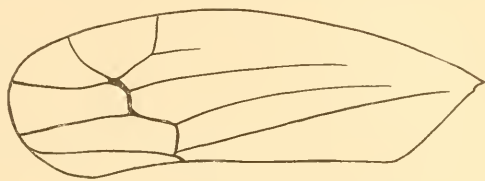


FIG. 6.—ELYTRON OF ALEBRA ROBUSTA.

the inner half and entire apex deep smoky. Tergum black with the lateral margins of the segments deep yellow, all beneath yellow.

Described from one male taken by Mr. H. H. Smith, in the month of April, at Chapada, Brazil.

**ALEBRA ALBOSTRIELLA** Fallen.

*Cicada albostriella* FALLEN, Hemiptera Suceiae-Cicadariae, p. 54, 1829.

*Typhlocyba albostriella* FLOR. Rhyn. Livl., pp. 373, 382, 1861; varieties *fulvcola*, *elegantula*, *Wahlbergi*, *discicollis*, and *fasciata*, *ibid.*, p. 384.

*Alebra albostriella* FIEBER, Kat. d. eur. Cicad., p. 14, 1872; varieties *elegantula*, *discicollis*, *fulvcola*, and *Wahlbergi*, *ibid.*, p. 14.—MAYR, Rhyn. Triol., II; Hemip. hom. (Cicad.), p. 23, 1880; Tab. d. Cicad. v. Centralenropa, p. 36, 1884.—PUTON, Cat. d. Hemipteres, p. 86, 1886; varieties *elegantula*, *discicollis*, *exima*, *fulvcola*, and *Wahlbergi*, *ibid.*, p. 86.—MELICHAR, Cic. v. Mittel-europa, p. 317, 1896.—WOODWORTH, Psyche, V, p. 76, 1888.

*Typhlocyba aurata*, *pallida*, and *binotata* WALSH, Proc. Bost. Soc. Nat. Hist., p. 315, 1864.

*Alebra aurea*, *pallida*, and *binotata* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 309, 1894.

*Erythronera mali* PROVANCHER, Pet. Faune Ent. Can., III, p. 298, 1890.

According to Fallen this species is described as follows:

*Cicada albostriella* lutescens, thoracie lineis tribus elytrorumque duabus albis, pedibus pallidis.

*Mas. & Fem.* Colore similes. In Ostrogothia a D. Zetterstedt inventa. Statura *Cic. variate*. Longit. 2 lin.—Caput immaenatum. Thorax untrinque striga laterali & media dorsali, quae scutellum transit, alba pulchre picta. Elytra pellucida lutescentia: striis duabus albis magisque pellucidis a basi fere ad apicem ductis. Abdomen supra nigricans, subtus pallidum. Pedes in exsiccatis albidii.



Fig. 7 shows form of vertex and pronotum, and Figs. 8 and 9 the venation of elytron and wing.

This species, on account of its wide distribution and great variety of forms, has been described, as indicated above, under no less than seven different names in Europe and four in this country. Walsh's *aurea* is identical with *fulvicola* H-S., and his *pallida* is like the *albostriella* of Fallen. These are the only two varieties that I have seen from this country. It is possible that Walsh's *binotata* may be a good species, but it hardly seems possible, as the only difference between this and *aurea* is its paler yellow color and a little dusky marking.



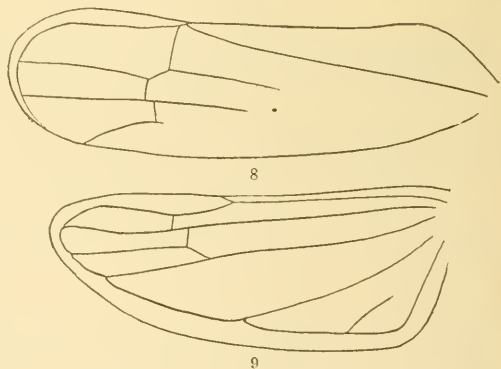
FIG. 7.—VERTEX AND PRONOTUM OF ALEBRA ALBOSTRIELLA.

This seems a rather rare species in this country. I have seen but nineteen specimens in all, and twelve of these were in one sending from Mr. Otto Heidemann.

I have received specimens of this species as follows: From Professor J. B. Smith, two specimens, labeled "Washington, D. C., 2-6, '93;" from Professor G. C. Davis, two specimens, one taken on pear and one on cherry at the Michigan Agricultural College; one from Mr. C. F. Hart, taken in Illinois; from Mr. E. P. Van Duzee, two, taken at Hamburg, New York, sweeping ferns and rank weeds; from Mr. Otto Heidemann twelve, eleven of which were marked "Washington, D. C.," and one "Rock Enon Spr., Va." Walsh's specimens were taken at Rock Island, Illinois, and Provancher's in Canada.

ALEBRA FUMIDA, new species.

Yellowish below, dark smoky above; length 3.75 mm. Face entirely yellow or slightly washed with smoky above; length of front 0.9 mm., breadth 0.8 mm.; the clypeus is pointed at the tip, broadest a little below the middle, and is a little more than one-third the length of the front. The genae are narrow, deeply incurved beneath the eyes, scarcely visible against the lorae, broadened beneath the lorae where they meet the clypeus at its broadest part, some distance from the apex. Antennae yellow, a little paler than the face. Vertex concolorous with the face, without markings, except a dark median line, not perceptibly longer at the middle than at the eyes, ocelli wanting. Pronotum varying from yellow washed with smoky brown on the middle and posterior portions to dark smoky throughout; width, one and six-



FIGS. 8 and 9.—ELYTRON AND WING OF ALEBRA ALBOSTRIELLA.

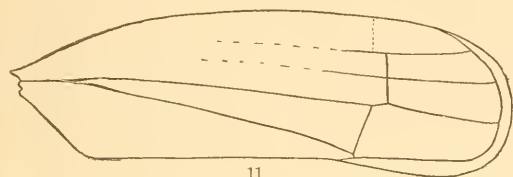
sevenths times the length, and its length just twice the length of the vertex; posterior margin a little concave. Scutellum usually a little darker than the pronotum, the transverse groove black; elytra deep smoky to blackish, the color deepest on clavus and near the tips. Tergum, smoky brown, with the apical margins of the segments yellowish; ovipositor, yellowish; sheaths, smoky brown; venter, yellow; pygofer, infuscated. Legs yellow throughout with claws blackish.

*Type*.—No. 3411, U.S.N.M.

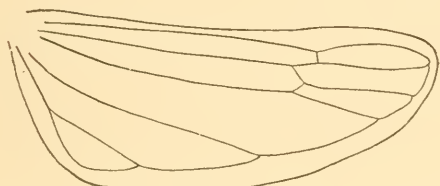
Described from four females and one male, all from Cornell University and labeled "Ithaca, N. Y.,



FIG. 10.—VERTEX AND PRONOTUM OF ALEBRA FUMIDA.



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FIGS. 11 and 12.—ELYTRON AND WING OF ALEBRA FUMIDA.

July 31, '94." (See Figs. 10, 11, 12.) I do not feel at all certain that the above may not prove to be another of the many varieties of *albostricella* when a larger series of this species has been studied, as the principal differences seem to be in coloration.

Genus DICRANEURA  
Hardy.

Only two American species in this genus have been reported up to the present time. From the material in hand, I am able to recognize a good number of both of these and to add eight others, seven of which are new.

ANALYTICAL KEY TO THE AMERICAN SPECIES OF THE GENUS DICRANEURA.

- A. Elytra with a deep triangular apical cell on costal margin.
  - B. Elytra covered with red spots of varying size.....*maculata*.
  - BB. Elytra whitish, unicolorous, or with two longitudinal sanguineous lines on each, without black spot.....*cruentatus*.
  - BBB. Elytra with orange markings and with a black spot in the middle apical cell.....*unipuncta*.
  - BBBB. Elytra largely colored with red and with a black spot in the inner apical cell.....*4-rivata*.
- AA. Elytra with apical cell on costal margin lanceolate or wanting.
  - B. Elytra milky white, nervures indistinct.....*communis*.
  - BB. Elytra yellowish or pinkish.
    - C. Vertex and pronotum with two reddish longitudinal lines; very slender species with strongly produced vertex.....*abnormis*.
    - CC. Vertex and pronotum without red lines.
      - D. Elytra with large median red spot or band.....*cockerellii*.
      - DD. Elytra without transverse red markings.
        - E. Length under 3 mm.....*kunzei*.
        - EE. Length 3 mm. or more.
          - F. Venter yellow.....*fiberti*.
          - FF. Venter nearly or entirely black.....*carneola*.

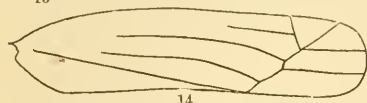
## DICRANEURA MACULATA, new species.

Ground color very pale yellow, almost white, spotted above on vertex, pronotum, scutellum, and elytra with red, and on the face with blackish. Length, 3 mm.

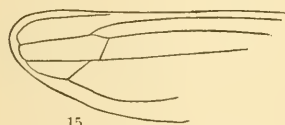
Vertex strongly produced, almost acute at apex, the angle slightly less than a right angle; a transverse red line on the extreme apex, and a broad red band beginning at either eye extends to near the middle line on either side, and then is deflected back to the posterior margin, where the two halves coalesce. Face pale yellow; a red line starting at either eye runs above the antennae and then is bent upward, meeting its mate at an acute point a little below the margin of the vertex; above this line and on a level with its highest point on either side of the front is a dark dot, and there is a row of about seven transverse dark dashes on either side of the front below the red line, and also a conspicuous dark spot on the gena below the compound eye on either



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FIGS. 13, 14 and 15.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF DICRANEURA MACULATA.

side. The pronotum has a broad red band which starts on its inferior surface, extends over the lateral margin onto the superior surface, attains or nearly attains the anterior margin at the inner angle of the eye, and then is bent back to near the posterior margin, when it crosses the middle line of the pronotum, so that the posterior margin and a large blotch on the middle anteriorly are whitish without red markings. The scutellum is slightly washed with a pinkish coloration, and the tip is red. On the clavus of the elytra are four red blotches in a line, the largest being near the base and the smallest at the extreme tip; there are also a few small red dots along the claval suture anteriorly; on the corium are about four large red spots and numerous minute red dots. The red spots are, one close to the base of the wing and not very large, a large elongate spot back of it extending toward the third spot on the clavus, another on the middle of the corium just anterior to the spot at the tip of the clavus, and a fourth on the middle of the costal margin. The red dots are scattered almost the entire length of the corium, but are most abundant in the region of the cross nervures. The cross nervures run very diagonally from the tip of the clavus toward the tip of the elytron, the first apical cell on the costal margin being short and triangular and coming far short of the apex of the elytron. In the wing the second inclosed apical cell is unusually small. Feet very pale yellow; tips of tarsi and spots at the base of the posterior tibial spines blackish. (See Figs. 13, 14, 15.)

*Type*.—No. 3412, U.S.N.M.



Described from one male sent from the Illinois State Laboratory of Natural History. This is a very beautiful species, and quite unlike any other that I have seen in its coloration.

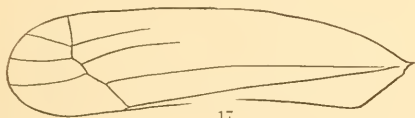
*DICRANEURA CRUENTATA*, new species.

Color very pale yellow, with pronotum, scutellum, and elytra marked with sanguineous. Length, 2.75 mm.

Face pale yellow, without markings, sutures rather indistinct, antennae concolorous with the face. Vertex of the same color as the face, except that it is usually darker and may or may not have a sanguineous blotch on the middle, considerably produced, apex moderately rounded, the angle somewhat less than a right angle. Pronotum three-fourths broader than long, less than once and a half the length of the vertex, a little concave posteriorly, with a sanguineous line on either side extending from the inner angle of the eye in a straight line to the basal angle of the scutellum, leaving the lateral margins and a large rectangular area on the disk pale yellow. Scutellum entirely sanguineous. Elytra pale yellow, translucent, with a bright red dash of greater or less extent on the clavus, and another along the inner sector on the corium, beginning at about the middle of the wing and extending nearly or quite to the cross veins. Venation of elytron very similar to that of *maculatus* as seen in the illustration. There is also a more or less intense smoky decoloration of the elytron in the region of the cross veins. Tergum and venter pale yellow, feet whitish.



FIG. 16.—VERTEX AND PRONOTUM OF *DICRANEURA CRUENTATA*.



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FIGS. 17 and 18.—ELYTRON AND WING OF *DICRANEURA CRUENTATA*.

The sanguineous markings vary from bright blood red to very pale, and in some specimens they are entirely wanting. The red dashes on the elytra are present in most of the specimens I have seen. (See Figs. 16, 17, 18.)

*Type*.—No. 3413, U.S.N.M.

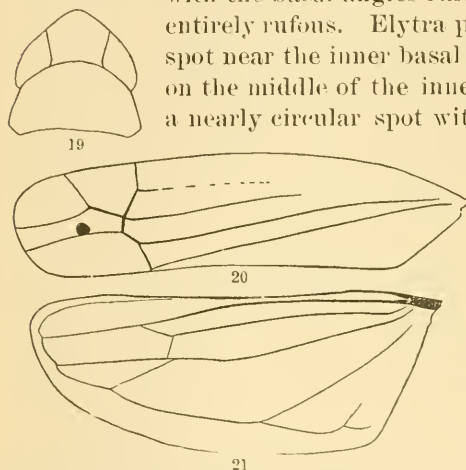
Described from fifteen specimens from Cornell University,

marked "Ithaca, N. Y., Aug. 28, '94," one specimen from Mr. Clermont Livingston, taken on Alder, at Corfield, Vancouver Island, and nine specimens taken by myself among dry leaves in the foothills near Fort Collins, Colorado, April 9. None of the specimens from the foothills show red markings on pronotum or scutellum and only about half have the red dashes on the elytra. The smoky coloration upon the two outer sectors of the elytron just before the cross-nervures and upon the inner cross-nervure is perfectly constant in the above mentioned specimens.

## DICRANEURA UNIPUNCTA, new species.

Color yellow, marked with fuscous and orange above. Length, 3.25 mm.

Face about one-fifth longer than broad, quite narrow below, clypeus very narrow, general color uniform light to sordid yellow. Vertex moderately produced, its angle a right angle, fully two-thirds as long as the pronotum, the width of the head hardly two and one-half times the length of the vertex, with or without two longitudinal orange-colored stripes. Pronotum slightly less than twice as wide as long, pale yellow in color, and with or without four narrow longitudinal orange lines above. These lines are sharply defined in two specimens, but in the others they are faint or entirely wanting. Scutellum pale yellow with the basal angles rufous, or, in one specimen, almost entirely rufous. Elytra pale yellow, a large round orange spot near the inner basal angle, another semicircular spot on the middle of the inner margin of the clavus, making a nearly circular spot with its mate, and a long orange-



FIGS. 19, 20, and 21.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF DICRANEURA UNIPUNCTA.

colored line just outside the clavus and extending from near the base of the clavus to its tip; the apical nervures are lemon-colored bordered with smoky, and near the center of the middle apical cell is a black spot which is very conspicuous. For the venation see Fig. 20. In one specimen the orange-colored spots on the clavus have run together and all the orange coloration is weak and obscured with fuscous. Abdomen in the females golden yellow above and below, in a single male, entirely dark smoky except the tips of the segments and at the sides. Feet uniform pale yellow. (See Figs. 19, 20, 21.)

*Type*.—No. 3414, U.S.N.M.

Described from three females and one male from the United States National Museum, one of which is labeled "Coquillett, Collector, Calif., through C. V. Riley," and three are labeled "Coquillett, Los Angeles, Calif."

## DICRANEURA COMMUNIS, new species.

Sordid milky white, pronotum vertex and scutellum slightly yellowish, without distinct markings above. Length, 3.75 mm.

Face very pale sordid yellowish, unicolorous, entire front hardly longer than broad; clypeus a little more than one-third the length of the front, broadest below the middle, somewhat constricted near the base, rounded at the apex; lorae as long as the clypeus and as broad as

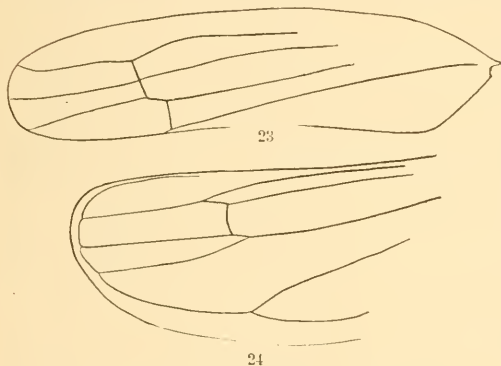
the base of the clypeus: genae rather broad beneath the lorae but not attaining the tip of the clypeus. Vertex concolorous with the face, without markings, the anterior angle a right angle and rather acute. Pronotum a little paler than the vertex except upon the middle where it is somewhat darker, a little more than once and a half as broad as long and fully once and a half the length of the vertex a little concave, behind. Scutellum whitish, or yellowish white, with the transverse groove short and black. Elytra dull milky white, subopaque, nervures indistinct, unicolorous throughout, with three long narrow apical cells as shown in the illustration. Tegum black, venter black to the last segment, which is whitish, with the tip corneous, pygofers whitish, pectus black, feet whitish throughout. (See Figs. 22, 23, 24.)



FIG. 22.—VERTEX AND PRONOTUM OF DICRANEURA COMMUNIS.

*Types*.—No. 3415, U.S.N.M.

Described from two specimens from the Illinois State Laboratory of Natural History: one swept from rye, April 22, and one at light, April 30, Nos. 14873 and 17904; one specimen from Cornell University marked "Ithaca, N. Y., 31 July, '94;" four specimens from Professor G. C. Davis taken at Michigan Agricultural College between April 21 and May 20; seven specimens from the collection of Mr. C. F. Baker, all taken at Lansing, Michigan, on grass, between April 28 and June 6; one specimen taken by the writer in miscellaneous sweepings along the river at Fort Collins, Colorado. Males and females.



FIGS. 23 and 24.—ELYTRON AND WING OF DICRANEURA COMMUNIS.

#### DICRANEURA ABNORMIS Walsh.

*Chloroncura abnormis* WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 316, 1864.

*Dicraneura abnormis* WOODWORTH, Psyche, V, p. 213, 1889.

Walsh describes this species as follows:

Pale dull green, front of head forming an angle of about 80°, with the apex rounded; antennae and eyes fuscous; vertex and thorax with two sanguineous vittae, more or less obsolete. Abdomen black, except the tips of the joints; the last joint almost entirely greenish. Tips of tarsal joints dusky. Elytra, towards the base, subopaque, dull greenish; at tips, subhyaline; an obscure sanguineous vitta on the anal vein, and another parallel with it halfway to the costa, both sometimes obsolete. Wings whitish, subopaque, with the tips of the costal veins fuscous; the cross vein forming a salient angle, and emitting from its apex an additional vein, as in *Typhlocyba*. Length to tip of wings, three-twentieths of an inch. (See Figs. 25, 26, 27.)

I have several specimens from the Illinois State Laboratory of Natural History, all taken September 13 in general sweeping, No. 15418. Others have been received from the private collection of Mr. C. A. Hart, taken in Illinois: from Mr. Th. Pergande, marked "D. C.;" and from the United States National Museum, marked "Texas, Injuring wheat."

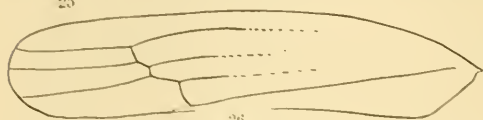
VARIETY RUFULA, new variety.

Colors above pale yellow and reddish. Breadth,  $\frac{2}{3}$  mm.; length, 3.5 mm.

Face long, pale yellow, or yellow slightly washed with reddish. Vertex rather strongly produced and pointed, the angle distinctly less than a right angle, two-thirds the length of the pronotum, but little less than half as long as the breadth of the head, yellow with two longitudinal reddish lines extending from the hind margin to near the anterior. Pronotum two-thirds as long as broad, yellow on the lateral and anterior margins, on



25



26



27

FIGS. 25, 26, 27.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF DICRANEURA ABNORMIS.

the middle and posterior portions red. Scutellum mottled with red and yellow, the red predominating. Elytra very long and slender, pale yellowish and finely spotted with red to the cross-veins, beyond the cross-veins transparent. Abdomen blackish above, yellow beneath, tip of the ovipositor infuscate. Feet entirely light yellow.

Described from a single female from the United States National Museum labeled "Coquillett, Los Angeles, Calif."

A mutilated specimen probably belonging with this variety and labeled "Placer Co., Calif., Aug.," differs in having the vertex a little shorter and in having the red coloration of the elytra evenly diffused over the basal two-thirds, except that the veins are yellow.

Additional specimens may show that this variety is worthy of specific rank, but I do not think such will be the case.

DICRANEURA COCKERELLII Gillette.

*Dicraneura cockerellii* GILLETTE, Psyche, VII, Supp., p. 14, 1896.—COCKERELL Bull. 19, N. M. Exp. Sta., p. 114, 1896.

General color light straw yellow, a bright red band crossing the elytra before the middle. Length, 3 mm.

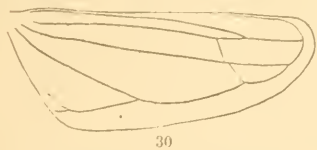
Head: Vertex strongly produced and almost acute in front, the angle being somewhat less than a right angle, as long as the pronotum; color

straw yellow, without distinct markings, in some specimens washed with dilute sanguineous with light spots on the posterior margin next the eyes. Pronotum: The breadth is twice the length, moderately concave behind, color like that of the vertex, and, when washed with sanguineous, there is a distinct whitish spot on the middle of the anterior margin next the vertex. Scutellum without distinct markings and agreeing with the vertex and pronotum in color. Elytra pale straw yellow crossed by a narrow band of bright cherry red varying some in depth of color, but plainly discernible in all mature specimens. The band crosses just before the middle of the clavus, and that portion of the band that is above the claval suture is pushed forward so that only about half of its width comes against that portion which is upon the corium; just beyond the cross nervures is a jet black spot lying in the inner apical cell. The venation of the wing is peculiar in that the posterior apical cell is very small. All beneath pale yellow. (See Figs. 28, 29, 30.)

*Types*.—No. 3416, U.S.N.M.

Described from twenty-five specimens, male and female, sent me by Professor T. D. A. Cockerell, who took them at Las Cruces, New Mexico.

Since publishing the above description I have seen a number of specimens from the United States National Museum labeled "Coquillett, Los Angeles, Calif." Professor Cockerell reports this species as abundant on grapevines in New Mexico.



FIGS. 29 and 30.—ELYTRON AND WING OF DICRANEURA COCKERELLI.



FIG. 28.—VERTEX AND PRONOTUM OF DICRANEURA COCKERELLI.

#### DICRANEURA KUNZEI, new species

Elytra and most of pronotum greenish; vertex and scutellum yellow. Length, 2.5 mm.

Face yellow above, but dusky below. Vertex moderately produced and rather bluntly rounded, its length hardly more than one third of the width of the head, without distinct markings. Pronotum greenish, with the anterior border and the lateral margins yellowish; twice as broad as long and one and a half times as long as the vertex. Scutellum yellow, without distinct markings. Elytra yellowish green, semi-transparent, outer apical cell lanceolate. For venation of elytra and wing see Figs. 32 and 33. Tergum black, venter blackish with the margins of the segments yellow, in one specimen the yellow color predominates below. Feet sordid or greenish yellow. (See Figs. 31, 32, 33.)

*Types*.—No. 3417, U.S.N.M.

Described from two males and one female taken by Doctor R. E. Knzée at Tucson, Arizona, between April 11 and 15.



## DICRANEURA CARNEOLA Stål.

*Typhlocyba carneola* STÅL, Stett. Ent. Zeit., XIX, p. 196, 1858.

*Notus carneolus* FIEBER, Kat. ent. Cicad., p. 11, 1872.

*Dicraneura carinata* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 311, 1894.

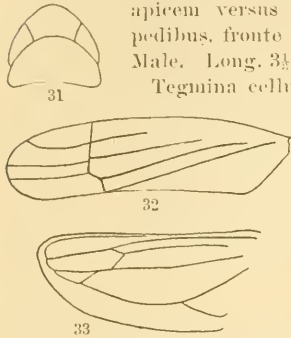
The following description is from Stål:

Dilute carnea, vertice sentelloque in pallide flavescens migrantibus; tegminibus apicem versus decoloribus, subcarneo-venosis, abdome nigro, ano, pedibus, fronte incisissimisque ventris tenuissime pallide flavescens. Male. Long.  $3\frac{1}{2}$ . Lat.  $\frac{2}{3}$  mm. Tab. I, fig. 7. Sitka.

Tegmina cellulis apicalibus 4 elongatis instructa, intermediis 2 subparallelis, quarum anteriore posteriore, paululum longiore, basi truncatis; marginale antica prope basin nonnihil angusta, postica elongato-triangulari. Alae marginate; anterioris venis 3 instructae, quarum 2 anticis pone medium ad unam confluentibus, posteriore pone medium furcata. (See Figs. 31, 35, 36.)

Stål's type was taken at Sitka, Alaska, and he seems to have described from a single male specimen.

FIGS. 31, 32, and 33.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF DICRANEURA KUNZEL.



I have a single male from Mr. C. Livingston, taken on Vancouver Island, in general sweeping, that answers the description perfectly. I have sixteen specimens from Mr. C. V. Piper, taken at Pullman, Washington, in the month of June in general sweeping that are identical with the Vancouver Island specimen, except that they vary greatly in the depth of the rosy coloration of the pronotum and elytra. In most of the specimens this coloration is very slight. Doctor R. E. Kunzé has also sent me a good number of specimens of his collecting at Tucson, Arizona. None of the Arizona specimens have the bright rosy coloration.

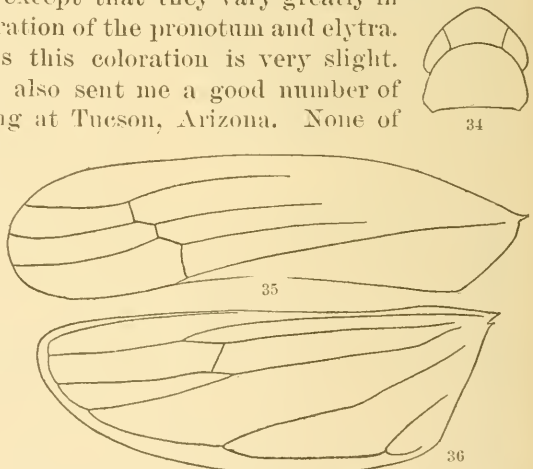
DICRANEURA FIEBERI Löw.

*Dicraneura fieberi* MELICHAR, Cicadien von Mittel-europa, p. 325, 1896.

I do not have access to the original description of this species, but have a number of Euro-

pean specimens in my collection sent me by Mr. E. P. Van Duzee, who obtained his specimens from Lethierry, and I find no difference whatever in the specimens from the two countries.

This is a yellow species, without markings and  $3\frac{1}{2}$  mm. in length. It will be readily separated from the other species of the genus by the



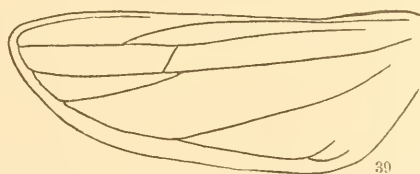
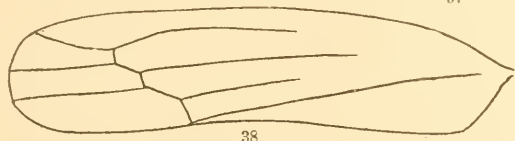
FIGS. 34, 35, and 36.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF DICRANEURA CARNEOLA.

foregoing synopsis and the drawings. (See Figs. 37, 38, 39.) American specimens have been received as follows: From Illinois State Laboratory of Natural History, a good number of specimens taken in general sweeping near Champaign, Illinois; from Iowa Agricultural College, specimens taken at Ames, July 26; from Mr. Samuel Henshaw one specimen marked, "From grass, Cambridge, Mass.;" from Mr. Otto Heidemann, a number of specimens marked, "Washington, D. C.;" from Cornell University, a good number of specimens marked "Ithaca, 25 July," and "Ithaca, 28 Aug.;" from Professor J. B. Smith one specimen marked "N. J., 7 20;" from F. F. Crevecoeur, three specimens taken at Onaga, Kansas.

*DICRANEURA QUADRIVITTATA*, new species.

Ground color pale yellow, heavily marked with red above. Length, 2.5 mm.

Face very much depressed, so that its line is almost parallel with the line of the vertex and pronotum, very short below the eyes, as broad as long, clypeus small, color a reddish yellow. Vertex moderately produced, its angle a right angle, its length about four-fifths the length of the pronotum and breadth of the head two and one-half times the length of the vertex: the anterior portion and a rather broad median line are yellow, the basal portion outside of the yellow line is bright red. Pronotum twice as broad as long, the colors light yellow and red, the latter color predominating and showing as four broad longitudinal stripes above; on either side there is



FIGS. 37, 38, and 39.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF *DICRANEURA FIEBERLI*.

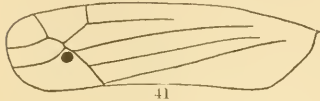
another short red line back of the eyes. Scutellum entirely red. Elytra whitish, marked with red; a large red vitta occupies nearly the whole of the anterior two-thirds of the corium; below this, beginning on the costal margin near its base and running parallel with the red line on the clavus, is another red line somewhat interrupted at the middle; back of these red lines, on the middle of the elytron, are two red spots, one extending in from the costal margin and another, the larger one, inside of this but not reaching to the inner margin; beyond these spots the veins of the elytron are orange bordered with smoky. At the base of the inner apical cell, at the end of the second sector, is a small black spot. Venter smoky yellow; feet light yellow, the tibiae slightly tinged with reddish. (See Figs. 40, 41, 42.)

Type.—No. 3418, U.S.N.M.

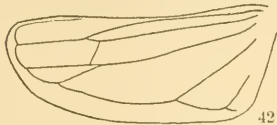
Described from a single male from the U. S. National Museum labeled "L. J. Bah, 4/1, 1879, Schwarz."



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FIGS. 40, 41, and 42.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF *DICRANURA QUADRIVITTATA*.

Genus *EMPOASCA* Walsh.

On account of feeble structural characters, a large number of similar species and many inadequate descriptions, I have found the genus *Empoasca* a difficult one to work with. Many of the species are extremely abundant in individuals and are widely spread geographically. It is a genus containing many species in both North and South America. Several species are reduced to synonyms in this paper, and a further study will probably reduce others.

ANALYTICAL KEY TO THE AMERICAN SPECIES OF THE GENUS *EMPOASCA*.

- 1A. Vertex not produced, or very slightly so.
- B. Elytra with smoky or black coloration only.
- C. Prevailing color green.
- D. Dark dorsal stripe on thorax and elytra.....*smaragdula*.
- DD. Elytra with two and pronotum with one transverse dark stripe...*trifasciata*.
- C. General color yellow.
- D. Unicolorous smoky yellow.....*clypeata*.
- DD. Mostly smoky to entirely blue-black above.
- E. Yellow beneath, length about 5 mm.....*livingstonii*.
- EE. Black beneath, length 3 mm.....*nigra*.
- BB. Elytra tinged with smoky and with narrow orange lines, vertex yellow, length 3 mm.....*pulchella*.
- BBB. Elytra without distinct dark coloration.
- C. Sides of last ventral segment of female incised.
- D. Length 5 mm.....*aureoviridis*.
- DD. Length 4.25 mm.....*smaragdula*.
- CC. Last ventral segment of female produced but entire on the posterior and lateral margins.
- D. Claval suture of elytra blue, a black spot before the cross-veins...*splendida*.
- DD. Claval suture of elytra pale, deep yellow each side.....*albolinca*.
- DDD. Unicolorous, no line on claval suture.....*obtusa*.
- CCC. Last ventral segment of the female notched at the tip.
- D. A broad U-shaped notch.....*pergandii*.
- DD. Notch otherwise formed.
- E. Length over 4 mm.....*incisa*.
- EE. Length under 4 mm.
- F. Notch broad, but shallow, basal margin straight.....*denticula*.
- FF. Like the preceding, except that the notch has a broad, blunt tooth extending into it from the base.
- G. Tooth very short, vertex slightly produced.....*atrolabes*.
- GG. Tooth reaching nearly to posterior margin of the notch without black spot on elytra.....*unicolor*.

<sup>1</sup>The description of *Empoasca salinarum* Berg, does not enable me to include this species in the table. I have copied the description in full and placed the species last.

- AA. Vertex distinctly and rather strongly produced, not evenly rounded.
- B. Last ventral segment of female incised or notched posteriorly.
- C. Without black spot before cross-veins of elytra. . . . . *unicolor*.
- CC. With black spot on elytra before cross-veins.
- D. Pronotum mostly bright orange, claval sutures blue. . . . . *similis*.
- DD. Golden green without bright orange coloration. . . . . *atrolabes*.
- BB. Last ventral segment of the female entire on hind margin.
- C. Pronotum bright orange and blue, claval suture blue. . . . . *splendidus*.
- CC. Pale longitudinal orange stripes on elytra, length under 3 mm.
- D. Venter and pronotum golden yellow spotted with white and green. *mericana*.
- DD. Very pale green, elytra faintly striped with pale orange, no black on tergum. . . . . *radiata*.
- DDD. Tergum more or less black.
- E. Elytra subhyaline, length under 3 mm. . . . . *nigroscuta*.
- EE. Robust, elytra milky subopaque, length under 3 mm. . . . . *robusta*.
- CC. Greenish, yellowish or whitish species, nearly unicolorous.
- D. Scutellum and spot at tip of clavus blackish. . . . . *nigroscuta*.
- DD. Yellowish or greenish with smoky band across the middle of the elytra. . . . . *birdii*.
- DDD. Without conspicuous dark markings.
- E. General color whitish, length 3.75 mm. . . . . *pallida*.
- EE. General color greenish or yellowish.
- F. Length exceeding 3.75 mm.
- G. Golden coloration on vertex, pronotum, scutellum and tergum. *snowi*.
- GG. Without the golden coloration of the preceding species. . . . . *pura*.
- FF. Length less than 3.75 mm.
- G. Elytra flecked with small dusky spots. . . . . *tessellata*.
- GG. Color green, nervures of elytra and line on pronotum pale. *albocneura*.
- GGG. Color green, face very tumid, length 2.5 mm. . . . . *tumida*.
- GGGG. Face one-third longer than broad. . . . . *viridescens*.
- GGGGG. Face only about one-fifth longer than broad.
- H. With six or eight white spots on anterior margin of pronotum. *mali*.
- HH. With three white spots or none on pronotum. . . . . *flavescens*

## EMPOASCA SMARAGDULA Fallén.

*Cicada smaragdula* FALLÉN, Hemiptera Suecicae, p. 53, 1829.—ZETTERSTEDT, Ins. Lapp., p. 298, 1840.—SAHLBERG, Cicadariae, p. 159, 1871.

*Typhlocyba smaragdula* FLOR, Rhyneh. Livl. II, p. 393, 1861.—KIRSIBBAUM, Die Cicad. d. gegend v. Wiesbaden und Frankfurt, Wiesbaden, p. 178, 1868.

*Kybos smaragdulus* FIEBER, Verh. Zool. bot. Gesell. Wien., XVI, p. 508, 1866; Kat. enr. Cicad., p. 14, 1872.—PUTON, Cicad. d. Hemip., p. 87, 1886.—EDWARDS, Trans. Ent. Soc. London, p. 81, 1888.—WOODWORTH, Psyche, V, pp. 76, 212, 1888, 1889.—VAN DUZEE, Psyche, V, p. 241, 1889; Trans. Am. Ent. Soc., XXI, p. 311, 1894.—MELICHAR, Cicadinen von Mittel-europa, p. 327, 1896.

*Empoasca smaragdula* GILLETTE & BAKER, Bull. 31. Colo. Ag. Exp. Sta., p. 110, 1895.

I do not possess a copy of Fallén's paper in which this species was described, but the following is a copy of that description as given by Fallén in Hemiptera Suecicae:

*Mas. & Fem.* colore similes. In Alnetis Vestrogothiae sat frequens; D. GYLLENHAL; in fruticibus Gyllobo Scaniae raro nobis obvia. Longit. 2½ lin.—*Cic. Flavescens* longior et robustior, at *Cic. virescente* angustior. Tota saturate viridis unicolor. Post mortem autem caput imprimis et scutellum saepius pallescent. Elytra viridi-aurata, apice aureo-valde nitentia. Pedes virides.

Fallén also gives a brief characterization of this species in connection with the preceding description in the following words:

*C. smaragdula* saturate viridissima, immaculata, capite scutelloque pallidioribus; elytris hyalinis aureo-nitidissimis. (See Figs. 43, 44, 45.)

Mr. Van Duzee reports this species as occurring in Canada, New England, west to Colorado and California.

The only American specimens that I have seen came from the mountains of Colorado and were taken by Mr. Baker at Steamboat Springs and by myself at Leadville and on Park Hill, east of Estes Park. The specimens taken by Mr. Baker were from willows.

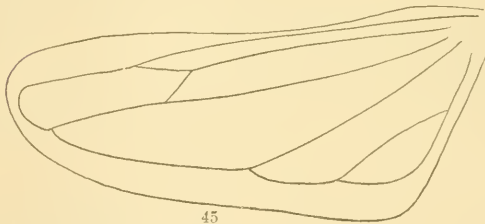
This species is very close to *aureociridis* Uhl. *Smaragdula* is the more slender species and the last ventral segment in the female is more strongly produced and sharper pointed than in *aureociridis*. The latter species is also more golden in color and in no case, that I have seen, does it have the smoky dorsal line that is so common in *smaragdula*. This



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FIGS. 43, 44, and 45.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF *EMPOASCA SMARAGDULA*.

dark line is not mentioned in the above description, but all of the twelve specimens in my collection from Europe have it; less than half of those from Colorado are so marked.

*Empoasca pura* (Stal) and *obtusa* (Walsh) also stand very close to this species.

Since writing the above I have taken a good number of speci-

mens of this species, with the dark dorsal stripe very pronounced, from *Crataegus rivularis* at Cimarron, Colorado, August 22, 1896.

#### EMPOASCA TRIFASCIATA, new species.

Pale green, with three transverse smoky bands above. Length, 4 mm.

Face golden yellow above, shading into green on the clypeus, with a broad whitish median stripe; face fully as broad as long. Front with sides nearly parallel, two-thirds longer than broad between the eyes, very obtusely rounded above. Clypeus about one-third longer than broad, a little less than one-half the length of the front, broad at the base, constricted at the upper one-third, rather blunt at the apex. Genae appearing as a mere line past the lorae but nearly attaining the tip of the clypeus; genae, lorae and clypeus pale green. Vertex slightly longer at the middle than at the eyes, very obtusely rounded in front,



color golden yellow, paler on posterior margin, having a slender dark median line, ocelli pits large and pale in color, but no ocelli; eyes very black and large, shortest distance between the eyes 1.7 times the length of the vertex at the middle. Pronotum twice the length of the vertex and nearly twice as wide as long; anterior two-thirds golden yellow, the remainder black. Scutellum bright green at tip but somewhat smoky on posterior portion. Elytra pale green, a deep smoky transverse band at the middle of the clavus, not quite attaining the costal margin, the apical area deep smoky on inner half, second apical cell with a short peduncle. Tergum washed with golden yellow, venter pale green, tips of pygofer and ovipositor deep green. Legs pale green with tips of tibiae and tarsi deep blue-green.

*Type*.—No. 3419, U.S.N.M.

Described from a female from Professor W. A. Snow marked "From electric light, Douglas Co., Kans.," from two females and one male from Mr. C. A. Hart, taken at Champaign, Illinois, and bearing the number 544, and a good number of both sexes from Ames, Iowa, taken by Mr. E. D. Ball, July 12, on cottonwood. Possibly a variety of *obtusa*.

#### EMPOASCA CLYPEATA Gillette & Baker.

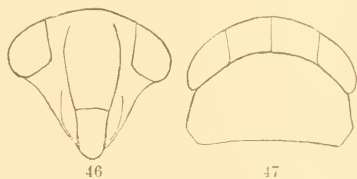
*Empoasca clypeata* GILLETTE & BAKER, Bull. 31, Colo. Agr. Exp. Sta., p. 108, 1895.

Male: Clypeus one-half longer than broad, basal suture straight; lorae as in *T. sanguinea*; genae very narrow, attaining the clypeus as a very narrow line, lateral margins nearly straight; front nearly twice as long as its greatest width between the eyes, twice the length of the clypeus, superior angle very broad and obtusely rounded. Face and vertex finely shagreened. Disk of vertex flat, sloping, scarcely longer on the middle than next the eye. Pronotum slightly wrinkled on posterior two-thirds, glabrous in front, slightly more than twice as broad as long, anterior margin broadly rounded, posterior margin concave, posterior angles sharply rounded, sides long. Scutellum normal, transverse suture straight. Color yellowish; in light specimens, face, vertex, pronotum, and scutellum yellowish, concolorous; in dark specimens front with a medium white line, pronotum dusky on posterior half, scutellum with basal angles and transverse groove dark; elytra in light specimens yellowish subhyaline, in dark specimens shaded into deep smoky subhyaline; venter and legs entirely pale yellow, sometimes tibiae and tarsi slightly smoky.

Length, 4.5 mm. Described from six males. (See Figs. 46, 47.)

*Type*.—No. 3420, U.S.N.M.

Estes Park, July 10 (Gillette). Steamboat Springs, July 10 on willow (Baker).



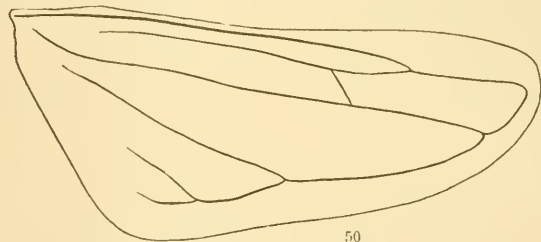
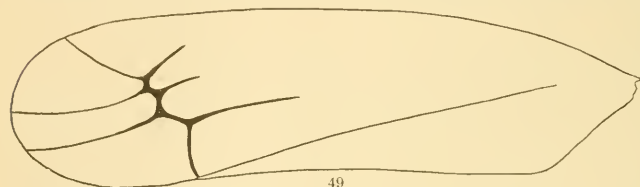
FIGS. 46 AND 47.—FACE AND VERTEX AND PRONOTUM OF *EMPOASCA CLYPEATA*.

This form is closely related to *obtusa* and may prove to be only a variety of that species.

EMPOASCA LIVINGSTONII, new species.

Color deep smoky to black. Length, 4.25 mm.

Face pale yellow, genae whitish, a more or less distinct white line down the middle of the front; the breadth of the face equal to the length. Vertex concolorous with the face, or with a little dusky coloration above in darkest specimens, not at all produced. Pronotum twice as broad as long and a trifle more than twice as long as the vertex; color, smoky brown to blackish, with a subobsolete pale line along the middle. Scutellum concolorous with the pronotum, a little paler on the middle, the transverse groove black. Elytra unicolorous, deep smoky to blackish, translucent, nervures distinct at the crossveins but soon fading out when traced toward the body, only three complete apical cells; wing venation



normal, nervures dusky. Abdomen more or less black above, yellow below. Feet entirely pale yellow, except in one very black specimen, which has the tibiae of the hind pair blackish. (See Figs. 48, 49, 50.)

*Cotype*.—No.

3421, U.S.N.M.

FIGS. 48, 49, and 50.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF EMPOASCA LIVINGSTONII.

Described from

three males and one female taken by Mr. C. Livingston during August and September at Corfield, Vancouver Island.

Since writing the above description I have received three specimens, that are more yellowish in color, from the U. S. National Museum and which were marked "Easton, Wash., Koebele." This species is also closely related to *obtusa*.

EMPOASCA NIGRA Gillette & Baker.

*Empoasca nigra* GILLETTE & BAKER, Bull. 31, Colo. Ag. Exp. Sta., p. 108, 1895.

Male: Clypeus about one-half longer than broad, basal suture straight; lorae as in *T. sanguinea*; genae suddenly broadening close to eye, lateral margin almost straight, attaining the clypeus in a very

narrow line; front nearly one-half longer than broad, once and two-thirds the length of clypeus, superior angle broadly obtusely rounded. Face coarsely and obsoletely shagreened. Disk of vertex sloping, with a slight median depression on the posterior half opening into a slight depression on the anterior margin of the pronotum, length at the middle slightly more than next the eyes. Pronotum opaque, on anterior third smooth, on posterior two-thirds indistinctly transversely rugose; slightly less than twice as broad as long, anterior margin broadly rounded, posterior margin somewhat concave, posterior angles sharply rounded. Scutellum opaque, with a median pit just in front of the transverse groove, posterior half irregularly wrinkled. Color black; antennae whitish; ocelli surrounded by a narrow pale margin; elytra black; posterior third fading into smoky subhyaline; anterior tibiae, and all the tarsi, smoky.

Length, 2.75 to 3 mm. Described from five males. (See Figs. 51, 52.)

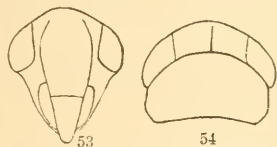
Type.—No. 3422, U.S.N.M.

Mountains southwest of North Park, July 10, on *Artemisia tridentata* (Baker).

#### EMPOASCA PULCHELLA Gillette & Baker.

*Empoasca pulchella* GILLETTE & BAKER, Bull. 31, Colo. Ag. Exp. Sta., p. 109, 1895.

Female: Clypeus a third longer than wide, basal suture straight; lorae long and narrow, scarcely grooved, attaining the end of the clypeus; front two-thirds longer than broad, nearly twice the length of the clypeus, superior angle obtusely rounded. Face and vertex without sculpturing, opaque. Disk of vertex scarcely longer on the middle than at the sides. Pronotum twice as wide as long, front margin broadly rounded, hind margin decidedly concave, posterior angles broadly rounded, sides rather short, without distinct sculpturing but with two small pits near the median line, one-fourth of the distance back from the anterior margin. Scutellum broader than long, transverse groove black. Last ventral segment with the hind margin deeply and broadly notched, posterior angles rounded. Color steel blue, varied with smoky and orange; head pale orange, genae and a large triangular mark on front extending onto and across vertex medially, ivory white; disk of vertex with a black median line on posterior two-thirds; ocelli rufous and distant from the eyes; pronotum pale blue, washed with white and pale orange on anterior and lateral margins; scutellum orange with whitish mottling; elytra subhyaline, smoky at base across median portion, and at tip, forming three broad indistinct transverse bands, elavus and corium posteriorly, each with a pale orange stripe,



FIGS. 53 and 54.—FACE, AND VERTEX AND PRONOTUM OF EMPOASCA PULCHELLA.



FIGS. 51 and 52.—FACE, AND VERTEX AND PRONOTUM OF EMPOASCA NIGRA.

veins whitish apically; last ventral segment almost entirely whitish, pygofer rufous below; legs sordid white.

Length 3 mm. Described from one female. (See Figs. 53, 54, 55, 56.)

In mountains southwest of North Park, July 10, on *Artemisia tridentata* (Baker).

#### EMPOASCA AUREOVIRIDIS Uhler.

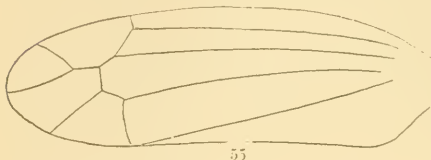
*Typhlocyba aureoviridis* UHLER, Bull. U. S. Geol. and Geog. Surv., III, p. 474, 1877.

*Empoasca aureoviridis* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans.

Am. Ent. Soc., XXI, p. 310, 1894.—GILLETTE & BAKER, Bull. 31, Colo. Ag. Exp. Sta., p. 108, 1895.

Dr. Uhler's description is as follows:

Long and slender, vivid yellowish green, the hemelytra translucent, exquisite golden green, plainly blackish on the apical margin. Head broad, hardly tumid, sublunate, wider than the pronotum, rich yellowish green on the vertex and front; the latter with a pale stripe down the middle, and a short one on the inner margin next the eye; cheeks deeper green; eyes narrow, as seen from above; antennae long, pale green at base, fuscous beyond. Pronotum smooth, yellowish green, moderately long, arcuated in front, and a little convex; each side and middle just behind the head with a pale round spot; lateral margins hardly reflexed, slightly prominent, a little obliquely arcuated. Beneath and legs green,



55



56

FIGS. 55 AND 56.—ELYTRON AND WING OF *EMPOASCA PULCHELLA*.

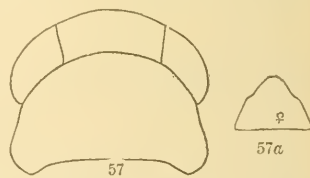
the nails and pulvilli black. Scutellum with a broad, paler green line along the middle; hemelytra narrow, yellowish-green golden; the apex with the four cells, of which the middle one is long, narrow, and almost straight, the two outer ones triangular, and the one next outside the middle obtriangular. Wings hyaline, highly iridescent, and with a bright golden tinge. Ovipositor projecting beyond the long valvular genital segment.

Length to tip of ovipositor 3-4 mm.; to tip of hemelytra 5-5½ mm. Width of pronotum 1½ mm. (See Figs. 57, 57a.)

This brightest of our green *Typhlocybas* was found in large numbers at Denver and Clear Creek Canyon, upon the leaves of willows August 7 to 18.

This species is close to *obtusa* but is more robust, the vertex is not produced, but evenly rounded, and the last ventral segment of the female is sinuate at the sides posteriorly.

I have found this species quite abundant on willows near Fort Collins, at Palmer Lake, and on Marshall Pass, Colorado. Those from the last-named place were taken August 23, and are more or less smoky in color, some being nearly black above.



57



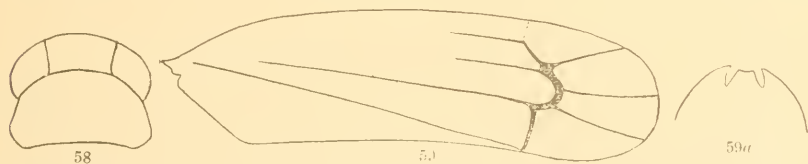
57a

FIGS. 57 AND 57a.—VERTEX AND PRONOTUM, AND LAST VENTRAL SEGMENT OF FEMALE OF *EMPOASCA AUREOVIRIDIS*.

## EMPOASCA UNICOLOR, new species.

Color varying from yellowish to greenish, without conspicuous markings, 3.5 mm. long.

Face yellow above, without markings, shading into green below, the length exceeding the breadth by about one-fifth, clypeus exceeding the lorae by about one-third its length, considerably constricted below its base and rather pointed. Vertex almost entirely yellow in some specimens but, in all, a median pale stripe and a pale or bluish blotch next each eye are more or less plainly visible. In some specimens there are also a pair of green dots a little before the middle of the vertex and rather near the median pale line. The vertex is not at all produced, its length is contained in the length of the pronotum almost exactly twice, and in the breadth of the head about 3.7 times. Pronotum slightly broader than the head, twice as wide as long, yellowish in color but more or less tinged with green posteriorly and, in most specimens, a small white spot can be seen on the middle of the anterior margin. Scutellum deeper yellow than the pronotum and with a pale or bluish blotch just before the apex, which, in some cases, extends for-



FIGS. 58, 59, and 59a.— VERTEX AND PRONOTUM, ELYTRON, AND LAST VENTRAL SEGMENT OF FEMALE OF EMPOASCA UNICOLOR.

ward to the margin of the pronotum. Elytra a golden green, the coloration stopping a little before the cross-veins, the tips slightly smoky. Abdomen yellowish above and below, the last ventral segment of the female having two deep oblique notches or slits on the posterior margin inclosing a stout blunt tooth between them. Legs greenish yellow, tarsi blue. (See Figs. 58, 59, 59a.)

*Type*.—No. 3423, U.S.N.M.

Described from a large number of specimens from Salineville, Ohio, sent by Cornell University, a small number of specimens from Michigan Agricultural College, taken by Professor Davis, July 15, on apple trees, and a good number taken by myself from *Crataegus coccinea* in Horse-tooth Gulch, near Fort Collins, August 16. I have also seen specimens from the U. S. National Museum, labeled "D. C., 6-19, on grape."

## EMPOASCA SPLENDIDA, new species.

Colors, blue, yellowish brown, and orange. Length, 3.5 mm.

Face as in the preceding species (*unicolor*). Vertex a little produced, reddish orange-yellow anteriorly and deep blue posteriorly (in



a faded specimen the colors are yellow and pale bluish). Length of vertex contained about one and two-thirds times in length of pronotum and three and one-third times in the width of the head. Pronotum as wide as the head and scarcely twice as wide as long, anterior two-thirds reddish orange and the posterior one-third blue in color. Scutellum yellowish brown without markings. Elytra concolorous with the scutellum with a rather broad deep-blue line extending along the claval suture and a rather broad costal margin of a fainter blue color, tips of elytra nearly hyaline, a velvety black spot just before the cross-nervure of the inner apical cell. Abdomen above and below yellowish, with genital organs somewhat greenish, last ventral segment of female almost truncate posteriorly and entire. Last ventral segment of male rather deeply notched. Legs yellowish with the tips of the tibiae and the tarsi deep blue. (See Fig. 60.)



FIG. 60.—VERTEX AND PRONOTUM OF EMPOASCA SPLENDIDA.

*Type*.—No. 3424, U.S.N.M.

Described from two females and one male collected by Mr. F. C. Pratt, at Lakeland, Maryland.

#### EMPOASCA ALBOLINEA, new species.

Color yellowish, more or less tinged with green, a pale line along the claval suture of the elytra, length 3.5 mm.

Face yellowish, shading into greenish below, a median white line extending to the clypeus, a white spot at the upper end of each of the lorae and two oblique white dashes just below the crest of the front, diverging toward the antennae. In some specimens these white markings are partly lacking. The length of the face equals the breadth; the clypeus exceeds the genae but little and is rounded below. Vertex yellow, in some specimens distinctly tinged with green, with a narrow median and two oblique pale lines or dashes plainly showing in the best-marked specimens, but wanting in others; but very little produced in front, its length contained in the length of the pronotum almost exactly twice, and in the width of the head nearly four times. Pronotum yellow with a median stripe and the hind margin pale; there is also a distinct white spot on the middle of the anterior margin, and another on either side back of the compound eye. These last spots are quite small in some specimens, but they are present in all; the width is hardly equal to that of the head, and is considerably less than twice the length. Scutellum yellow, slightly green toward the apex, and in some specimens there is a pale stripe through the middle. Elytra pale yellow to the tip of the abdomen; hyaline beyond, and with a conspicuous whitish line along the claval suture. Abdomen yellowish or greenish yellow above and below, the last ventral segment of the

female considerably produced posteriorly and entire. Legs yellowish to greenish, the tips of the tibiae and the tarsi always bluish-green. (See Figs. 61, 62.)

*Type*.—No. 3425, U.S.N.M.

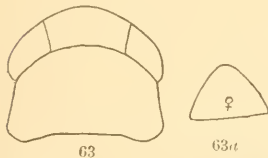
Described from numerous specimens from the Illinois State Laboratory of Natural History; from Th. Pergande, taken in Virginia; from Professor W. A. Snow, taken at electric light in Douglass County, Kansas. The Illinois specimens bear numbers 18520, 18526, and 18590. Mr. Hart writes me that those of the last number were taken on willow.

#### EMPOASCA OBTUSA Walsh.

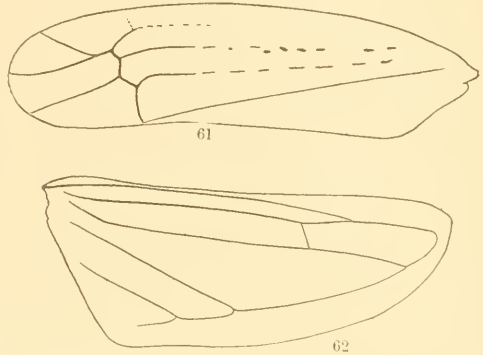
*Empoasca obtusa* WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 316, 1861.—WOODWORTH, Psyche, V, p. 213, 1889.—OSBORN, Proc. Ia. Acad. Sci., I, Pt. 2, p. 12, 1892.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 310, 1894.—GILLETTE & BAKER, Bull. 31, Colo. Exp. St., p. 110, 1895.

Walsh's description is as follows:

Pale grass-green. Front of head forming a very obtuse angle, with the apex rounded off. Each ocellus surrounded by a fuscous spot. Eyes and tips of tarsal joints fuscous; elytra greenish subhyaline; tips hyaline. Triangular cell peduncled. Wings hyaline. Length to tip of wings three-sixteenths of an inch.



FIGS. 63 and 63a.—VERTEX AND PRONOTUM AND LAST VENTRAL SEGMENT OF FEMALE OF EMPOASCA OBTUSA.



FIGS. 61 and 62.—ELYTRON AND WING OF EMPOASCA ALBOLINEA.

The above description is too meager to separate this species from *aureoviridis* Uhler. The specimens of the latter species that I have examined are more robust than those of *obtusa*; the vertex also is evenly rounded, not at all produced, and in the females the last ventral segment is produced and sinuate at the sides, posteriorly, as shown in Figs. 57, 57a. In *obtusa* the length hardly exceeds 4 mm. the vertex is distinctly, but not strongly produced, and the last ventral segment is produced and entire at the sides posteriorly. (See Figs. 63 and 63a.)

I have received specimens from Illinois State Laboratory of Natural History taken near Champaign, Illinois, and numbered 18529 and 18590, those of the latter number being from willow; from Mr. C. A. Hart, specimens taken near Champaign, Illinois, and numbered 544, 547 and 553; from Mr. Otto Heidemann, labeled "Washington, D. C.;" and from the U. S. National Museum labeled, "Ia., Gillette."

I have repeatedly taken this species on willow near Fort Collins and have specimens taken by Mr. Baker near this place on alfalfa, and at Steam Boat Springs in general sweeping, and by Master Carlos Stannard at this place in general sweeping.

A number of specimens from Mr. C. A. Hart are under size, being only about 3.75 mm. in length but I can find no other differences upon which to separate these small individuals from others.

It is possible that on receiving more material from the northwest this species will be found to be synonymous with *pura* (Stal).

#### EMPOASCA PURA Stål.

*Typhlocyba pura* STÅL, Stett. Ent. Zeit., XIX, p. 195, 1858.

*Chlorita pura* FIEBER, Kat. d. enr. Cicad., p. 14, 1872.—PUTON, Cat. d. Hemip., p. 87, 1886.

*Empoasca pura* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., p. 310, 1894.

Stal describes this species as follows:

Dilute subolivaceo-flava; abdomine pallide virescente, tibiis apicem versus tarsisque prasinis; tegminibus flavescendo-hyalinis, basi et apicem versus subdecoloribus, arcolis apicalibus 4, secunda (a commissura) parallela, tertia apicem versus latoire. ♂ Long. 3 $\frac{3}{4}$ ., Lat.  $\frac{5}{8}$  mm., Tab. I, fig. 5. Sitka.

Tegminia abdomine duplo fere longiora, apice rotundata, arcolis, apicalibus elongatis 4, quarum 1 (a commissura) elongato-triangulari basi reliquis latiore, 2 parallela, 3 basi secunda nonnihil angustiore, apicem versus sensim nonnihil latiore. Alae dilute lacteae, subvitreae, posterius ab apice limbatae, in parte antica venis 3 parallelis instructae, quarum 2 anticis magis approximatis, pone medium ad nam confluentibus. (See Fig. 61.)



FIG. 64.—VERTEX AND PRONOTUM OF EMPOASCA PURA.

I have seen but one specimen that I could refer to this species and that is in the collection of Mr. C. F. Baker, and was taken by Mr. Clermont Livingston at Corfield, Vancouver Island, upon marsh grass in the latter part of August.

While in general appearance this insect resembles *obtusa*, it has a much more produced vertex and the outer apical cell of the elytron is not pedunculated as it is in all the specimens of *obtusa* that I have seen. The last ventral segment is produced and entire as in *obtusa*. A large series might connect these forms, but I do not think it probable.

#### EMPOASCA DENTICULA, new species.

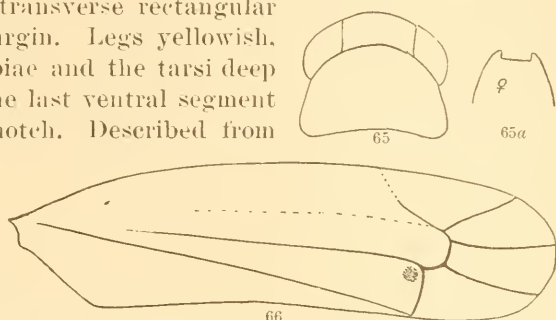
Pale yellowish green, vertex broadly rounded. Length, 4 mm.

Face pale yellowish, shading into greenish below in some specimens, without distinct markings; clypeus exceeding the genae by about one-third of its own length, rather narrow, and almost exactly one-third of the entire length of the face; the length of the face hardly exceeding the width. Vertex evenly rounded, not at all produced, and yellowish in color. Pronotum distinctly broader than the head and less than twice as wide as long, with or without indistinct whitish markings on a yellow or greenish yellow field. Scutellum yellowish or greenish, with

a pale longitudinal median stripe. Elytra greenish or yellowish subhyaline, the apical cells rather short and none of them pedunculated. In the only female specimen there is a dark spot just before the cross-nervure at the base of the anal apical cell. Wing venation normal. Abdomen yellowish above, greenish beneath, last ventral segment of female with a shallow transverse rectangular notch on the hind margin. Legs yellowish, with the tips of the tibiae and the tarsi deep blue. In the males the last ventral segment has a deep V-shaped notch. Described from one female and three males. (See Figs. 65, 65a, 66.)

*Cotype*.—No. 3426, U.S.N.M.

One male and one female were taken by the writer at Colorado Springs, August 3, and one male at Fort Collins, June 11. One male was taken by Mr. C. F. Baker, July 15, on Four-mile Hill, near Steamboat Springs, Colorado. All taken in general collecting.



FIGS. 65, 65a, and 66.—VERTEX AND PRONOTUM, LAST VENTRAL SEGMENT OF FEMALE, AND ELYTRON OF *EMPOASCA DENTICULA*.

*EMPOASCA PERGANDEI*, new species.

This species differs but slightly from the preceding (*denticula*) and as follows: The length is 3.75 mm.; there is considerable whitish mottling on the pronotum; the white line on the scutellum is broad and very distinct; the color of the basal angles of the scutellum and of the pronotum are distinctly yellowish, and the last ventral segment of the female has a U-shaped notch instead of a rectangular one. (See Fig. 67.)



FIG. 67.—LAST VENTRAL SEGMENT OF FEMALE OF *EMPOASCA PERGANDEI*.

*Type*.—No. 3427, U.S.N.M.

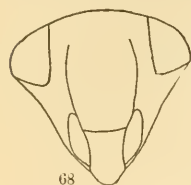
Described from a single female sent me by Mr. Theo. Pergande and labeled "F. Hills, Mass., July 4th, '90."

*EMPOASCA INCISA*, new species.

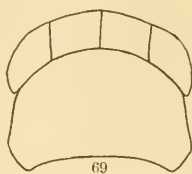
Color, golden green. Length, 5 mm.

Face light green, shading into rather deep green on the clypeus and deep golden yellow above; the eyes are margined with white opposite the ocelli, the ocelli are each located on a white spot and there is a median white line on the front; there are some transverse whitish markings upon the front, but these are rather indistinct. The face is as broad as long; the clypeus is about one-fourth longer than broad, broadly constricted at the middle and rounded at the apex. Vertex golden yellow, slightly tinged with green, not at all produced. Pronotum golden yellow before, shading into greenish posteriorly, with a median and two lateral white spots near the anterior margin; width

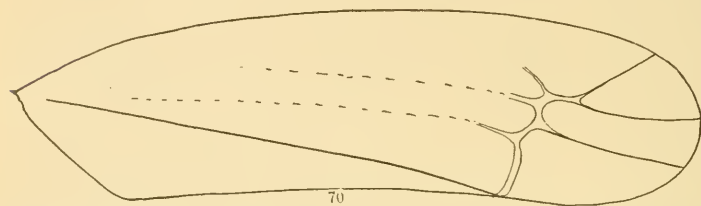
about one and three-fourths the length. Elytra yellowish subhyaline, sectors obsolete except near the cross-veins, first apical cell open posteriorly and the second one pedunculate. Wing normal, rather slender toward the apex. Scutellum with basal angles golden yellow, the median portion whitish and the apex green. The abdomen is mostly



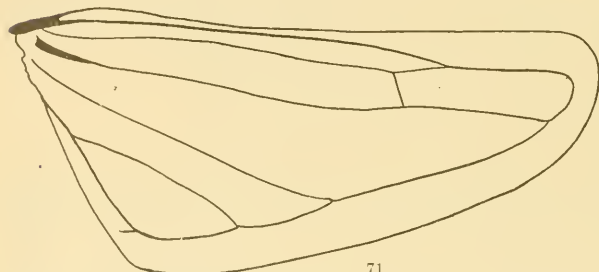
68



69



70



71

FIGS. 68, 69, 70 and 71.—FACE, VERTEX, AND PRONOTUM, ELYTRON, AND WING OF *EMPOASCA INCISA*.

yellow above, but is stained with green on some of the segments, the venter is pale green, the ovipositor is rather deep green, and the sides of the pygofers are yellow. The last ventral segment is strongly produced, with two deep, oblique incisions from the posterior margin, leaving a

large quadrangular tooth, rounded posteriorly. The femora are light green and the tibiae and tarsi deep bluish-green.

*Type*.—No. 3428, U.S.N.M.

Described from a single female taken

by the writer in Estes Park, Colorado, August 6. (See Figs. 68, 69, 70, 71.)

This species is readily separated from *aurcoriridis* Uhler by the incisions of the last ventral segment of the female.

#### *EMPOASCA ATROLABES*, new species.

Color, greenish golden with more or less deep blue. Length, 3.5 mm.

Face yellow, shading into greenish on cheeks and clypeus, marked between the eyes with bluish, front long and narrow, clypeus exceeding the genae by about one-third its length, total length of the face about one-fifth more than the total breadth. Vertex evenly rounded, slightly, or not at all produced, eyes greenish to infuscate, in none of the specimens black, a greenish median line and a similar, rather indistinct, oblique line near each compound eye. Pronotum fully twice the length of the vertex and a little less than twice as broad as long, yellow on the anterior half and greenish to bluish on the posterior half, in one specimen almost uniformly yellowish, entirely without pale or bluish lines or spots. Scutellum unicolorous, yellow. Elytra a beautiful



golden yellow to the cross-veins, the tips slightly smoky; with one exception the claval suture and the costal margins of the elytra are distinctly bluish, and in the brightest specimens this color is very beautiful. The first and fourth (outer and inner) apical cells are large and subtriangular, and the second and third are four-sided; just before the base of the fourth cell is a distinct black spot; the nervure running to the costal margin and forming the base of the first costal cell is rather indistinct near the margin. Tergum greenish yellow and, in some specimens, partly black, venter greenish yellow, last ventral segment of female considerably produced and with a nearly rectangular notch posteriorly, the hind edges of which are somewhat produced so that the notch is a little wider before than behind. Feet greenish yellow, the lower portions of the tibiae and the tarsi indigo blue. (See Figs. 72, 73, 74, 75.)

*Type*.—No. 3429, U.S.N.M.

Described from numerous examples of both sexes sent me by Professor G.

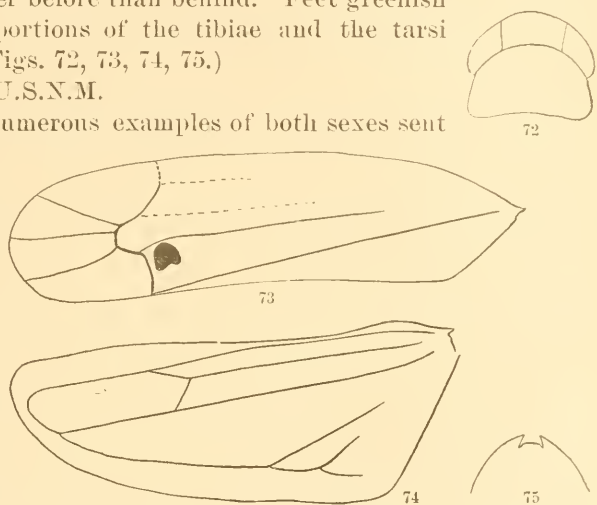
C. Davis and which were labeled "Mich. Ag. Coll., 7-5-'92, 297;" "8-9-'92, 387;" "8-15-'92, 395." I have since taken a number of specimens from hazelnut, *Corylus rostrata*, near Palmer Lake and near Golden, Colorado, July 18 and August 12, and from *Abnus viridis* and *Cratægus rivularis*, at Cimarron, Colorado, August 22.

Professor Herbert Osborn writes me that in their studies upon the *Jasside*, he and Mr. Ball have found that the last ventral segment of the female in some species of *Athysanus*, at least, is often notched during copulation. This notched last ventral segment is the chief character separating *atrolabes* from *splendida* and it is possible that the two forms may prove to be of one species when more material has been examined.

EMPOASCA MEXICANA, new species.

Color golden, marked with white and green. Length, 2.75 mm.

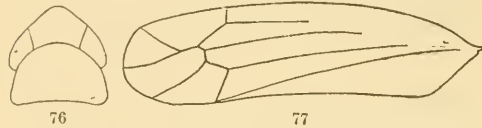
Face yellow above, greenish below, without distinct markings; length of face exceeding the breadth by one-third of the latter, clypeus exceeding the genae by one-third of its length. Vertex rather strongly produced, yellow, with a median whitish line and four spots of the same color, two of the spots being on the anterior margin and two near the



FIGS. 72, 73, 74, and 75.—VERTEX AND PRONOTUM, ELYTRON, WING, AND LAST VENTRAL SEGMENT OF FEMALE OF EMPOASCA ATROLABES.

posterior margin, and about midway between the compound eyes on the median line. Pronotum not broader than the head, one and one-half times as long as the vertex and one and three-fourths times as broad as long. The color is yellow, somewhat washed with green and with three white spots, one at the middle of the anterior margin and one back of each compound eye; in one specimen a whitish line extends from the first of these spots to the scutellum. Scutellum yellow with the apex and a median longitudinal line white, and a large spot near each basal angle green. Elytra with most of the clavus, a line below the claval suture and a broad costal margin golden yellow, apex hyaline, the apical nervures milky. Wing venation normal. Abdomen greenish yellow

above and below, the pygofers rather deep green, last ventral segment of female moderately produced and evenly rounded. Legs yellowish with tips of tibiae and tarsi blue. In some



FIGS. 76 and 77.—VERTEX AND PRONOTUM, AND ELYTRON OF EMPOASCA MEXICANA.

specimens the white markings are faint and the green of the scutellum entirely wanting. (See Figs. 76, 77.)

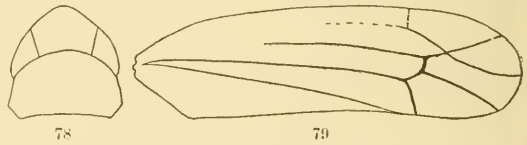
*Type*.—No. 3430, U.S.N.M.

Described from five females collected near Vera Cruz, Mexico, by Rev. H. Th. Heyde.

*EMPOASCA RADIATA*, new species.

Color pale yellowish green, with more or less distinct longitudinal markings. Length, 2.75 mm.

Face pale yellowish green above, the clypeus deeper green, face fully one-fourth longer than broad, clypeus fully one-third the length of the face, rather pointed below and exceeding the genae by nearly one-third its length. Vertex considerably produced, its length being contained in the breadth of the head



FIGS. 78 and 79.—VERTEX AND PRONOTUM, AND ELYTRON OF EMPOASCA RADIATA.

two and one-half times, and in the pronotum one and one-half times; the color is pale yellowish or greenish, and there are three distinct longitudinal paler stripes upon it in the better marked specimens, but in some these stripes are obsolete. Pronotum scarcely wider than the head, distinctly less than twice as wide as long; the color is very pale green and yellow, there being in the best marked specimens one median and two lateral greenish lines, and two dorsal and two lateral orange yellow lines. The orange coloration is rather dilute and in some of the specimens is wanting. Scutellum pale greenish. Elytra dilute milky, the nervures whitish and having about three more or less distinct dilute orange colored lines, one on either side of the claval suture and

another on the middle of the corium. Abdomen greenish yellow above and below, last ventral segment of female slightly produced and entire posteriorly. Legs whitish with the tips of the tibiae and the tarsi blue. (See Figs. 78, 79.)

*Type*.—No. 3431, U.S.N.M.

Described from four females and a male taken by the writer, three in Horsetooth Gulch, June 15, and two specimens taken on Bald Mount, east of Estes Park, August 1, all in Colorado.

EMPOASCA ROBUSTA, new species.

Small pale yellowish species, rather robust. Length, 2.75 mm.

Face smoky ivory-white, without distinct markings, hardly longer than broad, clypeus but little exceeding the genae. Vertex considerably produced, rounded in front, its length equal to one-third the width of the head, and three-fifths as long as the pronotum; eyes light brown, ocelli deep reddish brown. Pronotum about three-fourths broader than long, whitish or yellowish white with two more or less distinct lemon-yellow longitudinal lines, and outside of these, back of the compound eyes, slight spotting of the same color. In one specimen this lemon-yellow coloration is almost entirely wanting. Scutellum pale on the middle with the lemon-yellow coloration on the tip and base. Elytra whitish subhyaline to near the cross-veins, slightly smoky on the cross-veins, immediately before the cross-veins and beyond them transparent, the basal portion of the elytra slightly washed with lemon-yellow, which in some individuals is distributed in about three or four rather distinct longitudinal lines. Tergum mostly black; venter yellow, with pygofers a little greenish. Feet yellow, with the tibiae and tarsi of the second and third pairs greenish.

*Type*.—No. 3432, U.S.N.M.

Described from four female specimens from the U. S. National Museum labeled "Nevada Co., Calif., Sep.," collected by A. Koebele.

EMPOASCA NIGROSCUTA Gillette & Baker.

*Empoasca nigroscuta* GILLETTE & BAKER, Bull. 31, Colo. Ag. Exp. Sta., p. 108, 1895.

Female: Clypeus minutely transversely rugose, one-half longer than wide, basal suture straight, apex rather pointed; lorae two-thirds as long, and one-half as wide as clypeus, distant from tip of clypeus; genae narrow, a deep sunken furrow beneath the eyes extending to the lorae, not attaining tip of clypeus, outer margin nearly straight, very narrow below lorae; front smooth, nearly twice longer than wide, one and three-fourths the length of the clypeus, superior angle somewhat greater than a right angle, rather sharply rounded. Disk of vertex smooth, once or one and a half times as long on middle as next eyes. Pronotum very minutely transversely wrinkled on posterior three-fourths, anterior margin broadly rounded, hind margin nearly straight, sides short.

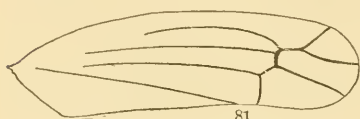
Scutellum broader than long, transverse groove slightly curved backward. Last ventral segment with hind margin nearly truncate. Color pale yellow marked with smoky; face and vertex pale yellowish, posterior one-half of latter with a median black line; pronotum pale yellow on anterior and lateral margins, remainder darker; scutellum black, basal angles sometimes yellowish; elytra yellowish, subhyaline, apex smoky, clavus with a large deep smoky blotch at tip; venter blackish, last segment yellow; tergum blackish, with tips and lateral margins of segments more or less yellowish; prosternum black; legs pale yellow.

Length, 3 mm. Described from two females. (See Figs. 80, 81, 82.)

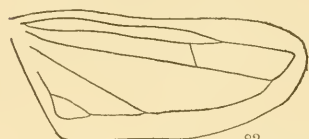
The types were taken by myself at Dolores, Colorado, June 18, and a single specimen has been received from Mr. Heidemann, labeled "Wasatch, Ut., 6-27." I have recently taken a large number of specimens (August 21) at Cerro Summit, Colorado, on Sage-brush, *Artemisia tridentata*, where it was associated with var. *Typhlocyboids* Gillette & Baker.



80



81



82

FIGS. 80, 81, AND 82.—VERTEX AND PRONOTUM, ELYTRON AND WING OF *EMPOASCA NIGROSCUTA*.

VARIETY *TYPHLOCYBOIDS* Gillette & Baker.

*Empoasca typhlocyboids* GILLETTE & BAKER,  
Bull. 31, Colo. Agr. Exp. Sta., p. 110, 1895.

Male: Clypeus subacute at apex, one fifth longer than broad, basal suture straight; loræ one-half as wide and two-thirds as long as clypeus; genæ narrow, not attaining tip of clypeus. furrow shallow, outer margin slightly concave over coxæ, slightly convex along loræ; front one-fourth longer than broad, nearly twice the length of clypeus, superior angle broadly rounded. Face and vertex nearly smooth. Length of vertex at middle nearly one and a half that next the eyes. Pronotum slightly less than twice as broad as long, posterior two-thirds minutely transversely rugose, front margin broadly rounded, hind margin concave, posterior angles broadly rounded. Scutellum broader than long, transverse groove straight. Color pale bluish or yellowish green; face and vertex pale yellow; pronotum pale yellow or bluish green, with front and lateral margins yellowish, hind margin sometimes whitish; disk of pronotum sometimes with three faint longitudinal orange lines; scutellum yellowish, sometimes posterior angles bluish. elytra milky subhyaline, clavus with two faint longitudinal orange marks, another near tip, a faint broken longitudinal orange line on corium, veins whitish toward apex; abdomen pale greenish yellow; legs pale yellow at base shading into deep blue at tips.

Length 2.5 mm. Described from three males.

*Cotype*.—No. 3534, U.S.N.M.

Steamboat Springs, July 12, on *Artemisia tridentata* (Baker).

I took this variety in large numbers from sagebush, *Artemisia tridentata*, August 21, at Cerro Summit, Colorado. It is identical with *nigroscuta* except in coloration.

**EMPOASCA PALLIDA**, new species.

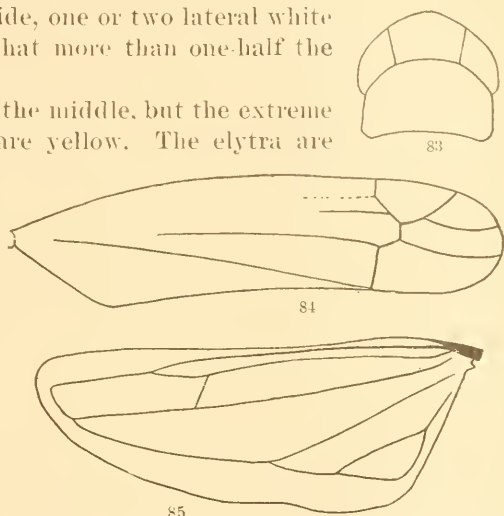
A slender species, color very pale yellow, almost white, 3.75 mm. long. Face but slightly longer than broad, front pale yellow, mottled with ivory white, the genæ and the clypeus nearly all white.

Vertex hardly produced, its length equal to one-third the breadth of the head and to three-fifths the length of the pronotum; it is yellowish in color with a median whitish line, and on either side of this an oblique whitish line, broadest at the posterior edge of the vertex; the compound eyes are rather faintly but distinctly greenish in color. The pronotum is whitish, tinged with yellowish, and with one median and, on either side, one or two lateral white spots; the length is somewhat more than one-half the breadth.

The scutellum is white on the middle, but the extreme tip and the basal angles are yellow. The elytra are whitish, subopaque to near the cross veins, beyond the cross veins transparent. Abdomen above and below yellowish white with the last ventral segment and the pygofers greenish. Legs whitish with tips of tarsi fuscous and a faint tinge of green on the tibiae and tarsi. (See Figs. 83, 84, 85.)

*Type*.—No. 3435, U.S.N.M.

Described from five females and two males from the U. S. National Museum and labeled from "Cotton, N. Car., June, '79."



FIGS. 83, 84 and 85.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF *EMPOASCA PALLIDA*.

**EMPOASCA SNOWI**, new species.

Colors green and yellow, form slender, length 4 mm.

Face yellow above, green below; on the upper portion there are numerous greenish white spots of irregular shape and a whitish median line, somewhat interrupted above, extending to the clypeus. In one specimen the light markings are rather indistinct. Length of face slightly exceeding the breadth, clypeus one-half the length of the front and but little exceeding the genæ. Vertex yellow anteriorly and greenish posteriorly and with two small green spots, one on either side of the median line and about equally distant from each other and from the compound eyes. Vertex moderately produced and a little less than



one-half as long as the pronotum; the total width of the head three and a half times its length. The pronotum is yellowish in color, with three white spots on the anterior margin. In one specimen there is an additional smaller white spot between the middle and lateral ones on either side. Scutellum yellow, with a rather broad, pale median stripe. Elytra semitransparent, with a slight golden color, marginal veins green, third apical cell pedunculate. Abdomen golden yellow above, pale green below, pygofer deep green, last ventral segment moderately produced and rounded. Legs yellow near the body, tibiae and tarsi blue. (See Figs. 86, 87.)

*Type*.—No. 3436, U.S.N.M.

Described from two female specimens sent me by Professor W. A. Snow, and labeled "Magdalena Mts., N. M., Aug. '94. Snow."

#### EMPOASCA TESSELLATA Fieber.

*Chlorita tessellata* FIEBER, Kat. eur. Cicad., p. 14, 1872.—PUTON, Cat. d. Heur., p. 87, 1886.

*Empoasca aspersa* GILLETTE & BAKER, Bull. 31, Colo. Ag. Exp. Sta., p. 107, 1895.

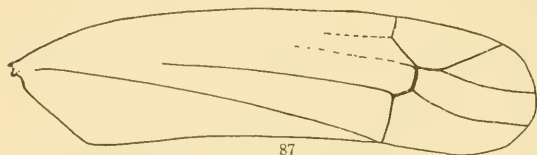
I do not possess Fieber's description of this species, but I have a specimen from Staudinger & Bang Haas that seems identical with species taken here in Colorado and which were described in the above publication as *E. aspersa*. I have also sent Colorado specimens to Doctor Melichar, of Vienna, who assures me that I am correct in

considering the Colorado specimens identical with *tessellata* Fieber.

The following is the description as given for *aspersa* Gillette & Baker.



86



87

FIGS. 86 AND 87.—VERTEX AND PRONOTUM, AND ELYTRON OF EMPOASCA SNOWII.

Female: Clypeus one-third longer than broad, basal suture straight; lorae half as broad and two-thirds as long as the clypeus; genae long and narrow, moderately furrowed beneath the eyes, the furrow extending to the lorae, outer margin somewhat concave; front two-thirds longer than broad, twice as long as the clypeus, superior angle little more than a right angle and broadly rounded. Face and vertex without sculpturing, the latter glabrous. Disk of vertex one and a half as long on the middle as next the eyes; pronotum slightly less than twice wider than long, front margin broadly rounded, hind margin slightly concave, disk very finely longitudinally aciculate. Scutellum broader than long, transverse groove straight and black. Last ventral segment with the hind margin evenly rounded and the posterior angles sloping. Color greenish; face yellowish green, front more or less distinctly marked with a pale median line and with transverse concentric pale lines; vertex and pronotum whitish or pale yellowish green, with about four more or less distinct deeper yellowish

green and variously bent, nearly longitudinal lines, sometimes orange on the former and dusky on the latter; scutellum with basal angles dark or yellowish green, median portion whitish mottled with greenish; elytra greenish, hyaline at tip, nervures whitish, basal two-thirds finely spotted with dusky green; tergum black with more or less of sides and apical margins yellowish; venter pale green, pygofers darker; legs pale greenish shading to bright blue at tips.

Length 3 mm.

Male: Markings which in the female are dark yellowish green are dusky here.

Described from six females and two males. (See Figs. 88, 89, 90, 91.)

Fort Collins, on *Bigeloria*, September 27 (Gillette). In mountains southwest of North Park, July 10, and at Steamboat Springs, July 12, on *Artemisia tridentata* (Baker).

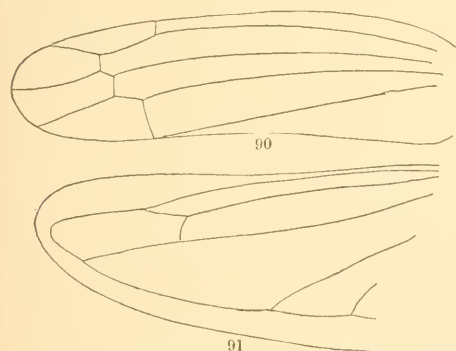
I have also received specimens from the U. S. National Museum marked "Los Angeles Co., Calif., Mar.," and from Mr. Heidemann one specimen labeled "Wasatch, Ut., 6-27."

#### EMPOASCA ALBONEURA, new species.

Robust, color pale greenish yellow. Length, 3 mm.

Face yellow, lorae and clypeus greenish, sometimes more or less washed with greenish on front, about one-sixth longer than broad, genae nearly attaining the tip

of the clypeus, which is one-half longer than broad; antennae greenish. Vertex one-third longer at the middle than at the eyes, somewhat pointed in front; color greenish yellow, marked with a median light line, an elongate light spot either side near the compound eyes and close to the posterior border, and another on the crest of the vertex on either side in front of a dark



FIGS. 90 and 91.—ELYTRON AND WING OF EMPOASCA TESSELLATA.

green spot. Pronotum yellow on anterior and green on posterior margin, marked with a median white line and a light spot on either side next the eyes. Scutellum yellow, with a median white line. Elytra greenish subhyaline tinged with yellowish, the tips smoky, and all the nerves pale. Venter and pygofers greenish; legs greenish or yellowish, the tibiae and tarsi deep blue.

*Type*.—No. 3437, U.S.N.M.

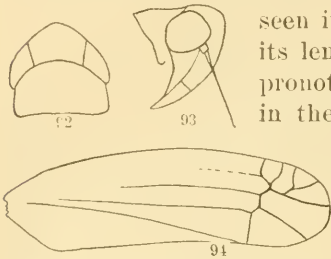
Described from fifteen females and nine males taken at the Missis-

Mississippi Agricultural College by Professor H. E. Weed in July and September; two specimens from Virginia sent me by Mr. T. H. Pergande, and seven specimens from Colorado, as follows: Five specimens near Fort Collins sweeping native plants between June 11 and July 24, one specimen at the same place on plum September 31, and one specimen taken by the writer at Leadville, at an elevation of 10,000 feet, August 23, on native plants. I have also received specimens from Mr. Heidemann marked "D. C.;" and from the U. S. National Museum, marked "Va.," "Los Angeles, Calif., Coquillett," "Nevada Co., Cal. Sep.," "Horace, Ks, July 28," and "Neb."

*EMPOASCA TUMIDA*, new species.

Color greenish-yellow or yellowish-green, face very tumid. Length, 2.50 mm.

Face varying in color from almost entirely yellow, the clypeus only being green, to almost entirely green with the upper portion of the front yellow; length but very little exceeding the breadth, clypeus but little exceeding the genae; front very tumid, as seen in Fig. 93: Vertex considerably produced, its length being contained in the length of the pronotum less than one and one-half times and in the breadth of the head less than two and



FIGS. 92, 93, and 94.—VERTEX AND PRONOTUM, SIDE OF HEAD, AND ELYTRON OF *EMPOASCA TUMIDA*.

one-half times; color yellow to greenish, with a median and two lateral longitudinal pale lines which are rather indistinct in the greener specimens. Pronotum not wider than the head, less than twice as wide as long, pale green in color with five whitish spots on the anterior margin, and in the best-marked specimen there are three illly defined pale lines which are the continuations of the pale lines of the vertex. Abdomen yellowish-green above and below, the last ventral segment in the female slightly produced and rounded posteriorly. Legs yellow with the tarsi bluish-green. In two specimens the basal segments of the tergum are largely black. (See Figs. 92, 93, 94.)

*Type*.—No. 3438, U.S.N.M.

Described from three females, all taken by the writer in Colorado—two in Horsetooth Gulch, June 15, and one on cultivated plums at Fort Collins, September 31.

*EMPOASCA MALI* Le Baron.

*Tettigonia mali* LE BARON. *Prairie Farmer*, XIII, p. 330, 1853.

*Empoasca mali* OSBORN, *la. Acad. Sci.*, I, Pt. 2, p. 12, 1892.

*Typhlocyba photophila*<sup>1</sup> BERG, *Hemip. Argent.*, p. 273, 1879.

<sup>1</sup>This may prove to be a good species, but I have examined specimens from Brazil in the collection of Mr. H. H. Smith that answer the description of this species, and

*Empoa albopicta* FORBES, Thirteenth Rep. Ill. St. Ent., p. 181, pl. XIV, 1883; Fourteenth Rep. Ill. St. Ent., p. 117, 1884.—WEED, Insects and Insecticides, p. 99, fig. 15, p. 151, 1891, 1895.

*Empoasca albopicta* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 310, 1894.

According to Doctor Le Baron:

This little insect is about one-eighth of an inch long, yellowish green, forehead and crown freckled with white; a series of white spots along the anterior margin of the prothorax; two white stripes on the meso-thorax united in the middle by a transverse stripe, like the letter H; a triangular white spot on the scutellum, with a smaller spot on each side of it; sexual appendages in both sexes ciliated, or bordered with fine fringe. The eyes are pearl white in the living insect, but become brown after death.

Doctor Le Baron mentioned this insect as occurring on apple; Doctor Forbes records it as injuriously abundant on apple, currant, and gooseberry, and Doctor Weed mentions it as occurring upon all these plants and others.

I have received this species as follows: From Professor G. C. Davis, taken in July on beans, potatoes, plum, and wild grapes, near Michigan Agricultural College; from Doctor Forbes (18249 and 16383) on corn, June; from Mr. E. P. Van Duzee, Buffalo, New York, on *Populus monilifera*, May; from Mr. Th. Pergande and also Mr. Otto Heidemann, specimens marked "D. C.;" from Mr. C. A. Hart, Champaign, Illinois, specimens marked 313, 332, 481, 512, 515, and 584; from Professor H. E. Weed, specimens marked "Ag. Coll. Miss., July, '94," and from the U. S. National Museum specimens marked "Mo., May."

This species can nearly always be quickly separated from closely related species by the row of six to eight (not three) white spots on the front margin of the pronotum.

#### EMPOASCA FLAVESCENS Fabricius.

*Cicada flavescens* FABRICIUS, Ent. syst., IV, Hafn., 1794.—FALLEN, Hemiptera Suecicae, p. 53, 1829.

*Chlorita flavescens* FIEBER, Kat. ent. Cicad., p. 14, 1872.—MAYR, Rhyn. Tirol., II, p. 24, 1880.—PUTON, Cat. d. Hemip., p. 87, 1886.—MELICHAR, Cicadinen von Mittel-europa, p. 326, 1896.

Not having Fabricius's writings, I give the description of this species as quoted by Fallén in "Hemiptera Suecicae:"

Mas. & Fem. colore similes. In gramine mense Jul. & Aug. frequens. In fruticibus frequentior. Parva & angustata, flavissima. Oculi fasci. Scutellum ad certum

that I am unable to separate from specimens of *E. mali* from the United States. Berg's description is as follows:

"♂ et ♀: Lacte virescenti-aurantiaca, maculis duabus anticis capitis, tibiis apicem versus tarsisque plus minusve viridibus; ant virescenti-flavi, vitta media verticis, lineolis lateralibus aut maculis plurimis parvis disci frontis, maculis sex velocto prope marginem anticum pronoti, vittis duabus vel quattuor partis anticae maculisque tribus triangularibus segmentorum abdominis rarissime obsolete viridimaculato ant fasciato; capite antice subrotundato; ocellis distinctis, viridibus aut glaucis; fronte sat magna et convexa; pronoto margine postico late sinuato; scutello apice acuto; tegminibus areolis apicalibus tribus vel quattuor instructis, clavo venis destituo; alis albido-hyalinis.—Long. corp. cum tegm. 2½-3; lat. pron. ½-⅔ mm.

"Patria: Corrientes."

luminis situm interdum lutescens. Elytra & alae corpore longiora. Abdominis dorsum raro nigricans. Pedes flavi. Macula elytrorum lateralis rhombea albicans, pro situ luminis, in plerisque individuis conspici potest. Longitudo 2 lin.

Not. Color variat pro aetate, vel pallide vel saturate flavus. In quibusdam individuis caput quasi angulatum, at obtusissime, extenditur. Nihilominus a *Cic. pascuella* & *assimili* facile distingui potest.

This is a common and widespread species in the United States, though it has never been recorded here. I have received specimens from Professor Cockerell, marked "Santa Fe, N. M.," from Professor H. E. Weed, marked "Ag. Coll. Miss.," from Mr. MacGillivray, marked "Ithaca, N. Y., August 28," from Professor G. C. Davis, marked "Ag. Coll. Mich.," from Mr. Th. Pergande, marked "Washington, D. C.," from Mr. Otto Heidemann, marked "D. C.," from Illinois State Laboratory Natural History (Doctor Forbes), marked "15433," from Mr. F. F. Crevecoeur, Onaga, Kansas, taken among leaves in timber in early spring; from the U. S. National Museum, marked "Los Angeles Co., Cal.," and "Garden Cy. Kans."

I have taken a number of specimens in general sweeping along the river near Fort Collins, Colorado. The only difference that I find in specimens taken here from those received from the eastern portions of this country and from Europe is that they are all of a rather deep green color, instead of yellow or greenish yellow.

#### VARIETY *BIRDII* Goding.

*Empoasca birdii* GODING, Ent. News, I, p. 123, 1890.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 310, 1894.

Doctor Goding describes this variety as follows:

Seen from above, long ovate, bright yellow, varying to green; abdomen deeper yellow and attenuated at the extremity. Head length of pronotum, obtusely rounded in front and convex; eyes purple-black; ocelli nearer the eyes than each other; three pale bands passing along the occiput, one at the center and one at the edge on each side along border of the eyes. Pronotum one and a half times length of scutellum, its posterior border straight, front arched; three large, pale spots on front edge, the mesial one being continuous with the corresponding band on the occiput. Scutellum large, triangular, depressed, having a pale green, broad band on posterior part; apex and base yellow, a dark spot occupying the disc. Abdominal joints gradually decreasing in size; pure yellow. Elytra slightly smoky, with a darker band passing across the center. Wings hyaline and iridescent, in the former the terminal vein is at the margin, while in the latter it has a membranous margin; lower part of tibiae and all of tarsi indigo blue; femora with a row of strong spines. One specimen with all colors much deepened, and some minor differences, may prove to be distinct. Length about 2 mm. to end of hemelytra; breadth one-third the length.

Doctor Goding reports this variety from apple, hop, walnut, beans, and weeds in Illinois.

I have received specimens from Agricultural College, Michigan (Professor Davis), Urbana, Illinois (Doctor Forbes and C. A. Hart), Ithaca, New York (Cornell University), and Ames, Iowa (E. D. Ball).

This is only a color variety of *flavescens*. The smoky markings of



the elytra and, possibly, the more distinct white spots upon the pronotum are all that I find to separate it from the typical form, and these markings are often very indistinct.

#### EMPOASCA VIRIDESCENS Walsh.

*Empoasca viridescens* WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 316, 1864.—WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 309, 1894.

*Empoasca consobrina* WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 316, 1864.—WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 310, 1894.

Walsh's brief description of *viridescens* is as follows:

Pale greenish; front of the head forming a right angle with the apex rounded off; eyes and tips of tarsi fuscous; elytra subhyaline, with a faint greenish tinge, the triangular cell not pedunculated as it is in Fig. V; wings hyaline.

I met with both sexes in southern Illinois. A single female, which occurred at Rock Island, Illinois, varies in being more yellowish than greenish, and in the tips of the ovipositor being fuscous. Length to the tips of the wings not quite an eighth of an inch.

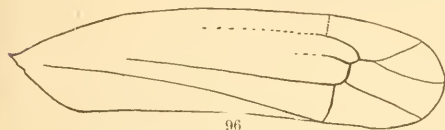
*Consobrina* was described at the same time as follows:

Differing from the preceding only in being sometimes yellowish, and in the triangular cell in the elytra being always pedunculated. Seven specimens, taken at one time at Rock Island, Illinois, all agree in this particular. Length slightly over one-eighth of an inch. (This is a mere variety of the preceding. I have now all the intermediate grades.)

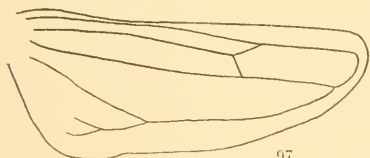
Although it is impossible from the above descriptions to identify this species with certainty, I have two specimens



95



96



97

FIGS. 95, 96, and 97.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF EMPOASCA VIRIDESCENS.

of what I believe to be this species from Doctor Forbes, which were taken in August and September at Champaign, Illinois. In one, the triangular cell of the wing is pedunculate and in the other it is not. I also have a considerable number of specimens from Agricultural College, Mississippi, sent me by Professor H. E. Weed, and others from Ithaca, New York, sent me from Cornell University. The specimens that I have determined as this species may be described as follows:

Color pale green with thorax, vertex and body beneath yellowish. Length slightly over 3 mm.

The face is about one-third longer than broad, front, above the clypeus, almost exactly twice the length of the clypeus. The clypeus is large, pointed below, broadly constricted at the sides near the base, and exceeds the genae somewhat. The vertex is considerably produced and is three-fifths the length of the pronotum; width of the head nearly

three times the length; pronotum hardly less than twice as wide as long. Elytra greenish subhyaline, triangular cell pedunculate or not. Body, below, light yellow; tip of abdomen and lower portion of tibiae and tarsi green. In well-marked specimens there is a white or pale line on the middle of the face, another upon the middle of the vertex and a broader one on the scutellum, which is suddenly widened back of the transverse groove. Aside from these lines there are spots of the same color next the compound eyes on the face, two oblique ones on the crest of the vertex, another near the posterior margin and approximate to the compound eye on either side; on the anterior margin of the pronotum three, one at the middle and one just back of either compound eye. In some specimens the light markings are in part wanting. The middle white spot of the pronotum and the white band on the scutellum are very constant. The markings of the face are most often missing. (See Figs. 95, 96, 97.)

This species is best separated from *flarescens* and *mali* by the long slender face.

#### EMPOASCA SALINARUM Berg.

*Typhlocyba salinarum* BERG, Hemiptera Argentina, p. 274, 1879.

Berg, in his Hemiptera Argentina, describes this species as follows:

Female: Capite, fronte, pronoto, scutello, dorso abdominis femoribusque maximam partem saturate aurantiacis, vitta media maculisque duabus antice sublateralibus capitis, lineolis obsoletis brevibus lateralibus capitis, lineolis obsoletis brevibus lateralibus frontis, vitta media pronoti scutellique flavido-albis, marginibus venisque tegminum late viridibus vel glaucescentibus, pedibus, dimidio basali femorum excepto, viridibus; capite subrotundato; ocellis distinctis, fulvis; fronto lineis duabus apicem versus conjunctis obsolete fuscis ornata; pronoto antice obsoletissime albidomaculato, margine postico sat profunde sinuato; tegminibus areolis apicalibus? instructis, clavo venis destituto; alis vitreis. Long. corp. cum tegm. 4; lat. pron.  $\frac{3}{4}$  mm.

Patria: Provincia Bonaërensis.

I have not recognized this species in any of the material I have examined.

#### Genus EUPTERYX Curtis.

Doctor Melichar in his Cicadinen von Mittel-Europa records twenty-two species under this genus. Not a species has been recorded from America to the present time, and it gives me pleasure to be able to report two new species in this paper.

#### EUPTERYX VANDUZEI, new species.

Color whitish, with head, pronotum, prosternum, and scutellum black or blackish: length 3.75 mm.

Head blackish on posterior portions of vertex and beneath the eyes, shading into pale yellow on the anterior margin of the vertex and the upper portion of the face; clypeus parallel-sided, rather acute at tip; genae rather broad beneath the lorae, vertex considerably produced but not acute at tip. Pronotum deep black, in one specimen whitish on middle of posterior margin and against the tegulae, nearly truncate

posteriorly, about twice the length of the vertex. Scutellum black, sometimes pale at the extreme tip. Elytra milky white, a little smoky near the tip, the costal margin and the veins more or less yellow; apical cells four, triangular one pedunculate, cell upon the costal and also the one upon the inner margin subtriangular. Abdomen and legs very pale yellow or white, with tips of last tarsal joints and sometimes the basal joints of the tergum black. (See Figs. 98, 99, 100.)

*Type*.—No. 3439, U.S.N.M.

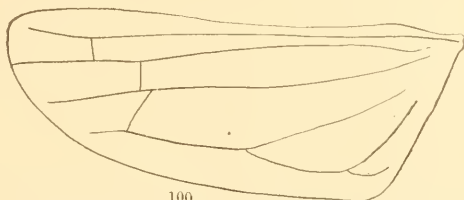
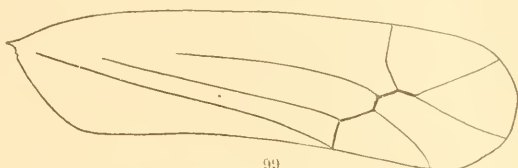
Described from seven females sent me by Mr. E. P. Van Duzee, who took them at Hamburg, New York, July 10, sweeping ferns and weeds.

**EUPTERYX FLAVO-SCUTA**, new species.

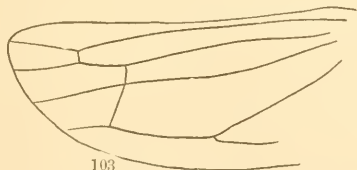
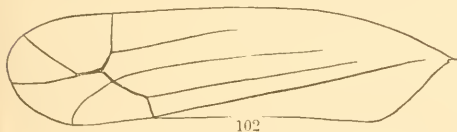
Color, smoky above, yellow beneath; length 3 mm.

Yellow on the face and anterior margin of vertex, the posterior margin of the vertex shading into dark fuscous; vertex moderately produced and rather broadly rounded. Pronotum distinctly

less than twice the length of the vertex, black, with a large yellow rectangular spot on the middle posteriorly. Scutellum with the basal angles dusky and the remaining portion yellow. Elytra smoky, with the costal and inner margins and the veins yellowish; the smoky coloration is deepest at the base, along the middle, and at the apex; venation much as in the preceding species. Tergum, and pygofer below, black, lateral margins of abdominal segments yellow. Entire feet, and thorax below, yellow, except the extreme tips of the last tarsal joints, which are infuscate. (See Figs. 101,



FIGS. 98, 99, and 100.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF EUPTERYX VANDUZELI.



FIGS. 101, 102, and 103.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF EUPTERYX FLAVOSCUTA.

102, 103.)

*Type*.—No. 3440, U.S.N.M.

Described from two female specimens sent me by Mr. Van Duzee, who took them along with those of the preceding species.

Since writing the above I have received two specimens of this species

from the U. S. National Museum labeled "Holderness, N. H., 20 11," and two specimens from Mr. Otto Heidemann marked "Washington, D. C."

Three of these specimens differ from the types in that they are more infuscated above, even the scutellum is almost entirely dark.

### Genus TYPHLOCYBA Germar.

This genus is represented by a good number of species, both in this country and in Europe, but I was surprised to notice that in a considerable collection of *Typhlocybinae* from South America, collected by Mr. H. H. Smith, there was not a single species of this genus.

The genus is characterized by many species that are beautifully and variously marked with shades of red and black, which has resulted in many synonyms and varieties.

A number of species are common to both Europe and America.

#### ANALYTICAL KEY TO THE AMERICAN SPECIES OF THE GENUS TYPHLOCYBA.<sup>1</sup>

- A. General color above red.
- B. With two black spots on vertex.....*hipunctata*.
- BB. Without distinct markings.
- C. Pale yellow beneath.....*sanguinea*.
- CC. Orange beneath.....*coccinea*.
- AA. General color of head and thorax yellow; elytra more or less colored with sanguineous or blood brown.
- B. Elytra blood red to near the cross veins.
- C. Head and thorax yellow.....*tunicarubra*.
- CC. Head and pronotum marked with red.....*crevecoeurii*.
- B1. Elytra yellow, banded with dark blood brown across their middle, the band becoming black on the costal margin.....*tricolorata*.
- B2. Elytra blood red to cross veins, their tips, costal margin, and spot on middle of inner margin yellow.....*hartii*.
- B3. Scutellum entirely bright red and a large spot of the same color on the middle of the elytra.....*rubroscuta*.
- B4. Elytra finely flecked with red, the extreme tip of the scutellum jet black.  
*trifasciata*.
- B5. Elytra with two oblique red lines, one on the clavus and one on the inner sector.....*obliqua*.
- B6. Elytra with a conspicuous black spot, which has a red margin, on the corium at the middle of the claval suture.....*illinoisensis*.
- B7. Elytra with zigzag red lines or red spots or, in smoky species, with blood-brown or yellowish markings.....*comes*.
- C. A narrow pale median line, continuous on vertex, pronotum, and scutellum; also a pale line or dash either side of this on vertex and pronotum...*vulnerata*.
- CC. Not like the preceding.
- D. Color almost entirely yellow, reddish markings on the elytra, last ventral segment of the female suddenly produced posteriorly and notched at the tip.....*dentata*.

<sup>1</sup> *Typhlocyba centralis* Berg is not included in the table. It is the last species given in the text.





This species is described by Doctor Fitch as follows:

Scarlet red, immaculate, pectus and venter orange, elytra brownish pellucid. Length 0.10 inch.

Taken on pines. No. 829 ♂.

This is a species that I have not seen, and I do not know that there is a determined specimen in existence. It could undoubtedly be obtained with little trouble from pines, and would be readily recognized by its scarlet color without markings.

#### TYPHLOCYBA SANGUINEA Gillette & Baker.

*Typhlocyba sanguinea* GILLETTE & BAKER, Bull. 31, Colo. Agr. Exp. Sta., p. 112, 1895.

Near *coccinea*. Female: Clypeus one half longer than broad, basal suture straight; lorae very long and narrow, a half longer than clypeus, reaching half the distance between the base of clypeus and antennae; genae long and narrow, lateral margin concave, slightly grooved along sides of lorae. Front nearly twice longer than wide at widest place



FIG. 104.—VERTEX AND PRONOTUM OF TYPHLOCYBA SANGUINEA.

between the eyes, two and one-fifth times as long as clypeus, superior angle greater than a right angle, very obtusely rounded; face and anterior half of vertex very finely rugose; length at middle of vertex one-fourth more than at the eyes. Pronotum glabrous with obscure transverse wrinkles on posterior one half. four-fifths broader than long, anterior margin broadly rounded, posterior margin distinctly concave, sides normal; scutellum broader than long; last ventral segment with hind margin strongly produced, very slightly notched at apex. Color pale yellow; face tinged with sanguineous above; vertex, pronotum, except at sides, and scutellum bright sanguineous; elytra hyaline, veins very light yellow; vertex at sides and tergum tinged with sanguineous: legs unicolorous.

Length 4 mm. Described from one female. (See Fig. 104.)

The type specimen was taken by the writer at Manitou, Colorado, September 29, on *Salix*.

#### TYPHLOCYBA TUNICARUBRA, new species.

Color pale yellow and bright red, form robust. Length 3.75 mm.

Face very pale yellow, almost white, a trifle broader than long, genae nearly attaining the tips of the clypeus, superior angle obtuse and more than a right angle. Vertex, pronotum, and scutellum light yellow; vertex one-third longer at middle than at eyes, distance between the eyes one-half more than the length at the middle, pronotum two and one-third times as long as vertex and a little less than twice as wide as long, almost truncate behind, posterior angle one-fourth broader than anterior. Compound eyes yellowish, slightly infuscate. Elytra bright red to cross veins, tips yellowish subhyaline. Tip of wing broad.

Basal segments of tergum somewhat infuscated, remainder of tergum and all below light yellow.

*Type*.—No. 3442, U.S.N.M.

Described from two females sent me by Professor G. C. Davis. The pins bear labels which read, "Mich. Ag. Coll., July 15, '91. Ac. 445 Sp.?"

This species stands very close to highly colored forms of *3-fasciata* Say, but in the latter species the coloration is in the form of spots of varying size, while in *tunica rubra* the color is solid with no indication of spots.

#### TYPHLOCYBA TRICINCTA Fitch.

*Erythroncra tricincta* FITCH, Homop. N. Y. St. Cab. Nat. Hist., IX, p. 63, 1851; Trans. N. Y. St. Agr. Soc., XVI, pp. 392, 436, 1856; reprint in Lintner's 9th Rep., Ins. N. Y., p. 403, 1893.—WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 317, 1864.

*Typhlocyba tricincta* WOODWORTH, Psyche, V, p. 213, 1889.—PACKARD, Forest Insects, p. 218, 1890.—WEED, Insects and Insecticides, p. 81, fig. 2, 1891; p. 131, fig. 2, 1895.—OSBORN, Proc. Ia. Acad. Sci., I. Pt. 2, p. 11, 1892.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 313, 1894.—GILLETTE & BAKER, Bull. 31, Colo. Agr. Exp. Sta., p. 113, 1895.

Doctor Fitch describes this species as follows:

Pale yellow with three broad bands, the anterior velvet black, occupying the thorax and basal half of scutell; the middle bright ferruginous ending outwardly in black, forward of the middle of the elytra, the posterior dusky brown on the apex. Length 0.12 inch.

Var. a. Anterior band sanguineous. (See Fig. 105).

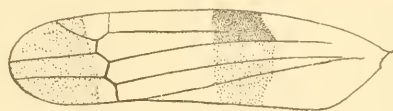


FIG. 105.—ELYTRON OF TYPHLOCYBA TRICINCTA.

Doctor Fitch took this species upon raspberry and currant bushes and grapevines, and in his later writings was inclined to think it only a variety of *vitis*. I have taken the species at Ames, Iowa, on grapevines, and at Fort Collins, Colorado, on grass. I have received it from others as follows: From the private collection of Mr. C. A. Hart, Nos. 32, 514, 547, 562, and 565, all from Illinois; also a number of specimens taken by Mr. Hart at Havana, Illinois, on grape vines; from Iowa Agricultural College, specimens taken at Ames, Iowa, July 1; from Mr. Otto Heidemann, specimens marked, "Marsh Hall, Md.;" from Mr. F. F. Crevecoeur, specimens taken among leaves in the timber at Onaga, Kansas, in early spring; from the U. S. National Museum, specimens marked, "Mo., Riley, Grape, Sep. 12," and from Professor H. E. Weed, specimens marked, "Ag. Coll. Mo."

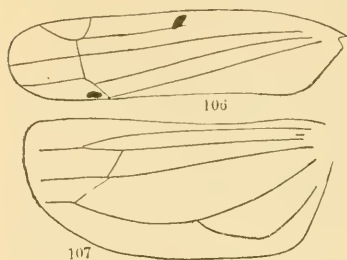
Doctor Packard, in "Forest Insects," mentions this insect as injuriously abundant upon elm trees.

Although this species is often abundant upon grapevines along with *comes* and its varieties, it seems to me to be a very distinct and well marked species.

TYPHLOCYBA HARTII, new species.

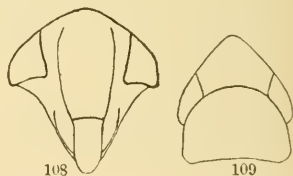
Colors light yellow and bright red, length 2.9 mm.

Face pale yellow to ivory white, more or less streaked with red across the upper portion; a little longer than wide, the clypeus only about one-fourth of the entire length of face, genae nearly attaining the tip of the clypeus. Vertex ivory white with a row of four spots between the compound eyes, the two end spots touching the eyes and smaller than the two middle spots, which are quite large; the two spots on the same side run together in some of the specimens, and in one the large spot also extends to the middle line of the vertex at the posterior margin, making a continuous arc from the eyes. These spots may be bright red or only reddish yellow. Vertex considerably produced, rather pointed and almost exactly in a right angle; length at middle one-half greater than at the eyes, distance between the eyes one-fifth greater than the



FIGS. 106 and 107.—ELYTRON AND WING OF TYPHLOCYBA HARTII.

length at middle. Pronotum one and a half as long as the vertex and nearly twice as wide as long, a broad median red stripe forked before, the forks joining a large spot on either side just behind the eye, and which does not extend to the posterior margin of the pronotum. Scutellum with broad median stripe, and all back of the transverse groove ivory white, basal angles more or less reddish. Elytra bright red to near cross veins, with a narrow yellowish costal margin and a large semicircular spot of the same color on the middle of the inner margin of the clavus, making a large circular spot when the elytra are closed; tips of elytra yellowish white. Abdomen above pale yellow with the apical margins of the segments in some cases reddish. All below pale yellow, except tips of tarsi, which are infuscated. (See Figs. 106, 107.)



FIGS. 108 and 109.—FACE, AND VERTEX AND PRONOTUM OF TYPHLOCYBA RUBROSCUTATA.

Described from five females and four males sent me from the Illinois State Laboratory of Natural History, bearing the numbers 14873, 14877, 17867, and one specimen from the private collection of Mr. Hart bearing the number 466. Mr. Hart writes me that those bearing the first two numbers were taken from rye, April 22 and 23, at Champaign, Illinois, and those bearing the number 17867 were taken at the same place and date among leaves.

This is a very pretty little species, and I take pleasure in dedicating it to Mr. C. A. Hart.

## TYPHLOCYBA RUBROSCUTA, new species.

Color whitish, marked with bright red, compound eyes black: length 3.25 mm.

Face nearly, or quite, as broad as long, sutures very indistinct, color yellowish brown to reddish, a rather broad yellow band on the edge of the vertex between the eyes. Vertex mostly pale yellow, but the extreme tip and a spot approximate to each compound eye at the hind margin are usually red. It is strongly produced and rather acutely pointed, its length being contained in the length of the pronotum only about one and one half times. Pronotum varying in color from yellow, tinged with red, to bright red with a large yellow spot on the middle of the anterior margin: it is but little wider than the head and considerably less than twice as wide as long. Scutellum uniformly red, or with a rectangular median portion that is paler in color than the rest. Elytra very pale yellow with a broad transverse red band which does not attain the costal margins. There is also a little red coloration on the costal margin near the base and on the cross nervures. Abdomen pale yellow, the tips of the segments sometimes pinkish, tip of the ovipositor black, last ventral segment of female with a rather strongly produced tooth on the middle of the posterior margin. Legs pale yellow, usually more or less strongly tinged with pinkish. (See Figs. 108, 109, 109a, 110, 111.)

*Type*.—No. 3443, U.S.N.M.

Described from a large number of males and females taken in February among leaves in the timber at Onaga, Kansas, by Mr. F. F. Crevecoeur.

I have also received a single specimen from Champaign, Illinois, sent me by Mr. C. A. Hart, who writes that it was taken among leaves April 23.

## TYPHLOCYBA TRIFASCIATA Say.

*Tettigonia trifasciata* SAY, Jour. Acad. Nat. Sci. Phila., IV, p. 343, 1825; reprint, Compiled Writings, II, p. 259, 1891.—SIGNORET, Ann. Soc. Ent. de Fr., 3 ser., p. 805, 1855.

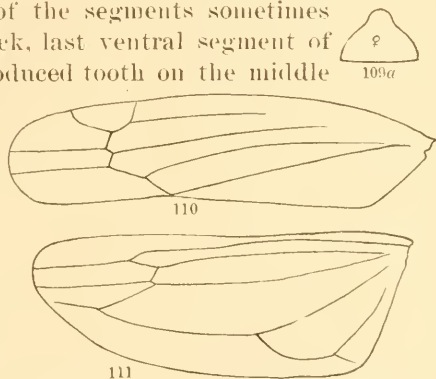
*Typhlocyba trifasciata* WOODWORTH, Psyche, V, p. 213, 1889.—OSBORN, Proc. Ia. Acad. Sci., 1, Pt. 2, p. 11, 1892.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 313, 1891.

Say's description is as follows:

Pale yellowish white; elytra irrorate with reddish and somewhat trifasciate with dusky.

Inhabits Missonri.

Body pale yellowish white; head with two or three obsolete dull sanguineous



FIGS. 109a, 110, and 111.—LAST VENTRAL SEGMENT OF FEMALE, ELYTRON, AND WING OF TYPHLOCYBA RUBROSCUTA.

spots on the vertex in the form of curves or circles; eyes dusky; thorax, a dull sanguineous line abbreviated before, and an obsolete curve at the anterior angle, hemelytra whitish, irrorate with sanguineous; a dilated, brownish, interrupted, subbasal band; an obsolete interrupted band behind the middle, upon the posterior costal termination of which is an abbreviated sanguineous line, and an oblique blackish band near the tip; a large quadrate white immaculate spot on the middle of the costal margin: humeral base white, immaculate; tergum dusky at base; feet white.

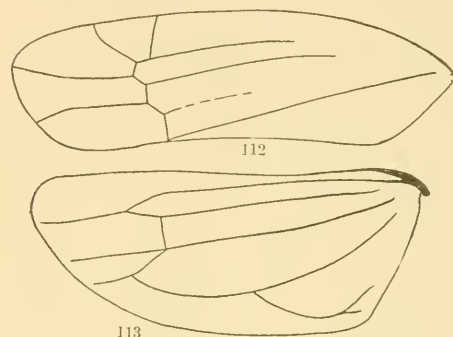
Length to tip of the hemelytra one-eighth of an inch.

The spots of the head and thorax are sometimes hardly discernible, and the intermediate band is often so faint and interrupted as to be overlooked. (See Figs. 112, 113.)

I have received specimens of this species as follows: From Professor H. E. Weed, marked "Ag. Coll. Miss., Oct. 22, '94;" from Illinois State Laboratory of Natural History, marked 13572 and 17398, those of the latter number taken on grapes; from the private collection of Mr. C. A. Hart, specimens bearing the numbers 462, 550, 562, and 566, all taken in Illinois; also from Mr. Hart a number of specimens that he took on grape at Havana, Illinois; from Mr. F. F. Crevecoeur, a number of spec-

imens taken by himself in early spring among leaves in the timber at Onaga, Kansas; from the U. S. National Museum specimens labeled "Mo. Riley."

This is a very pretty species that varies to a considerable extent in its markings. The three dusky fasciae are very distinct in some specimens and almost wanting in others; some have almost none of the red coloration, while others are highly colored upon the elytra



FIGS. 112 and 113.—ELYTRON AND WING OF TYPHLOCYBA TRIFASCIATA.

with sanguineous. In all the specimens that I have examined the tip of the scutellum has been jet black.

#### TYPHLOCYBA OBLIQUA Say.

*Tettigonia obliqua* SAY, Jour. Acad. Nat. Sci. Phila., IV, p. 342, 1825; reprint, Compiled Writings, II, p. 259, 1891.

*Erythronera obliqua* FITCH, Homop. N. Y. St. Cab. Nat. Hist., p. 63, 1851; Trans. N. Y. St. Agr. Soc., XVI, p. 435, 1856; reprint in Lintner's 9th Rep., p. 403, 1893.—WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 317, 1861.—PROVANCHER, Pet. Faune Ent. Can., III, p. 340, 1890.

*Typhlocyba obliqua* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 312, 1894.—GILLETTE & BAKER, Bull. 31, Colo. Agr. Exp. Sta., p. 112, 1895.

The original description by Say is as follows:

Body yellowish white with two sanguineous lines, connivent upon the head and scutellum; hemelytra white, with the two sanguineous lines. Inhabits the United States.

Body pale yellowish white; head with two dilated sanguineous lines, connivent



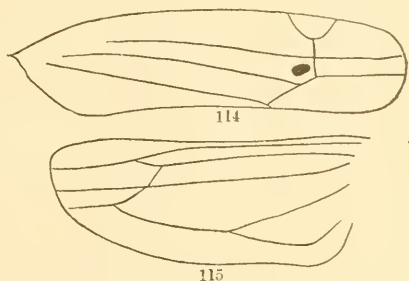
before; antennae, seta as long as the head and thorax, dusky; thorax with two sanguineous lines; scutel with two lines and tip sanguineous; hemelytra whitish, an oblique line from the base slightly refracted on the thinner margin, and terminating behind the middle of the margin; an oblique longitudinal line on the disk, a more abbreviated, obsolete, subcostal line, and a costal line from the base to the middle of the edge, sanguineous; feet whitish; tail rosaceous. Length rather more than one-tenth of an inch. Found at Engineer Cantonment, and is also common in Penn.

In the Transactions of the New York State Agricultural Society mentioned above, Doctor Fitch speaks of this insect as follows:

A very small white leaf hopper 0.12 (inch) long, its head and thorax with two bright blood-red or orange stripes and three short oblique ones on the wing covers, the outer one placed on the shoulder, the middle one on the disk, and the inner one ending on the middle of the inner margin. This is common, particularly upon the bushes of the wild currant, but occurs on various other shrubs and trees throughout the year. It is subject to considerable variations, the stripes being sometimes of a pale yellow color, and one or another of them wanting. Commonly three black or dusky dots may be seen on the wing covers in an oblique row forward of the membranous tips. (See Figs. 114, 115.)

This is one of the grape-infesting species and is commonly taken along with *comes* and its varieties.

I have received specimens as follows: from Th. Pergande, labeled, "D. C. On Oak;" from Mr. Otto Heidemann, labeled "D. C.;" from Professor G. C. Davis, labeled "Ag. Coll. Mich., on Apple, July 15;" from Illinois State Laboratory of Natural History, taken at Champaign, Illinois, in general sweeping; from Mr. C. A. Hart, labeled 32, 335, 448, 449, 474, 512, and 535; from the U. S. National Museum, labeled, "Calif.," "D. C.," "Ia.," "Me.," and "Mo.;" and from Mr. F. F. Crevecoeur labeled, "Taken among leaves in timber near Onaga, Kansas."



FIGS. 114 and 115.—ELYTRON AND WING OF TYPHLOCYBA OBLIQUA.

I have taken this species in general sweeping near Fort Collins, along the river and in the foothills, and also at Canyon City, Colorado, on plum and at Manitou, Colorado, on oak.

I find the following very well marked varieties in this species which have not been characterized. Some of these may prove to be worthy of specific rank, but I do not feel safe in so placing any of them at present.

*Variety dorsalis*, new variety has the red markings so run together as to form a continuous red or dark (sometimes almost black) dorsal stripe the entire length of the insect. This is a common variety that I have seen from many localities.

*Variety nervis*, new variety has the typical red lining, but the scutellum and hind margin of the pronotum are more or less black. This is

a rather common form also; they were specially common in the lot of specimens from Mr. Crevecoeur mentioned above.

*Type*.—No. 3444, U.S.N.M.

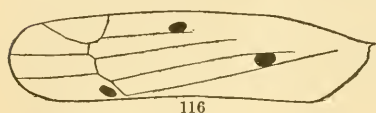
*Variety fumida*, new variety is more or less dusky throughout, the deepest dusky coloration being a broad smoky transverse band upon the cross nervures of the elytra.

*Type*.—No. 3345, U.S.N.M.

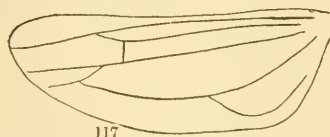
There were a large number of this form in the lot sent me by Mr. Crevecoeur from Onaga, Kansas, and I also have a few specimens that are not so well marked from Mr. C. A. Hart. The specimens from Mr. Hart were taken near Champaign, Illinois, and differ from the others in having the red coloration almost evenly diffused over the vertex, pronotum, scutellum, and anterior two-thirds of the elytra. It would be hard to recognize this form as belonging to *obliqua* were it not for the short clypeus, strongly contracted at the base, and the very oblique direction of the inner cross nervure of the elytron, which are peculiarities of this species.

TYPHLOCYBA ILLINOIENSIS, new species.

Color whitish, with eyes and three spots on elytra black, and red spots on head, pronotum, and scutellum: length 3 mm.



116



117

FIGS. 116 and 117.—ELYTRON AND WING OF  
TYPHLOCYBA ILLINOIENSIS.

This species is whitish or pale yellow throughout, except the eyes and the red and black spots, which are distributed as follows: In well-marked specimens there is a bright red spot on the vertex, one on the pronotum, one on the tip of the scutellum, a few very minute ones on the bases of the elytra, and one on the mesopleura. In

pale specimens all of these may be absent or appearing as pale yellow spots, the one on the scutellum being the most constant. Each elytron has three distinct black spots, one midway near the costal margin, one at the base of the inner apical cell, and one between the third transverse vein and the claval suture, nearer the base of the wing than to the transverse nerves. This last spot is usually the largest and is surrounded by a halo of red or yellow. The legs are whitish, with the tibiae and tarsi more or less tinged with pinkish in most specimens. The tergum is also often tinged with reddish. (See Figs. 116, 117.)

*Type*.—No. 3446, U.S.N.M.

Described from six specimens from Illinois, eleven from Mississippi, and one from Michigan, males and females. The Illinois specimens are from the State Laboratory of Natural History, and bear the numbers 17399 and 17397. I am informed by Mr. Hart that those bearing the former number were taken on grapevines, the others in general sweep-

ings. Those from Mississippi were sent me by Professor H. E. Weed, who took them on October 8 and 23. The specimen from Michigan was taken by Professor G. C. Davis August 12. Mr. Heidemann has also sent me a specimen marked "D. C.," and I have specimens from the U. S. National Museum marked "On Vogelleim grape."

#### TYPHLOCYBA COMES Say.

*Tettigonia comes* SAY, Jour. Acad. Nat. Sci. Phila., IV, p. 343, 1825: reprint, Compiled Writings, II, p. 259, 1891.

*Typhlocyba comes* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 312, 1894.—MARLATT, Yearbook, U. S. Dep. Agr., p. 400, 1896.

*Erythroneura vitifer* FITCH, Trans. N. Y. St. Agr. Soc., XVI, p. 392, 1856.

*Typhlocyba vitifer* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 312, 1894.—MARLATT, Yearbook, U. S. Dep. Agr., p. 400, 1896.

This is one of the most common, and, in its markings, one of the most variable of all the *Typhlocybas*, and has been described no less than eight times under different names. Fitch's *Erythroneura vitifer* seems to have been completely covered by Say's description of *comes*, so I have not retained the name as representing a variety at all distinct from what Say described.

Say's description is as follows:

Pale yellowish, with sanguineous spots.

Inhabits Missouri.

Body pale yellowish; head, a transverse sanguineous line, profoundly arcuated in the middle, and a smaller transverse spot before; eyes fuscous; thorax with three sanguineous spots, the lateral ones smaller, and the intermediate one arcuated; scutell. a sanguineous spot at tip; hemelytra yellowish white spotted with sanguineous; spots arranged two at base,

of which the outer one is small and the inner one elongated and abruptly dilated on the inner side at tip; two upon the middle, of which the outer one is elongated in a very oblique line; two behind the middle, of which the inner one is obliquely elongated, and the outer one smaller and interrupted; and a transverse linear one near the tip, ramose upon the nervures; feet whitish.

Length to the tip of the hemelytra one-ninth of an inch.

The line and spot on the head and the spots of the thorax are sometimes obsolete, but always visible, and the latter are sometimes connected by curving toward the anterior edge of the thorax. The spots of the hemelytra are also sometimes slightly interrupted, or connected into four oblique bands. (See Figs. 118, 119, 120.)

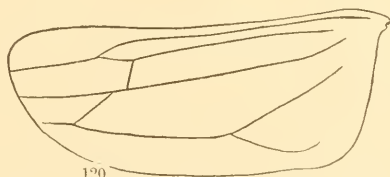
Outside of Colorado I have received this species from the following localities and persons: Arizona (Toumey), District of Columbia (Pergrande), Illinois (Forbes and Hart), Iowa (Osborn and Ball), Maryland (Pratt, F. C.), Michigan (Davis), Mississippi (Weed, H. E.), Ohio (Comstock), New York (Comstock), Vancouver Island (Livingston).



118



119



120

FIGS. 118, 119 and 120.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF TYPHLOCYBA COMES.

In Colorado I have taken this species near Fort Collins and Canon City, at the former place on Virginia creeper and wild grape, at the latter on cultivated plum. The specimens taken from Virginia creeper were few in number and resembled var. *ziczac* as closely as typical *comes*; the specimens from plum were exceedingly abundant so as to do considerable injury to the foliage. I have also a single specimen that I swept from dwarf oaks, *Quercus undulata*, at Maniton, this State. Mr. Pergande's specimens were from oak and grape; those from Professor Forbes bear the numbers 14877 and 17867. Mr. Hart writes that the former lot were taken from rye and the latter among dried leaves.

#### VARIETY BASILARIS Say.

*Tettigonia basilaris* SAY, Jour. Acad. Nat. Sci. Phila., IV, p. 344, 1825; reprint, Compiled Writings, II, p. 260, 1869.

*Erythronoea basilaris* WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 317, 1864.—GLOVER, Rep. U. S. Dep. Agr., p. 33, 1876.

*Typhlocyba basilaris* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 321, 1894.

*Erythronoea affinis* FITCH, Homop. N. Y. St. Cab., p. 63, 1851; reprint, Lintner's 9th Rep., Ins. N. Y., p. 403, 1893.

*Typhlocyba affinis* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 321, 1894.

I do not consider Fitch's var. *affinis* to be worth retaining as a variety of *basilaris*. The only thing that Fitch gives to separate his *affinis* from *basilaris* is the yellow instead of sanguineous markings. Any of the *Typhlocybas* marked with bright red sometimes occur with faint yellow markings, and in *basilaris* I find all gradations from those marked with bright red to those having the markings so faint as to be hardly discernible.

The original description of *basilaris* is as follows:

Pale yellowish, varied with sanguineous; elytra reddish brown at base.

Inhabits Missouri.

Body pale yellowish; head obsoletely varied with sanguineous; eyes dusky or black; thorax dusky behind; anterior margin with four or five obsolete sanguineous spots; scutell dusky reddish brown or sanguineous at tip; hemelytra with a broad band of reddish brown at base; a spot on the middle of the inner margin, then an oblique line, and another oblique line toward the tip, sanguineous; at the inner extremity of the latter is a minute black spot. Length to the tip of hemelytra one-ninth of an inch.

I have received a number of specimens of this variety from the Illinois State Laboratory of Natural History and from the private collection of Mr. Hart, all taken near Champaign, Illinois; a few specimens from Iowa Agricultural College, and a large number of specimens from Mr. F. V. Crevecoeur, taken at Onaga, Kansas, among leaves in the timber in early spring.

#### VARIETY VITIS Harris.

*Tettigonia vitis* HARRIS, Encyclopedia Amer., VIII, p. 43, 1831; Ins. Inj. to Veg., 1st ed., p. 184, 1842; 2d ed., p. 198, 1852; 3d ed., p. 22, pl. III, 1862.

*Erythroneura vitis* FIRCH, Homop. N. Y. St. Cab., p. 63, 1851; reprint, Lintner's 9th Rep., p. 403, 1893.—WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 317, 1864; Pract. Ent., II, p. 49, 1867.—GLOVER, Rep. U. S. Dep. Agr., p. 32, 1876.—SAUNDERS, Insects Inj. to Fruit, p. 286, 1883.—UHLER, Stand. Nat. Hist., II, p. 246, 1884.—PROVANCHER, Pet. Fanne Ent. Can., III, p. 298, 1890.—COMSTOCK, Manual of Ins., p. 154, 1895.

*Typhlocyba vitis* WALSH & RILEY, Amer. Ent., I, p. 227, 1869.—RILEY, Trans. Ill. St. Hort. Soc. for 1873-74.—WOODWORTH, Psyche, V, p. 213, 1889.—WEED, Insects and Insecticides, p. 122, 1892.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 311, 1894.

The original description of this variety is as follows:

One-tenth of an inch in length. Of a pale yellow or straw color; there are two little red lines on the head; the back part of the thorax, the scutel, the base of the wing covers, and a broad band across their middle are scarlet; the tips of the wing covers are blackish and there are some little red lines between the broad band and the tips. The head is crescent shaped above and the eyelets are situated just below the ridge of the front. On grape. (See Fig. 121.)

The only specimens that I have seen of this variety from Colorado I took in Clear Creek Canyon, near Golden, on wild grape, July 18, 1896. I have received specimens from Professor Davis taken in Michigan and from Mr. Hart taken in Illinois, and in both instances from grape. Specimens from Mr. Pergande were taken in District of Columbia on *Cercis canadensis*. I also have specimens taken by Mr. E. D. Ball and by myself in Iowa, by Mr. MacGillivray in New York and Professor Weed in Mississippi.

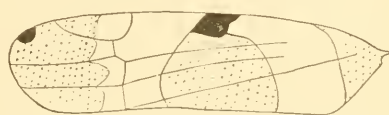


FIG. 121.—ELYTRON OF TYPHLOCYBA COMES VAR. VITIS.

Typical individuals of this variety are so different in their markings from typical *comes* that one would not be inclined at first to think that they could belong to that species, but, structurally, the two forms are alike and one can go from one extreme to the other through *ziczac*, which seems to be an intermediate form. Specimens from Mr. Hart's private collection bear the numbers 345, 476, 535, 550, 562, and 573.

Specimens from Professor Davis were taken from wild grape and the specimens from Mr. Livingston were taken on alder. I do not know the host plants from which others took their specimens.

#### VARIETY ZICZAC Walsh.

*Erythroneura ziczac* WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 317, 1861.

*Typhlocyba ziczac* WOODWORTH, Psyche, V, p. 312, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 312, 1894.

According to Mr. Walsh this variety has the following characteristics:

Pale yellowish. Front of the head in a right angle, with the apex rounded. Eyes dusky; ocelli pale; vertex with two pale sanguineous vitta, generally sub-obsolete. Thorax blood brown, yellowish in front, often with a yellowish vitta, scutel blood-brown, with a yellowish vitta, occasionally entirely yellowish. Abdomen often blood-brown, except at base and tip. Tip of ovipositor and of tarsi dusky. Elytra pale yellowish; on the costal tip a black spot, and on the interior margin,



forming a triangle with the two other spots, a black spot; a blood-brown, irregular, broad stripe, covering the humerus, thence in a zigzag direction to the rhomboidal spot; thence to the spot on the interior margin; thence not quite attaining the terminal dot. Wings hyaline; tips of costal veins often dusky. Length to tip of wings a little over one-tenth of an inch. Occurs abundantly on the grapevine. (See Fig. 122.)

This is a variety of *comes* in which the red lines and spots of the elytra run together and are usually of a dull blood-brown or smoky color, but among the specimens that I have examined there is every possible variation into typical *comes* in one direction and into typical *vitis* in the other.

Mr. Baker and myself have both taken this variety here in large numbers from Virginia creeper and occasionally on grape; Walsh took his specimens on grape, and Mr. Hart, of Illinois, and Professor Davis, of Michigan, have both sent it to me recorded for grape. I also have specimens from Professor H. E. Weed, of Mississippi, and Mr. E. D. Ball, of Ames, Iowa, but do not know from what plants their specimens were taken.



FIG. 122.—ELYTRON OF TYPHLOCYBA COMES, VAR. ZICZAC.

#### VARIETY OCTONOTATA Walsh.

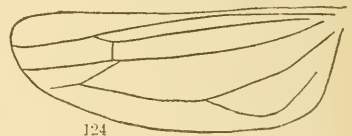
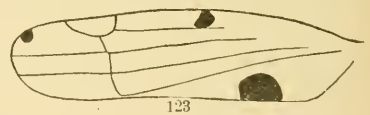
*Erythroneura octonotata* WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 318, 1864.

*Typhlocyba octonotata* WOODWORTH, Psyche, V, p. 213, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 312, 1894.

This is another well marked variety of *comes*, differing from the typical form by having the markings, especially upon the posterior half of the wing covers, rather faint and by having a large spot on the middle of the internal margin of the clavus and a broad median stripe on the scutellum black. The spot on the scutellum is sometimes wanting.

This form was described by Walsh as follows:

Whitish. Head as in the preceding (*ziczac*). Thorax a little clouded with fuscous. Abdominal and ventral joints in mature specimens dusky, except at tip. Tips of tarsi dusky. Elytra whitish subhyaline, with the same three spots as in the preceding, and, in addition, one on the inner margin not far from the base; on the cross veins an irregular fuscous band and on the disk a small brown cloud, often obsolete. Length a little over one-tenth of an inch. (See Figs. 123, 124.)



FIGS. 123 AND 124.—ELYTRON AND WING OF TYPHLOCYBA COMES, VAR. OCTONOTATA.

Walsh found this species in small numbers upon grapevines in company with *ziczac*, *vitis*, and *trilineata*.

Mr. C. A. Hart, of Champaign, Illinois, sent me a quantity of *Typhlocybinae*, swept from grapevines, in which were a large number of beautiful specimens of this variety, and I also received a considerable

number of pinned specimens from Professor H. E. Weed, taken in Mississippi. I have, besides these, a single specimen taken at Ithaca, New York, by Mr. MacGillivray, and one taken by Professor G. C. Davis at the Michigan Agricultural College.

**VARIETY COLORADENSIS** Gillette.

*Typhlocyba vitifer* FITCH. var. *coloradensis* GILLETTE. Bull. 19. Colo. Agr. Exp. Sta., p. 16, 1892.—GILLETTE & BAKER. Bull. 31. Colo. Agr. Exp. Sta., p. 113, 1895.

*Typhlocyba coloradensis* COCKERELL, Bull. 19. N. M. Agr. Exp. Sta., p. 114, 1896.

*Typhlocyba vitis* GILLETTE, Bull. 15. Colo. Agr. Exp. Sta., p. 18, 1891.

The form which occurs here, however, differs from the typical *vitifer* by having a large black spot on either side of the scutellum at the base, by having the red line on the middle of the thorax usually not forked in front, and by not having the red on the head in two lines, but in a large blotch more or less spotted with whitish.

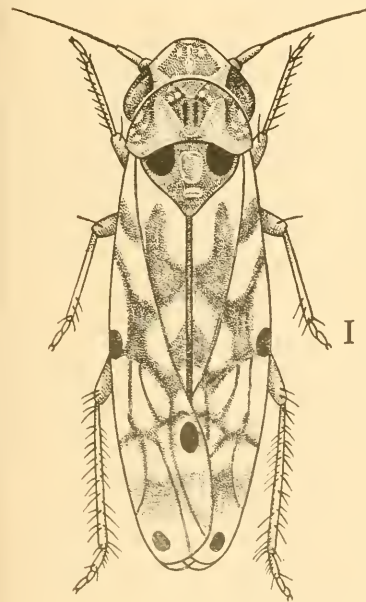
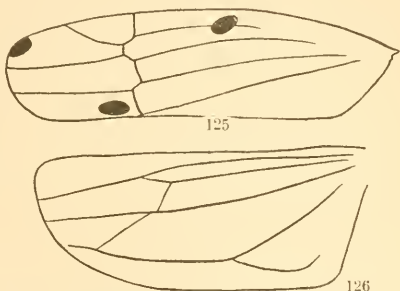


FIG. 127.—*TYPHLOCYBA COMES*, VAR. *COLORADENSIS* (From Bulletin 19. Colo. Exp. Sta., p. 17.)



FIGS. 125 and 126.—ELYTRON AND WING OF *TYPHLOCYBA COMES*, VAR. *COLORADENSIS*.

The illustration (Fig. 127) was made from a specimen that most nearly approaches a typical *vitifer* in coloration. It seems that the Colorado form is a very distinctly marked variety, and for it I suggest the name *Coloradensis*. The two spots on the scutellum, which are perfectly constant, will alone separate it from the eastern form. (See Figs. 125, 126, 127.)

*Cotype*.—No. 3447. U.S.N.M.

This is one of the most beautiful of the numerous varieties of *comes*. I have taken it in several localities in Colorado, and have received it from Professor T. D. A. Cockerell, who took specimens on grape at Las Cruces, New Mexico, from Mr. Vernon L. Kellogg, specimens taken on grape in California, and from the U. S. National

Museum, a large number of specimens bearing the following labels: "Denver, Colo., V. Devinny, July '86, on grape;" "Berkeley, Calif., on grape, May '81;" "Ft. Collins, Colo., on grape, J. Cassidy;" "Bloomington, Nebr., on grape, '88, J. Graf;" "Anthony, N. M., on grape, H. H. Bailey;" "Basco Falls (Kans.), G. Marlat."

This is a very distinctly marked variety and one that seems to be entirely confined to the West. We should not go far wrong in giving it specific rank, but it is so exactly like *comes*, with simply the basal angles of the scutellum blackened, that I have not thought it best to consider it more than a variety of that species.

VARIETIES OF *TYPHLOCYBA COMES* Say.

Typical *comes* (Say).—With zigzag red lines and spots on elytra, but without black markings on the scutellum.

Variety *coloradensis* (Gill).—Like the preceding, with the addition of a large black spot on either basal angle of the scutellum.

Variety *ziczac* (Walsh).—Like *comes*, except that the zigzag line running from the humerus to the inner margin and thence to the cross-nervures of the elytron is broad and smoky or blood brown in color.

Variety *ritis* (Harris).—Mostly red above, with two transverse yellow lines on the elytra, surrounding a large central red or brown spot.

Variety *basilaris* (Say).—The reddish or blood-brown coloration nearly all massed on the basal half of the elytra.

Variety *maculata*, new variety.—Vertex, pronotum, scutellum, and elytra, with small bright red spots.

*Type*.—No. 3448, U.S.N.M.

Variety *scutelleris*, new variety.—Like *comes*, with scutellum black.

*Type*.—No. 3449, U.S.N.M.

Variety *S-notata* (Walsh).—Like *comes*, with the sanguineous markings faint beyond middle of clavus, and at this point a rather large black spot on a sanguineous field. Middle portion of scutellum also black.

Variety *rubra*, new variety.—Like *comes*, except that the red markings are so broadened as to nearly unite with one another, giving the entire insect a very red appearance above.

*Type*.—No. 3450, U.S.N.M.

Variety *infuscata*, new variety.—A broad median black or dark band extending over the vertex, pronotum, and scutellum, including the whole of the scutellum, and thence onto the elytra, where it takes the form of the dark band in *ziczac*, but is even broader. At the tip of the clavus is a dark spot surrounded by a narrow yellow stripe.

*Type*.—No. 3451, U.S.N.M.

All the above varieties are quite sharply defined, and one who has not specially studied the group would be very likely to consider them different species.

*TYPHLOCYBA VULNERATA* Fitch.

*Erythroncra vulnerata* FITCH, Homop. N. Y. St. Cab., p. 62, 1851; Trans. N. Y. St. Agr. Soc., XVI, p. 393, 1856; reprint, Lüntner's 9th Rep., Ins. N. Y., p. 162, 1893.—WALSH, Proc. Bost. Soc. Nat. Hist., IX, p. 317, 1864.—PROVANCHER, Pet. Faune Ent. Can., III, p. 299, 1890.

*Typhocyba vulnerata* WOODWORTH, Psyche, V, p. 213, 1889.—WEED, Insects and Insecticides, p. 84, fig. 6, 1891; p. 134, fig. 6, 1895.—OSBORN, Ia. Acad. Sci., I, Pt. 2, p. 11, 1892.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 313, 1891.—GILLETTE & BAKER, Bull. 31, Colo. Agr. Exp. Sta., p. 113, 1895.

Dr. Fitch's description of this species is as follows:

Fulvous brown, spotted and lined with whitish; elytra with an abbreviated yellowish-white vitta on the outer margin, interrupted near the middle by an oblique black line, and toward the apex by an oblique sanguineous one; tips dusky, with whitish nervures and spots; a whitish medial line common to the vertex, thorax and scutellum; beneath black, legs pallid. Length 0.12 (inch). (See Figs. 128, 129).

On raspberry bushes, grapevines and other situations where the foliage is dense, often in great numbers.

I have received specimens of this species as follows: From Mr. Pergande, labeled "D. C., on elm;" from Mr. C. A. Hart, taken at Havana, Illinois, on grape, and others taken near Champaign in general collecting; from Professor H. E. Weed, taken at the Mississippi Agricultural College; from Mr. E. D. Ball, taken at Ames, Iowa; from Mr. Otto Heidemann, marked "D. C.;" from the U. S. National Museum, marked "Denver, Colo., on grape, V. Deviny;" and "Mo.;" from Mr. F. F. Crevecoeur, Onaga, Kansas, taken among leaves in the spring; from Professor J. W. Tonney, marked "Salt River Valley, Ariz., very bad on grapes."

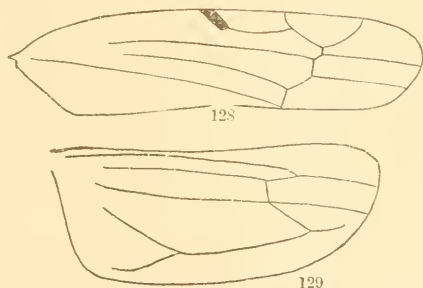
I have taken this insect in Colorado on *Clematis ligusticifolia*, on Virginia creeper, and on grape.

Variety *niger*, new variety.—I have a number of specimens of a very dark, almost black, form of this species. They have been received from the Illinois State Laboratory of Natural History, Cornell University, Mr. E. D. Ball, Ames, Iowa, Mr. Th. Pergande, District of Columbia, and Mr. F. F. Crevecoeur, Onaga, Kansas, and I have also taken this form at Fort Collins, Colorado.

The color above is almost entirely black but the large light colored spot on the middle of the costal margin of the elytron is always present, and nearly always a yellow spot on the inner basal angle of the elytron, and yellow spots or narrow lines in the places of the ordinary light lines of the thorax and vertex, and a median yellow line on the scutellum.

*Type*.—No. 3452, U.S.N.M.

The specimens sent me by Professor Tonney from Salt River Valley, Arizona, are very light colored.



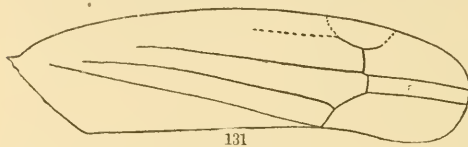
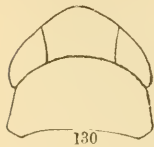
FIGS. 128 and 129.—ELYTRON AND WING OF TYPHLOCYBA VULNERATA.

#### TYPHLOCYBA DENTATA, new species.

Light straw color marked with orange yellow above; length 3 mm.

Face pale yellow, unicolorous, hardly longer than broad, clypeus unusually small. Vertex moderately produced, one-half as long as the pronotum and a little less than one third as long as the head is broad, concolorous with the face and having two illly defined orange, or lemon colored spots which, in one specimen, extend forward over the crest of

the vertex. Pronotum pale yellow with two rather large and approximate orange-colored spots just before the middle. Scutellum light yellow on the middle but more or less washed with orange on all the angles. Elytra light yellow, subhyaline on the basal portion, transparent beyond the cross veins and with two orange vittæ, one on the clavus and another longitudinal one on the middle of the corium and reaching to the cross veins; there is also a little orange decoloration on the inner margins of the elytra near the tip of the clavus. Color of venter and feet light yellow. The last ventral segment of the female has a large broad tooth notched at the tip which is different from any other American *Typhlocybid* that I have seen and which suggested the specific name.



FIGS. 130 AND 131.—VERTEX AND PRONOTUM, AND ELYTRON OF *TYPHLOCYBA DENTATA*.

Museum, marked "Folsom, Calif., Aug. 7, '85." (See Figs. 130, 131.)

*Type*.—No. 3453, U.S.N.M. Described from three females from the U. S. National

#### *TYPHLOCYBA QUERCI* Fitch.

*Empoa querci* FITCH, Homop. N. Y. St. Cab., p. 63, 1851; reprint, Lintner's 9th Rep., Ins. N. Y., p. 463, 1893.

*Typhlocyba querci* WOODWORTH, Psyche, V, p. 214, 1889.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 313, 1894.

This variety is described by Dr. Fitch as follows:

White; elytra pellucid, with three blackish dots in a transverse row behind the middle. Length 0.12 (inch). On oaks, sometimes excessively numerous.

#### *VARIETY BIFASCIATA* Gillette & Baker.

*Typhlocyba bifasciata* GILLETTE & BAKER, Bull. 31, Colo. Agr. Exp. Sta., p. 111, 1895.

Near *tricincta*. Female: Clypeus once and a quarter as long as broad, basal suture straight; genæ long and narrow, with a broad deep groove from eye to clypeus, slightly concave outwardly, broadest at eye, attaining tip of clypeus; loræ as long and somewhat narrower than clypeus; front three-fourths longer than broad between eyes, three times as long as clypeus, superior angle more than a right angle and broadly rounded. Face and vertex very finely and obsoletely punctured, more distinctly on upper part of front. Disk of vertex flat, sloping, slightly less than one-half longer at middle than at eyes. Pronotum slightly less than twice as broad as long at middle, broadly rounded before, slightly concave behind, posterior angles rather sharply rounded, lateral margins long; disk of pronotum with anterior third



smooth, posterior two-thirds very indistinctly transversely rugose; scutellum slightly shorter than pronotum, broader than long, transverse groove straight, black, ends bent backward; last ventral segment with hind margin broadly rounded. Color yellow; face, vertex, and pronotum, light lemon yellow, concolorous; scutellum dark smoky; elytra light lemon yellow, with a broad smoky transverse band just in front of middle, broader on inner margins, another broad smoky band at apex, lighter on middle portion; venter pale yellow; legs pale whitish yellow. Length 4 mm.

*Cotype*.—No. 3454, U.S.N.M.

Described from one female, which I took at Minturn, Colorado, August 24. (See Figs. 132, 133, 134, 135.)

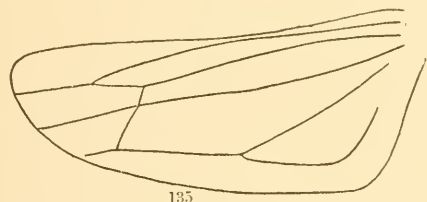
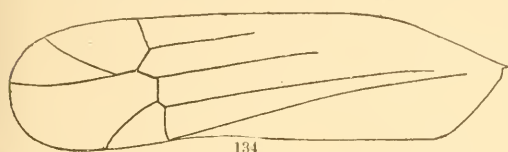
I have received specimens from New York (Lintner), Illinois (Forbes), Iowa (Osborn), and from Mr. Th. Pergande labeled, "From oak, D. C.;" from Professor G. C. Davis labeled, "M. A. C., 7 5 '92;" from Mr.



FIGS. 132 and 133.—FACE AND VERTEX AND PRONOTUM OF TYPHLOCYBA QUERCI, VAR. BIFASCIATA.

Samuel Henshaw labeled, "From balsam, N. C. W. J. P. Coll.," and from Mr. E. D. Ball labeled, "Ames, Ia."

A specimen received from Professor Davis is interesting on account of the dark band on the middle of the elytra being extended forward to the scutellum, so that the only yellow portion of the basal half of the elytron is a



FIGS. 134 and 135.—ELYTRON AND WING OF TYPHLOCYBA QUERCI, VAR. BIFASCIATA.

narrow costal margin for a short distance.

#### TYPHLOCYBA CREVECŒURI, new species.

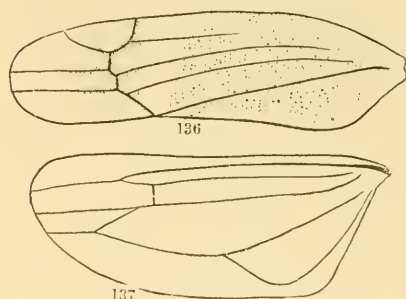
Color light yellow, basal two-thirds of elytra red; length 3 mm.

Face yellowish, suffused with reddish, sutures indistinct. Vertex rather strongly produced and angular, not broadly rounded in front; vertex and pronotum straw yellow, with two broad longitudinal red lines; these lines upon the vertex are so broadened in some specimens as to completely cover it. Scutellum entirely red, or in some specimens almost black; elytra yellow beyond the tip of the clavus, and with more or less yellow on the base of the costal margin, the remainder of the elytra red. In most specimens, however, the middle portion of this large reddish area on the elytra is more smoky than red in color. The inner transverse nervure is very oblique and the middle apical cell is

narrow and parallel-sided, as in *obliqua*. All beneath pinkish yellow. (See Figs. 136, 137.)

*Type*.—No. 3455. U.S.N.M.

Described from nineteen specimens sent me by Mr. F. F. Crevecoeur, which he took among leaves in timber at Onaga, Kansas, in early spring.



FIGS. 136 and 137.—ELYTRON AND WING OF TYPHLOCYBA CREVECOEURI.

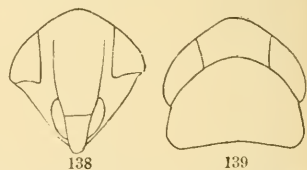
The red lines upon the vertex and pronotum, the very oblique direction of the inner transverse nervure of the elytron, the parallel-sided and very narrow apical cell of the elytron, and the fact that these specimens were taken along with specimens of *obliqua*, led me to suspect that this was only another variety of that species; but *crevecoeur* is much more robust

than *obliqua*, and the characteristic markings of the former is so constant that I can not but think it a good species.

#### TYPHLOCYBA FLAVOMARGINATA Gillette & Baker.

*Typhlocyba flavomarginata* GILLETTE & BAKER, Bull. 31, Colo. Agr. Exp. Sta., p. 111, 1895.

Female: Clypeus a third longer than broad, basal suture straight, sides nearly parallel; lore and genae as in *bifasciatus*; front three times the length of clypeus, one-third broader than long, superior angle greater than a right angle, broadly rounded. Face, vertex, and pronotum sculptured as in *bifasciata*. Proportions of vertex, pronotum, and scutellum same as in *bifasciata*. Last ventral segment with posterior angles produced, acute, a broad, deep emargination between them, the base of which is notched. Color pale yellow or whitish; face, vertex, and pronotum whitish, concolorous; scutellum whitish, with basal angles darker; elytra whitish subhyaline, nervures lighter, costal and internal margins flavescent, deeper on inner margin; venter and legs pale yellow; pygofers, sheaths of ovipositor, prosternum, and tip of rostrum tinged with flavescent.



FIGS. 138 and 139.—FACE, AND VERTEX AND PRONOTUM OF TYPHLOCYBA FLAVOMARGINATA.

Length 4 mm. Described from three females. (See Figs. 138, 139.)

*Cotypes*.—No. 3456, U.S.N.M.

The type specimens were taken by myself at Manitou, Colorado, September 29, on oak, and I have since taken the species in considerable numbers at Cerro Summit, August 21, and Cimarron, August 22, and Manitou October 8, in each case from dwarf oaks. All in Colorado.

## TYPHLOCYBA ULMI Linnæus.

*Cicada ulmi* LINNÆUS, Fauna Suecica, p. 900, 1761.—DE GEER, Abh. x. Gesch. d. Ins. etc., p. 189, 1780.—FABRICIUS Ent. Syst., 1803.—FALLEN, Hemiptera Suecicæ, Cicadariae, p. 49, 1829.

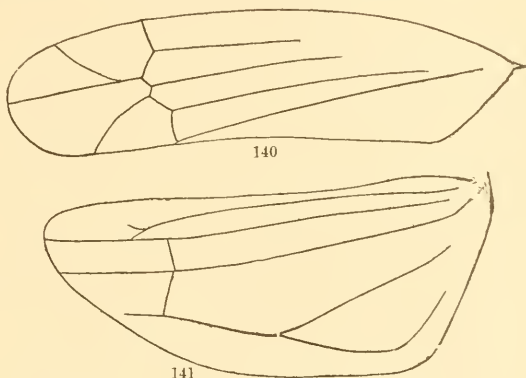
*Anomia ulmi* FIEBER, Kat. d. eur. Cicad., p. 15, 1872.

*Typhlocyba ulmi* PUTON, Cat. d. Hemip., p. 88, 1886—MELICHAR, Cic. v. Mitteleuropa, p. 348, 1896.

I do not possess the original description of this species, my specimens being determined by comparison with European specimens loaned me by Mr. E. P. Van Duzee, and others obtained in exchange from Doctor L. Melichar, of Vienna.

The species may be briefly characterized as follows:

Color yellowish; length 3.75 mm.; head rather small, narrower than the pronotum; vertex of female with two black dots on the anterior margin; males and females with a small black spot on the middle of the anterior margin of the pronotum; tergum of abdomen black, with the hind margins of the segments yellow; venter yellow, or yellow and black; clytra somewhat infuscate in the region of the cross nervures and at their tips; feet yellow. (See Figs. 140, 141.)



FIGS. 140 and 141. —ELYTRON AND WING OF TYPHLOCYBA ULMI.

I received a good number of males and females of this species from Doctor Lintner labeled, "Albany, N. Y., 1886," and one specimen labeled "Mass.," also a few examples from Mr. Ball labeled "Ames, Ia., June 19."

## TYPHLOCYBA COMMISSURALIS Stål.

*Typhlocyba commissuralis* STÅL, Stett. Ent. Zeit., XIX, p. 196, 1858.—WOODWORTH, Psyche, V, p. 214, 1859.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 313, 1894.

*Kybos commissuralis* FIEBER, Kat. d. eur. Cicad., p. 14, 1872—PUTON, Cat. des Hémpip., p. 87, 1886.

Stål's original description of this species is as follows:

Flavo-albida, capite circa oculos scutelloque pallide brunnescentibus, hujus marginibus lateralibus termissime venaque ipsa marginali interna tegminum ultra medium nigricantibus; tegminibus pallidissime flavescentibus, apice subdecoloribus, costa basi fusciscente, areolis apicalibus 4 triangularibus, lateralibus marginem apicalem ipsam hand attingentibus, Ida basi latiuscula, 3-tia basi angulum scutum formante. ♂. Long.  $4\frac{1}{2}$ . Lat.  $\frac{3}{4}$  mm.

T. lineatilla subsimilis. Tegmina areolis apicalibus 4 instructa, quarum externis apicem hand attingentibus, obtriangularibus, basi latis et ibidem utrimque suboblique truncatis, secunda (a commissura) apice omnium latissima, intus sensim

angustata, basi utrimque oblique truncata, tertia triangulari, basi angulum acutum formante. (See Figs. 142, 143, 144.)

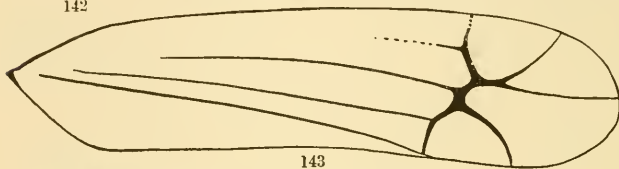
Stål's description was made from a male specimen taken at Sitka, Alaska, and I am not aware that it has ever been reported by anyone since its description.

Mr. Clermont Livingston, of Corfield, Vancouver Island, recently sent a large quantity of insects that he took sweeping various plants, and in the lot were a large number of specimens of *T. commissuralis*. According to Mr. Livingston's notes the specimens of this species were taken from alder, willow, and weeds.

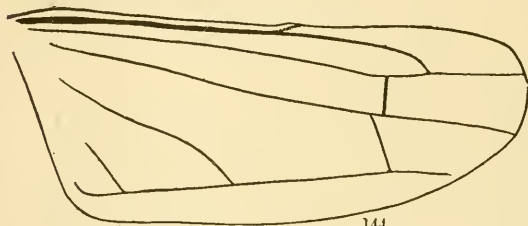
The black commissural line is present in a number of specimens, both male and female, but the greater proportion have no dark marking upon the elytra at all, and resemble *T. rosa* so perfectly that I can separate the species only by the difference in size, *rosa* not exceeding  $3\frac{1}{2}$  mm., while *commissuralis* measures from  $3\frac{3}{4}$  to nearly 5 mm.



142



143



144

FIGS. 142, 143 and 144.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF TYPHLOCYBA COMMISSURALIS.

The only other representatives of this species that I have seen were taken by myself at Cimarron, Colorado, August 22, from alder, *Alnus viridis*. They were taken along with numerous specimens of *Empoasca atrolabes* and *E. smaragdula*.

A specimen of *Typhlocyba callosa* Then, sent me by Doctor Melichar seems identical with *commissuralis*, as do examples of *T. cratagi* Douglas, that I have examined from Europe.

#### TYPHLOCYBA TENERRIMA Herrich-Schäffer.

This is also an European species, the description of which I have not seen. I determined my specimens by comparison with named European specimens sent me by Mr. E. P. Van Duzee, and I also sent specimens to Doctor Melichar, who assured me that my determinations were correct.<sup>1</sup>

This is a very slender pale-yellow species, a trifle more than 3 mm. in length. There is a row of dusky blotches on the elytron just before

<sup>1</sup>A description in German may be found in Cicadinen von Mittel-Europa, p. 349, by L. Melichar.

the cross nervures, and the extremities of the outer cross nervure and of the inner and outer apical nervures are black; the tip of the ovipositor and the basal portion of the tergum of the abdomen are also black; aside from the dark compound eyes, these are the only markings. (See Fig. 145.)

Specimens of this species were sent me by Professor G. C. Davis. One lot was labeled, "Ag. Coll. Mich., 9/23/92, 460," and another lot, "Ag. Coll. Mich., 9/17/95, on wild grape." I found it rather common on hazelnut (*Corylus rostrata*) in Colorado, in Clear Creek Canon, above Golden, July 18, and in the foothills near Palmer Lake, August 12, 1896.

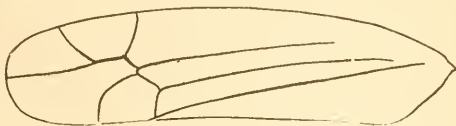


FIG. 145.—ELYTRON OF TYPHLOCYBA TENERIMA.

#### TYPHLOCYBA LETHIERRYI Edwards.

I have not seen the original description of this species, but determined the specimens that I have by comparison with European specimens loaned me by Mr. E. P. Van Duzee. I also sent specimens to Doctor Melichar, who determined them *T. lethierryi*, so there can be little doubt as to the correctness of the determinations. The species is described by Doctor Melichar along with the preceding.

The species resembles *T. rosæ* very closely, but is sulphurous yellow in color instead of pale yellow or whitish. The color is deepest on the elytra where it stops abruptly at, or a little in front of, the cross-nervures, and the palest yellow is beneath. The dark eyes and black tip of the ovipositor are the only markings. (See Fig. 146.)

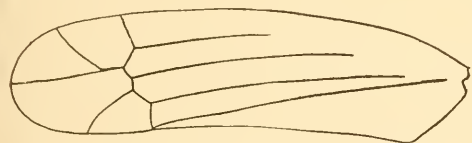


FIG. 146.—ELYTRON OF TYPHLOCYBA LETHIERRYI.

The only specimens of this species that I have seen from America were a few samples sent by Professor G. C. Davis, labeled, "Ag. Coll. Mich., 7/5/92," and a good number sent me by Mr. E. D. Bell, labeled "Ames, Iowa, June 19, from hard maple."

#### TYPHLOCYBA ROSÆ Linnaeus.

*Cicada rosæ* LINNÆUS.

*Typhlocyba rosæ* TOLLIN, Ent. Zeit. v. Stett., p. 67, 1851.—FLOR, Die Rhyn. Livl., p. 378, 407, 1861.—PUTON, Cat. d. Hémipt., p. 88, 1886.—WOODWORTH, Psyche, V, p. 76, 1888.

*Anomia rosæ* FIEBER, Kat. der eur. Cicad., p. 15, 1872.

*Tettigonia rosæ* (HARRIS) HARRIS, Ins. Inj. to Veg., 2d ed., p. 192, 1852; 3d ed., p. 229, 1862.

*Typhlocyba rosæ* WOODWORTH, Psyche, V, p. 214, 1889.—WEED, Insects and Insecticides, p. 156, fig. 83, 1891; p. 217, fig. 115, 1895.—VAN DUZEE, Trans. Am. Ent. Soc., XXI, p. 313, 1894.—GILLETTE & BAKER, Bull. 31, Colo. Agr. Exp. Sta., p. 112, 1895.—MELICHAR, Cic. v. Mittel-europa, p. 345, 1896.

*Erythroeneura rosæ* PROVANCHER, Pet. Faune Ent. Can., III, p. 299, 1890.

*Empoa rosæ* COMSTOCK, Manual of Ins., p. 154, 1895.

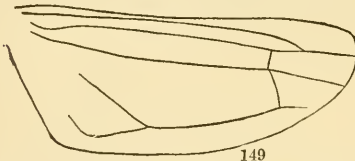
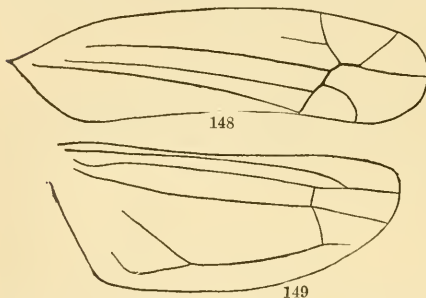


I do not have access to the description of this species by Linnæus, and so give the following brief characterization by Harris:

On rose. \* \* \* In its perfect state it is rather less than three-twentieths of an inch long. Its body is yellowish white, its wing covers and wings are white and transparent, and its eyes, claws, and piercer brown. The male has two recurved appendages at the tip of its hind body. It may be called *Tettigonia rosa*. (See Figs. 147, 148, 149.)

Doctor Gustav Flor, in Rhynchoten Livlands (*Cicadina* und *Psyllodea*),<sup>1</sup> says that this species is sometimes golden yellow in color to near the elytra, and that the males are  $2\frac{1}{2}$  and the females  $2\frac{3}{4}$  mm. in length. He also says that it is abundant on rose and also upon linden from August to late in October.

This is a very widespread and common species. Specimens in my collection from Europe, and from ocean to ocean in this country, seem to be identical, the chief variation being in size. Specimens that I have studied vary from 3.25 to  $3\frac{1}{2}$  mm. in length. The only dark markings that I have seen are those mentioned by Harris in his description, but I find that the males frequently have the upper portion of the face bright orange in color.



FIGS. 147, 148 and 149.—VERTEX AND PRONOTUM, ELYTRON, AND WING OF *TYPHLOCYBA ROSAE*.

Professor G. C. Davis sent me specimens of this species that he took at the Michigan Agricultural College on apple, plum, tame cherry, currant, and grape. Mr. Pergande sent me specimens that he took in the District of Columbia on apple, and I have received specimens from Mr. Samuel Henshaw, marked "Mass. on rose," and others from the Illi-

nois State Laboratory of Natural History from grape (10819). Specimens sent me from the U. S. National Museum were labeled as follows: "Ft. Collins, Colo., Sep. 4th, on apple, J. Cassidy." "Burlington, Vt., on apple." "Iowa, Gillette." I have specimens from Corfield, Vancouver Island, taken on rose by Mr. Clermont Livingstone, where they are evidently abundant.

I have taken the species in this State at Denver and Fort Collins on apple, at Manitou on oak, and at Fort Collins on cottonwood.

#### TYPHLOCYBA CENTRALIS Berg.

*Typhlocyba centralis* BERG, Add. et Emend. ad Hémip. Argent., p. 175, 1884.

According to Berg, the species is described as follows:

♂ ♀: et Dilute flavidi, straminei vel late luridi, vertice pronotoque anterius interdum punctis duobus fusciscentibus obsolete ornatis; pectore dorsaque abdominis adpartem infuscatis.—Long. corp. 1.5–1.8, cum tegm. 2.5–3; lat. 0.5–0.6 mm.

Vertex obtusissimus, marginibus antico et postico parallelis. Frons sat convexa. Clypeus longus, basin versus nonnihil ampliatus. Ocelli distincti. Pronotum vertice triplo longius, antice admodum productum, postice subrectum, utrinque ante medium fortiter impressum. Scutellum prope basin vel medio impressum, fere bipunctatum. Tegmina hyalina, areolis apicalibus quattuor instructa. Venter flavus; maris segmento ultimo quam pænultimo æquilongo, truncato; feminae paullo brevior, medio triangulariter exciso. Pedes flavidi.

Patria: Chaco.

This is a species I have not seen and could not place it with certainty in the synoptic table. The full description is given above.