

REVISION OF THE AMERICAN LEAF HOPPERS OF THE JASSID GENUS TYPHLOCYBA

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INTRODUCTION

The genus *Typhlocyba* is one of a group of leaf hoppers which seem naturally allied by their small size, frail structure, reduction of tegminal venation, and usual absence of ocelli. However, the most appropriate rank for this group, and its definition, are debatable points. Certainly prior definitions of what is here called the subfamily Eupteryginae including that¹ of the present writer must be abandoned. Contrary to previous conceptions certain members of the group have ocelli,² and others have antepical cells in the tegmina.³ There is no basal sutural line defining the front from the vertex and the lateral sutural lines bounding the front are evanescent basally. In Baker's key of 1923⁴ the members of this group run to the family Jassidæ. What the scope of the group should be, and its proper definition are matters of far from exact knowledge at present. However, the general characters mentioned in the first sentence and the reduction of claval veins to one or usually to none are aids to recognition of the leaf hoppers we now call Eupteryginae.

For recognition of the genus *Typhlocyba* within the subfamily the following characters should be verified: Wing has two apical cells and no submarginal vein; tegmen has no appendix, nor antepical cells, the third apical vein curves so as to join radial margin of tegmen about half way between fourth crossvein and apex of tegmen and the second apical cell usually is more or less stalked (pl. 1). The vertex usually is between rounded and angulate, and

¹ Proc. Biol. Soc. Wash., vol. 31, p. 110, November, 1918.

² McAtee, W. L., Florida Entomologist, vol. 8, Nos. 3-4 (December, 1924), February, 1925, pp. 34-35.

³ Baker, C. F., Psyche, vol. 8, p. 403, September, 1899.

⁴ Baker, C. F., Philippine Journ. Sci., vol. 23, No. 4, pp. 351-353, October, 1923.

coloration is rather plain. Numerous species are whitish to yellowish without markings, several have dark markings, and only a few show any other colors.

The scarcity of external features upon which classification might be based suggested appeal to the characters of the genitalia. The aedeagus assumes a remarkable variety of forms, but its structure is very constant for each species. The shape of the eighth sternite of the female also is helpful in segregating species, but is more limited in diversity.

TECHNIQUE OF GENITALIC STUDY

Remove the entire abdomen; this is easily done by applying pressure at the base while the specimen is held back down on a cork or other support under a low power of the binocular microscope. The abdomen is more readily severed at the base than elsewhere and usually can be removed without otherwise damaging the specimen. A great advantage in removing the entire abdomen is securing a sizable object to work with; the hypopygium alone is small and more easily lost, and the abdomen makes a convenient handle for it in consequent manipulations. Before proceeding further observe, describe, and draw if necessary, the external features of the genitalia. These are more easily made out in dry than in cleared specimens. For identification all that is necessary in some cases is to flip off (by a forward and lifting pressure with a needle) the anal tube. The apex of the aedeagus often is thus exposed fully enough for its characteristic shape to be observed without further dissection. When it is desired to go further place the specimen in saturated solution of potassium hydroxide in a small beaker or test tube and gradually bring to the boiling point. This is sufficient clearing for most specimens; in fact a little shorter exposure to the reagent will serve in many cases. A fine needle or pin, hooked and mounted in a handle, is convenient for transferring the specimen to and from the reagent. Upon removal place the cleared abdomen in glycerine, using a slide with a concavity or cell ground in it. Under a moderate power of the binocular examine for additional details of external structure and add to or amend the notes previously made. This accomplished, tease the hypopygium with fine needles so as to loosen and draw out the aedeagus, but not to disconnect it. These organs are very minute and if separated are likely to be lost; it is well, therefore, to keep them attached to large "handles." Observe the natural relationship of the parts, and describe and draw them in natural positions. Flattening them out under cover glasses is very inadvisable. The genitalia can be studied in a drop of glycerine under powers of the microscope as great as are needed. If high

lights interfere add more glycerine to keep the specimen completely submerged. For drawing it is desirable sometimes to hold the parts in a fixed position. This can be done with glycerine jelly. Slightly warming the jelly fits it for reception of the specimen which can be manipulated into the desired position with needles (warmed if necessary). The jelly will gradually set and when it seems assured that the specimen will retain its position, the slide can be laid on some cool object to complete the hardening process. To avoid losing the connection between the treated hypopygium and the insect from which it was removed, the writer transfers them from the slide to a drop of shellac on the same card point on which the insect is mounted. The glycerine and shellac seem to form a persistently viscous combination, from which the specimen can be removed at will for further examination, and which is transparent enough to permit seeing details sufficiently in many cases so that removal is unnecessary. How long this desirable consistency of the mounting medium will persist is unknown, but if a solvent is needed, alcohol which can not injure the specimen will serve the purpose.

TECHNIQUE FOR DRAWINGS AND REPRODUCTIONS THEREOF

Whether made by the aid of the binocular or the monocular microscope, drawings are scaled by a grid-ruled micrometer and drawn on graph or profile paper. The divisions on both the micrometer and the paper being on a decimal system, proportions of the drawing take care of themselves. Details also are traced easily and quickly even by one not especially proficient in drawing. Use profile paper with faint blue ruling; ink in the drawing with rather heavy lines and have about half of the reduction ultimately desired made by photography. The blue lines are thus eliminated, the drawing standing out well on a nearly white background. By this process the operations of tracing and redrawing the figures are eliminated.⁵ Another way in which the same economy of effort may be had is to make the drawing directly on tracing paper held stationary over a sheet of profile paper.

NOMENCLATURE OF THE GENITALIA

The nomenclature for the parts of the genitalia are partly adapted from those used by Lawson⁶ and Brittain⁷ and partly improvised.

⁵ Using the technique described in this and in the preceding section, the writer is able to clear and describe a hypopygium and make all drawings required for one species in an hour, and to do all work necessary to identification of a previously known species in from 10 to 15 minutes.

⁶ Kans. Univ. Sci. Bull., vol. 12, 1920, pp. 44-52.

⁷ Proc. Acadian Ent. Soc., No. 8, 1922, pp. 62-66.

Their application is shown in figures 40, 41, and 110, and their equivalents in the following table:

MALE (FIGS. 40 AND 41)

Terms in this paper	Equivalents
Ninth segment----- (a) --	Pygofers (the plural is incorrect.)
Anal tube----- (b) --	Anal tube.
Outer clasper----- (c) --	Plates.
Inner clasper----- (d) --	Styles, gonostyli, parameres.
Connective----- (e) --	Connective.
Aedeagus ----- (f) --	Same term spelled in various ways; penis.

FEMALE (FIG. 110)

Ninth segment----- (a) --	Valvifer.
Anal tube----- (b) --	Anal tube.
Ovipositor sheath----- (c) --	Valvulae.
Eighth sternite----- (d) --	Genital plate; ultimate ventral segment.

RELATION OF THE GENITALIA IN COPULATION

In copulation members of the genus *Typhlocyba* assume a tail to tail position. The entire hypopygium of the female is elevated, as is also the anal tube of the male. The upper posterior angles of the ninth segment (often toothed within) of the male press against the sides of the female hypopygium. The outer claspers extend over, and the inner claspers under the eighth sternite of the female. The aedeagus is inserted into the ninth segment just behind and above the eighth sternite (fig. 110).

SOURCES OF MATERIAL

Besides the collection of the United States National Museum, material from the following sources has been available for the present study: Museum of Comparative Zoology (through Nathan Banks); Illinois State Natural History Survey (through S. A. Forbes and T. H. Frison); Nova Scotia Department of Agriculture (through W. H. Brittain); British Columbia Department of Agriculture (through W. Downes); State College of Iowa (through Carl J. Drake); University of Kansas (through Paul B. Lawson); and the private collections of E. D. Ball, and the author. Throughout the following pages names or abbreviations in parentheses indicate the location of the specimens recorded. The writer much appreciates the cooperation of the individuals and institutions named above.

Further acknowledgment is due J. R. Malloch, who made special efforts to collect material and donated it to the writer, and who made the drawings for Plate 1.

KEY TO THE GROUPS OF SPECIES

For the purposes of this key, the sectors (1-3), the cross veins (1-4), the apical veins (1-3), and the apical cells (1-4), are numbered in order from the costal to the radial margin of the tegmen.

1. Third apical vein continuous (or nearly so) with third sector, fourth apical cell therefore approximately triangular (fig. 10)-----Group 3, p. 35
- Third apical vein separated from third sector by a portion of the third cross vein, the fourth apical cell therefore distinctly trapezoidal (figs. 1-9)----- 2
2. A dark spot where cross vein 1 and each of the apical veins joins the margin of the tegmen (fig. 1); outer claspers of male distinctly shouldered (fig. 11)-----Group 1, p. 5
- Without these dark spots; outer claspers of male usually gradually narrowed from base-----Group 2, p. 8

GROUP 1

The species of this group examined all have the aedeagus three-branched from base, the outer clasper distinctly shouldered and definitely bristled (fig. 11), and the inner clasper with a tooth below at beginning of the apical curvature (fig. 12); the eighth sternite in the females seen is more or less emarginate laterally; besides the dark spots at intersection of apical veins and wing margins, there are dark clouds between the sectors just anterior to the cross veins.

KEY TO THE SPECIES OF GROUP 1

1. Apex of scutellum black, and a spot on middle of anterior margin of pronotum dark; length 4 mm. or more; lateral branches of aedeagus distinctly shorter than central one (fig. 15)-----*ulmi* Linnaeus p. 5
- Lacking these dark markings; length less than 4 mm.; lateral branches of aedeagus nearly as long as, or even longer than, central one----- 2
2. Tegmina washed with greenish-yellow; central shaft of aedeagus unbranched apically (fig. 16)-----*tenerrima* Herrich-Schaeffer, p. 6
- Tegmina whitish-hyaline; central shaft of aedeagus with apical processes-- 3
3. Aedeagus with two pairs of lateral appendages, central shaft simply bifid apically (figs. 18-19)-----*unca*, new species, p. 8
- Aedeagus with one pair of lateral appendages, central shaft with two pairs of apical appendages (fig. 21)-----*piscator*, new species, p. 7

TYPHLOCYBA ULMI Linnaeus

Cicada ulmi LINNAEUS, CAROLUS, Systema naturae, Regnum animale, ed. 10, 1758 (Engelmann reprint, 1894), p. 439 [Sweden?].

Cicada ulmi LINNAEUS, CAROLUS, Fauna Suecica, sistens Animalia Suecicae Regni, etc., 1761, species 900, p. 243 [Sweden].

* *Eupicryx ocellata* CURTIS, JOHN, British Entomology, vol. 14, 1837, art. 640 [p. 2]. [Great Britain.]

Male.—General color above pale greenish-yellow, more hyaline near costa, and fumose in apical cells; a spot, sometimes faint, on

* Synonymy of European forms is given on the authority of Oshanin's Verzeichnis, 1907, and have not been verified by the writer.

middle of front margin of pronotum, apex of scutellum, first cross vein and ends of apical veins black or blackish; apical cells dusky fumose, a band across tegmen in front of cross veins a little darker; below pale yellow (brighter on face), abdomen black with pale edgings, outer claspers pale yellowish.

Hypogium with the lower posterior angle of ninth segment rounded, prominent, projecting farther posteriorly than the upper; the lower side of the segment a little emarginate subapically. Outer clasper broad basally abruptly contracted about the middle, the shoulder very prominent, the narrow apical portion of about same width to the rounded apex, with definite bristling as in Figure 11; inner clasper with a prominent tooth below beginning of apical curvature, apex acute (fig. 12). Aedeagus with the central shaft, fairly stout, upcurved, tapering gradually to near apex and ending in a curved slender bifid process; two stout processes about two-thirds as long as the central shaft arise from the base of the aedeagus, the apical third of each directed outwardly, the apex moderately acute (figs. 13-15).

Female.—Like the male in color but having in addition two oval dark spots on rondure of vertex; genitalia largely dark. Eighth sternite moderately pointed medially, distinctly emarginate each side of median process and moderately lobate laterally (fig. 105); ovipositor sheaths each with a row of about eight conspicuous pale bristles.

Length, 3.5-4 mm.

Distribution.—This species occurs over most of Europe and specimens from England and Germany have been examined. American localities represented in material studied by the writer are:

Cambridge, Mass., October 24 to 30, November 1 (M. C. Z.); Vine-land, Ont., August, 1922, W. Robinson; Jordan, Ont., August 15, 1916, W. A. Ross (Kans. Univ.); two miles west of St. Louis, Mo., April 25, 1904, W. V. Warner (U.S.N.M.); Vernon, B. C., September 25, 1919, on elm, W. Downes (Ball); Vernon, B. C., September 29, 1919, on elm, W. Downes (McAtee); Victoria, B. C., August 12, 1920, on elm, W. Downes (Downes, Kans. Univ.); Mount View, Calif., Ehrhorn (Ball).

TYPHLOCYBA TENERRIMA Herrich-Schaeffer

Typhlocyba tenerrima HERRICH-SCHAEFFER, G. A. W. in the continuation of Panzer, G. W. F., Faunae Insectorum Germanicae oder Deutschlands Insecten, 124, 10a, 164, 16, 1834 [Germany]. This reference not verified.

Typhlocyba rubi HARDY, JAMES, Descriptions of some new British Homopterous Insects, Trans. Tyneside Nat. Field Club, vol. 1 (1846-1850) 1850, pp. 417-418 [Great Britain].

Male.—General color above pale greenish-yellow, the costa glassy, the membrane fumose hyaline; faint clouds between sectors anterior to cross veins, first cross vein and ends of apical veins, dusky; underparts pale yellowish, sometimes with narrow transverse dark bands across abdomen. Hypopygium: Outer claspers of the same shape and with the same bristling as in *ulmi* (see fig. 11). Inner clasper with a distinct, slightly falcate tooth below at beginning of apical curvature, apex acute. Aedeagus with a stout central shaft and two longer, rather broad, and moderately pointed lateral appendages from the base (figs. 16–17).

Female.—Coloration as in male. Eighth sternite a little more rounded medially and less emarginate laterally than in *ulmi* (see fig. 105); bristling of ovipositor sheath the same.

Length 3–3.5 mm.

Distribution.—Has been recorded from many localities in Europe from Sweden to Italy and westward; specimens from England and France have been available for the present study and from them the description here given has been drawn. The writer has been unable to verify the reported occurrence of this species in America. Van Duzee⁹ gives records for Quebec, Ontario, Maine, New Hampshire, New York, Michigan, and Colorado.

TYPHLOCYBA PISCATOR, new species

Male.—Head and thorax pale yellowish, the tegmina whitish hyaline, sometimes slightly washed with yellow; faint clouds between sectors anterior to cross veins, and distal ends of first cross vein and apical veins, dusky (fig. 1); underparts pale yellow. Hypopygium: Lower posterior angle of ninth segment well rounded off, the upper rounded prominent; outer claspers distinctly shouldered; inner clasper with a tooth below at the beginning of apical curvature, the apex very acute. Aedeagus with the long slender central shaft bent downward (just the reverse of the prevailing type in the genus) the apex aculeate; just basad of the apex are two pairs of slender, curved, pointed appendages of which the inferior are longest. From the base of the aedeagus arise two long sinuous pointed processes, three-fourths as long as the aedeagus itself (fig. 21–22).

Female.—Colored like male. Eighth sternite convex, slightly emarginate both medially and laterally.

Length, 3–3.5 mm.

Holotype.—Male, Elizabeth, Ill., July 8, 1917 (Ill. State Nat. Hist. Survey); Allotype, female, and paratype, male, Ames, Iowa, Sept. 28, 1894 (State Coll. Iowa).

⁹ Catalogue Hemiptera, 1917, p. 710.

TYPHLOCYBA UNCA, new species

Male.—Color as in *T. piscator* the tegmina somewhat more densely whitish, the clouds in front of cross veins slightly larger. Hypopygium: Upper posterior angle of ninth segment produced and moderately angulate, the lower well rounded. Claspers of the same type as in *ulmi* and *tenerrima*, the angulate shoulder on outer side of outer clasper not quite so prominent. Aedeagus stout, a superior view showing two divergent acute processes from base which are as long or a little longer than central process; the latter is again subdivided at about its middle, emitting two rami which at first are abruptly divergent, then parallel, and ultimately slightly outcurved and acute; the central shaft continues beyond them and is slightly enlarged subapically and recurved and bifid apically (figs. 18–20).

Female.—Dusky markings usually less distinct than in male. Eighth sternite slightly emarginate both laterally and medially.

Length, 3 mm.

Holotype.—Male, Mount Washington, N. H. (E. D. Ball); Allotype, female and paratypes, both sexes, Ames, Iowa, June 19, 1897 (State Coll. Iowa); Paratypes of both sexes, Salem, N. Y., June 27, 1924, on birch, E. D. Ball (Ball); and Glencarlyn, Va., June 11 to 21, 1925, J. R. Mallach (McAtee).

GROUP 2

Besides the characters mentioned in the key, it may be mentioned that the aedeagus in species of this group is seldom bifid and rarely caliper-like or trifid.

KEY TO THE SPECIES OF GROUP 2

- | | |
|---|----|
| 1. Forms with distinct, though sometimes not extensive dark markings on tegmina..... | 2 |
| — Forms without dark markings on tegmina..... | 13 |
| 2. Dark markings consisting only of spots near cross veins or of a band across these veins..... | 3 |
| — Dark markings otherwise..... | 9 |
| 3. With dusky spots only..... | 4 |
| — With a band over cross veins..... | 8 |
| 4. Males..... | 5 |
| — Females..... | 7 |
| 5. Apices of inner claspers directed inwardly, often projecting between the outer claspers (figs. 40–41); aedeagus as in Figures 41–42, <i>flavomarginata</i> Gillette and Baker, p. 17 | |
| — Apices of inner claspers directed outwardly..... | 6 |
| 6. Outer clasper with a single long bristle near base (fig. 54); ninth segment unusually long as seen from side (fig. 55), its posterior margin not sinuate; aedeagus as in Figures 56–58..... <i>gillettei</i> Van Duzee, p. 23. | |
| — Outer clasper without such a bristle; ninth segment not unusually long, its upper posterior angle produced, the posterior margin sinuate; aedeagus as in Figures 77–78..... <i>antigone</i> , new species, p. 35 | |

7. (Three alternatives). Eighth sternite moderately pointed apically, the apex projecting farther posteriorly than the sides (fig. 101).
gillettei Van Duzee, p. 23
- Eighth sternite with broadly rounded lateral lobes which project farther posteriorly than middle of segment, hind margin sinuate between these lobes (fig. 108)-----*flavomarginata* Gillette and Baker, p. 17
- Eighth sternite moderately emarginate both laterally and medially.
phryne, new species, p. 34
8. Eighth sternite of female slightly emarginate medially (fig. 107); aedeagus of male without crossed processes at apex (figs. 49-50).
rubriocellata Malloch, p. 20
- Eighth sternite moderately pointed medially (fig. 107); aedeagus of male with crossed processes at apex (figs. 56-57)----*gillettei* Van Duzee, p. 23
9. Dark marking, including a vitta along commissure----- 10
- Dark markings otherwise----- 11
10. Scutellum or narrow margins thereof also dark----*commissuralis* Stal, p. 11
- Marks like parentheses on thorax, and spots anterior to crossveins also dark-----*phryne*, new species, p. 34
11. Species from 4 to 5 mm. in length-----*cymba* McAtee, p. 21
- Species from 3 to 4 mm. in length----- 12
12. (Three alternatives). Tegmen with a dark band across base and another across apex of corium, or wholly dark to crossveins; aedeagus as in figures 71-72 (a European species recorded from this country, but American specimens not seen by present author)-----*nitidula* Fabricius, p. 33
- Tegmen may have similar markings, but usually with the anterior cross-band near middle, not base of corium; aedeagus as in figures 56-58 (a common American species with numerous color varieties).
gillettei Van Duzee, p. 23
- Tegmen with dark dots at base, middle, and apex of clavus and dusky spots anterior to crossveins-----*6-notata* Van Duzee, p. 34
13. Tegmina scarlet to the crossveins-----*tunicarubra* Gillette, p. 19
- Tegmina colored otherwise----- 14
14. Females----- 15
- Males----- 21
15. (Four alternatives). Eighth sternite distinctly emarginate medially (figs. 106, 108)----- 16
- Eighth sternite almost evenly convex posteriorly, sometimes slightly emarginate medially----- 17
- Eighth sternite more or less emarginate laterally (figs. 101, 103), but scarcely to be described as pointed medially----- 19
- Eighth sternite distinctly pointed medially (fig. 104), but sometimes may appear slightly emarginate laterally-----*rosae* Linnaeus, p. 13
ariadne, new species, p. 14
niobe, new species, p. 20
lethierryi Edwards, p. 15
16. Posterior angles of eighth sternite developed as rounded lobes (fig. 108).
flavomarginata Gillette and Baker, p. 17
- Posterior angles of eighth sternite not so developed (fig. 106).
modesta Gibson, p. 33
17. Tegmina with distinct dark crossbands----*duplicata*, new species, p. 16
- Tegmina without crossbands----- 18

18. Most specimens with a decidedly yellowish wash—*arsinoe*, new species, p. 31
persephone, new species, p. 11
xanthippe, new species, p. 14
 — Rarely yellowish.....*commissuralis* Stal, p. 11
melite, new species, p. 32
19. Species from 4 to 5 mm. in length.....*cymba* McAtee, p. 21
 — Smaller species..... 20
20. Lateral emarginations of eighth sternite decided (fig. 109).
euphrante, new species, p. 12
 — Lateral emarginations of eighth sternite slight (figs. 101, 103).
pomaria, new species, p. 29
gillettei Van Duzee, p. 23
21. Outer clasper with a strong outwardly and posteriorly directed bristle near
 outer basal angle (fig. 54); aedeagus as in figures 56–58.
gillettei Van Duzee, p. 23
 — Outer clasper without such a bristle..... 22
22. Lower posterior angle of ninth segment developed as a more or less promi-
 nent, downwardly directed, tubercle or process, which is heavily pig-
 mented apically, and generally can be seen without dissection; outer
 claspers usually black apically..... 23
 — Lower posterior angle of ninth segment not so developed; outer claspers
 usually not black apically..... 25
23. Outer claspers heavily pigmented apically (five alternatives).
 Aedeagus as in figures 68–69.....*melite*, new species, p. 32
 Aedeagus as in figure 23.....*persephone*, new species, p. 11
 Aedeagus as in figures 45–46.....*lancifer*, new species, p. 19
 Aedeagus as in figures 64–65.....*athene*, new species, p. 31
 Aedeagus as in figure 67.....*andromache*, new species, p. 32
 — Outer claspers not heavily pigmented apically..... 24
24. Lower posterior angle of ninth segment developed as a long falcate, acute
 and heavily pigmented process (fig. 59); aedeagus as in figures 61–62;
 outer claspers not black apically.....*pomaria*, new species, p. 29
 — This process not long and falcate (three alternatives).
 Aedeagus as in figure 66.....*arsinoe*, new species, p. 31
 Aedeagus as in figures 29–30.....*ariste*, new species, p. 13
 Aedeagus as in figure 47.....*niobe*, new species, p. 20
25. Apices of inner claspers directed inwardly, usually to be seen protruding
 on median line between outer claspers (fig. 40); aedeagus as in figures
 41–42.....*flavomarginata* Gillette and Baker, p. 17
 — Apices of inner claspers directed outwardly, usually visible laterally between
 outer claspers and ninth segment..... 26
26. Species from 4 to 5 mm. in length; aedeagus as in figures 51–52.
cymba McAtee, p. 21
 — Smaller species..... 27
27. One or both posterior angles of ninth segment produced posteriorly..... 28
 — Neither angle produced..... 29
28. (Three alternatives). Lower posterior angle of ninth segment developed
 as a prominent posteriorly directed tooth (fig. 24); aedeagus as in figures
 29–30.....*euphrante*, new species, p. 12
 — Upper posterior angle of ninth segment distinctly angulate produced, hind
 margin emarginate (fig. 35); aedeagus as in figure 36.
ariadne, new species, p. 14

- Side of ninth segment produced and decidedly narrowed, with a tooth at both the upper and the lower posterior angles (fig. 73); aedeagus "two-storied" (fig. 74)-----modesta Gibson, p. 33
29. (Three alternatives):
 Aedeagus as in figures 31 and 33-----rosae Linnaeus, p. 13
 Aedeagus as in figure 34-----xanthippe, new species, p. 14
 Aedeagus as in figure 37-----lethierryi Edwards, p. 15

TYPHLOCYBA PERSEPHONE, new species

Male.—Pale yellowish above and below, the tint on tegmina to crossveins being near to light cadmium yellow, apical cells faintly fumose. Hypopygium: Ninth segment with the upper posterior angle rounded, the lower slightly produced into a moderately developed tooth which is heavily pigmented apically. Outer clasper narrowed at about middle then slightly broadened, narrowed again for the posterior fourth which is rounded, slightly spatulate, and heavily pigmented apically. Inner clasper narrowed from base, simply curved, until beginning of the distal fourth which is more abruptly curved outwardly, and aciculate apically. Aedeagus about twice as long as connective, consisting (apart from the attachments for muscles at base) of a simple shaft upwardly curved to middle, then slightly decurved, the apex again slightly upcurved, channeled along upper side and somewhat bilobate at apex (fig. 23).

Female.—Paler than male, stramineous, more or less tinged with yellow; eighth sternite evenly convex posteriorly.

Length, 3.5 mm.

Holotype, allotype, and paratypes.—Of both sexes, Ames, Iowa, June 20, 1897, E. D. Ball (Ball).

TYPHLOCYBA COMMISSURALIS Stal

Typhlocyba commissuralis STAL, C., Beitrag zur Hemipteren-Fauna Sibiriens und des Russischen Nord-Amerika, Ent. Zeit. (Stettin), vol. 19, 1859, p. 196 [Sitka, Alaska].

Male.—For color characters see key to color varieties and descriptions below. Hypopygium (fig. 25): Upper angle of 9th segment well rounded off, lower rather prominent, with a slight angulation on inner side; a patch of bristles near articulation of outer clasper, and some finer hairs on posterior margin below anal tube; outer claspers narrowed gradually from base, apex rounded; inner clasper strongly upcurved apically, ending in a long, sharp thorn which projects laterally at right angles to the general vertical plane of the clasper (fig. 27); aedeagus twice as long as connective, provided apically with two pairs of slender, freely movable, lanceolate appendages of which the posterior (outer) pair are the longer (figs. 26, 28).

Female.—For color characters see key to color varieties and descriptions below. Eighth sternite evenly convex posteriorly (fig. 100); due to posture of the sternite, it sometimes appears a little pointed medially, or a little emarginate laterally, but the hind margin, as well as may be is smoothly rounded.

Length, 3.5–4 mm.

This species often has the second apical cell long-stalked, but this character is quite variable as in other species of the genus.

KEY TO THE COLOR VARIETIES OF COMMISSURALIS

1. At least the free margins of scutellum, and the commissure, dusky to black; these markings usually covering most of scutellum and the inner margins of tegmina broadly-----var. *commissuralis* Stal.
Entirely lacking dark markings above-----var. *munda*, new variety.

TYPHLOCYBA COMMISSURALIS, var. COMMISSURALIS Stal

The general coloration above varies from whitish to greenish yellow, and the scutellum and commissure have dark markings as noted in key. Underparts whitish to yellowish.

Records: Vancouver, B. C., C. F. Baker; Kaslo, B. C., July 17, A. N. Caudell (U.S.N.M.); Victoria, B. C., August 30, 1921, on Lombardy poplar; November 11, 1921, on alder; Penticton, B. C., September 22, 1919, W. Downes (Downes); Easton, Wash.; Lake Tahoe, Placer Co., Calif., September (U.S.N.M.); Hamilton, Calif., June 22, 1908, Colfax, Calif., June 23, 1908 (Ball); Idaho, C. F. Baker; Colorado, 2284 (U.S.N.M.); North Park, Colo., August 20, 1899 (Ball).

TYPHLOCYBA COMMISSURALIS, var. MUNDA, new variety

Like the typical variety except for entire lack of dark markings above.

Holotype.—Male, paratype male, allotype and paratype females, Vancouver, B. C., C. F. Baker (U.S.N.M.).

Paratypes: N. Westminster, B. C., September 14, 1920, W. Downes (Downes); New York, September 1, 1919; Saanich District, B. C., September 12, 1918, W. Downes (Ball).

A male too much damaged to be designated a paratype, 2 miles west St. Louis, Mo., April 25, 1904, W. V. Warner (U.S.N.M.).

Holotype, allotype, and paratypes.—Cat. No. 28488, U.S.N.M.

TYPHLOCYBA EUPHIRANTE, new species

Male.—General color above pale yellow, at its deepest approaching cadmium yellow; scutellum paler; apical cells faintly fumose hyaline; underparts stramineous to pale yellow. Hypopygium: Upper posterior angle of ninth segment well rounded off, with several strong bristles, lower angle produced in a distinct posteriorly

projecting triangular process (fig. 24). Outer claspers gradually narrowed for about two-thirds of their length, then more abruptly, the apices spatulate and slightly divaricate. Inner claspers somewhat as in *T. commissuralis*, aedeagus also similar to the same organ of that species, rather more slender, however, and with the pairs of apical appendages more contrasted in length (figs. 29-30).

Female.—Coloration as in male; vertex in the single specimen at hand longer than in male and more nearly angulate than usual in the genus. Eighth sternite, very slightly emarginate medially, decidedly so laterally, sides projecting about as far posteriorly as center of hind margin (fig. 109).

Length, 3-3.5 mm.

Holotype.—Two other males, and allotype female, Soldier, Utah, August 13, 1906 (Ball).

TYPHLOCYBA ARISTE, new species

Male.—Head and thorax pale greenish yellow; tegmina hyaline, slightly washed with greenish yellow, apical cells hyaline; lower parts pale yellowish. Hypopygium: 9th segment as in *T. commissuralis* (fig. 25) except that the lower posterior angle is produced downward in a flap-like lobe. Claspers and aedeagus as in *T. euphrante* (figs. 29-30).

Length, 3.25 mm.

Holotype.—Pecos, N. M., September 1, on *Ribes*, T. D. A. Cockrell. (Ball).

TYPHLOCYBA ROSAE Linnaeus

Cicada rosae LINNAEUS, C., Systema naturae, ed. 10, 1758 (Engelmann Reprint, 1894), p. 439 [Sweden?].

Cicada rosae LINNAEUS, C., Fauna Suecica, 1761, Species 902, p. 244 [Sweden].

Typhlocyba pteridis DAUBLOM, A. G., Anteckningar öfver Insekter, som blifvit observerade på Gottland och i en del af Calmare Län, under sommaren 1850, Kgl. Vet.-Akad. Handl. (1850) 1851, pp. 179-181 [Gottland].

Typhlocyba lactea DOUGLAS, J. W., Notes on British Homoptera, with descriptions of new species, Ent. Mo. Mag., vol. 12, September, 1875, p. 77 [Great Britain].

Male.—General color stramineous, both above and below, sometimes with a yellowish wash on sectors and about front of head. The species is described by Edwards¹⁰ as chiefly whitish, and with faint dusky spots anterior to crossveins. The latter markings have not been present on any specimen seen by the present writer. Hypopygium: Upper angle of 9th segment slightly produced in a short downwardly and inwardly projecting process, below which the posterior margin of segment is slightly emarginate (fig. 32).

¹⁰ Homoptera British Islands, 1896, p. 216.

Ninth segment with a patch of bristles near articulation of outer claspers, the latter with several equidistant long setae within; posterior margin of segment and anal tube also with long slender hairs, the apex of latter with a few bristles also. Outer and inner claspers shaped as in *T. pomaria* (figs. 59–60). Aedeagus measured along curve only about $1\frac{1}{2}$ times as long as connective, greatly dilated subapically, the tip with four lanceolate appendages of which the outer (morphologically inferior) pair are about one-fourth longer, stouter, and more curved than the inner (figs. 31–32).

Female.—Coloration as in male; eighth sternite moderately emarginate laterally and quite pointed medially as in *T. ariadne* (fig. 104).

Records: Arnold Arboretum, Boston, Mass., July 27, 1921, on rose, Harold Morrison (U.S.N.M.); Malden, Mass., June, 1895 F. H. Sprague (M. C. Z.); Ithaca, N. Y., July 1921, Paul B. Lawson (Kans. Univ.); Pittsburgh, Pa., May 25, 1894, including nymphs, on apple, J. P. Henderson (U.S.N.M.); Rocky River, Cleveland, Ohio, September 1, 1920, on Delaware grape, C. I. Bliss (McAtee); Green Bay, Wis., June 10, 1917, on rose, E. D. Ball (Ball); Urbana, Ill., October 1, 1907, November 4, 10, 1915 (Ill. State Nat. Hist. Survey); Salt Lake, Utah, June 4, 1910; Logan, Utah, June 26, 1906 (Ball); Vancouver, B. C., C. F. Baker; Wenatchee, Wash., June 26, 1914, on apple, E. J. Nelson (U.S.N.M.); Mt. View, Calif., September 21, 24, Ehrhorn; San Francisco, Calif., July 25, 1912, E. D. Ball; Quincy, Calif., July 23, 1912, E. D. Ball (Ball).

TYPHLOCYBA XANTHIPPE, new species

Male and female.—Agree with *T. lethierryi* as described in this paper, except that the posterior appendages of the aedeagus are unbranched, the anterior simply forked (fig. 34), and the eighth sternite of female almost evenly convex.

Length: 3.5–3.75 mm.

Holotype.—Male, allotype, and paratypes of both sexes New York, N. Y., June 22, 1924; paratypes and several general specimens; Boston, Mass., June 23, 1924, E. D. Ball (Ball).

A specimen from Lille, France, seems to be this species which therefore may have a name in Europe, but I have been unable as yet to confirm this surmise.

TYPHLOCYBA ARIADNE, new species

Male.—Pale yellowish above, apical cells more hyaline, underparts stramineous. Hypopygium: Upper angle of 9th segment produced as a strong inwardly projecting tooth, below which the hind margin of the segment is emarginate, the side below this forming a prominent obtuse lobe (fig. 35). Outer claspers gradually nar-

rowed from base, inner strongly curved outwardly near apex, then downwardly, aciculate. Aedeagus slender, with two pairs of furcate appendages at apex, of which the superior (anterior) are longer, more curved, and more deeply forked (fig. 36).

Female.—More whitish above than male, otherwise the same. Eighth sternite somewhat emarginate laterally, and quite pointed medially (fig. 104).

Length, 3.5–4 mm.

Holotype.—Male, allotype female and paratypes of both sexes, Vancouver, B. C., C. F. Baker; two paratype males, Kaslo, B. C., July 17, 1903, R. P. Currie, and a female, same locality, July 16, A. N. Caudell, U. S. N. M.; paratype female, Royal Oak, B. C., September 29, 1917, W. Downes (Downes).

Holotype, allotype and paratype.—Cat. No. 28489, U.S.N.M.

This species seems to be allied to *T. bergmani* Tullgren,¹¹ but probably is distinct. In that species the posterior (morphologically inferior) appendages are the longer pair; in coloration *T. bergmani* differs by having two dark spots on scutellum.

A specimen labelled only California (State Coll. Iowa) and somewhat damaged, is not made a paratype.

TYPHLOCYBA LETHIERRYI Edwards

Typhlocyba lethierryi EDWARDS, JAMES, An additional species of British Homoptera, Ent. Mo. Mag., vol. 17, p. 224, March, 1881 [England].

Male.—Varies in color from stramineous as to head and thorax, and whitish hyaline as to tegmina, to sulphur or even orange yellow above, as far posteriorly as the crossveins, apical cells in that case hyaline though the tegminal margin and apical veins may be colored. In highly colored specimens, according to Edwards, the head, pronotum, and commissure may be more or less tinged with reddish. Hypopygium: Lower posterior angle rather squarish, somewhat incurved, upper with a slight emargination, above which is a short inwardly projecting tubercle. The patch of bristles near articulation of outer clasper is conspicuous. Outer clasper with a strong outwardly directed bristle near base as in *T. gillettei* (fig. 54), tapering more gradually than abruptly, the inner margin almost straight, the apex slightly spatulate; inner clasper with the terminal fourth rather abruptly outwardly directed, as in *T. commissuralis* (fig. 27). Aedeagus with a slender, upcurved shaft, surmounted at the apex by two pairs of curved and bifurcate appendages, the anterior pair on a short common stalk projecting anteriorly from the top of the central shaft (fig. 37). These figures are from a specimen collected at Colesborne, England, by J. Ed-

¹¹ Ent. Tidskr., vol. 37, Heft. 2, 1916, pp. 67–69 [Norway].

wards, the describer of the species, and differ from figures and descriptions published¹² by him in showing a short branch on the inner ramus of each of the anterior appendages. Probably this is merely an exuberant development in this already elaborate aedeagus that is not present to the same degree in all specimens. A specimen from Cambridge, Mass., agrees entirely in genital characters with the diagnosis of Edwards and the aedeagus is as illustrated in figure 37 except for lack of the small supplemental tooth here discussed.

Female.—Coloration like that of ordinary males, those examined being pale sulphur yellow above, with the apical cells more hyaline, and stramineous below. Eighth sternite slightly emarginate laterally, moderately pointed apically.

Length, 3.5–4 mm.

Distribution.—The species has been recorded from nearly all parts of Europe, from northern Africa, and from Michigan, Iowa, Maine, New York, and Pennsylvania. So far as the writer is aware these American records are not based on examination of the genitalia, and as we have several other species with similar coloration, there is chance for confusion. The only definite identification from the material examined by the present writer is a male collected at Cambridge, Mass., September 13 (M. C. Z.). With it are associated four females collected at the same locality October 20, 24, and November 1.

Even the European distribution of *T. lethierryi* is not a matter of certainty as specimens under that name from Lille, France, which agree in coloration have the oedeagus notably different in form, as described and figured (fig. 34) for *T. xanthippe*, new species. p. 14.

TYPHLOCYBA DUPLICATA, new species

Male.—Ground color milky-white, a little inclined to ivory on vertex and scutellum; apical cells fumose, a dusky band over cross-veins, and another from middle of clavus to middle of costal plaque; under parts whitish. Hypopygium: Upper posterior angle of ninth segment produced in a broad process which is emarginate as seen from the side, and bears two acute incurved teeth which can be seen from above (much as in *T. danae*, fig. 83); lower posterior angle rounded. A conspicuous patch of bristles near articulation of outer clasper. Outer clasper, lacking single strong basal bristle as in *T. gillettei*, gradually narrowed from base for three-fourths of its length where the shoulder is so prominent as almost to suggest a process (fig. 39), apical fourth in line with the inner side of clasper, upcurved, gradually narrowed and rounded at tip. Inner

¹² Ent. Mo. Mag., March, 1908, pp. 83–84, figs. 10–11.

claspers stout at base, approximate medianly, very abruptly curved, the acute apices directed outwardly, and a little backwardly. Connective very broad at base, almost equilaterally triangular. Aedeagus but little longer than connective, bifid, the rami stout at base, gradually tapering, up- and in-curved the apices acute (fig. 38).

Female.—Colored like male. Eighth sternite emarginate laterally, the median lobe shorter and less pointed than in *T. gillettei* and itself slightly emarginate.

Length, 3.5 mm.

Holotype.—Male, allotype and paratype, females, Toronto, Ont., August 8, 1924, some of them labeled *Crataegus*, E. D. Ball (Ball).

The color pattern of this species is almost exactly that of *T. gillettei*, var. *casta*; however, the ground color is decidedly milky white, which it rarely is in that variety, and the genitalia of both male and female are distinct.

TYPHLOCYBA FLAVOMARGINATA Gillette and Baker

Typhlocyba flavomarginata GILLETTE, C. P., and CARL F. BAKER, A preliminary list of the Hemiptera of Colorado, Bull. 31 (Tech. Ser. 1) Colo. Agr. Exp. Sta., June 7, 1895, pp. 111–112, 4 figs. [Manitou, Colo.].

Male.—For color characters see key to color varieties and descriptions farther on. Hypopygium (fig. 40): Upper posterior angle of ninth segment moderately produced in a rather rounded incurved angle that is not so obvious from the side as from a dorsal or inside view of the segment, lower angle receding and rounded. Outer claspers as seen from below gradually narrowed from base; on the outer side is a thin vertical crescentic plate extending from near base to apex of clasper. The inner claspers (fig. 41D) are fairly stout at base, much narrowed and approximate at about their middle length, then divergent with a more or less prominent tooth on outer side at beginning of posterior fourth, where the clasper is abruptly bent *inwardly* and downwardly, the apex aciculate. (This clasper differs from that of all the other American species seen in the apex, being directed inwardly instead of outwardly. The claspers of *T. gratiosa* Boheman are similar but the aedeagus is different.) Aedeagus short and stout at base, hardly longer than connective, divided just distad of middle into two strongly divergent rami which are inflated at base, and abruptly tapered at about the middle into inwardly and downwardly directed slender aciculate processes (figs. 41–42).

Female.—For color characters see key to color varieties and descriptions farther on. Eighth sternite with the posterior angles developed as prominent rounded lobes, a broad rounded emargination between them, the center of which is slightly notched (fig. 108).

Length, 3.5–4 mm.

KEY TO COLOR VARIETIES OF FLAVOMARGINATA

1. Tegmen lacking reddish coloration..... 2
 Tegmen with more or less reddish coloration..... 3
2. Tegmen of female whitish hyaline without flavescent margins
 var. *vesta*, new variety.
 Tegmen of female whitish hyaline, flavescent on margins anterior to cross-
 veins; of male wholly flavescent, deeper on margins
 var. *flavomarginata* Gillette and Baker.
3. Clavus mostly orange-red.....var. *media*, new variety.
 Whole tegmen except apical cells washed with wine red, deepest on clavus
 var. *scorta*, new variety.

TYPHLOCYBA FLAVOMARGINATA, var. VESTA, new variety

Head, thorax, and underparts stramineous, tegmina whitish-hyaline, eyes, claws, and tip of ovipositor black, apical cells faintly fumose.

Holotype and paratype.—Females, Salt Lake City, Utah, July 13, 1908; another paratype female, same locality, August 29, 1908 (E. D. Ball).

TYPHLOCYBA FLAVOMARGINATA, var. FLAVOMARGINATA Gillette and Baker

Male.—Head and thorax pale yellow, tegmina entirely flavescent.

Female.—Head, thorax, and underparts pale yellow, claws and tip of ovipositor black, eyes greenish; tegmina whitish hyaline, the commissure distinctly and the costa less distinctly flavous margined, apical cells fumose.

Three females from the Gillette and Baker collections, undoubtedly the type material are labelled "Colo." only. A male with same data is labelled cotype, but it can have no such standing as the species was described from females only. This specimen is now designated as neo-allotype. (U.S.N.M.) Other specimens seen are labelled, Alder, Colo., August 25, 1899, Durango, Colo., August 7, 1899, and Salida, Colo., October 8, 1898 (E. D. Ball); Colorado Springs, Colo., 5915 feet, July; Garden of the God, Colo., July. E. S. Tucker (Kans. Univ.); Pecos, N. Mex., September 1, on oak, T. D. A. Cockerell (Ball).

Holotype and paratypes.—Cat. No. 3456, U.S.N.M.

TYPHLOCYBA FLAVOMARGINATA, var. MEDIA, new variety

Male.—General color pale yellow, a little richer flavous on costa and patches elsewhere on tegmen; apical cells fumose, and spaces between sectors anterior to crossveins with dusky spots, the inner most pronounced. Large triangle on pronotum, basal triangles of scutellum, and clavus chiefly orange-red.

Female.—Similar to male but with less yellow on tegmen and less red markings on pronotum and scutellum. Underparts pale yellowish except for the dark claws and tip of ovipositor.

Holotype.—Male and allotype female, Colorado Springs, Colo.; July 19, 1901; paratype female, Trinidad, Colo., July 13, 1899 (E. D. Ball).

TYPHLOCYBA FLAVOMARGINATA, var. SCORTA, new variety

Male.—General color pale yellow; tegmen anterior to crossveins washed with pinkish or vinaceous red, the costa and apical cells flavescens.

Female.—Similar to male, the tegmina without yellowish coloration and more exclusively covered with the reddish tinge; apical cells nearly hyaline.

Holotype.—Male and allotype female, Altus, Utah, July 30, 1911; paratype male and female Salt Lake City, Utah, July 13, 1908 (E. D. Ball).

TYPHLOCYBA TUNICARUBRA Gillette

Typhlocyba tunicarubra GILLETTE, C. P., American Typhlocybinae, Proc. U. S. Nat. Mus., vol. 20, 1898, pp. 752-753 [Mich. Agr. College.]

Male.—Head and thorax yellow, the scutellum somewhat dusky posteriorly; tegmina from all but extreme base nearly to crossveins scarlet when fully colored, apical cells yellowish hyaline the veins deeper yellow; face yellow, other underparts whitish. Hypopygium: with the side of 9th segment widened apically, both the upper and lower angles squarish, prominent. Outer claspers, turgid prominent at bend, the upcurved terminal third much narrowed, rounded apically; inner claspers of the simply curved type, the apices directed outwardly, and acute. Aedeagus somewhat longer than connective, the basal two-thirds a simple shaft (as seen from above) which expands distally, and is bifid into two laterally and upwardly directed, inflated, rami; from the inner side of apex of each arises an inwardly, downwardly and posteriorly directed acuminate process, which crosses its fellow near apex (fig. 43-44).

Female.—Coloration as in male; eighth sternite long, evenly convex posteriorly; apparent slight emargination medially in some specimens probably caused by pressure of ovipositor.

Length, 3.6-4 mm.

Records: Conesus Lake, N. Y., July 16, 1916, H. H. Knight (Ball, Kans. Univ.); Holotype, female, Agr. College, Mich., July 15, 1891 (U.S.N.M.); Lake Geneva, Wis., July 21, 1918, on bur oak; Ames, Iowa, July 26, 1919, E. D. Ball (Ball); Douglas County, Kans., August, 1923, W. Robinson (Kans. Univ.).

Holotype.—Cat. No. 3442, U.S.N.M.

TYPHLOCYBA LANCIFER, new species

Male.—Head and thorax pale yellow, tegmina to crossveins cadmium to light orange yellow; apical cells whitish hyaline; under-

parts stramineous. Hypopygium: Upper posterior angle of ninth segment rounded, the lower produced as a short blunt tooth, the apex of which as well as that of the outer clasper is heavily pigmented; outer clasper narrowed from base, a little bowed outwardly at two-thirds of its length, then narrowed and again slightly turned outward at the apex which is broadly rounded; inner claspers approximate medially, in general curved outwardly the apical fourths rather abruptly so; aedeagus thrice as long as connective, the slender upwardly directed shaft bifid on the apical third into processes which are lanceolately expanded apically (figs. 45-46).

Length 3-3.5 mm.

Holotype and paratype.—Males, Hampshire County, Mass., June, 1922, Philip A. Readio (Kans. Univ.); paratype male, Urbana, Ill., June 4, 1916 (Ill. State Nat. Hist. Survey).

TYPHLOCYBA NIOBE, new species

Male.—Head and thorax pale greenish yellow, tegmina to cross-veins deeper yellow, apical cells hyaline; underparts stramineous. Hypopygium: Upper posterior angle of ninth segment rounded, lower produced downwardly in a short, blunt, black-tipped tooth. Outer and inner claspers as in *T. persephone*. Aedeagus more than twice as long as connective, bifid almost from base, the rami upwardly directed and parallel for three-fourths of their length, then diverging outwardly and curving a little posteriorly, apices acute (fig. 47).

Female.—Paler than male; eighth sternite rather pronouncedly emarginate laterally and pointed medially.

Length 3.25-3.75 mm.

Holotype.—Male, Racine, Wis., July 30, 1916, J. G. Sanders (Ball); allotype, and paratypes, Iowa, No. 2803 (State Coll. Iowa); paratypes of both sexes, Ames, Iowa, June 23, on hard maple, E. D. Ball (Ball).

Except for paler coloration this species agrees with the description of *Empoa aureotecta* Sanders and De Long¹³. However, only females of that form are known as yet, so the question of its exact identity can be solved only by further collection and study.

TYPHLOCYBA RUBRIOCELLATA Malloch

Typhlocyba rubriocellata MALLOCH, J. R., A new species of Typhlocyba from Illinois (Hemiptera, Homoptera), Bull. Brooklyn Ent. Soc., vol. 15, nos. 2-3, April-June, 1920, p. 48 [Augerville Grove, Urbana, Ill.]

Male.—Head and thorax yellowish-white, washed with greenish-yellow; tegmina whitish-hyaline, corium near base washed with

¹³ Ann. Ent. Soc. Amer., vol. 10, No. 1, March, 1917, pp. 93-94 [Madison, Wis.].

pinkish-red, which color extends along costa and sectors fading posteriorly to yellow; a broad dusky band over crossveins, apical cells fumose, 2 and 3 the least so. Underparts pale yellowish. Hypopygium: Lower posterior angle of ninth segment with a short, stout, downwardly projecting, heavily pigmented tooth, upper angle squarish (fig. 48). There is a patch of stout bristles near articulation of outer clasper, and the middle of the side of this segment has numerous pointed bristles; outer clasper and anal tube with the usual ciliation. Outer clasper narrowed from base and spatulate apically whether viewed from the side or from below; inner clasper stout and hairy at base, tapering to about two-thirds of its length, dilated and with a compound curve subapically, the apex sharp and turned outward. Apices of both claspers heavily pigmented (fig. 48). Aedeagus split from base, the parallel parts slender, expanded subapically and pointed apically; the paired hooks at base shown in figures are not connected to aedeagus by heavy chitin but appear nevertheless to be functional appendages of that organ (figs. 49-59).

Female.—General color pale yellowish white, the sectors of tegmen near crossveins touched with deeper yellow, the dusky band over crossveins as in male. Near base of each tegmen is an elongate irregular bright red spot, lying partly on clavus and partly on corium but touching neither the base, costa or commissure and extending posteriorly to or beyond middle of tegmen. Underparts pale yellowish-white, ovipositor brown, apex of sheath black. Eighth sternite about evenly convex posteriorly in general outline; distinctly angularly emarginate medially.

Length, 3.5-4 mm.

One male and several females, Urbana, Ill., July 12, 1920, J. R. Malloch (Ill. State Nat. Hist. Survey). These specimens labelled "Cottonwoods;" this term does not refer to a food plant but is an abbreviation for Cottonwood Grove, a locality name, which moreover is the same as Augerville Grove. The specimens examined, therefore, are topotypic. Mr. Malloch informs me these specimens were all collected on buckeye (*Aesculus*).

A variety without trace of the reddish spot on tegmen, but otherwise typical, represented by a female with the same data as the other specimens examined, may be known as var. *clara*, new variety.

TYPHLOCYBA CYMBA McAttee

Typhlocyba cymba McATEE, W. L., Notes on Nova Scotian Eupterygid Leafhoppers including descriptions of new species. Can. Ent., vol. 50, no. 11, Nov. 1918, pp. 360-361 [Halifax, N. S.]

Male.—For color characters see key to color varieties and descriptions further on. Hypopygium (fig. 53): Upper posterior angle of

9th segment prominent, subangulate, the apex with numerous hairs; lower angle well rounded off, receding. Outer clasper narrowed from base, but more abruptly so in posterior fourth, with a row of widely-spaced short hairs on upper margin on this portion, apex subacute; inner clasper slender, the terminal fourth curved outwardly then anteriorly and at the extreme tip, downwardly, apex aciculate (fig. 51). Aedeagus divided for its apical third into four pointed processes, of which the inner pair are shorter and converge apically, the outer longer, divergent, and curved slightly forward apically (figs. 51-52). Supporting laminae somewhat as in *T. querci*.

Female.—Eighth sternite moderately pointed medially, slightly emarginate laterally, and except for larger size, almost exactly as in *T. gillettei* (fig. 102).

Length, 4-4.5 mm.

KEY TO COLOR VARIETIES OF CYMBA

1. Pale yellowish, entirely lacking dark markings above; apex of ovipositor sheath dark..... var. **pallens**, new variety.
- On the same general color some dark markings superimposed..... 2
2. Only the scutellum dark..... var. **unipuncta**, new variety.
- Dark markings more extensive..... 3
3. Scutellum and a narrow band just behind middle of clavus dark
var. **cymba** McAtee.
- Scutellum and a dorsal saddle involving practically all of clavus, and much of the adjacent corium dark..... var. **grata** McAtee.

TYPHLOCYBA CYMBA, var. CYMBA McAtee

Head and thorax pale yellow, flecked with pellucid greenish yellow; tegmina whitish hyaline faintly washed with greenish yellow, apical cells clear. Scutellum and a straight-sided crossband just behind middle of and confined to clavi, dusky. Underparts yellowish-white.

Halifax, Nova Scotia, August 9, 1919 (Nova Scotia Dept. Agr., and McAtee); Digby County, Nova Scotia, August 31, 1918 (N. S. Dept. Agr.); Hazelhurst, Wis., July 12, 1918, on *Acer*, L. G. Gentner (Ball).

TYPHLOCYBA CYMBA, var. PALLENS, new variety

Like var. *cymba* but entirely lacking dark markings.

Holotype.—Male, allotype, and paratype females, Halifax, Nova Scotia, August 8, 1919 (N. S. Dept. Agr., and McAtee); also Ithaca, N. Y., July 15, 1907 (Ill. State Nat. Hist. Survey); Agricultural College, Michigan, June 1, 1920, seriously injuring sugar maple; Hazelhurst, Wis., July 12, 1918, on *Acer*, L. G. Gentner (Ball).

TYPHLOCYBA CYMBA, var. UNIPUNCTA, new variety

Typhlocyba cymba, var. *unipuncta* Brittain ms.¹¹

Like var. *pallens* but with the scutellum dusky, a median vitta most pronouncedly so.

Holotype.—Female, Halifax, Nova Scotia, August 9, 1919 (N. S. Dept. Agr.); Paratypes: Muskoka, Ont., July 1888, E. P. Van Duzee (State Coll. Iowa); Agricultural College, Michigan, June 1, 1920, seriously injuring sugar maple (Ball).

TYPHLOCYBA CYMBA, var. GRATA McAtee

Typhlocyba querci, var. *grata* McAtee, W. L. Report on a Second Collection of Nova Scotian Eupterygid Leaf-hoppers, including descriptions of new varieties. Can. Ent. vol. 51, no. 10, October 1919, p. 226 (Digby County, N. S.).

Like the typical variety, but dark markings more extensive: Scutellum and a large saddle spot on tegmina occupying most of the clavi and a portion of each adjoining corium, dusky.

Holotype.—Female, Digby County, Nova Scotia, August 14, 1918 (N. S. Dept. Agr.). The writer is greatly indebted to Dr. W. H. Brittain for returning the type specimen to him for re-examination. It is clearly a variety of *cymba* rather than of *gillettei* (*querci*) under which it was originally described. Robust females of *gillettei* may closely resemble corresponding varieties of *cymba* but in practically all cases have dark markings over crossveins or in apical cells; apparently *cymba* never has such markings.

Other records: Halifax, Nova Scotia, August 9, 1919 (N. S. Dept. Agr.); Mount Washington, N. H. (Ball); Cambridge, Mass., August 19, N. Banks (M. C. Z.); Cranberry Lake, N. Y., August 9, 1920, Osborn and Drake (Ball); Rock City, N. Y., July 4, 1915, Ithaca, N. Y., July 26, 1916, H. H. Knight (Kans. Univ.); Muskoka, Ont., July 1888, E. P. Van Duzee (State Coll. Iowa); Agricultural College, Mich., June 1, 1920, seriously injuring sugar maple; Hazelhurst, Wis., July 12, 1918, on *Acer*, L. G. Gentner (Ball).

TYPHLOCYBA GILLETTEI Van Duzee

Typhlocyba bifasciata GILLETTE and BAKER, Bull. 31 (Tech. Ser. 1) Colo. Agr. Exp. Sta., 1895, p. 11, 2 figs. [Minturn, Colo.].

Typhlocyba querci, var. *bifasciata* GILLETTE, C. P. American leaf-hoppers of the subfamily Typhlocybinae, Proc. U. S. Nat. Mus., vol. 20, 1898, p. 766.

Empoa querci, var. *gillettei* VAN DUZEE, E. P. Catalogue of the Hemiptera of America north of Mexico, Univ. Calif. Publ., Tech. Bull. Ent., vol. 2, 1917, p. 708. The combination *Typhlocyba bifasciata* is preoccupied by Boheman, 1852.

¹¹ So published with the approval of Dr. W. H. Brittain.

The name given above must take the place of the time-honored *querci* Fitch, unless we arbitrarily fix the latter upon one of the six or more species to which the brief original description applies. Dr. E. P. Felt informs me that No. 828 of Fitch, the type of *Empoa querci* is lost, hence there is no possibility of really identifying Fitch's species. Under the circumstances it seems best to drop *Empoa querci* Fitch¹⁵ as unidentifiable, action that will also cure the more or less undesirable situation of there being in the same genus specific names so similar as *querci* and *quercus* (the latter the genotype).

Male.—For color characters see key to color varieties and descriptions farther on. Venation of tegmen as in Figures 2-9. Hypopygium: Outer claspers narrowed from base, apical third upcurved, apices rounded, a little divaricate; each clasper with a strong, outwardly and posteriorly directed pale bristle arising near outer basal angle (fig. 54). Ninth segment rather longer (as viewed from side) than in other species, the upper posterior angle rounded prominent, the lower receding (fig. 55). Inner claspers nearly semicircular in shape, the two tangent ventrally, each tapering gradually to a sharp point, the terminal fourth curved outward, then forward, then downward (fig. 56). Aedeagus with three pairs of appendages at the tip of which the inner pair are long pointed, bent at about a right angle at the middle so that they cross each other, the intermediate pair short and pointed, and the outer pair, long, slender, aciculate and divergent. Seen from the side all of these appendages have an anterior inclination or curvature, and the aedeagus is reinforced by a median and two lateral thin lamellae, the former with a hooked process apparently for muscle attachment (figs. 56-58).

Female.—For color characters see key to color varieties and descriptions farther on. Eighth sternite moderately pointed medially, slightly emarginate laterally (fig. 101). Side view of hypopygium as in figure 110.

Length, 3.5-4 mm.

KEY TO COLOR VARIETIES OF GILLETTEI

- | | |
|--|-----------------------------|
| 1. With no dark markings above..... | sincera, new variety, p. 25 |
| — With dark markings above..... | 2 |
| 2. Dark markings consisting of only a few dusky spots anterior to crossveins (figs. 2-3); first and second apical cells faintly fumose | |
| | fitchii, new variety, p. 25 |
| — Dark markings both sides of the crossveins; apical cells usually more distinctly and extensively darkened..... | 3 |

¹⁵ *Empoa querci* Fitch, Asa, Catalogue with references and descriptions of the insects collected and arranged for the State Cabinet of Natural History, Fourth Ann. Rept. Regents Univ. State of N. Y., 1851, p. 63, Reprint, Ninth Rep. Ins. N. Y. Lintner, 1893, p. 403 [New York].

- | | |
|--|--------------------------------------|
| 3. Tegmina with a single more or less band-like dark marking over crossveins (figs. 4-5)..... | 4 |
| — Tegmina with two transverse bands, or more extensive markings..... | 5 |
| 4. (Three alternatives) | |
| Tegmina anterior to crossveins whitish or stramineous | |
| | <i>apicata</i> , new variety, p. 25 |
| — Tegmina anterior to crossveins cadmium yellow | |
| | <i>saffrana</i> , new variety, p. 26 |
| — Tegmina anterior to crossveins rufous..... | <i>russeola</i> , new variety, p. 26 |
| 5. With a dark band over crossveins and another across middle of tegmina (figs. 6-9)..... | 6 |
| — With tegmina more extensively darkened..... | 8 |
| 6. Anterior crossband narrow, directed toward posterior end of costal plaque..... | 7 |
| — Anterior crossband broad, passing anterior end of costal plaque | |
| | <i>volans</i> McAtee, p. 28 |
| 7. Scutellum pale..... | <i>casta</i> , new variety, p. 26 |
| — Scutellum dark..... | <i>gillettei</i> , Van Duzee, p. 27 |
| 8. Scutellum, longitudinal vittæ over clavus and adjacent corium, and crossbands as in var. <i>gillettei</i> , dark..... | <i>scripta</i> McAtee, p. 28 |
| — Coloration otherwise..... | 9 |
| 9. Anterior half of tegmina, band over crossveins, and scutellum dark | |
| | <i>venusta</i> , new variety, p. 29 |
| -- More of tegmina dark..... | 10 |
| 10. Tegmina dusky from crossveins anteriorly..... | <i>sellata</i> , new variety, p. 29 |
| — Whole upper surface, except the yellowish to reddish costa, fumose to dusky..... | <i>vestita</i> , new variety, p. 29 |

TYPHLOCYBA GILLETTEI, var. SINCERA, new variety

Entirely pale yellowish white above, and also below except for the claws and tip of ovipositor.

Holotype and paratype.—Females, Buffalo, N. Y., September 1886. E. P. Van Duzee (Iowa State College.)

TYPHLOCYBA GILLETTEI, var. FITCHII, new variety

Pale yellowish white the only dark markings above being a series of three to five dusky black spots just anterior to crossveins (figs. 2-3), and the fumosity of the apical cells, generally noticeable only in cells 1 and 2.

Holotype male, Washington, D. C., July 16, 1885; *Allotype*, female, Washington, D. C. (U.S.N.M.); *Paratypes*: Washington, D. C., June 16, 1915, on *Quercus macrocarpa*, W. L. McAtee (McAtee); Buffalo, N. Y., September 1886, E. P. Van Duzee (State Coll. Iowa).

Holotype and allotype.—Cat. No. 28490, U.S.N.M.

TYPHLOCYBA GILLETTEI, var. APICATA, new variety

Ground color pale yellowish white, as usual, the only dark marking above being rather definite band over crossveins (figs. 4-5); apical cells more or less fumose. Some specimens with slight traces of a median crossband also are conveniently grouped here.

Holotype.—Male, Washington, D. C., May 28, 1902, O. Heidemann; Paratypes: Forest Glen, Md., October, 1914, O. Heidemann (U.S.N.M.); Beltsville, Md., June 23, 1918, on *Quercus alba*, W. L. McAtee (McAtee); Glencarlynn, Va., June 7, 16, 23, 1925, J. R. Malloch (McAtee); Urbana, Ill., June 7, 9, 17, 1916; White Heath, Ill., June 24, 1916, on oak; Elizabeth, Ill., July 7, 1917 (Ill. State Nat. Hist. Survey); Spirit Lake, Iowa, June 28, 1897, Ames, Iowa, June 28, 1892 (State Coll., Iowa); Spirit Lake, Iowa, June 28, 1897; Ames Iowa, June 16, 1919; Ames, Iowa, June 19, 1897, June 28, 1892, Sept. 11, 1919 (Ball).

Specimens not in good enough condition to be made paratypes: Tazewell, Va., June 10, 1915, L. O. Jackson (McAtee).

Specimens with traces of anterior crossband: Osceola, Wis., July 21, 1917; Toronto, Ont., August 8, 1924, E. D. Ball (Ball); Douglas County, Kans., June 2, 1922, P. B. Lawson (Kans. Univ.).

Holotype and paratypes.—Cat. No. 28491, U.S.N.M.

TYPHLOCYBA GILLETTEI, var. SAFFRANA, new variety

With a single dark crossband over crossveins bordered anteriorly by a hyaline area, and with the upper parts generally washed with yellow, deepest on tegmina anterior to crossveins, and varying from lemon to cadmium yellow; underparts pale yellowish-white.

Holotype.—Male, Mount Washington, N. H. (E. D. Ball); allotype, female, Douglas Co., Kans., August, 1923, W. Robinson (Kansas Univ.); paratype female, White Heath, Ill., July 5, 1916 (Ill. State Nat. Hist. Survey); paratype females, Glencarlynn, Va., June 12, 23, 1925, J. R. Malloch (McAtee).

Empoa aureotecta Sanders and DeLong¹⁶ seems similar, but apparently is not a variety of *T. gillettei*, as it has no dark markings over crossveins. See also remarks under *T. niobe*, new species, p. 20.

TYPHLOCYBA GILLETTEI, var. RUSSEOLA, new variety

Head and thorax washed with lemon yellow, tegmina to crossveins rufous, dusky spots near crossveins in small hyaline areas; apical cells distinctly fumose; underparts pale yellowish-white, except the dark claws, and tip of ovipositor.

Holotype.—Female, Osceola, Wis., July 20, 1917, E. D. Ball (Ball).

TYPHLOCYBA GILLETTEI, var. CASTA, new variety

General color whitish to pale yellowish, apical cells dusky, a distinct dark band over crossveins, and another across tegmen at middle of clavus, scutellum pale.

¹⁶ Ann. Ent. Soc. Amer., vol. 10, No. 1, March, 1917, pp. 93-94, figs. 43-45.

Holotype.—Male, allotype female, and paratypes, Beltsville, Md., June 23, 1918, on *Quercus alba*, W. L. McAtee (McAtee); Paratypes: Andover, Mass., Uhler Collection (U.S.N.M.); Toronto, Ont., August 8, 1924, E. D. Ball (Ball); Sea Cliff, N. Y., August, N. Banks, (M. C. Z.); Batavia, N. Y., August 12, 1916, H. H. Knight (Kans. Univ.); Glencarlyn, Va., June 16, 23, 1925, J. R. Malloch (McAtee); Cabin John Bridge, Md., July 7, 1902 (U.S.N.M.); Maywood, Va., August, 14, 1917, July 14, 1925, at light, W. L. McAtee (McAtee); Lapeer, Mich., August, 24, 1919; Madison, Wis., July 29, 1917; Osceola, Wis., July 20, 1917; Lake Geneva, Wis., July 21, 1918, on bur oak, E. D. Ball (Ball); Urbana, Ill., July 2, 1920 (McAtee); Illinois, No. 18739; Algonquin, Ill., June 10, 1896, October 13, 1895; White Heath, Ill., June 24, 1916, on oak, July 5, 1916; Urbana, Ill., June 9, 1916, July 9, 13, 14, 1920, October 25, 1916; Crystal Lake, Ill., July 21, 1916; Monticello, Ill., June 28, 1914; Elizabeth, Ill., July 6, 1917 (Ill. State Nat. Hist. Survey); Spirit Lake Iowa, August 1, 1919, on bur oak; Spirit Lake, Iowa, June 28, 1897; Iowa, July 31, 1919; Ames, Iowa, June 20, 1897, September 11, 1919 (Ball); Leavenworth County, Kans., June 30, 1924; Wyandotte County, Kans., June 21, 1924; Atchison County, Kans., July 10, 1924, R. H. Beamer; Douglas County, Kans., June 2, 1922, June 21, July 9, 1924, P. B. Lawson, August, 1923, W. Robinson (Kans. Univ.).

Paratypes.—Cat. No. 28492, U.S.N.M.

TYPHLOCYBA GILLETTEI, var. GILLETTEI Van Duzee

General color whitish to rather decidedly yellowish, with dark markings similar to those of the preceding form but usually more decided, and the scutellum dusky to black. Figures 6-9 illustrate variations in tegminal markings of specimens assigned to this variety.

Records: Digby County, Nova Scotia, August 8, 1918; Halifax, Nova Scotia, August 9, 1919 (N. S. Dept. Agr.); Mount Washington, N. H. (Ball, U.S.N.M.); Waterville, N. H., July 17, 1906; Glen to Halfway House, White Mountains, N. H., July 8, 1891 (U.S.N.M.); Boston, Mass., August 31, 1919, E. D. Ball (Ball); Cambridge, Mass., October 25 (M.C.Z.); Peabody, Mass. Andover Mass. Uhler Coll.; Connecticut (U.S.N.M.); Elba Park N. Y. August 13-18, 1917, C. J. Drake (McAtee); Albany, N. Y., June 20, 1890 (Kans. Univ.); Slide Mountains, Catskills, N. Y., September 1, E. L. Dickerson; Batavia, N. Y., August 12, 1916, on bur oak. H. H. Knight (Ball); Buffalo, N. Y., July, 1886, E. P. Van Duzee; Botanic Garden, New York, N. Y., July 7, on *Quercus macrocarpa*, H. L. Sanford; District of Columbia, May 20, 1886, June 20, 1888; Washington, D. C., July 11, 1902, July 2, 1901; Rock Creek, D. C., July 17, 1902 (U.S.N.M.); Washington, D. C., June 7, N. Banks (M.C.Z.);

Washington, D. C., June 6, 1912, June 15, July 31, 1925, W. L. McAtee; July 24, 1924, at light, J. R. Malloch; Maryland near Plummer Island, July 26, 1914, W. L. McAtee (McAtee); Virginia opposite Washington, D. C., June 15, 1902 (U.S.N.M.); Toronto, Ont., August 8, 1924, one labelled *Crataegus*, E. D. Ball (Ball); Cedar Lake, Ind., July 17, 1914 (Ill. State Nat. Hist. Survey); Oxford, Ind., August, 1916, Mrs. W. L. McAtee (McAtee); Madison, Wis., October 1, 1917, H. K. Harley; Reedsburg, Wis., September 27, 1917, E. D. Ball; Osceola, Wis., July 20, 1917, E. D. Ball (Ball); Waukegan, Ill., August 24, 1917 Elizabeth, Ill., July 7, 1917; Urbana, Ill., July 14, 1920 (Ill State Nat. Hist. Survey); Kings Bluff, Winona County, Minn., June 30, 1922, Paul B. Lawson (Kans. Univ.); Spirit Lake, Iowa, June 28, 1897; Ames, Iowa, June 19, 1897, on maple, July 20, 1895 (Ball); June 9, 1897 (State Coll. Iowa); Nebraska; Riley County, Kans., May, C. F. Marlatt (U.S.N.M.); Wyandotte County, Kans., June 21, 1924, R. H. Reamer (Kans. Univ.); Colorado, 2248, part of type material of *bifasciata* Gillette and Baker (Cat. No. 3454 U.S.N.M.); Fort Collins, Colo., July 11, 1900; Rist Canyon, Colo., August 20, 1898; Rico, Colo., August 2, 1900; Dutch George, Colo. August 14, 1899 (Ball).

TYPHLOCYBA GILLETTEI, var. VOLANS McAtee

Typhlocyba querci, var. *rolans* McAtee, W. L., Can. Ent., vol. 51, No. 10, October, 1919, pp. 225-226 [Digby County, Nova Scotia].

With two dusky crossbands much broader than in var. *gillettei*, the posterior over the crossveins, the anterior over middle of clavi, sloping forward on the corium parallel to anterior edge of tegmen. Scutellum with two faint dusky spots in the basal triangles, apical cells fumose.

Holotype.—Female, Digby County, Nova Scotia, August 8, 1918 [N. S. Dept. Agr.].

TYPHLOCYBA GILLETTEI, var. SCRIPTA McAtee

Typhlocyba querci, var. *scripta* McAtee, W. L., Can. Ent., vol. 51, No. 10, October 1919, p. 226 [Digby County, Nova Scotia].

Scutellum chiefly dusky, tegmina with dusky crossbands at middle and on crossveins as in var. *gillettei*, and with a longitudinal dusky stripe on clavus and adjacent corium extending from near base of clavus to crossveins; apical cells smoky. These markings leave the apex of clavus, its inner margin anteriorly, narrow anterior margin or corium, and broad costal area, of the ground color (except for crossband at posterior part of costal plaque).

Holotype.—Female, Digby County, Nova Scotia, September 5, 1918 (N. S. Dept. Agr.)

TYPHLOCYBA GILLETTEI, var. VENUSTA, new variety

General color whitish to lemon yellow, tegmina from crossveins posteriorly (apical cells sometimes nearly hyaline), and from middle of clavus anteriorly (except forward costal margin), and scutellum, dusky to black.

Holotype and paratype.—Males, Milwaukee, Wis., July 30, 1917, E. D. Ball (Ball); paratype male, New York (Kans. Univ.); allotype female, Toronto, Ont., August 8, 1924, E. D. Ball (Ball).

TYPHLOCYBA GILLETTEI, var. SELLATA, new variety

Ground color whitish to stramineous, tegmina from crossveins to base, except costal plaque dusky, apical cells fumose.

Holotype.—Female, Batavia, N. Y., August 12, 1916, on *Quercus macrocarpa*, H. H. Knight, (Kans. Univ.); paratype female, Botanic Garden, New York, N. Y., July 7, 1921, on *Quercus macrocarpa*, H. L. Sanford (U.S.N.M.).

Paratype.—Cat. No. 28493, U.S.N.M.

TYPHLOCYBA GILLETTEI, var. VESTITA, new variety

Ground color above golden yellow, which remains evident particularly on vertex, front of pronotum, costal margins of tegmina, and on crossveins, but elsewhere is more or less heavily overlaid with fumose to sooty coloring, deepest on scutellum; underparts pale yellowish. In richly colored specimens the costa posterior to plaque, posterior portions of sectors, and crossveins, are reddish.

Holotype.—Male, allotype female, and paratypes Douglas County, Kansas, August 1923, W. Robinson; paratypes: Douglas County, Kans., May 21, 1923, Paul B. Lawson (Kans. Univ.); Onaga, Kans., Buffalo, N. Y., E. P. Van Duzee (Ball).

TYPHLOCYBA POMARIA, new species

Male.—Head and thorax pale yellow, more or less tinged with orange to reddish on front of vertex; tegmina hyaline, the costa, commissure and sectors yellow, apical cells faintly dusky; underparts pale yellowish, the face more or less tinged with orange to reddish, touches of this higher coloration elsewhere also on some specimens.

Hypopygium (fig. 59): Strongly distinguished by the falcate process forming the posterior border of the side of the 9th segment, which is heavily chitinized and black in color; as the correlation of this falcate process with the type of aedeagus here illustrated for this species has thus far been constant, it results that the species can be recognized from the superficial aspect of the hypopygium, the black tips of the falces being easily seen. Near the upper posterior border of the falx are several backwardly directed bristly hairs;

similar but shorter hairs form a row on the outer clasper, and longer softer hairs spring from the under side of this clasper, from the lower border of the 9th segment near articulation of outer clasper, and from the end of the anal tube. Outer claspers as seen from below depressed interiorly so that together they inclose a long narrow sunken area, clasper as a whole narrowed on posterior third, the apices somewhat spatulate and divergent; seen from side the outer clasper is curved upward at the beginning of its posterior third, in almost a right angle, apex somewhat spatulate and recurved; inner clasper slender, outcurved apically (fig. 60); the aedeagus as seen from above (fig. 61) with a median and two lateral branches, the former considerably shorter than the latter, furcate at the tip, and reinforced along the lower surface by two longitudinal strips extending nearly to the apex appearing as ribs on back of aedeagus as seen from above; lateral processes becoming very slender apically the terminal portion curved outward and then forward. Aedeagus measured along curve, fully twice as long as connective (fig. 62).

Female.—Paler than male, general coloration stramineous, with little or no yellow, orange, or reddish washing; tip of ovipositor sheath black. Eighth sternite, moderately pointed medially and emarginate laterally (fig. 103).

Length, 3–3.5 mm.

Holotype.—Male, allotype female, and paratypes, West Chester, Pa., 7.6.16, Quaintance No. 11709, on apple, A. J. Ackerman (U.S.N.M.); Paratypes: Smith's Cove, Nova Scotia, October 4, 1915 (U.S.N.M.); South Amherst, Mass., June 17, 1924 (Ball); Cabin John Bridge, Md., June 17, 1915, Roberts (U.S.N.M.); Leesburg, Va., September 24, 1919, on apple, L. A. Stearns (McAtee); Vineland, Ont., August, 1922, W. Robinson (Kans. Univ.); Clayton, Ill., September 30, 1916; Olney, Ill., September 21, 1916, on apple; Urbana, Ill., September 20, 1916 (Ill. State. Nat. Hist. Survey); Iowa, Ac. Cat. 206 (Ball); Bentonville, Ark., September 1, 1925, on apple, A. J. Ackerman (U.S.N.M.); Douglas County, Kans., August, 1923, W. Robinson; Winona County, Minn., July 1, 1922, P. B. Lawson (Kans. Univ.); Boulder, Colo., Cockerell; Colorado, No. 1892 (U.S.N.M.), No. 1888 (State Coll. Iowa); Fort Collins, Colo., June 20, 1902, on apple (Ball); Fort Collins, Colo., September 4, 1886, on apple, J. Cassidy (U.S.N.M.).

Specimens not good enough to be made paratypes: Malden, Mass., June, 1895, F. H. Sprague (M.C.Z.); Copeley, Va., October 6, 1903, injurious to orchards, Eugene C. Massie (U.S.N.M.).

Females unassociated with males, probably of *pomaria*: Milton, Can., Uhler Coll.; Montmorency, Can., Uhler Coll.; Burlington, Vt., on apple, September 15, 1890, No. 4915, A. B. Cordley; Washington, D. C., September 5; Washington, D. C., October 5, 1904, on black-

berry, O. Heidemann; District of Columbia, June 8, 1873, on apple (U.S.N.M.); Falls Church, Va., October 6, on apple, N. Banks (M. C. Z.); Winchester, Va., September 29, 1908, on apple. Quaintance No. 4347; Iowa, Gillette, Acc. Cat. No. 161 (U.S.N.M.).

This is the species that has most often been identified as *T. rosae* Linnaeus.

Holotype, allotype, and paratypes.—Cat. No. 28494, U.S.N.M.

TYPHLOCYBA ATHENE, new species

Male.—Pale yellowish, the tegmina with a greenish cast, apical cells hyaline, underparts stramineous. Hypopygium: Upper posterior angle of 9th segment produced as a stout, somewhat decurved tooth, the lower angle as a prominent, recurved, conical tooth, which is heavily pigmented, posterior margin of segment between the processes, convex (fig. 63). Outer clasper unusually long and slender, tapered gradually on the basal three-fourths, then upcurved, and abruptly narrowed, the apical fourth quite slender, distinctly outcurved, somewhat spatulate apically, and pigmented. Inner clasper hairy at base, slender, outcurved, the apex upwardly, and somewhat anteriorly curved, aciculate. Aedeagus thrice as long as connective, the central shaft rather stout, bifid apically into long, slender, divergent aciculate processes; at about the middle of whole aedeagus two lateral arms arise from the central shaft, their tapering pointed extremities about the same length as the apical processes of the central shaft and paralleling them so closely as to conceal them from the side (figs. 64–65).

Length, 3.5 mm.

Holotype.—Male Urbana, Ill., June 7, 1916, J. R. Malloch (Ill. State Nat. Hist. Survey).

TYPHLOCYBA ARSINOE, new species

Male.—Head, thorax, and underparts stramineous, tegmina whitish hyaline, apical cells faintly fumose. Hypopygium: Upper posterior angle of 9th segment rounded, lower receding, produced at juncture with lower margin into a short, blunt process the apex of which is heavily pigmented, (and visible from below between the outer claspers); outer claspers rather slender and gradually tapered; inner of the simply curved and acuminate type; aedeagus with three slender upcurved branches from base, the lateral ones nearly as long as the median, acute apically, the medium one blunt apically and provided with two widely divergent, upwardly and outwardly curved acuminate process (fig. 66).

Female.—Pale greenish yellow, apical cells hyaline; underparts stramineous, tip of beak reddish; claws and apex of ovipositor sheath black. Eighth sternite almost evenly convex laterally, but moderately pointed medially.

Length, 3.5–3.8 mm.

Holotype.—Male, and allotype female, Boston, Mass., August 31, 1919, E. D. Ball (Ball).

TYPHLOCYBA ANDROMACHE, new species

Male.—Head and thorax stramineous, tegmina hyaline tinged with yellowish especially on veins and margins. Underparts stramineous. Hypopygium: Upper posterior angle rounded, hind margin nearly straight, lower angle slightly produced, black-tipped, the lower margin a little sinuate anterior to the tooth. Outer claspers gradually narrowed from base for three-fourths of their length, then abruptly, the apex compressed, black-margined, the tip rounded as seen from side. Inner claspers slender, rather straight for basal three-fourths, then outcurved and aciculate. Aedeagus three-parted from base, the lateral processes somewhat longer than the central one, acuminate apically, the central shaft slightly bifid and two-pointed (fig. 67).

Length, 3.5 mm.

Holotype.—Male, Salem, N. Y., June 27, 1924, on birch, E. D. Ball (Ball).

TYPHLOCYBA MELITE, new species

Male.—Body whitish to pale yellowish above and below, tegmina nearly hyaline, apical cells sometimes slightly fumose. Hypopygium: Upper posterior angle of 9th segment rounded off, lower developed as a short, blunt, downwardly projecting tooth (fig. 70). Outer claspers gradually narrowed on basal two-thirds, more decidedly on apical third, apex somewhat spatulate and heavily pigmented; a line of short bristles on upper edge of outer clasper, and longer hairs along posterior margin of 9th segment, above tooth, in region of articulation of outer clasper, and on anal tube. Inner clasper slender, curved outwardly, most so near apex, which is aciculate. Aedeagus three-parted almost from base, the lateral processes extending nearly as far posteriorly as the central one, each lateral process shaped somewhat like the letter L, the shorter arm projecting laterally as seen from above and abruptly angulate apically; tip of central process bifid, the divisions tapering rapidly, curving outward and backward, and sharp-pointed (figs. 68–69).

Female.—Colored like male; eighth sternite almost evenly convex posteriorly, slightly emarginate medially.

Length, 3.75–4 mm.

Holotype.—Male, Colorado, No. 1584, C. F. Baker Collection (U.S.N.M.); paratypes both sexes (and allotype), Sea Cliff, N. Y., some labeled "August," others "on gooseberry," N. Banks (M. C. Z.)

Holotype.—Cat. No. No. 28495, U.S.N.M.

TYPHLOCYBA NITIDULA Fabricius

Cicada nitidula FABRICIUS, J. C. Systema Rhyngotorum secundum ordines, genera, species, adiectis synonymis, locis, observationibus, descriptionibus. 1803, p. 79 [Paris, France].

"Pale yellow; the scutellum, a broad band across the base of the elytra, and another across the apex of corium, blackish brown. Membrane whitish hyaline. Claws fucous." The variety *norgueti* Lethierry, has the space between the two bands on the elytra filled up with blackish brown.

Length, 3.3–3.6 mm.

James Edwards, from whose work on the Homoptera of the British Island (1896, p. 219), the above description is quoted, has kindly supplied me with a male *T. nitidula*, var. *norgueti* which has enabled me to present the following details relating to the Hypopygium: Upper posterior angle of 9th segment rather produced, subangulate, and incurved, the lower receding, the surface of the segment in general well-haired; outer claspers narrowing gradually, to the bluntly rounded apices, inner claspers of ordinary form, the apices out-curved and acute; aedeagus with a very short base from which arise at almost right angles, two straight, tapering, moderately pointed processes, above which there is an unpaired, shorter, upcurved processes, giving a "two-storied" aedeagus, a type seen in only one other species, *T. modesta* Gibson (figs. 71–72).

The eighth sternite of females from England in Baker Collection is almost evenly convex posteriorly.

Distribution: *Typhlocyba nitidula* ranges from Russia over northern and central Europe. It has been recorded¹⁷ from Mount Washington, N. H., by Mrs. Annie Trumbull Slosson. In the present study no specimen of the true *nitidula* has been found, and it is suggested that the Slosson record may be based on one of the varieties of *T. gillettei* or *T. cymba*.

TYPHLOCYBA MODESTA Gibson

Typhlocyba modesta GIBSON, E. H. Three new species of Jassoidea from Missouri, Can. Ent., vol. 49, no. 5, May, 1917, p. 184 [Charleston, Mo.].

Male.—Head, thorax, and underparts stramineous, tegmina nearly hyaline, faintly dusky apically. Hypopygium with the side of the ninth segment strongly produced in a lobe which is provided with a projecting tooth both above and below, the upper the longer, and more curved and acute (fig. 73), sometimes pigmented; outer clasper narrowed on apical third, the apex slightly spatulate and heavily

¹⁷ Additional list of insects taken in Alpine region of Mount Washington, Ent. News, vol. 17, No. 9, November, 1906, p. 326.

pigmented. Inner claspers strongly curved, abruptly tapered near tip which is aciculate. Aedeagus remarkable in having two medially situated shafts, the uppermost of which is short, upcurved, simple and acute at apex, and the lower much longer, upcurved, bifid on its apical fourth, the rami parallel, a little expanded subapically, tapered apically and slightly curved outwardly and backwardly (figs. 74-75).

Female.—Coloration as in male, a little more tinged with yellow, especially on head. Eighth sternite decidedly emarginate medially (fig. 106); apex of ovipositor sheath black.

Length, 3.5-3.75 mm.

Holotype and paratype.—Females, Charleston, Mo., June 7, 1916; allotype male, same locality May 18, E. H. Gibson (U.S.N.M.). Other specimens seen are from Falls Church, Va., May 30, N. Banks (M. C. Z.); Glenearlyn, La., June 11, 12, 16, 1925, J. R. Malloch (McAtee); Urbana, Ill., August 28, 1917, October 11, 1914 (Ill. State Nat. Hist. Survey); Ames, Iowa, June 19, 1897, September 25, 1889, (State Coll. Iowa); Ames, Iowa, June 19, 1897 (Ball).

Holotype, allotype, and paratype.—Cat. No. 21, 393, U.S.N.M.

TYPHLOCYBA 6-NOTATA Van Duzee

Empoa querci, var. *6-notata* VAN DUZEE, E. P., A preliminary List of the Hemiptera of San Diego County, Calif., Trans. San Diego Soc. Nat. Hist., vol. 2, no. 1, Nov., 1914, p. 57 [Alpine, Calif.]

Female.—Vertex and pronotum pale yellowish, the pronotum with a deeper yellow round spot on center of disk; scutellum fulvous, paler centrally at base; tegmen rather bluish green hyaline, a greenish-yellow vitta just exterior to claval suture, the apical cells dusky, dusky spots anterior to crossveins of which the innermost is largest and darkest, a black dot at middle and another at base of inner claval margin; commissure blackish near apex of scutellum, yellowish posteriorly. Dorsum of abdomen chiefly blackish, underparts pale yellowish. Eighth sternite nearly straight across hind margin, very slightly emarginate laterally and very briefly and indistinctly pointed medially.

Length, 3.5 mm.

Spreckels, Calif., September 10, 1907, E. D. Ball; October 5, 1907, on sugar beets, Titus and Ball (Ball).

TYPHLOCYBA PHRYNE, new species

Female.—Ground color of head and thorax pale yellowish, tegmina whitish hyaline, with the following markings, median seam-like line from back of vertex and two spots at middle of vertex translucent allowing the darker subcutaneous parts to show through; two spots on hind margin of vertex unite with two curved vittae on

pronotum and scutellum to produce a heavy black parentheses-like marking; inner margins of tegmina from base to crossveins with a pronounced black edging; distinct black spots anterior to crossveins 2, 3, and 4; membrane fumose hyaline. Underparts stramineous, claws and entire ovipositor brown. Eighth sternite emarginate both laterally and medially.

Length, 3.5 mm.

Holotype.—Female, Urbana, Ill., July 9, 1920 (Ill. State. Nat. Hist. Survey).

Another female Ames, Iowa, October 15, 1897 (State. Coll. Iowa) is made the type of the variety *subpulchra*, new variety; it lacks the dark parentheses on thorax and the commissural marking is much narrower.

GROUP 3

Besides the characters mentioned in the key, common features of species of this group are aedeagus bifid, more or less caliper-like, and dark spots anterior to crossveins.

KEY TO THE SPECIES OF GROUP 3

1. Dusky spots anterior to crossveins rather elongate, sometimes forming an ill-defined band..... 2
- Spots anterior to crossveins not elongate..... 3
2. Outer clasper of male with a distinct process exteriorly near apex (figs. 96-97); eighth sternite of female emarginate medially
appendiculata Malloch, p. 39
- Outer clasper of male without process. (Two alternatives.)
 Aedeagus as in figs. 77-78.....*antigone*, new species, p. 35
 Aedeagus as in figs. 81-82.....*clymene*, new species, p. 36
3. Apical cells with decided dusky markings, aedeagus as in figures 90 and 94.....*hermione*, new species, p. 38
- Apical cells clear or merely fumose. (Four alternatives.)
 Aedeagus as in figs. 88-89.....*berenice*, new species, p. 38
 Aedeagus as in figs. 85-86.....*eurydice*, new species, p. 37
 Aedeagus as in figs. 79-80.....*nicarete*, new species, p. 36
 Aedeagus as in fig. 84.....*danae*, new species, p. 37

TYPHLOCYBA ANTIGONE, new species

Male.—Head and thorax pale yellowish, tegmina nearly to crossveins, light sulphur yellow; somewhat elongate spots anterior to crossveins 2, 3, and 4, faintly dusky; apical cells hyaline; underparts stramineous. Hypopygium: Posterior lateral margin of ninth segment distinctly emarginate, the upper angle developed as a process resembling in shape, as seen from above or below, a thumb and index finger, but appearing as an acute tooth as seen from side (fig. 76), the finger much longer than the thumb and decidedly incurved: claspers in no way unusual, aedeagus short, widely bifid apically,

caliper-like, the arms strongly incurved, then at extreme apex de-curved and pointed (figs. 77-78).

Length, 3.5 mm.

Holotype.—Male White Heath, Ill., June 24, 1916, on oak (Ill. State Nat. Hist. Survey); paratype males, Glencarlyn, Va., June 12, 16, 20, 1925, J. R. Malloch (McAtee).

In the holotype the third apical vein is not quite in line with the third sector, hence this species has been keyed in Group 2 as well as 3; the characters of the aedeagus, however, indicate that the species is best placed in the latter group.

TYPHLOCYBA NICARETE, new species

Male.—Vertex pale yellowish, thorax stramineous, tegmina whitish hyaline, with small dusky spots anterior to cross veins 2, 3, and 4, apical cells slightly fumose; underparts stramineous. Hypopygium: Posterior margin of ninth segment squarish as seen from side, with an interior lengthwise, nearly median, chitinous supporting strip, and another along margin, which unite to form a support shaped like a falx of *T. pomaria* (fig. 59), which reaches the apex of the rather pointed lower angle, upper angle rounded. Outer clasper of ordinary form, narrowed on apical third; inner almost semi-circularly curved, the pair tangent to each other in the middle ventrally, the apices aciculate, directed outwards and barely extending beyond sides of outer claspers. Aedeagus short, stout, bifurcate from middle, the arms, curved, stout, caliper-like, each abruptly constricted at apex into a thornlike appendage which is directed downwardly and inwardly (figs. 79-80).

Female.—Colored like male, apex of ovipositor sheath black; eighth sternite evenly convex posteriorly.

Length, 3-3.5 mm.

Holotype.—Male, and three females assigned to the species because of identical data, White Heath, Ill., June 24, 1916, on oak (Ill. State Nat. Hist. Survey); paratype male, Urbana, Ill., June 17, 1916; paratype males and associated females, Virginia near the District of Columbia, June 15, 1924; Salem N. Y., June 27, 28, 1924, E. D. Ball (Ball); paratype males, Glencarlyn, Va., June 12, 16, 20, J. R. Malloch (McAtee).

TYPHLOCYBA CLYMENE, new species

Male.—Stramineous above, scutellum a little deeper yellowish, tegmina whitish hyaline, elongate dark spots anterior to cross veins 2, 3, and 4, nearly coalesced in a band; underparts stramineous. Hypopygium: Upper posterior angle of ninth segment produced

upward and incurved, acute at apex, the lower angle well rounded. Claspers of ordinary form. Aedeagus short, bifurcate in stout caliper-shaped rami, which subapically are abruptly narrowed and curved downward and inward, terminating in slender acute processes (figs. 81-82).

Length, 3.75 mm.

Holotype.—Male, McLean, N. Y., July 14, 1919, John L. Buys (McAtee). Aedeagus of holotype lost.

TYPHLOCYBA DANAE, new species

Male.—Whitish above tending to pale ivory on vertex and thorax; tegmina whitish hyaline, with small dusky spots anterior to cross veins 2, 3, and 4, apical cells slightly fumose; underside stramineous. Hypopygium: Upper posterior angle of ninth segment with two strong inwardly curved teeth, the emargination between them U-shaped (fig. 83), lower angle slightly produced downwardly; outer claspers narrowed from base outbowed for about two-thirds their length, then incurved; the apices slightly divaricate, rounded; inner claspers of the simple outcurved type, acute apically; aedeagus resembling that of *T. eurydice*, but much larger, more than twice as long as connective, the base more slender, and the angulation of rami less abrupt (fig. 84).

Female.—Coloration as in male, apex of ovipositor sheath black; eighth sternite evenly convex posteriorly.

Holotype.—Male and allotype female, and another pair, Conesus Lake, N. Y., July 16, 1916, in copula, H. H. Knight (Kans. Univ.); paratype males, Glencarlyn, Va., June 12, 16, 20, 23, J. R. Mallach (McAtee).

TYPHLOCYBA EURYDICE, new species

Male.—Whitish above, a little yellowish showing through vertex and scutellum; tegmina whitish hyaline, with small dusky spots anterior to crossveins 2, 3, and 4, and the apical cells fumose marginally; underparts stramineous. Hypopygium: Upper posterior angle of ninth segment, produced, incurved, and acute (fig. 87), lower angle rounded; outer clasper abruptly narrowed beyond middle to about a third of its basal width, the apex slightly spatulate; inner clasper rather thick and tortuous basally, abruptly tapering beyond middle, simply curved and acute apically; aedeagus short, no longer than connective, with a stout base, then bifurcate for three-fourths of its length, the rami rather angulate, directed outwardly, then downwardly, the slender acute apices crossing (figs. 85-86).

Female.—Like the male in color, apex of ovipositor sheath black; eighth sternite slightly emarginate laterally, very moderately pointed medially.

Length, 3.5 mm.

Holotype.—Male and allotype female, Beltsville, Md., June 23, 1916, on *Quercus alba*, taken in copula; paratype females same data; paratype male, Odenton, Md., July 12, 1914, W. L. McAtee (McAtee).

A male with same data as holotype, which almost entirely lacks dusky markings, may be taken as the type of var. *discincta*, new variety; it has a slight yellowish wash on tegmina, especially along costa near crossveins.

TYPHLOCYBA BERENICE, new species

Male.—Pale yellowish overlaid with whitish; tegmina whitish hyaline, small dusky spots in front of cross veins 2, 3, and 4, apical cells with dusky clouding marginally; underparts stramineous. Hypopygium: Upper posterior angle of ninth segment rounded protuberant (fig. 91) without inner teeth as in *T. danae*, posterior margin nearly vertical, lower angle rather squarish. Outer claspers of ordinary form, the apices rounded; inner claspers simply curved and acute pointed. Aedeagus with short base, from which arise two slender, outcurved arms which approach subapically where each emits a slender very acute, inwardly and downwardly curved process, apices of main branches of aedeagus, acute, slightly curved posteriorly (figs. 88–89).

Length, 3.5 mm.

Holotype.—Male, Rock Creek, D. C. June 19 (U.S.N.M.); paratype, male, Toronto, Ont., August 8, 1924, E. D. Ball (Ball).

Holotype.—Cat. No. 28496, U.S.N.M.

TYPHLOCYBA HERMIONE, new species

Male.—Head and thorax whitish to stramineous, tegmina whitish hyaline, with small dark spots anterior to cross veins 2, 3, and 4, and the apical cells with considerable dusky clouding, sometimes with rather well defined elongate spot along the inner side of cell 1; underparts stramineous, lower part of face yellowish. Hypopygium: Upper posterior angle well produced, rounded as seen from side (fig. 93), incurved and pointed as seen from above or below; in the latter view distinct serration of the margin is visible, as well as a prominent incurved spine a little basad of apex (fig. 92); posterior border of ninth segment nearly straight, receding, lower angle almost eliminated. Apical third of outer clasper decidedly narrowed, somewhat outcurved and slightly spatulate apically. Inner clasper

narrowed from base, outcurved, acute apically. Aedeagus with two stout but rapidly tapering divergent rami, which are abruptly incurved at two-thirds of their length and terminate in delicate acute processes which cross apically; on the abrupt angle is a short acute thorn which is difficult to see except in exact profile (figs. 90 and 94).

Length, 4 mm.

Holotype.—Male, Washington, D. C., July 2, 1913; paratype males; Bluemont, Va., July 1, 1914, W. L. McAtee (McAtee); Madison, Wis., August 11, 1918, E. D. Ball (Ball).

TYPHLOCYBA APPENDICULATA Malloch

Typhlocyba appendiculata MALLOCH, J. R., A new species of *Typhlocyba* (Hemiptera Homoptera, Typhlocybidae), Can. Ent., vol. 52, no. 4, April 1920, p. 95 [Elizabeth, Ill.].

Male.—Head and thorax pale yellowish, tegmina whitish hyaline with a broad dusky band anterior to crossvein, which is sometimes reduced to poorly defined elongate spots, some specimens with more or less dusky clouding also on anterior part of corium and on clavus, apical cells slightly fumose (fig. 10); underparts stramineous. Hypopygium: Upper posterior angle of ninth segment rounded acute and incurved; as seen from side, the posterior margin slightly emarginate (fig. 95) in the lower two-thirds, and the upper end of the emargination is a small tooth; lower angle a little produced downwardly; outer surface bristly and rugose, margin serrulate interiorly. Outer clasper gradually narrowed from base for about two-thirds of its length where a strong, somewhat falcate, fairly acute pointed process is given off externally (figs. 96-97); portion of clasper beyond this point gradually tapering, rounded at apex. Inner clasper broad at base, gradually tapered to the acute outwardly directed apex, curved so that the inner margin forms almost a quarter circle (fig. 98). Aedeagus with a slender stem between connective and the bifurcation; the rami are stout, outcurved, appearing from above like the cross-section of a goblet, each is downcurved and incurved apically in the form of a long pointed process (fig. 99.) For clearness only one of the processes is shown in drawing.

Female.—Coloration as in male. Eighth sternite slightly emarginate laterally, convex medially.

Length, 3.5 mm.

A male and several females, Urbana, Ill., July 9-20, 1920, one female Elizabeth, Ill., July 8, 1917, (Ill. State Nat. Hist. Survey); Ames, Iowa, September 11, 1919, E. D. Ball; June 19, 1897 (Ball); Washington, D. C., June 18, 29, 1925, W. L. McAtee (McAtee).

LIST OF NUMBERS USED FOR HYPOPYGIA AND THE NAMES OF SPECIES TO WHICH THEY PERTAIN

It seems desirable to place on record these numbers and their equivalents, as tickets bearing them have been placed on numerous specimens, some of which may later become separated from their name labels.

- | | |
|--|--------------------------------------|
| 1. <i>pomaria</i> , new species. | 21. <i>commissuralis</i> Stal. |
| 2. <i>commissuralis</i> Stal. | 22. <i>rubriocellata</i> Malloch. |
| 3. <i>pomaria</i> , new species. | 23. <i>nicarctc</i> , new species. |
| 4. Not used. | 24. <i>antigone</i> , new species. |
| 5. <i>cymba</i> McAtee. | 25. <i>piscator</i> , new species. |
| 6. <i>gillettei</i> Van Duzec. | 26. <i>elymenc</i> , new species. |
| 7. <i>hermione</i> , new species. | 27. <i>lethierryi</i> Edwards. |
| 8. <i>flavomarginata</i> Gillette and Baker. | 28. <i>appendiculata</i> Malloch. |
| 9. <i>modesta</i> Gibson. | 29. <i>arisinoc</i> , new species. |
| 10. <i>ulmi</i> Linnaeus. | 30. <i>unca</i> , new species. |
| 11. Not used. | 31. <i>persephone</i> , new species. |
| 12. <i>xanthippe</i> , new species. | 32. <i>euphrante</i> , new species. |
| 13. <i>rosae</i> Linnaeus. | 32a. <i>ariste</i> , new species. |
| 14. <i>bernice</i> , new species. | 33. <i>niobe</i> , new species. |
| 15. <i>eurydice</i> , new species. | 34. <i>lancifer</i> , new species. |
| 16. Not used. | 35. <i>danac</i> , new species. |
| 17. <i>melite</i> , new species. | 36. <i>athene</i> , new species. |
| 18. <i>ariadne</i> , new species. | 37. <i>duplicata</i> , new species. |
| 19. <i>ariadne</i> , new species. | 38. <i>andromache</i> , new species. |
| 20. <i>rosae</i> Linnaeus. | |

CORRELATION OF THE NOMENCLATURE OF THE VAN DUZEE CATALOGUE¹⁸ WITH THAT OF THE PRESENT PAPER

Genus *Empoa* Fitch=*Typhlocyba* Germar (See Proc. Biol. Soc. Wash., vol. 31, 1918, pp. 112-113, 114-115).

Empoa querci Fitch=*Typhlocyba gillettei* Van Duzec, p. 23.

Empoa querci, var *gillettei* Van Duzec=*Typhlocyba gillettei*, var *gillettei* Van Duzec, p. 27.

Empoa querci, var *6-notata* Van Duzec=*Typhlocyba 6-notata* Van Duzec, p. 34.

Empoa querci, var *morgani* De Long. See entry under De Long, p. 41.

Empoa nitidula Fabricius=*Typhlocyba nitidula* Fabricius, p. 33.

Empoa aureotecta Sanders and De Long=*Typhlocyba aureotecta* Sanders and De Long, pp. 20, 26.

Empoa australis Walsh. See entry under Walsh, p. 42.

Empoa flavomarginata, Gillette and Baker=*Typhlocyba flavomarginata* Gillette and Baker, p. 17.

Empoa ulmi Linnaeus=*Typhlocyba ulmi* Linnaeus, p. 5.

Empoa commissuralis Stal=*Typhlocyba commissuralis* Stal, p. 11.

Empoa tenuerrima Herrich-Schaeffer=*Typhlocyba tenuerrima* Herrich-Schaeffer, p. 6.

Empoa lethierryi Edwards=*Typhlocyba lethierryi* Edwards, p. 15.

Empoa rosae Linnaeus=*Typhlocyba rosae* Linnaeus, p. 13.

Empoa fabae Harris. See entry under Harris, p. 42.

Empoa albicans Walsh. See entry under Walsh, p. 42.

Empoa modesta Gibson=*Typhlocyba modesta* Gibson, p. 33.

¹⁸ Univ. Calif. Publ. Tech. Bull. Ent. Vol. 2, 1917, pp. 708-711, 827.

PUBLICATIONS CONTAINING NAMES UNPLACED IN THIS PAPER.

BAKER, C. P.

New Typhlocybini, Invertebrata Pacifica, vol. 1, pp. 5-9, Sept. 15, 1903.

Typhlocyba pseudo-maculata, new species, p. 8 [Champerico, Guatemala],

Typhlocyba verticis, new species, pp. 8-9 [Managua, Guatemala], *Typh-*

locyba pseudo-obliqua, new species, p. 9 [Managua, Guatemala], *Typhlo-*

cyba bimaculata, new species, [Champerico, Guatemala; Acapulco, Mexico]. Probably none of these belong to the genus *Typhlocyba* in the sense of this paper.

BERG, CARLOS

Hemiptera Argentina enumeravit speciesque novas descripsit, 1879, 316 pp.

Typhlocyba photophila, new species, pp. 273-274 [Corrientes, Argentina];

Typhlocyba salinarum, pp. 274-275 [Buenos Aires, Argentina].

Addenda et Emendanda ad Hemiptera Argentina, 1884, 213 pp.

Typhlocyba centralis, new species, p. 175 [Chaco, Argentina].

Hemipteros de la Tierra del Fuego, Anales Mus. Nac. Buenos Aires, vol. 4, (ser. 2, vol. 1) 1895, pp. 195-206.

Typhlocyba fulgidula, new species, p. 205 [Filaret, Argentina].

DE LONG, D. M.

The Leafhoppers or Jassoidea of Tennessee, Bull. No. 17 (vol. 4, no. 2), Tenn. State Board Ent., June 1916, 113 pp., 20 figs.

Typhlocyba osborni, new species, pp. 103-104, figs. 19-20 [Clarksville,

Tenn.], *Typhlocyba morgani*, new species, p. 104, fig. 18 [Clarksville,

Tenn.], and *Typhlocyba nigridorsum*, new species, p. 110 [Clarksville,

Tenn.] belong to the genus *Erythroneura* Fitch. (See Trans. Amer. Ent. Soc., vol. 46, 1920, pp. 267-321).

Some new Cicadellidae (Homoptera) from the Southern United States, Journ. N. Y. Ent. Soc., vol. 32, no. 1, March 1924, pp. 63-69, pl. 7.

Empoa minutus, new species, p. 68, pl. 7, figs. 7, 7a [Miami, Florida].

FITCH, ASA

Catalogue with references and descriptions of the insects collected and arranged for the State Cabinet of Natural History, Fourth Ann. Rep. Regents Univ., N. Y., on the State Cabinet of Natural History, 1851, pp. 48-69.

Of the two species described in genus *Empoa*, one, *querci*, is disposed of on p. — of the present paper, and the other, *coccinea*, is said by Dr. E. D. Ball to belong to the genus *Empoasca* Walsh.

GILLETTE, C. P.

American Leaf-hoppers of the Subfamily Typhlocybinae, Proc. U. S. Nat. Mus., vol. 20, 1898, pp. 709-773, 149 figs.

Of the 23 species included in the genus *Typhlocyba*, ten belong to the genus *Erythroneura* Fitch (See Trans. Amer. Ent. Soc., vol. 46, 1920, pp. 267-321); one has been removed to the genus *Hymetta* McAtee (See Proc. Biol. Soc. Wash., vol. 32, pp. 121-124, June 1919); and nine are retained in the genus *Typhlocyba* and are treated in the present revision. The others, *Empoa coccinea* Fitch, *Typhlocyba centralis* Berg, and *Typhlocyba sanguinea* Gillette and Baker are mentioned under the proper entries in this bibliography.

GILLETTE, C. P., and BAKER, C. F.

A preliminary list of the Hemiptera of Colorado, Bull. No. 31 (Tech. Ser. No. 1), Colo. Agr. Coll., June 1895, 137 pp.

Typhlocyba sanguinea, new species, pp. 112-113, 2 figs. [Manitou, Colo.] No specimens have been seen and the proper generic reference is unknown.

HARRIS, T. W.

A report on the Insects of Massachusetts Injurious to Vegetation, Cambridge, 1841.

Tettigonia fabae, new species., p. 186, assigned by Van Duzee to the genus *Empoa*, with little doubt is an *Empoasca*.

SANDERS, J. G., and DELONG, D. M.

The Cicadellidae (Jassoidea-Fam. Homoptera) of Wisconsin with descriptions of new species, Ann. Ent. Soc. Amer., vol. 10, no. 1, March 1917, pp. 79-95, pls. 8-9.

Empoa aureotecta, new species, pp. 93-94, pl. 9, figs. 43-45 [Madison, Wis.]. See pp. 20, 26 of the present paper.

SANDERS, J. G., and DELONG, D. M.

New American Records and Notes of Cicadellidae, Gen. Bull. No. 346, Pennsylvania Dept. Agr., June 1920, pp. 18-19.

Empoa debilis Douglas recorded from Bound Brook, N. J. English specimens of *debilis* received from J. Edwards are not specifically distinct from *Typhlocyba ulmi* Linnaeus, and there is little in existing descriptions to persuade one to believe that *debilis* is a distinct species.

SANDERS, J. G., and DELONG, D. M.

New species of Cicadellidae (Homoptera) from the Eastern and Southern United States, Proc. Ent. Soc. Wash., vol. 24, No. 4, April 1922, pp. 93-100, pls. 11-12.

Typhlocyba inscripta, new species, pp. 99-100, pl. 12, figs. 3a, b, c = *Eupteryx stellulata* Burmeister.

VAN DUZEE, E. P.

Notes on Jamaican Hemiptera, A Report on a Collection of Hemiptera made on the Island of Jamaica in the Spring of 1906, Bull. Buffalo Soc. Nat. Sci., vol. 8, No. 5, 1907, 79 pp.

Typhlocyba pseudo-maculata Baker recorded from Rock Fort, Jamaica, p. 77.

WALSII, BENJAMIN D.

Fire-blight. Two new foes of the apple and pear, The Prairie Farmer, vol. 10, no. 10, September 6, 1862, pp. 148-149.

Typhlocyba aurea, new species, p. 149 [Rock Island, Illinois], *Typhlocyba pallidula*, p. 149 [Southern Illinois], and *Typhlocyba binotata*, p. 149 [Rock Island, Illinois] are forms of the genus *Alcra* Fieber. *Empoa albicans*, new species [Illinois?], p. 149 is a *Typhlocyba* but unidentifiable. *Erythroncra australis*, new species, p. 149 [Rock Island, Ill.] is referred to the genus *Typhlocyba* by Van Duzee, but like the preceding species is unrecognizable in the absence of a type specimen.

EXPLANATION OF PLATES

PLATE 1

Tegmina of *Typhlocyba*

- FIG. 1. *T. piscator*.
 2. *T. gillettei*, var. *fitchii*.
 3. *T. gillettei*, var. *fitchii*.
 4. *T. gillettei*, var. *apicata*.
 5. *T. gillettei*, var. *apicata*.
 6. *T. gillettei*, var. *gillettei*.
 7. *T. gillettei*, var. *gillettei*.
 8. *T. gillettei*, var. *gillettei*.
 9. *T. gillettei*, var. *gillettei*.
 10. *T. appendiculata*.

Figures on this plate by J. R. Malloch.

PLATE 2

Male genitalia of *Typhlocyba*

- FIG. 11. *T. ulmi*, outer clasper.
 12. *T. ulmi*, inner clasper.
 13. *T. ulmi*, connective and aedeagus from above.
 14. *T. ulmi*, apex of aedeagus from behind.
 15. *T. ulmi*, connective and aedeagus from side.
 16. *T. tenerrima*, aedeagus from above.
 17. *T. tenerrima*, aedeagus from side.
 18. *T. unca*, aedeagus from above.
 19. *T. unca*, apex of aedeagus from behind.
 20. *T. unca*, aedeagus from side.
 21. *T. piscator*, aedeagus from above.
 22. *T. piscator*, aedeagus from side.
 23. *T. persephone*, aedeagus from above; apex from side.
 24. *T. euphrante*, hind margin of ninth segment.
 25. *T. commissuralis*, hypopygium from side.
 26. *T. commissuralis* aedeagus from above.
 27. *T. commissuralis*, inner clasper.
 28. *T. commissuralis*, aedeagus from side.
 29. *T. euphrante*, aedeagus from side.
 30. *T. euphrante*, apex of aedeagus from above.
 31. *T. rosae*, aedeagus from side.
 32. *T. rosae*, hind margin of ninth segment.
 33. *T. rosae*, apex of aedeagus from above.
 34. *T. xanthippe*, aedeagus from side, its apex from above, and upper posterior angle of ninth segment.
 35. *T. ariadne*, hind margin of ninth segment.
 36. *T. ariadne*, aedeagus from side and its apex from above.
 37. *T. lethierryi*, aedeagus from side, and its apex from above.

Figures on this plate by the author.

PLATE 3

Male genitalia of *Typhlocyba*

- FIG. 38. *T. duplicata*, aedeagus from above.
 39. *T. duplicata*, apex of outer clasper from below.
 40. *T. flavomarginata*, hypopygium from side.
 41. *T. flavomarginata*, connective, aedeagus, and inner clasper from above.
 42. *T. flavomarginata*, connective and aedeagus from side.
 43. *T. tunicarubra*, aedeagus from above.
 44. *T. tunicarubra*, aedeagus from side.
 45. *T. lancifer*, aedeagus from above.
 46. *T. lancifer*, aedeagus from side.
 47. *T. niobe*, aedeagus from above, apex of one ramus of aedeagus from side.
 48. *T. rubriocellata*, hind margin of ninth segment, and outer and inner claspers from side.
 49. *T. rubriocellata*, aedeagus from above.
 50. *T. rubriocellata*, aedeagus from side.
 51. *T. cymba*, aedeagus from above, and inner clasper.
 52. *T. cymba*, aedeagus from side.
 53. *T. cymba*, hypopygium from side.
- Figures on this plate by the author.

PLATE 4

Male genitalia of *Typhlocyba*

- FIG. 54. *T. gillettei*, outer claspers from below.
 55. *T. gillettei*, hind margin of ninth segment.
 56. *T. gillettei*, connective, aedeagus, and outer and inner claspers from above.
 57. *T. gillettei*, apex of aedeagus from behind.
 58. *T. gillettei*, connective and aedeagus from side.
 59. *T. pomaria*, hypopygium from side.
 60. *T. pomaria*, inner clasper.
 61. *T. pomaria*, connective and aedeagus from above.
 62. *T. pomaria*, connective and aedeagus from side.
 63. *T. athene*, hind margin of ninth segment.
 64. *T. athene*, aedeagus from above.
 65. *T. athene*, aedeagus from side.
 66. *T. arsinoe*, aedeagus from above.
 67. *T. andromache*, aedeagus from above.
 68. *T. melite*, aedeagus from above.
 69. *T. melite*, aedeagus from side.
 70. *T. melite*, hind margin of ninth segment.
 71. *T. nitidula*, aedeagus from side.
 72. *T. nitidula*, aedeagus from behind.
 73. *T. modesta*, hind margin of ninth segment.
 74. *T. modesta*, connective and aedeagus from side.
 75. *T. modesta*, apex of aedeagus from behind.
- Figures on this plate by the author.

PLATE 5

Male Genitalia of *Typhlocyba*

- FIG. 76. *T. antigone*, hind margin of ninth segment.
 77. *T. antigone*, aedeagus from above.
 78. *T. antigone*, aedeagus from side.
 79. *T. nicarcte*, aedeagus from above.
 80. *T. nicarcte*, aedeagus from side.
 81. *T. clymene*, one ramus of aedeagus from above.
 82. *T. clymene*, aedeagus from side.
 83. *T. danae*, inner side of upper posterior angle of ninth segment as viewed from above.
 84. *T. danae*, aedeagus from above (one ramus omitted).
 85. *T. curydice*, aedeagus from above.
 86. *T. curydice*, aedeagus from side.
 87. *T. curydice*, hind margin of ninth segment.
 88. *T. berenice*, aedeagus from above.
 89. *T. berenice*, aedeagus from side.
 90. *T. hermione*, connective and aedeagus from above.
 91. *T. berenice*, hind margin of ninth segment.
 92. *T. hermione*, upper posterior angle of ninth segment as seen from below.
 93. *T. hermione*, hypopygium from side.
 94. *T. hermione*, connective and aedeagus from side.
 95. *T. appendiculata*, hind margin of ninth segment.
 96. *T. appendiculata*, outer clasper from below.
 97. *T. appendiculata*, outer clasper from side.
 98. *T. appendiculata*, inner clasper.
 99. *T. appendiculata*, aedeagus from above (one apical process omitted).

Figures on this plate by the author.

PLATE 6

Female Genitalia of *Typhlocyba*

- FIG. 100. *T. commissuralis*, half of eighth sternite.
 101. *T. gillettei*, half of eighth sternite.
 102. *T. cymba*, half of eighth sternite.
 103. *T. pomaria*, half of eighth sternite.
 104. *T. ariadne*, half of eighth sternite.
 105. *T. ulmi*, half of eighth sternite.
 106. *T. modesta*, half of eighth sternite.
 107. *T. rubriocellata*, half of eighth sternite.
 108. *T. flavomarginata*, half of eighth sternite.
 109. *T. euphrante*, half of eighth sternite.
 110. *T. gillettei*, hypopygium from side, showing position of aedeagus in copulation.

Figures on this plate by the author.

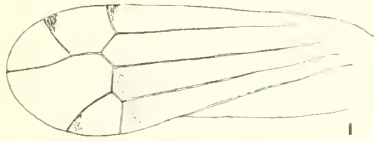


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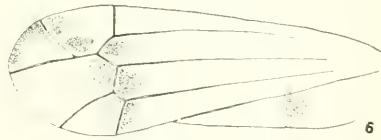
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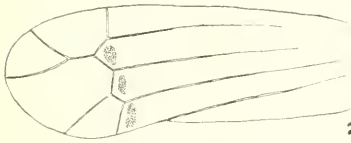




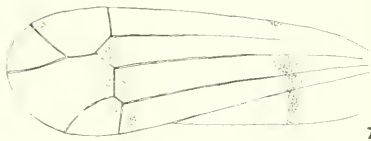
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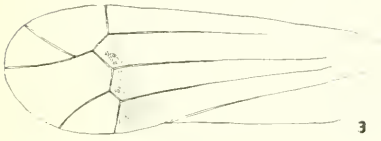
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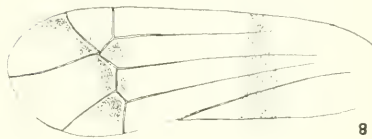
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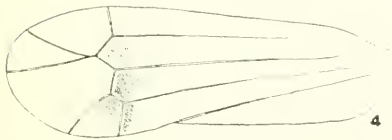
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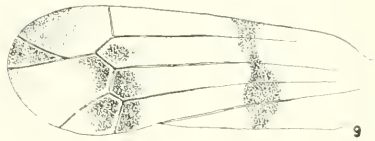
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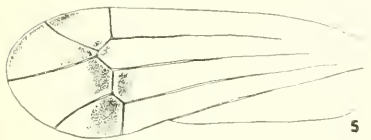
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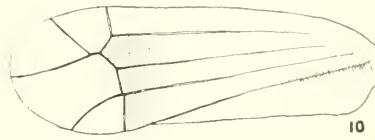
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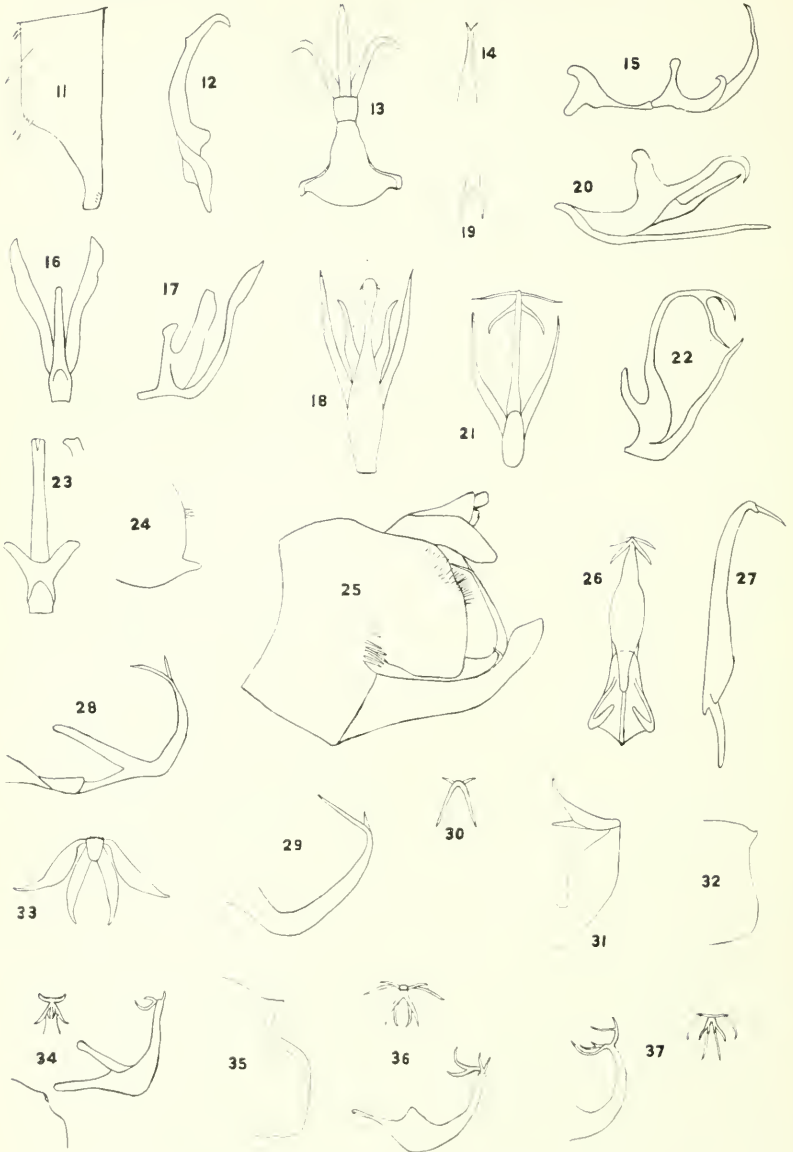
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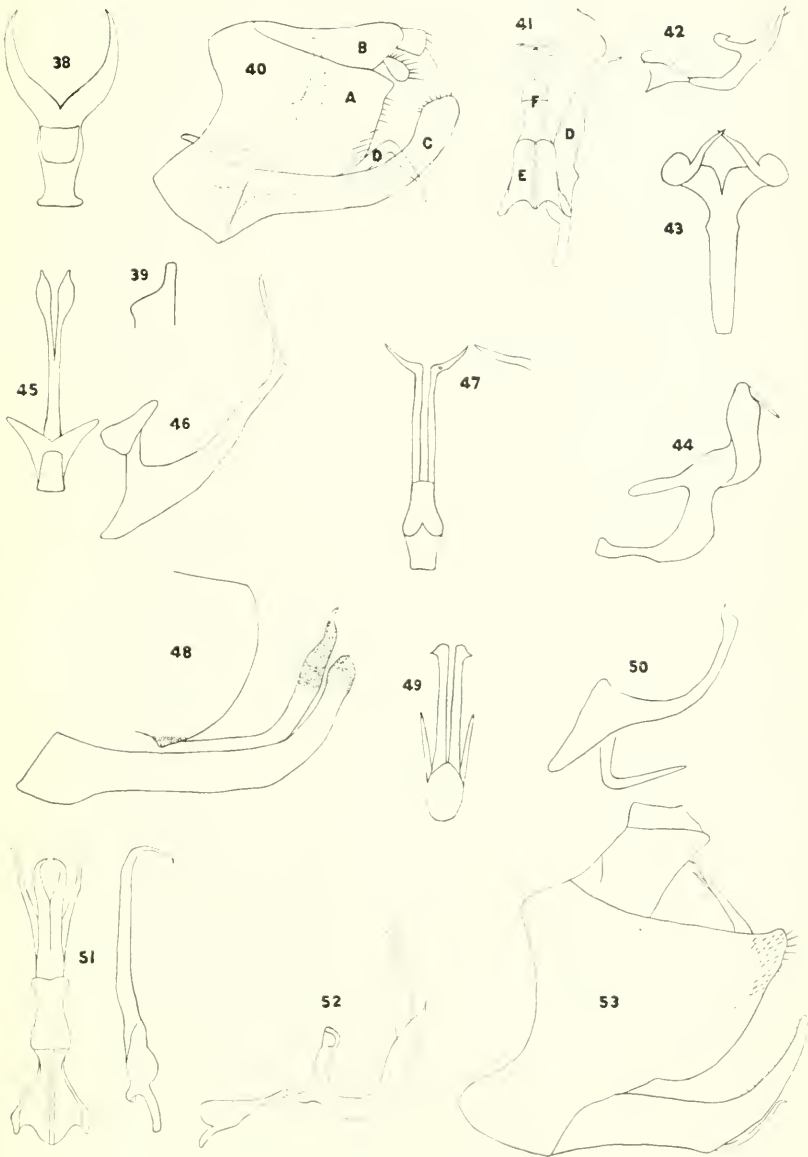
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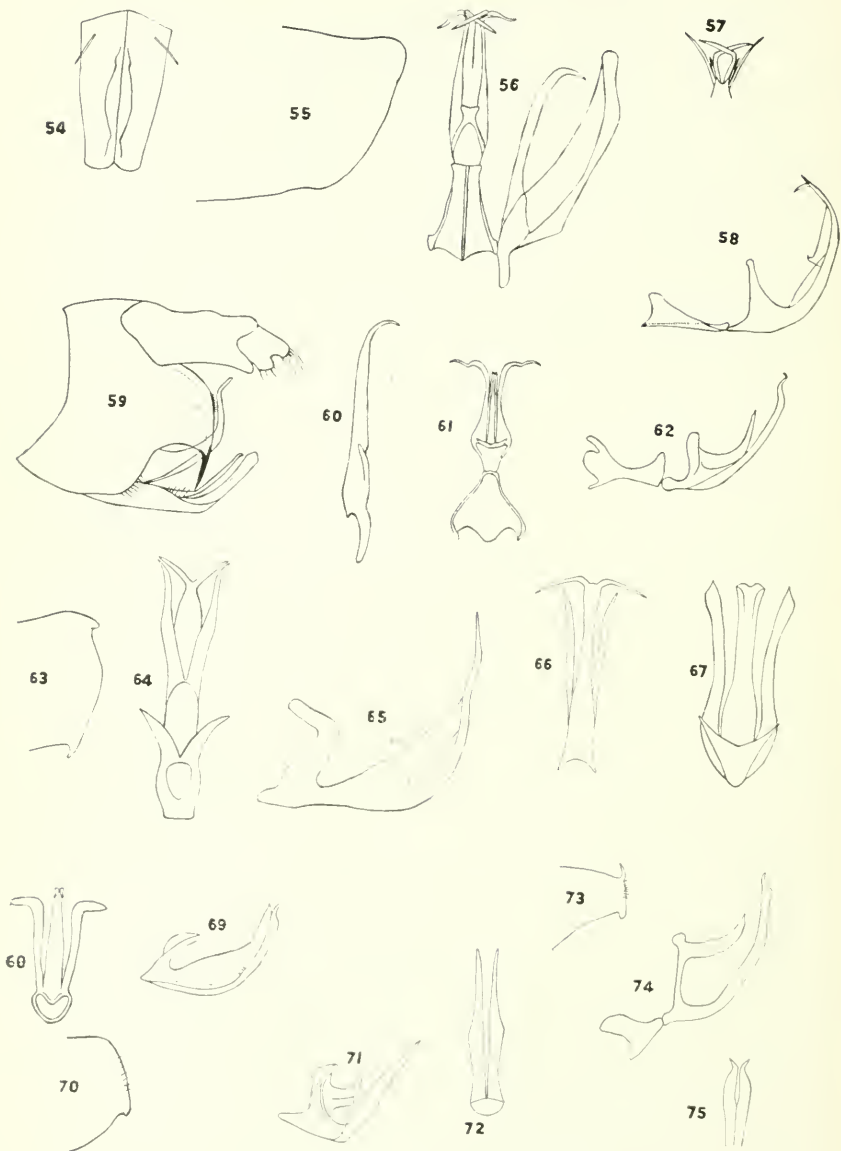
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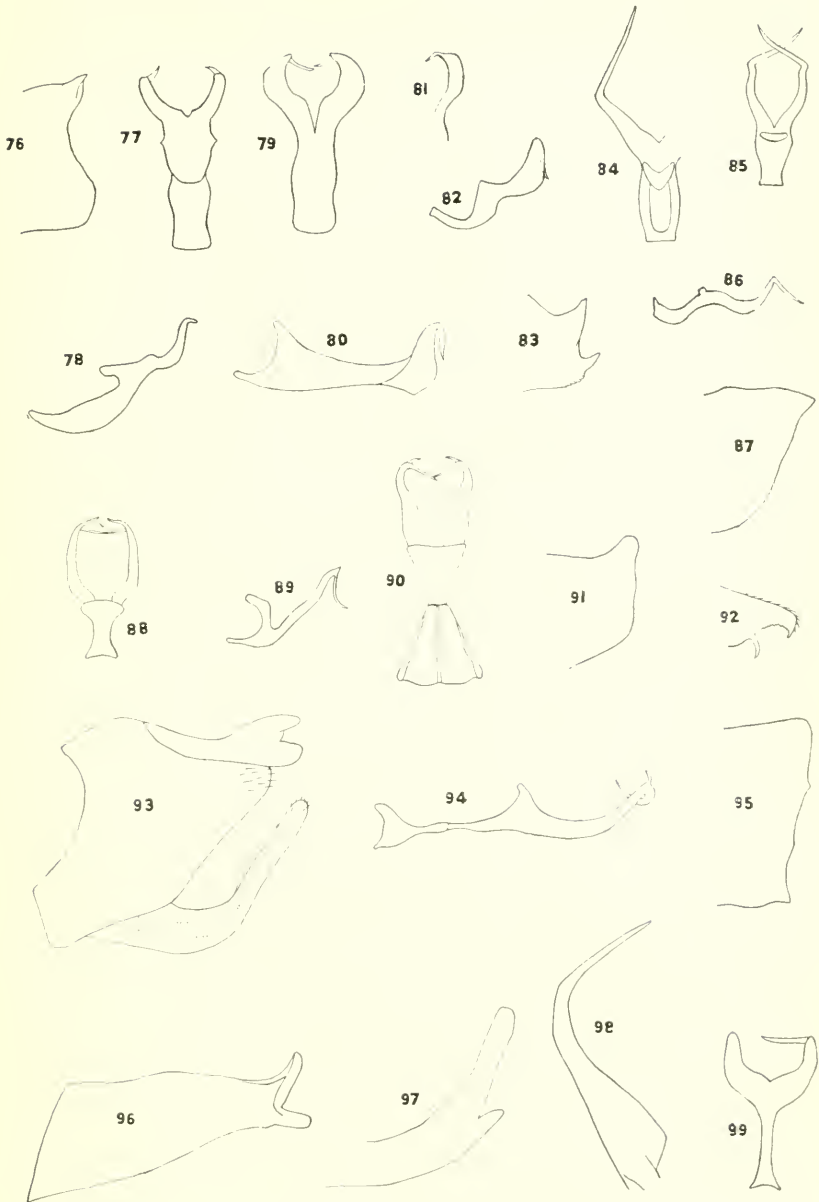
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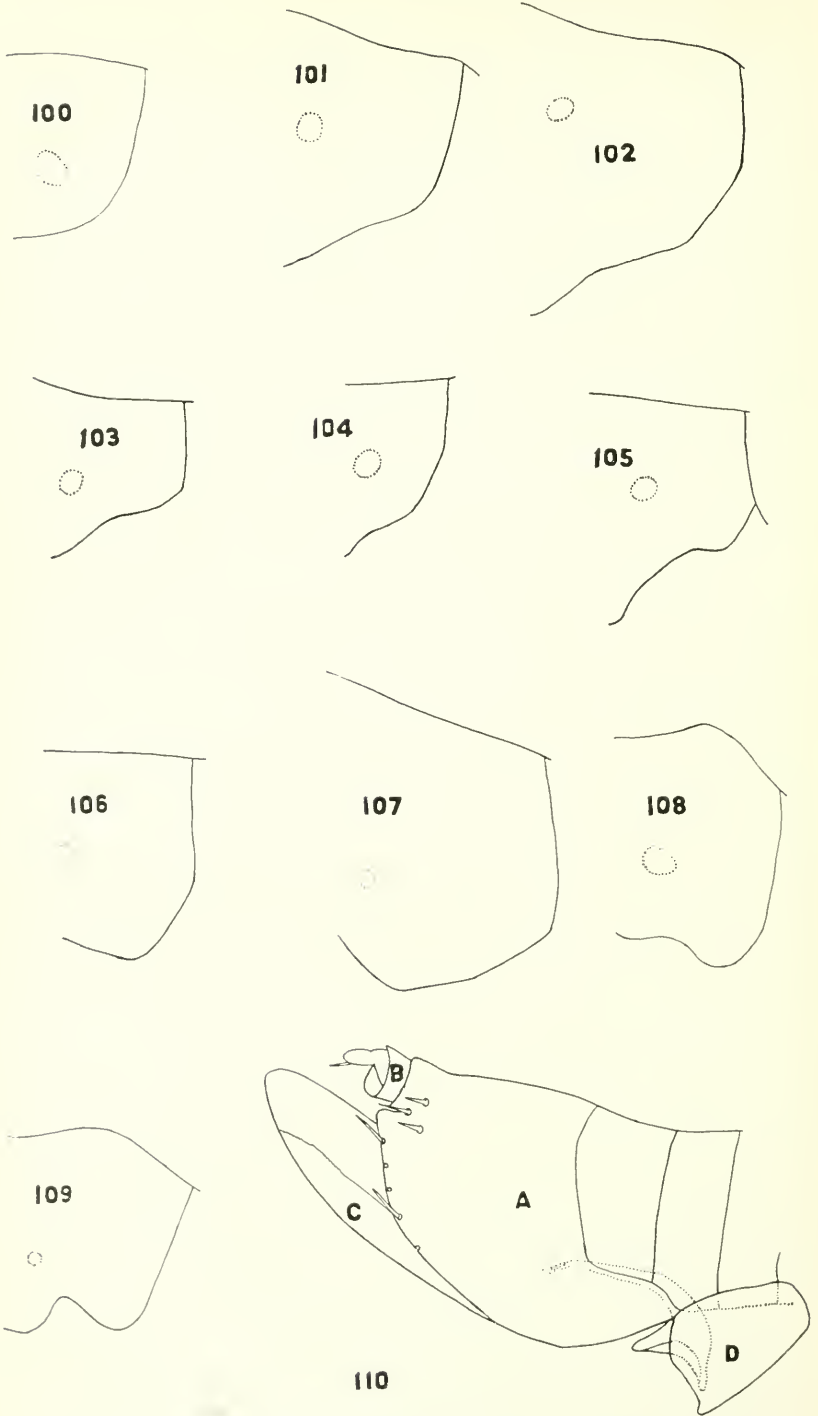
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