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## OHIO BIOLOGICAL SURVEY

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### LEAFHOPPERS OF OHIO Subfamily Typhlocybinae (Homoptera: Cicadellidae)

*By* DOROTHY M. JOHNSON  
*The Ohio State University*

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# OHIO BIOLOGICAL SURVEY

HERBERT OSBORN, Director

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COLUMBUS OHIO



# LEAFHOPPERS OF OHIO

## SUBFAMILY TYPHLOCYBINAE

(Homoptera: Cicadellidae)

DOROTHY M. JOHNSON

### INTRODUCTION

From the Fall of 1932 until the present time a field and laboratory study of the leafhoppers of Ohio, especially of the subfamily Typhlocybinae, has been made. Specimens from other parts of the United States, especially from the middle western and southern states, have been examined for the sake of comparison, but the material presented here is all from Ohio.

### SOURCES OF MATERIAL AND ACKNOWLEDGMENTS

Work on the subfamily Typhlocybinae was begun as a project of the Ohio Biological Survey under the direction of Professor Herbert Osborn. The Obliqua Group of the genus *Erythroneura* was selected for special study and presented as a dissertation under the supervision of Professor D. M. DeLong, who has given many helpful suggestions.

Literature has been contributed by A. J. Ackerman, R. H. Beamer, D. M. DeLong, C. P. Gillette, W. L. McAtee, H. Osborn, and W. Robinson. Dr. Beamer very kindly identified some material from Nebraska which has been available in this work. E. P. Breakey and C. C. B. Mayer did much of the collecting of the Survey material. J. S. Caldwell has made an extensive collection, especially of hibernating forms. Dr. Osborn's collection served as a basis for this work.

I am particularly indebted to Dr. Mary Auten, who has done a great deal of collecting and has accompanied me on many trips. She has given valuable assistance in preparing mounts and labeling figures.

### TECHNIQUE

Collecting was done chiefly by sweeping. Use of black nets as suggested by Professor DeLong was of some assistance in picking out the pale species readily. For hibernating forms leaves were sifted. Into especially thorny trees and bushes finely divided cy-

anide dust was sprayed and insects collected from a sheet placed below. This method could be used to best advantage on still, humid days.

Preparations of inner male genitalia were made as described by Professor DeLong (1931) for *Empoasca* and the majority placed in glycerine in small corked vials. In some cases the styles and oedagus were dissected out and mounted on glass slides in diaphane. From these mounts most of the drawings of genitalia were made with the aid of a projection microscope. Ventral views of the tip of the oedagus were taken from the glycerine mounts and a camera lucida was used.

Some study of the ovipositors was made from mounts prepared by Dr. Auten according to the technique described by W. V. Balduf (1934). The dentation of the large median valvula seems to be of some diagnostic value. It is possible that with further study the characteristics of the ovipositor may facilitate the recognition of species.

Figures were drawn to the same scale, which permits comparison. The dorsal views were made with the aid of a camera lucida. The figures of the genitalia are reduced twice, the dorsal views three times.

### BIBLIOGRAPHY

The original reference, and in some cases a brief synonymy, is given with each species. A bibliography for the genus *Erythroneura* is included at the end. Only work done since 1917 and not included in Van Duzee's Catalogue of Hemiptera is given.

The localities in which collecting was done are arranged from east to west and from north to south in the State. If there are more dates than one for the locality, they are arranged in sequence from the first of the year. The Roman numeral indicates the month.

Collectors names are indicated by initials as follows: Mary Auten, M.A.; E. P. Breakey, E.P.B.; J. S. Caldwell, J.S.C.; D. M. Johnson, D.M.J.; C. C. B. Mayer, C.C.B.M.; and Herbert Osborn, H.O.

Keys are presented for all genera and groups with the exception of the genus *Typhlocyba* and the Maculata Group of *Erythroneura*. Members of the Vulnerata and Obliqua Groups of the *Erythroneura* are dealt with more thoroughly than the others and figures are presented for them.

## Subfamily TYPHLOCYBINAE (Kirschbaum)

Cicad. v. Wiesbd., 16, 1868, Subfamily Typhlocybidae.

The Typhlocybinae are readily separated from all other Cicadellids by the four longitudinal veins or sectors of the elytra which run to the crossveins, forming the apical cells without branching, so there are no anteapical cells. There are no supernumerary cells in the posterior wings.

## KEY TO THE GENERA OF TYPHLOCYBINAE

- |        |   |                     |
|--------|---|---------------------|
| 1.     | Sectors of posterior wings ending in marginal vein.....                   | 2                   |
| 1'.    | Sectors of wings not ending in marginal vein.....                         | 4                   |
| 2(1).  | Elytra with appendix.....   | <i>Alebra</i>       |
| 2'.    | Elytra without appendix.....  | 3                   |
| 3(2'). | Two apical cells in posterior wing.....                                   | <i>Dikraneura</i>   |
| 3'.    | One apical cell in posterior wing.....                                    | <i>Empoasca</i>     |
| 4(2'). | All four sectors extending to wing margin.....                            | <i>Eupteryx</i>     |
| 4'.    | Sectors 1 and 2 uniting; three veins extending to apical margin....       | 5                   |
| 5(4'). | Second apical cell triangular or pedunculate.....                         | <i>Typhlocyba</i>   |
| 5'.    | Second apical cell not triangular or pedunculate.....                     | 6                   |
| 6(5'). | Scutellum thickened and elevated at tip; elytra with red maculae<br>..... | <i>Hymetta</i>      |
| 6'.    | Scutellum of ordinary form.....   | <i>Erythroneura</i> |

Genus *Alebra* Fieber

Kat. Europ. Cicad. IV, 1872.

Appendix prolonged around apex of elytron; submarginal vein distinctly within margin of hind wings; head broad, vertex short.

*Alebra albostriella* Fallen

Vertex parallel-margined. Pronotum with two, tegmen with three yellow vittae. The species was not taken in Ohio although four varieties are recorded. McAtee says "not so common in this country as varieties *agresta* and *fulveola*."

KEY TO VARIETIES OF *ALEBRA ALBOSTRIELLA*

- |       |  |                  |
|-------|--|------------------|
| 1.    | With color markings.....   | 2                |
| 1'.   | Lacking distinct yellow or red markings; apical cells hyaline or slightly fumose ..... | <i>pallidula</i> |
| 2(1). | Color markings covering tegmina.....   | 3                |
| 2'.   | Pronotum with one, tegmen with two yellow vittae, one along each margin .....          | <i>agresta</i>   |
| 3(2). | Tegmen anterior to apical cells yellow to orange; head yellow to orange .....          | <i>fulveola</i>  |
| 3'.   | Tegmen deep smoky.....   | <i>fumida</i>    |

***Alebra albostriella* var. *pallidula* (Walsh)**

*Typhlocyba pallidula* Walsh, *Prairie Farmer*, p. 149, Sept. 6, 1862.

Entirely pale milky white above but for hyaline apical cells. Elytra semihyaline.

Sandusky VII-2-04 H.O.; Columbus VI-22-23 D.M.J. At light; Hancock Co. VII-4-33 D.M.J. *Asimina*; Wauseon VII-10-96 J. S. Hine *Quercus alba*.

***Alebra albostriella* var. *agresta* McAtee**

J. N.Y. Ent. Soc. XXXIV, p. 144, 1926.

Vertex and pronotum washed medianly with golden yellow, elytra with a broad band of same color along each margin anterior to crossveins; apical cells more or less fumose.

Apple Grove VIII-17-15 C.J. Drake; Hocking Co.; Columbus VI-20-19, VI-29-21 H.O.; Worthington, Brown Fruit Farm VIII-21-28 C.C.B.M.; Hancock Co. VII-4-33 D.M.J. *Quercus*, *Asimina*.

***Alebra albostriella* var. *fulveola* (Herrich-Schaeffer)**

*Typhlocyba fulveola* Herrich-Schaeffer, *Faunae Insectorum Germaniae* No. 165, 16, 1839.

Mentioned as occurring in Ohio:

Van Duzee, E.P., *Cat. Hem. N.A.*, p. 699, 1917.

Osborn, H., *Ohio Biol. Surv. Bul.* XIV, p. 342, 1928.

Golden yellow to hyaline; apical cells slightly fumose.

Ashtabula Co. VI-24-31 C.C.B.M.; Sandusky VII-2-04 H.O.; Maycy Trumbell VI-24-31 H.O. Hickory; Hancock Co. VII-4-33 D.M.J. *Asimina*, VI-23-34 M.A. & D.M.J. *Crataegus*; Indian Lake VI-11-34 M.A.; Fulton Co. VI-24-34 D.M.J.; Wauseon VII-10-96 J.S. Hine *Quercus alba*; Clermont Co. VI-6-22 Annette F. Braun.

***Alebra albostriella* var. *fumida* (Gillette)**

*Alebra fumida* Gillette, C. P., *Proc. U.S. Nat. Mus.* XX, pp. 714-15, Figs. 10-12, 1898.

Mentioned as occurring in Ohio:

Osborn, H., *Ohio Biol. Surv. Bul.* XIV, p. 342, 1928.

Yellowish below and dark smoky above; elytra with color deepest on clavus and near tips.

Maycy Trumbell VI-24-31 H.O.; Columbus VII-22, 27-21, VIII-1-28 C.C.B.M., VIII-18-34 M.A.; Hancock Co. V-23-34 H.O. & D.M.J. *Crataegus*.



Genus *Dikraneura* Hardy

Hardy, Trans. Tyneside Nat. Field Club, I, p. 423, 1850.

Widely distributed inhabitants of damp meadows; small, slender, with long, closely folded elytra; usually unicolorous, greenish-yellowish or pale, occasionally ornamented with red. The elytra lack an appendix, and the third apical cell is long and rectangular. Underwings with marginal vein and two closed cells at apex, the first two nervures unite to form the outer boundary of the first apical. Head conical, usually rectangular or even acutely angular in female; in male more rounding.

## KEY TO SPECIES OF DIKRANEURA

- |        |   |                                    |
|--------|---|------------------------------------|
| 1.     | Fourth apical cell long and slender; chiefly unicolorous, sordid species                                  | 2                                  |
| 1'.    | Fourth apical cell short, almost triangular; small whitish highly ornamented species .....                | 6                                  |
| 2(1).  | Broad, unicolorous, sordid milky white.....   | <i>mali</i>                        |
| 2'.    | Slender, greenish or yellowish.....   | 3                                  |
| 3(2'). | Yellowish with apex of head rounded, often orange.....  | <i>feberi</i>                      |
| 3'.    | Greenish or pale.....   | 4                                  |
| 4(3'). | Very slender; female segment concave; male plates with apices attenuate, diverging; length 3-3.25 mm..... | <i>angustata</i>                   |
| 4'.    | Larger, more robust; length 3.75 mm.....  | 5                                  |
| 5(4'). | Greenish marked with red lateral stripes on vertex and pronotum .....                                     | <i>abnormis</i>                    |
| 5'.    | Lacking red markings.....   | <i>abnormis</i> var. <i>urbana</i> |
| 6(1'). | With median longitudinal red vitta on vertex.....   | 7                                  |
| 6'.    | Pale, with red spots and maculae; from <i>Celtis</i> .....  | <i>maculata</i>                    |
| 7(6).  | Apices of elytra with narrow black streaks on sectors near crossveins and on inner crossvein.....         | <i>cruentata</i>                   |
| 7'.    | Apices before and after crossveins distinctly smoky.....  | <i>kansiensis</i>                  |

*Dikraneura mali* (Provancher)

*Erythroneura mali* Provancher, Pet. Faune Ent. Can. III, p. 298, 1890.

*Dikraneura mali*, Ball and DeLong, Ann. Ent. Soc. Am. XVIII, pp. 326-7, Pl. XXI Fig. 1, Pl. XXII Figs. 1, 1a, 1b.

## Recorded for Ohio:

Ball and DeLong (see above reference).

Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 343, 1928.

Broad, uniformly sordid milky white; yellowish on vertex.

Castalia VII-05 H.O.; Columbus IV-29-99 H.O.; Franklin Co. VI-15-34 M.A. &amp; D.M.J.; Oxford W. H. Stehr.

**Dikraneura fieberi (Löw)**

*Notus fieberi* Löw, Then, Kat. Ostr. Cicad. 39, 1886.

*Dikraneura fieberi*, Van Duzee, E. P., Cat. Hem. N.A., p. 701, 1917.

Small, 3 mm. long, narrow, pale yellow with anterior margin of short rather round vertex orange to bright yellow.

Very abundant throughout the State.

Recorded for Ohio:

Ball and DeLong, Ann. Ent. Soc. Am. XVIII, p. 327, 1920.

Osborn, H., Ohio Biol. Surv. Bul. XIV, pp. 343-4, 1928.

**Dikraneura angustata Ball & DeLong**

Ann. Ent. Soc. Am. XVIII, p. 328, Pl. XXI Fig. 4, Pl. XXII Figs. 5, 5a, 5b, 1925.

Very slender, small, 3-3.25 mm. long, with strongly produced and angled vertex; red lines on vertex and pronotum may be present. Last ventral segment of female is concavely rounded and brown on middle; plates of male broad at base with narrow, divergent, upturned apices.

Guernsey Co. V-19-15; Marietta VII-20 H.O.; Knox County VII-2-33 M.A.; Georgesville IX-10-98; Columbus IX-15-03, IX-20-19, X-3-98 H.O.; Magnetic Springs IX-6-14; Hillsboro IX-10-30 F. W. Poos; New Bremen VII-18-27.

**Dikraneura abnormis (Walsh)**

*Chloroneura abnormis* Walsh, Prairie Farmer, Sept. 6, 1862; reprint Boston Soc. Nat. Hist., p. 316, 1864.

Recorded for Ohio:

Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 343, 1928.

Slender, pale green, pale yellowish anteriorly with pair of lateral red stripes on vertex and pronotum. Female, last ventral segment produced, faintly notched medianly; male plates broad at base, narrowing to blunt, rather thick apices.

Columbus IX-20-19 H.O., VIII-27-31 E.P.B. *Carpinus*.

**Dikraneura abnormis var. urbana Ball & DeLong**

Ann. Ent. Soc. Am. XVIII, p. 329, 1925.

This is the more common form and lacks red markings. Specimens of *angustata* were included with *abnormis* in Dr. Osborn's records.

Akron, H.O.; Little Mt., Lake Co. IX-18-29 C.C.B.M.; Marietta VII-20-21; Wooster IX-13-10 H.O.

**Dikraneura cruentata** Gillette

Proc. U. S. Nat. Mus. XX, p. 717, 1898.

Pale yellowish white with red markings as follows: median vitta on vertex, parallel lateral lines on pronotum, scutellum all red; elytra, dash on clavus and longer one on corium extending from middle almost to crossveins; smoky thin streaks on two outer sectors before crossveins and inner crossvein.

Taken commonly hibernating as adults along with *Erythro-neura*.

McConnellsville VI-24-27; Hocking Co. IX-17-33 D.M.J.; Buckeye Lake V-18-33 M.A.; Columbus IV-29-33 M.A. & D.M.J. *Aesculus*, X-20-22; Adams Co. IX-1-31 E.P.B. *Malus*.

**Dikraneura kansiensis** Lawson

Can. Ent. LXII, pp. 38-9, Pl. IV Fig. 7, Pl. V Figs 7, 7a, 7b, 1930.

Allied to *cruentata* but elytra with red markings broader and distinctly dusky apices. Median line on vertex, two lateral broad streaks on pronotum and scutellum red.

Athens IX-12-05 H.O.; Hocking Co. IX-17-33 D.M.J. on Jewell weed.

**Dikraneura maculata** Gillette

Proc. U. S. Nat. Mus., XX 716-17, 1898.

*Dikraneura celtidis* Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 344, 1928.

Slender, minute, pale yellow spotted with bright red and posteriorly with darker red maculae. Transverse sinuate line on middle of pronotum and lateral curved lines before middle on vertex bordering pale round spots and meeting at mid-base.

Lawson, P.B., Can. Ent. LXII, p. 42, 1930, claims that *D. celtidis* Osborn is a synonym of *maculata*. Dr. Osborn's type material agrees with the description and figures of *maculata* as represented by Ball and DeLong, (Ann. Ent. Soc. Am. XVIII, pp. 333-4, Pl. XXI Fig. 8, Pl. XXIII Figs. 16, 16a, 1925).

A rather common form on *Celtis occidentalis*. Taken from this host in Columbus VIII-20-27 H.O., VIII-10-33 M.A. & D.M.J.; Ashland Co. VIII-14-34 M.A. & D.M.J.

**Genus Empoasca** Walsh

Bost. Soc. Nat. Hist. Proc. IX, p. 315, 1864.

No appendix in first pair of wings; one apical cell in posterior wing closed by submarginal vein. Fragile species usually some shade of green with faint or variable markings.

The following list of species known to occur in Ohio has been furnished by Professor D. M. DeLong.

*pergandei* Gillette.  
*maligna* (Walsh): Neotype—Delaware VII-29-26 Apple.  
*atrolabes* Gillette.  
*unica* (Provancher).  
*obtusa* Walsh: Neotype—Mitiwanga VIII-15-27 Willow.  
*patula* DeLong.  
*smaragdula* (Fallén).  
*trifasciata* Gillette.  
*osborni* Hartzell: Types—Marietta IX-1905.  
*alboneura* Gillette.  
*coccinea* (Fitch).  
*recurvata* DeLong.  
*bifurcata* DeLong.  
*birdii* Goding: Columbus, Trinway, Wooster.  
*fabae* (Harris).  
*erigeron* DeLong: Columbus.  
*junipera* DeLong.  
*radiata* Gillette.  
*infusca* DeLong: Types—Columbus, Canal Winchester, Carroll, Worthington, April and May 1931 and 1932, P. Oman, E. P. Breakey, D. M. DeLong, from Buckeye.  
*bicornia* DeLong & Caldwell: Types—Cedar Swamp IV-17, 24-34; Hocking Co. IV-28-34 J.S.C.  
*spira* DeLong & Caldwell: Types—Old Man's Cave, Hocking Co. IV-15-34, J.S.C.  
*hama* DeLong & Caldwell: Types—Cedar Swamp IV-24-34 J.S.C.; Chesapeake IV-8, 29-34 J.S.C.; Hocking Co. VI-7, VII-20-34 J.S.C.  
*lata* DeLong & Caldwell: Types—Chesapeake IV-8, 29-34 J.S.C.; Hocking Co. IV-15-34 J.S.C.  
*recta* DeLong & Caldwell: Types—Old Man's Cave, Hocking Co. IV-28-34 J.S.C.  
*ditata* DeLong & Caldwell: Types—Cedar Swamp IV-17, 24-34 J.S.C.  
*vergena* DeLong & Caldwell: Types—Cedar Swamp IV-17, 24, 28-34 J.S.C.  
*distracta* DeLong & Caldwell: Types—Attica V-4-34 J.S.C.  
*pyramidata* DeLong & Caldwell: Types—Cedar Swamp IV-24-34 J.S.C.  
*convergens* DeLong & Davidson: Types—Cedar Swamp IV-17-34 J.S.C.  
*constricta* DeLong & Davidson: Types—Columbus IX-15-98, IV-4-99.  
*venusta* DeLong & Davidson: Types—Hocking Co. IX, X-33 D.M.J.  
*torqua* DeLong & Davidson: Paratypes—Champaign Co. IV-34 J.S.C.

#### Genus *Typhlocyba* Germar

Silb. Revue Ent. I, p. 18, 1833.

The second apical cell is more or less stalked; two apical cells in wings. For the most part whitish to yellowish forms, some with more or less extensive dark markings. Inhabitants of deciduous trees.

McAtee has dealt rather fully with members of this genus and further information concerning them may be obtained from his paper: Revision of the American Leaf Hoppers of the Jassid Genus *Typhlocyba*, Proc. U.S. Nat. Mus. LXVIII, pp. 1-47, Pls. 1-6, 1926.

*unca* McAtee: Indian Point, Lake Co. IX-19-28 C.C.B.M.; Wooster X-14-96; Columbus VI-22-31 E.P.B. *Carpinus*, IX-18-31 E.P.B. *Carpinus*, X-9-33 D.M.J. *Alnus*; Fulton Co. VI-24-34 H.O. and D.M.J.

*rosae* (Linnaeus): Common on rose throughout State. Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 355, 1928.

*ariadne* McAtee: Columbus IX-9, 12-34 D.M.J. *Acer*.

*duplicata* McAtee: Hancock Co. VI-23-34 H.O. & D.M.J. *Crataegus*; Lucas Co. VI-21-34 D.M.J.

*tunicarubra* Gillette: Wauseon VII-10-96 J. S. Hine; Vinton Co. VI-19, 22-1901. Recorded for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 356, 1928.

*rubriocellata* Malloch: Franklin Co. VII-8-31 E.P.B. *Aesculus*. Reported for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.

*aureotecta* (Sanders and DeLong): Meigs Co. VI-21-27. Recorded for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 356, 1928.

*gillettei* var. *sincera* McAtee: Columbus H.O. On English Hawthorne.

*gillettei* var. *fitchi* McAtee: Jackson Co. Washington Tp. VI-10-33 E. S. Thomas. Recorded for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 354, 1928.

*gillettei* var. *apicata* McAtee: Jackson Co. Washington Tp. VI-10-33 E. S. Thomas; Columbus VI-6-33 M.A.

*gillettei* var. *russeola* McAtee: Pickaway Co. VI-4-34 J.S.C.

*gillettei* var. *casta* McAtee: Jefferson Co. VI-30-27 C.C.B.M.; Jackson Co. Washington Tp. VI-10-33 E. S. Thomas; Columbus III-25-96 J. S. Hine, Under Sycamore bark; Resaca, Madison Co. VIII-27-28 C.C.B.M.; Madison Co. IX-25-31 E.P.B.; Mineral Springs, Adams Co. VI-21-33 E. S. Thomas, At Light; Wauseon VIII-10-96 J. S. Hine, Jarred from *Quercus alba*. Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 354, 1928; Ohio J. Sci. XXXII, p. 515, 1932.

*gillettei* Van Duzee: Ashtabula Co. VI-24-31 E. P. B.; Harrison Co. VI-29-27 C.C.B.M.; Sandusky VII-2-04 H.O.; Buckeye Lake VIII-22-04; Columbus X-1-98 H.O. Sycamore; X-13-33 D.M.J. *Platanus*; Bexley IX-12-28 C.C.B.M. Light; Williams Co. IX-5-31 E.P.B. Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 354, 1928.

*gillettei* var. *venusta* McAtee: Ashtabula Co. VI-24-31 E.P.B.; Williams Co. IX-5-31 E.P.B. Reported as *T. nitidula* (Fabr.), Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.

*gillettei* var. *sellata* McAtee: Ashtabula Co. VI-24-31 E.P.B.

*gillettei* var. *vestita* McAtee: Ashtabula Co. VI-24-31 E.P.B.; Sandusky VII-2-04 H.O. (Described as *melanota* n. sp. by Osborn, H., Ohio Biol. Surv. Bul. XIV, pp. 355-6, 1928.) Columbus VI-33, At Light, D.M.J. Listed as *T. nitidula* var. *norgueti*, Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.

- pomaria** McAtee: Common on apple. Athens IX-12-05 H.O.; Chillicothe VII-1-31 H.O. Apple; Waterville IX-10, 11— H.O.; Fulton Co. VI-24-34 D.M.J.; Hancock Co. VI-23-34 M.A., H.O. & D.M.J. *Crataegus*. Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 355, 1928.
- modesta** Gibson: Ashtabula Co. VI-24-31 E.P.B.; Athens VIII-1-32 W. C. Stehr; Columbus VII-15-33 D.M.J. *Acer*, VII-22-21 H.O. Listed as *T. gillettei* var. *sincera*, Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.
- phryne** McAtee: Columbus VI-20-33 Anthony; Ashtabula Co. VI-24-31 E.P.B. Recorded for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.
- antigone** McAtee: Athens VI-9-32 W. C. Stehr.
- nicarete** McAtee: Marietta VII-10 H.O.; Delaware Co. VI-21-31 E.P.B.; Wauseon VII-10-96 J. S. Hine, Jarred from *Quercus alba*.
- berenice** McAtee: Madison Co. IX-25-31 E.P.B.; Knox Co. VIII-24-31 H.O.; Wayne Co. IX-15-34 D.M.J.
- appendiculata** Malloch: Williams Co. IX-5-31 E.P.B. Reported as *appendicula*, Osborn, H. Ohio J. Sci. XXXII, p. 515, 1932.

### **Eupteryx Curtis**

Ent. Mag. I, p. 192, 1833.

In this genus the wings are without submarginal vein and the four sectors extend to the border in the elytra. The outer apical cell is triangular, the inner angle extending deeply into the apical area.

### **Eupteryx flavoscuta Gillette**

Proc. U. S. Nat. Mus. XX, pp. 749-50, 1898.

Large, 4 mm.: Yellow below, smoky above. Yellow on anterior margin of vertex, posterior disc of pronotum, mid-base and apex of scutellum, broad costal area and more or less of clavus except fuscous base and apex; remainder of dorsum fuscous to black, especially dark at base of elytra. Pygofer hook in male double, the outer part long, delicate and narrow, inner part half as long, and thick.

Little Mt., Lake Co. IX-18-28 C.C.B.M. Fern; Hocking Co. IX-17-33, X-23-32 D.M.J. Fern.

### **Eupteryx nigra Osborn**

Report N. Y. St. Ent. XX, pp. 543-4, 1904, Paratype—Columbus, Ohio. *Eupteryx flavoscuta* var. *nigra*, McAtee, W. L., Ent. News XXX, pp. 185-6, 1919.

*Eupteryx nigra*, Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 352, 1928.

Above black but for yellow anterior margin of vertex and narrow costal border. Length 3.75 mm. Pygofer hook in male single,

heavy, blunt. This fact supports Dr. Osborn's assertion that this is a true species distinct from *flavoscuta*.

Little Mt., Lake Co. IX 18-28 C.C.B.M. Fern; Columbus H.O.

**Eupteryx clavalis McAtee**

*Eupteryx flavoscuta* var. *clavalis* McAtee, W. L., Ent. News XXX, p. 185, 1919.

Smaller, 3-3.25 mm. Yellow area more extensive on vertex, pronotum and scutellum; clavus and costal margin broadly yellow, narrow corial strip dusky semihyaline. Pygofer hook double with parts of about equal length.

The smaller size, markings, and pygofer hook seem to warrant raising this to specific rank.

Hocking Co. IX-17-33, X-23-32 D.M.J. Fern.

**Hymetta McAtee**

Proc. Biol. Soc. Wash. XXXII, pp. 121-2, 1919.

Scutellum swollen and elevated apically; elytra more or less ornamented with minute maculae and dark crossbands on opaque whitish background. Fairly common on grape.

KEY TO SPECIES OF HYMETTA

1. Crossband one strongly narrowed on costal margin.....*trifasciata*
- 1'. Crossband one slightly narrowed on costal margin..... 2
- 2(1'). Posterior margin of crossband one almost transverse, not extending caudad of black spot on corium; other dark bands very faint or wanting .....*distincta*
- 2'. Posterior margin of first crossband projecting slightly caudad or dark spot near claval suture on outer side..... 3
- 3(2'). Maculae bright red and very numerous; crossband red.....*anthisma*
- 3'. With dark crossband or bands..... 4
- 4(3'). Anterior crossband distinct, others obsolete or very faint.....*balteata*
- 4'. Three distinct bands, that on apex of elytron oblique and dusky; maculae dark red.....*balteata* var. *mediana*

**Hymetta trifasciata (Say)**

*Tettigonia trifasciata* Say, J. Acad. Nat. Sci. Phila. IV, pp. 344-5, 1825; Compl. Writ. II, pp. 259-60, 1859,

*Hymetta trifasciata* var. *trifasciata*, McAtee, W. L., Proc. Biol. Soc. Wash. XXXII, p. 123, 1919.

*Hymetta trifasciata*, Fairbairn, V., J. Kans. Ent. Soc. I, p. 87, Pl. I Figs. 5, 8; Pl. II Figs. 3, 3a.

Recorded for Ohio:

Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 352, 1928.

First crossband of elytra strongly narrowed at costal margin; plaque white; distinct band before crossveins; apices with oblique dusky streak from apex of cell  $M_4$  to mid-outer margin of  $R_3$ .

Marietta VI-20-21 H.O.; Pickaway Co. VII-28-34 J.S.C.

#### ***Hymetta balteata* McAtee**

Proc. Biol. Soc. Wash. XXXII, p. 123, 1919.

Fairbairn, V., J. Kans. Ent. Soc. I, 88-9, Pl. I Fig. 2; Pl. II Figs. 1, 1a, 1928.

One dark crossband across base of elytron, black on costa, extending a little caudad on outer side to dark round spot on corium; second crossband obsolete and apical cells subhyaline with faint suggestion of oblique dusky streak.

Athens IX-11, 12-05 H.O.

#### ***Hymetta balteata* var. *mediana* Fairbairn**

J. Kans. Ent. Soc. I, 89; Pl. II Fig. 3, 1928.

First crossband dark red, projecting caudad of black spot on corium; second band distinct, reddish or dusky; oblique band on apical cells distinct, dusky; spots dark red to blackish.

Cedar Point IX-3-33 M.A. *Vitis*; Athens IX-11-05 H.O.; Pickaway Co. VII-28-34 J.S.C.; Columbus III-25-96 J. S. Hine, Taken under Sycamore Bark; Apple Grove VIII-17-15 C. J. Drake; Adams Co. IX-1-31 E.P.B. *Malus*.

#### ***Hymetta anthisma* McAtee**

*Hymetta trifasciata* var. *anthisma* McAtee, W. L., Proc. Biol. Soc. Wash. XXXII, p. 123, 1919.

*Hymetta balteata* var. *anthisma*, Fairbairn, V., J. Kans. Ent. Soc. I, 89, Pl. II, Fig. 4, p. 92, 1928.

*Hymetta anthisma*, Osborn, H., Ohio Biol. Surv. Bul. XIV, pp. 352-3, 1928. (Roosevelt Park, Adams Co., July, 1927, S. A. Watson.)

This is doubtless the form described by McAtee and the elytron figured by Fairbairn, but the inner male genitalia correspond to those figured for *H. distincta* by Fairbairn. Specimens agreeing perfectly with Fairbairn's description and figure of elytron of *distincta* have inner male genitalia corresponding to those figured as *kansasensis* Fairbairn. Therefore, since the latter specimens are regarded as *H. distincta*, *anthisma* is regarded as a species.

A very highly colored form with scarlet maculae; first crossband red, dark-edged; second band scarlet; transverse faint band across apical cells with extension to base of  $M_4$ .

Athens IX-11-20 H.O.; Mineral Springs VIII-31-31 H.O.;



Hocking Co. X-10-31 E.P.B.; Adams Co. IX-1-31 E.P.B. *Carpinus*,  
*Vitis*, *Castanea*.

***Hymetta distincta* Fairbairn**

J. Kans. Ent. Soc. I, pp. 87-8, Pl. I Figs. 2, 2a (*kansasensis*); Pl. II  
Fig. 6, 1928.

Posterior margin of broad, dark crossband one almost straight  
across, not extending caudad to black spot in corium; second cross-  
band obsolete; smoky transverse band across apical cells, oblique  
mark very indistinct.

Athens X-28-32 W.C. Stehr; Pickaway Co. IV-30, VII-9-34  
J.S.C.

**Genus *Erythroneura* Fitch**

*Erythroneura* was established by Fitch (Homoptera N.Y. St.  
Cab., p. 62, 1851) and Van Duzee has placed *tricincta* of the Comes  
Group as logotype. The name refers to the color of portions of the  
elytral nerves in a number of the species, red-nerved. The original  
description follows: "Head crescentiform, about as broad as the  
thorax; vertex rounded down to the front without an angular edge;  
ocelli between the vertex and the front, almost as near each other  
as to the eyes; elytra without closed cells in the disc; apical cells  
four, longish; middle apical nerve simple. Forward of the trans-  
verse nerve the exterior and middle nerves are sometimes obsolete  
. . . . "

Since this description was made the genus *Hymetta* has been  
separated out by McAtee, on the basis of the thickness and apical  
elevation of the scutellum.

The ocelli are inconspicuous if present, and the veins are not  
obsolete toward the base of the elytron but continuous, and may be  
seen when studied under proper light. Aside from these points  
Fitch's description holds.

**BIOLOGIC**

Very little life-history work has been carried out for members  
of this genus. An examination of the literature shows but little  
information with regard to host plants. An effort has been made to  
determine hosts of the summer brood in Ohio.

The great majority, if not all, hibernate in Ohio as adults under  
leaves, bark, etc. The overwintering adults are from the fall brood  
and are generally more brightly colored than are those of the sum-  
mer brood.

With the approach of winter, sometimes early in September,  
*Erythroneura* may be seen swarming in clouds about the trunks of

trees or on houses, especially on screens on the sunny side. At apple-picking time they may swarm in such numbers as to seriously annoy the pickers by getting into eyes, noses and mouths. The moisture of clothes hung on a line to dry seems especially attractive, particularly in dry seasons. During the winter they remain quite inactive but readily resume activity upon removal to a warm place.

The emergence in the spring occurs with the first warm weather. The hoppers swarm to the nearest available trees as they begin to foliate. There seems to be no discrimination as to the location of moisture for the first drink after hibernation, and a great variety of species of all groups of *Erythroneura* may be taken at such points.

As an example of this, the following species of the Obliqua Group (other groups were also represented) were taken from *Aesculus glabra* Willd. on the banks of the Scioto River near Columbus, April 29, 1933: *rubroscuta*, *crevecoeurii*, *harpax*, *brundusa*, *diffisa*, *aenea*, *gleditsia*, *fulvocephala*, *noeva*, *plena*, *obliqua* and *magnacalx*. Associated with the buckeye were hickory, hackberry, elm, linden, walnut, honey locust and locust.

In a thick and relatively pure stand of *Carpinus caroliniana* Walt. at the edge of a grove on a farm in Knox Co. May 8, 1933 were taken: *stolata*, *lawsoniana*, *kanza*, *alternata*, *auteni*, *noeva*, *stylata*, *cruciformis*, *tenuispica*, *eluta*, *modica*, *bicornis*, *obliqua*, *magnacalx*, *rubrotincta* and *fragilis*. Associated here were beech and dogwood. Although it may not be significant, it is interesting that the majority of those from buckeye are dark-bodied forms, while those from the American hornbeam are pale-bodied.

As the season advances and nymphs appear on foliage from the early part of June until September, the leafhoppers seem to be more restricted to certain foods. The following lists indicate host-insect relationships which have been observed:

| <i>Leafhopper sp.</i>                          | <i>Host genus</i>                 | <i>Leafhopper sp.</i>  | <i>Host genus</i>               |
|--|-----------------------------------|------------------------|---------------------------------|
| <i>rubroscuta</i>                              | <i>Aesculus</i>                   | <i>gleditsia</i>       | <i>Gleditsia</i>                |
| <i>crevecoeurii</i>                            | <i>Aesculus</i>                   | <i>fulvocephala</i>    | <i>Aesculus</i> , <i>Ulmus</i>  |
| <i>bitincta</i>                                | <i>Crataegus</i>                  | <i>auteni</i>          | <i>Carpinus</i>                 |
| <i>rufostigmosa</i> and<br>var. <i>subnila</i> | <i>Salix</i>                      | <i>penenoeva</i>       | <i>Carpinus</i>                 |
| <i>lawsoniana</i>                              | <i>Malus</i> , <i>Crataegus</i>   | <i>noeva</i>           | <i>Juglans</i> , <i>Acer</i>    |
| <i>kanza</i>                                   | <i>Salix</i>                      | <i>rubrataeniensis</i> | <i>Cornus</i>                   |
| <i>brundusa</i>                                | <i>Gleditsia</i>                  | <i>apicalis</i>        | <i>Crataegus</i>                |
| <i>diffisa</i>                                 | <i>Gleditsia</i>                  | <i>dowelli</i>         | <i>Malus</i>                    |
| <i>clavata</i>                                 | <i>Gleditsia</i>                  | <i>modica</i>          | <i>Malus</i>                    |
| <i>aenea</i>                                   | <i>Robinia</i> , <i>Gleditsia</i> | <i>magnacalx</i>       | <i>Crataegus</i> , <i>Malus</i> |

On *Malus* are found *lawsoniana*, *dowelli*, *modica* and *magnacalx*; on *Crataegus*, *bitincta*, *crataegi*, *apicalis*, *magnacalx*, *lawsoniana*; on *Aesculus*, *rubroscuta*, *crevecoeursi*, *fulvocephala*; *Gleditsia*, *brundusa*, *diffusa*, *clavata*, *aenea*, *gleditsia*; *Juglans*, *noeva*; *Salix*, *rufostigmosa* and its variety *subnila*, *kanza*; *Ulmus*, *fulvocephala*; *Carpinus*, *auteni*, *penenoeva*; *Acer*, *noeva*; and *Cornus* supports *rubrataeniensis*.

It is on warm humid nights in July and August that occasionally the adults of the first brood swarm to the lights in great numbers. The *Erythroneura* and some other Typhlocybinae are small enough to pass through the interstices of screens and may become quite annoying to anyone sitting near a light. Occasionally a leafhopper will stab the skin with its beak and a very sharp though short-lived pain is felt.

There are generally two broods a year in Ohio. The coloring of the summer brood is much less vivid than that of the winter forms. Fairbairn (1929) has given a complete record of the life history of *E. ziczac* of the Comes Group.

Eggs are laid singly beneath the epidermis on the under side usually near the base of rather mature leaves. Nymphs hatch about a week after deposition of eggs and the young nymphs usually remain rather immotile, feeding near the place of emergence. Nymphs pass through five instars, becoming rather active during the last two. There are usually two broods a year although it is possible that there may be some overlapping and a third brood produced, as young nymphs of *E. aelys* of the Comes Group have been taken in October on *Cercis canadensis*, but they were not abundant.

#### ECONOMIC IMPORTANCE

Accurate estimates as to the damage done by *Erythroneura* of the Obliqua Group cannot be made here. Generally they do not occur in such abundance as do those of the Comes and Maculata Groups.

Two species of some importance in apple orchards are *E. lawsoniana* and *E. dowelli*. They are present through the year in orchards and must, during the growing season, draw considerable sap from the trees. Also, the dark excreta dropping on the maturing fruit may be in sufficient quantity to spoil its appearance. The discomfort suffered by apple pickers has already been mentioned, as well as that caused when hoppers swarm to lights.

It might be expected that the apple species would be found on *Crataegus* species, but although occasional specimens of *lawsoniana*

have been taken, *Crataegus* seems to support an entirely different leafhopper fauna, and the species peculiar to that genus have not been taken on apple. *Crataegus* suffers heavily from its leafhopper population.

It is possible that some of these leafhoppers may be vectors of disease, either externally or internally. Some members of the closely related *Empoasca* have been shown to carry virus diseases.

#### NATURAL ENEMIES

No very extensive observations have been made with regard to natural enemies. Remains of *Erythroneura* are often found in spider webs. *Nabis fesus* has been observed with an *Erythroneura* impaled upon its beak.

Occasionally but by no means frequently specimens are taken with dryinid sacs on the abdomen. Fenton (1918) mentions in some detail the habits and life history of *Aphelopus comesi* Fenton on *E. comes*. According to Fenton, only the Hymenopterous parasites of the genus *Aphelopus*, Subfamily Anteoninae (Dryinidae), Family Bethyridae, superfamily Proctotruipoidea, are parasitic upon *Erythroneura* or upon members of the subfamily Typhlocybinae. *Aphelopus* is considered by Fenton "the most primitive and generalized of the Dryinid genera." A species is mentioned as taken upon *E. obliqua*, Marietta, Ohio. Figures of *E. comes* parasitized by *A. comesi* appear. As high as 80 per cent of *E. comes* in a vineyard in Columbus, October, 1917, was parasitized by this species according to Fenton.

The development of the genitalia in both sexes of leafhoppers seems to be arrested or disturbed by the parasites. This makes specific recognition in some species practically impossible. Fenton apparently did not observe modification of the internal genitalia by the parasites.

#### GENERAL DISTRIBUTION

Because of the paucity of work done on the genus, but little is known of the general distribution of these leafhoppers. They seem to reach maximum abundance in the hardwood regions of the north temperate zone and may be abundant as far south as Mexico. Few have been noted from the tropics.

#### KEY TO THE GROUPS OF ERYTHRONEURA

McAtee (1920) separated the genus into groups on the basis of wing venation. This classification was later followed by Robinson (1926) and a modification of his key is here presented.

- |        |  |                   |
|--------|--|-------------------|
| 1.     | M-Cu crossvein present.....  | 2                 |
| 1'.    | Media 3 + 4 forming continuous line; M-Cu crossvein absent.....  | 4                 |
| 2(1).  | Base of cell M <sub>4</sub> curved, extending obliquely to apex of clavus  |                   |
|        | .....Obliqua Group   |                   |
| 2'.    | Base of cell M <sub>4</sub> angulate.....  | 3                 |
| 3(2'). | Dark species with median light vitta on vertex, pronotum and scutellum.....  |                   |
|        | .....Vulnerata Group   |                   |
| 3'.    | Light background; medium pale vitta lacking.....   | Scutelleris Group |
| 4(1'). | Base of cell M <sub>4</sub> oblique; a dark spot near suture at base.  | Maculata Group    |
| 4'.    | Base of M <sub>4</sub> square, at right angles to margin; dark spot in base of M <sub>4</sub> and apex of R <sub>3</sub> ..... | Comes Group       |

#### OBLIQUA GROUP

The Obliqua Group is defined by McAtee and later by Robinson. It is characterized by the base of the broad cell M<sub>4</sub> which consists of a smooth, slightly curved line formed by the union of part of the cubitus and the M-Cu crossvein and joins the radial margin at an acute angle. In some species there is a slight angle at the juncture of these veins but these may be readily separated from members of the Vulnerata Group by their general fascies, lighter coloring, vittae and inner male genitalia. The vertex is marked with an inverted V-shaped vitta, the elytra are usually marked with two pair of oblique vittae parallel with the claval vein. Pygofer hooks are characteristic for the group but are not of diagnostic value in determining species. They are short, thick and bluntly pointed apically, bearing some resemblance to a bird-head. The foot of the style and the oedagus with its appendages are of value in specific determinations. For these parts Beamer's nomenclature has been followed. In the illustrations presented the style is always at the right of the oedagus.

Prior to this study seventy species of the Obliqua Group had been described from North America. Of these, seven were recorded for Ohio. Descriptions and figures are presented here of fifty-eight species and one variety taken in the State, of which forty-two have been described and eighteen appear to be new. The inner male genitalia of *E. dowelli* Beamer are figured for the first time.

Distribution of color is the basis for the first half of the key and is applied to those forms which have at least some dark color on the body. Inner male genitalia are the basis of classification for the pale-bodied forms.

The base of the foot is measured from the tip of the heel to the outer margin at the juncture of the anterior and posterior points; the posterior point is measured on mid-line from juncture with anterior point to tip.

## KEY TO SPECIES OF THE OBLIQUA GROUP OF THE GENUS ERYTHRONEURA

1. White; scutellum, pronotum and narrow band across middle of elytra scarlet red.....*rubroscuta*
- 1'. Without scarlet crossband..... 2
- 2(1'). At least some dark coloring on body..... 3
- 2'. Body pale, sometimes tinged with scarlet or orange..... 31
- 3(2). Elytral pattern confined chiefly to oblique vittae parallel to claval veins ..... 17
- 3'. Elytral pattern transverse or covering most of elytra; oblique vittae may be present..... 4
- 4(3'). Basal two-thirds of elytra deep russet, red-tinged toward costa .....*crevecœuri*
- 4'. Coloring extending at least to crossveins..... 5
- 5(4'). One or more pale spots on median line..... 6
- 5'. No definite pale spots..... 9
- 6(5). One round pale spot..... 7
- 6'. Two pale spots..... 8
- 7(6). Spot large, definite, extending from tip of scutellum to apex of clavus.....*bitincta*
- 7'. Spot small, confined to posterior half of clavus and adjacent corium; two inner apical cells subhyaline.....*crataegi*
- 8(6'). Spots very definite; two inner apical cells hyaline.....*electa*
- 8'. Spots indefinite; apical cells smoky semihyaline.....*fumida*
- 9(5'). With dark median dorsal stripe extending from vertex over elytra.. 10
- 9'. Dark color covering elytra, not a stripe..... 15
- 10(9). Stripe entirely black or brownish black..... 11
- 10'. Stripe consisting of vittae run together or connected by black or red medianly ..... 12
- 11(10). Large, 3 mm.; stripe broad; face, clypeus and venter dark .....*atrimucronata*
- 11'. Smaller, 2.75 mm.; stripe narrow; venter entirely pale cream white, dorsum dusky.....*stolata*
- 12(10'). Stripe yellow on vertex, orange yellow on elytra, filled with darker color interiorly; inverted V of vertex broadly touching eyes.....*penelutea*
- 12'. Inverted V not touching eyes except at base..... 13
- 13(12'). Stripe starting on vertex as golden yellow triangle, fuscous interiorly .....*rufostigmata*
- 13'. Stripe dark red or scarlet..... 14
- 14(13'). Stripe broad, scarlet red, somewhat fumose toward elytral suture .....*lawsoniana*
- 14'. Stripe dark red, black interiorly.....*rufostigmata* var. *submila*
- 15(9'). Vertex and pronotum with distinct vittae; gray clover-shaped median area on vertex.....*harpax*
- 15'. Vittae of vertex and pronotum obscure or lacking..... 16
- 16(15'). Small, 2.75 mm.; vittae obscure, maroon on slate gray background .....*kanza*
- 16'. Large, 3.5 mm.; morocco red, elytra evenly colored throughout .....*brundusa*
- 17(3). Dorsum chiefly dark, visible through semihyaline elytra; inverted V of vertex with sides extended toward eyes..... 18

- 17'. Dorsum only partially dark, or inverted V of vertex broad and even-sided ..... 27
- 18(17). Large species with broad vittae; elytra with apices smoky ..... 19
- 18'. Apices of elytra almost hyaline; length 3.25 mm. .... *diffusa*
- 19(18). Apical third of elytra uniformly dusky. .... *caldwelli*
- 19'. Apical cells and usually three spots before crossveins smoky semi-hyaline ..... 20
- 20(19'). Vittae very broad, that in clavus almost filling it and of deeper red than others. .... *clavata*
- 20'. Vittae of uniform color. .... 21
- 21(20'). Vertex with two short impressed black horizontal dashes before apex ..... *aenea*
- 21'. Vertex without conspicuous impressed lines. .... 22
- 22(21'). Large, 3.5 mm.; basal angles of scutellum smoke-gray outlined in yellow or orange. .... *gleditsia*
- 22'. Smaller, 3 mm. or less. .... 23
- 23(22'). Scutellum black to blackish brown, at least basally. .... 26
- 23'. Scutellum not dark. .... 24
- 24(23'). Spots before crossveins distinctly darker than apical cells. .... *alternata*
- 24'. Apical area of elytra of almost uniform color. .... 25
- 25(24'). Apices of elytra subhyaline; inverted V of vertex with arms broadly touching eyes. .... *fulvocephala*
- 25'. Apices dusky; crossveins pale, space between veins anterior to crossveins filled with three dusky spots, the outer ones larger than inner; apex contrast to pale elytron. .... *auteni*
- 26(23). Dark abdomen showing through semihyaline elytra. .... *penenoeva*
- 26'. Background pearly white, body white but for fuscous thorax. .... *noeva*
- 27(17'). Inverted V of vertex suddenly widened toward eyes. .... 28
- 27'. Inverted V even-sided, sides gradually if at all expanded toward eyes ..... 29
- 28(27). Elytral tips decidedly dusky, three dark spots before crossveins ..... *rubens*
- 28'. Elytral tips subhyaline. .... *rubrataeniensis*
- 29(27'). Elytral vittae of uniform width and color, apices subhyaline. .... *plena*
- 29'. Claval vittae broader than others, or apices dusky. .... 30
- 30(29'). Claval vittae broad, almost filling clavi, costal area lemon yellow; apical cells subhyaline. .... *funesta*
- 30'. Apical area dusky, outer cells darker; two outer spots before crossveins conspicuous, elongate, black, inner spot smaller; veins pale ..... *repleta*
- 31(2'). Posterior point of style very long, about one and a half times length of foot. .... 32
- 31'. Posterior point shorter. .... 33
- 32(31). Diverging processes ventrad to and almost as long as shaft of oedagus ..... *stylata*
- 32'. Oedagus lacking processes, and and curved. .... *albescens*
- 33(31'). Posterior point half length of foot or more. .... 34
- 33'. Posterior point less than half length of foot. .... 37
- 34(33). Oedagus with lateral wing-like expansions, attenuate and turning dorsad toward tips. .... *cruciformis*
- 34'. Without such expansions on oedagus. .... 35

- 35(34'). Oedagus with pair of processes arising ventrad to shaft and continuing parallel in front of it full length.....*dowellii*
- 35'. Oedagus with lateral projections or processes not equal to length of shaft, or unadorned..... 36
- 36(35'). Posterior point not as long as base of foot..... 40
- 36'. Posterior point equal in length to base of foot; processes of oedagus near tip at sides.....*spatulata*
- 37(33'). Anterior point longer than posterior..... 38
- 37'. Anterior point shorter than posterior..... 45
- 38(37). Large, 3.5 mm.; base of foot straight; tip of oedagus greatly expanded .....*gargantua*
- 38'. Tip of oedagus not expanded..... 39
- 39(38'). Base of foot and points sinuate.....*sinua*
- 39'. Base of foot and points narrow and straight.....*celebrata*
- 40(36). Oedagus with processes arising at base of shaft or absent..... 43
- 40'. Oedagus broad at tip or with lateral projections..... 41
- 41(40'). Oedagus heavy with broad transverse tip.....*volucris*
- 41'. Oedagus with lateral projections before tip..... 42
- 42(41'). Lateral projections sharp-pointed, near tip, posterior point broad .....*tenuispica*
- 42'. Projections blunt, triangular, rough; posterior point narrow....*eluta*
- 43(40). Posterior point sickle-shaped; processes arise ventrad to oedagus, diverge widely, sinuate.....*hamata*
- 43'. Processes not sinuate, or absent..... 44
- 44(43'). Posterior point very broad and blunt; processes of oedagus large, expanded leaf-like.....*latapex*
- 44'. Posterior point sharp..... 51
- 45(37'). Oedagus with lateral horns..... 48
- 45'. Without lateral horns on oedagus..... 46
- 46(45'). No processes, shaft of oedagus with expanded tip..... 47
- 46'. With processes, or shaft not expanded at tip..... 49
- 47(46). Base of foot distinctly convex.....*modica*
- 47'. Base straight; tip of oedagus with large lateral inflations, hoof-like .....*cornipes*
- 48(45). Base of foot convex, posterior point very short.....*intricata*
- 48'. Base straight, posterior point half length of foot.....*complicata*
- 49(46'). Heel very prominent..... 50
- 49'. Heel of moderate size..... 53
- 50(49). Oedagus with lateral processes as long as shaft.....*tridens*
- 50'. Oedagus with processes half length of shaft arising their width ventrad to it.....*magnacalx*
- 51(44'). Oedagus heavy, processes thick, extending two-thirds length of shaft .....*bicornis*
- 51'. Without heavy processes..... 52
- 52(51'). Oedagus straight, narrow, processes inconspicuous, short, close to base .....*obliqua*
- 52'. Oedagus curved, moderately heavy..... 57
- 53(49'). Anterior point projecting latero-cephalad, at least half as long as posterior ..... 54
- 53'. Anterior point projecting laterad..... 55



- 54(53). Oedagus with processes as long as shaft, diverging at half their length ..... *rubrotincta*  
 54'. Oedagus with rather thick blunt ventral processes, half length of shaft ..... *nondescripta*  
 55(53'). Oedagus without processes..... 56  
 55'. Ventral processes of oedagus slender, extending to opening of oedagus ..... *minima*  
 56(55). Oedagus long, heavy, curved..... *inconspicua*  
 56'. Oedagus slender, dorsal margin sinuate..... *sincera*  
 57(52'). Lacking processes on oedagus..... *unicuspis*  
 57'. With processes ventrad to shaft at base..... 58  
 58(57'). Posterior point sickle-shaped; processes extending beyond opening ..... *fragilis*  
 58'. Posterior point meeting base of foot at right angle curve; oedagus very short and stout..... *minuta*

***Erythroneura rubroscuta* (Gillette) Pl. I Fig. 1**

- Typhlocyba rubroscuta*, Gillette, C. P., Proc. U. S. Nat. Mus. XX, p. 755, 1898.  
*Erythroneura rubroscuta*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, pp. 282-3, 1920.  
*Erythroneura rubroscuta*, Robinson, W., Uni. Kans. Sci. Bul. XVI, No. 3, p. 114, 1928. (Ohio)  
*Erythroneura rubroscuta*, Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 359, 1928. (Columbus, O., September 20, 1919).

Ground color creamy semihyaline, washed with pale lemon yellow on vertex and toward apex of clavus, the crossveins and adjacent longitudinal veins lemon yellow; pronotum scarlet red but for small circular light spot at mid-anterior margin; scutellum with basal angles scarlet red, a narrow median vitta and tip pinkish; an irregular scarlet red band beginning in apical half of clavus and not attaining tip extends across tegmina to costal plaque, apices clear; below pale cream but for black tarsal claws and tip of ovipositor.

Genitalia: Style with large heel; base straight; anterior point extending laterally, twice as large as posterior point; posterior point with outer margin in line with that of anterior, inner margin forming less than right angle with base: oedagus slightly curved dorsally in lateral view; a pair of processes arises just before base and extends two-thirds length of shaft.

Length: 3.1 mm.

Wooster X-17-96 A.C. 2631; Athens IX-11-95; Ashland Co. VIII-14-34 M.A.; Pickaway Co. III-31-34, VIII-4-34 J.S.C.; Cedar Swamp IV-17,24-34 J.S.C.; Columbus IV-29-33 M.A. & D.M.J. *Aesculus*, V-11-33 M.A.; *Aesculus*, VIII-10-33 D.M.J. *Celtis occidentalis*, IX-9-34 D.M.J. *Acer pictum*, IX-15-03 H.O., IX-20-19 H.O.; Franklin Co. V-14-33 H.O., VII-8-31 E.P.B. *Aesculus*, VIII-

Male (holotype) Hancock Co., VIII-18-34 M.A. *Crataegus*, female (allotype) same data D.M.J., (paratypes) same data—15 male, 25 female M.A. and D.M.J., two male and two female VI-23-34 D.M.J.; the following specimens not made types, Hancock Co. VI-23-34 and VIII-18-34 M.A. and D.M.J.; one IX-30-34 M.A. *Crataegus*, two IX-30-34 Hickory M.A. and D.M.J.; Pickaway Co. III-31-34 and IV-5-34 J.S.C.

***Erythroneura electa* McAtee Pl. I Fig. 5, Pl. V Fig. 2**

*Erythroneura obliqua* var. *electa* McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 282, 1920.

*Erythroneura electa*, Beamer, R. H., Ann. Ent. Soc. Am. XXIII, p. 423, 1930.

Ground color opaque white; vertex with red inverted V narrow at apex and broad basally, bordering eyes, median pale area narrow and almost parallel-sided, ocelli-like spots pale, distinct, on inner margin of vittae in darkened area above middle; red vittae continued across pronotum widening slightly, disc gray except anterior part, sides white; scutellum, basal angles black outlined in red, white median vitta narrow, tip red; elytra with two contiguous white heart-shaped spots on mid-line, with a red streak following claval suture in posterior, remainder fuscous, more reddish in region of normal oblique vittae, semihyaline, the inner two apical cells distinctly hyaline, area before crossveins and outer apical cells brownish black; below, face fuscous with apical margin red, thorax fuscous, abdomen sooty black, legs pale orange yellow, the first few spines of outer row on hind tibiae dark.

Genitalia: Foot small; heel prominent; base slightly sinuate; anterior point sharp, a third width and length of posterior; posterior point slightly wider near middle, thick, blunt-pointed; oedagus straight, tip flattened and widened slightly with narrow processes arising at sides of shaft and almost attaining tip.

Length: 2.75 mm.

Pickaway Co. III-31-34, IV-5-34, IV-30-34 J.S.C.; Columbus IV-19-34 J.S.C.

***Erythroneura fumida* (Gillette) Pl. I Fig. 6**

*Typhlocyba obliqua* var. *fumida* Gillette, Proc. U. S. Nat. Mus. XX, p. 758, 1898.

*Erythroneura fumida*, Beamer, R. H., Ann. Ent. Soc. Am. XXIII, p. 423, 1930.

Dark, with two pale spots on mid-line of dorsum, background of vertex and anterior pronotum yellowish white, of posterior pro-

15-31 E.P.B. *Aesculus*, VIII-16-31 E.P.B. *Prunus*, VIII-24-31 E.P.B.; Allen Co. VIII-19-34 M.A.; Williams Co. IX-5-31 E.P.B. Never taken in abundance. Food plant not determined.

***Erythroneura crevecoeuri* (Gillette) Pl. I Fig. 2**

*Typhlocyba crevecoeuri* Gillette, C. P., Proc. U. S. Nat. Mus. XX p. 767, 1898.

*Erythroneura crevecoeuri*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 283, 1920. (Ohio)

*Erythroneura crevecoeuri*, Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 359, 1928. (Columbus, O., Sept. 15, 1903 H.O.)

Vertex and pronotum cream with mustard yellow inverted V-shaped vitta spreading and deepening in color on pronotum; scutellum, basal angles darker and basal two-thirds of tegmina deep russet discally becoming brazil red around margin, apical third hyaline with nervures yellowish; below pale cream, face and clypeus pale yellow, prothorax and abdomen to plates with segments brown, cream-margined.

Genitalia: Foot with sharp small outwardly projecting heel; base straight, half as long as anterior point which extends antero-laterad and is four times as large as the blunt posterior point which joins the base at right angle: oedagus long, slender, curved in lateral view, ending in a broad bifid tip.

The foot differs considerably from that figured by Beamer, Ann. Ent. Soc. Am. XXIII, Pl. I Fig. 2, 1930.

Length: 3 mm.

Pickaway Co. III-31-34 J.S.C., VI-14-34 J.S.C.; Columbus IV-29-34 M.A. & D.M.J. *Aesculus*, IX-15-03 H.O.; Franklin Co. V-14, 15-31 E.P.B. *Aesculus*, VIII-10-31 E.P.B., VIII-15,24-31 E.P.B. *Aesculus*.

Taken chiefly on *Aesculus glabra* in the spring, but never in abundance.

***Erythroneura bitincta* McAtee Plate I Fig. 3**

*Erythroneura obliqua* var. *bitincta* McAtee, Ill. Nat. Hist. Surv. Bul. XVI, Art. III, p. 130, 1926.

*Erythroneura bifurca*, Beamer, R. H., Ann. Ent. Soc. Am. XVIII, p. 422, 1930.

Head, pronotum, base of scutellum and tegmina from base of scutellum to costal plaque washed with dark brownish black and apical third of tegmina from apex of clavus to posterior end of costal plaque also dark. The tegminal area between these bands is entirely scarlet in some specimens with a narrow semihyaline strip

along the claval veins, or with narrower orange to pale lemon yellow vittae. Two small spots on anterior margin of vertex midway between apex and eye, pale.

Genitalia: Styles with large sharply projecting heel; base concavely curved; anterior point short, sharp, projecting out, about half as large as posterior which is evenly curved to base: oedagus with bifurcate base, straight shaft; a pair of processes arises just behind the base and reaches almost to tip of shaft.

Length: 2.75 mm.

Marietta VII-20-03 H.O.; Pickaway Co. III-31-34 and IV-5-34 J.S.C.; Hancock Co. VI-23-34, VIII-18-34, IX-30-34 M.A. & D.M.J. *Crataegus*; Columbus VIII-15-31 E.P.B. *Crataegus* (Determined as *fulvocephala* by E.P.B.). The specimen from Marietta was recorded as *E. fulvocephala* Rob. by Osborn, Ohio Biological Survey Bul. XIV, p. 359, 1928.

Taken consistently from *Crataegus* in large numbers.

*Erythroneura crataegi* n. sp. Pl. I Fig. 4, Pl. II Fig. 1

Ground color carbon gray; vertex with inverted jasper red V, the sides of which, widening toward eyes but not touching them, are continued over the pronotum as slightly thickening almost parallel vittae; scutellum, basal angles slate gray outlined in dark red, tip dark red; elytra, basal fourth pale with normal red oblique vittae, a circular white spot covering the apical third of the clavus and adjacent corium is completely surrounded by dusky reddish brown circular band which is extended a little forward on clavus, a red streak borders the claval suture in apical third, costal plaque pale lemon yellow, below it to crossveins bright red area, elongated streaks before crossveins dusky, apical cells 3 and 4 smoky semi-hyaline, the others distinctly darker, crossveins white. In many of the females the anterior vittae are yellowish becoming red along sectors anterior to the crossveins. Below, face bright yellow to red bordered at sides with narrow fuscous strip, clypeus dark, beak pale, remainder of venter black, legs translucent sordid yellow.

Genitalia: Style, heel moderately projecting; base evenly curved to posterior point; anterior point a third as long and wide as posterior, projecting cephalad; posterior point almost as long as base of foot; oedagus slightly curved in lateral view, with a bifurcate base in front of which arise two slender processes which follow the shaft at its sides and terminate a little before its apex with sword-like points; tip of oedagus widened.

Length: 2.75 mm.

notum and elytra fuscous; vittae flame scarlet; vertex, basal half scarlet with median triangular projection, narrow, to apex, two dark ocelli-like spots nearer each other than to eyes at half length; pronotum dark especially posterior two-thirds, the broad vittae more or less obscured by it; scutellum, basal angles broadly fuscous, outer margin and tip flame scarlet; elytra, normal vittae present overlaid considerably by dark smoky regions which leave two indefinite pale spots, one near base, the other at apex of clavus, plaque pale, an especially dark transverse band crosses elytra from just posterior to plaque to apex of clavus, and extends across crossveins including apical third of cells, remainder paler, smoky semihyaline; below, face, genae and sides of thorax orange, narrow border of face, clypeus, lorae and remainder of venter fuscous, legs paler.

Genitalia: Style with moderate foot; base straight; heel heavy, a right angle; anterior point about a right angle; posterior point about as long as width of toe, sides converging sharply: oedagus curved in lateral view; pair of processes ventrad to base of shaft diverge astride it one-third distance before tip.

Two male specimens Cedar Swamp IV-17-34 J.S.C.

*Erythroneura atrimucronata* Beamer Pl. I Fig. 7

Ann. Ent. Soc. Am. XXIII, p. 424, 1930.

General ground color yellowish white: vertex, blackish brown stripe starting at apex of vertex and gradually widening but not touching eyes; pronotum with stripe continued, margins yellow; scutellum entirely black; elytra, clavus fuscous, corium fuscous interiorly, becoming ferruginous exteriorly, apical cells and spots just anterior to crossveins smoky,  $M_2$  and  $M_4$  darker, remainder of elytra whitish semi-hyaline becoming sulphur yellow toward costa; below, a dark brown prolongation of dorsal stripe on face, disc sordid, clypeus dark, legs creamy translucent, thorax and abdomen dark but for last ventral abdominal segment and pygofer bordering ovipositor which are cream.

Genitalia: Style with heel small, projecting sharply; base straight; anterior point a right angle; posterior point broad, about as long as base, slightly swollen near middle and blunt: oedagus long, curved in lateral view, thick, becoming narrow toward apex, tip widened, below middle on ventral side two small triangular projections.

Length: 3 mm.

Hocking Co. X-15-33 D.M.J. *Pinus rigida*, X-14-34 J.N.Knull; Richland Co. VII-7-34 M.A.; Rupels VIII-15-05; Columbus IX-11-01; Franklin Co. V-14-33 M.A. *Aesculus*.

**Erythroneura stolata** McAtee Pl. I Fig. 8

*Erythroneura obliqua* var. *stolata* McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 279, 1920.

*Erythroneura stolata*, Beamer, R. H., Ann. Ent. Soc. Am. XXIII, pp. 442-3, 1930.

Ground color opaque white, markings brownish black anteriorly, fuscous on elytra: median longitudinal fuscous stripe starts very dark at apex of vertex with a rounded tip, occupies middle third of vertex and pronotum where it widens slightly toward base, all of scutellum but small outer corners of basal angles, inner part of clavus to before middle where it widens suddenly to entirely fill it, widened again on corium opposite anterior end of costal plaque and finally just before crossveins to include apical cells, the inner two darker. Some specimens have a more reddish brown stripe on the corium and a pink tinge on the costa posterior to the plaque, in others it is yellowish. Venter entirely pale creamy white; dorsum dark discally; legs white, a few of the outer row of spines on the basal part of the hind tibiae dark.

Genitalia: Foot with large prominent heel; base straight; anterior point a right angle; posterior point about as long as base, curved to meet it at about a 45° angle, broad, sides parallel to near tip where it becomes abruptly narrower and is acutely pointed: oedagus very long, broad, especially at base and slightly tapered toward tip, considerably curved in lateral view.

Length: 2.75 mm.

Streetsboro, tamarack swamp IX-20-28 C.C.B.M.; Knox Co. V-8-33 M.A. and D.M.J. *Carpinus*, VIII-28-34 M.A.; Chesapeake IV-29-34 J.S.C.; Indian Springs, Columbus VIII-1-23; Franklin Co. VIII-16-31 E.P.B. *Vitis*; Allen Co. VIII-19-34 D.M.J.

**Erythroneura penelutea** Beamer

Ann. Ent. Soc. Am. XXIII, pp. 427-8, 1930.

General ground color carbon white: vertex sordid yellow except for oval area anterior to eye, darker interiorly; sordid yellow area continued across pronotum, dusky on disc; scutellum dusky, tip light orange yellow; elytral vittae broad orange yellow, margins indistinct, plaque chalky white, costal margin before and behind plaque orange, apical cells smoky hyaline; venter cream, tip of ovipositor dark.

Genitalia: No males taken. Beamer's description of male genitalia is quoted: "Styles with average foot; sinuate base; prominent heel; anterior point about a right angle; posterior point almost

as long as base of foot, sides almost parallel, inner margin forming smooth curve with base of foot, pygofer hook of common *obliqua* type. Oedagus of medium length, curved dorsally with a diamond-shaped process on ventral side about three-fourths distance to tip. Ends in a flattened and widened tip bent at right angles to shaft."

Length: 2.75 mm.

One female, Indian Springs, Columbus VIII-1-28 C.C.B.M.

**Erythroneura rufostigmosa** Beamer Pl. I Fig. 9

Ann. Ent. Soc. Am. XXIII, p. 429, 1930.

Ground color yellowish white on vertex, pronotum and basal fourth of elytra, remainder of elytra semihyaline; dark dorsal stripe arises on vertex as a brown-filled golden yellow triangle, continues across pronotum; scutellum fuscous with lighter median vitta and tip; clavus dark red, fuscous interiorly, a dark stripe arises opposite anterior end of plaque and follows Cu, broadening at posterior end of plaque to cover elytra to crossveins; outer apical cells dusky, inner semihyaline; venter sordid yellow with thorax and abdomen anterior to genital plate darker; edges of frons and apex of clypeus fuscous, ovipositor dark brown, outer row of spines of tibiae dark.

Genitalia: Style of medium size with base straight; heel projecting; anterior point a right angle; posterior point narrow, parallel-sided, blunt, as long as foot, meeting base at right angle curve: oedagus curved in lateral view, ending in a laterally widened lip which turns up at right angles to the shaft.

Length: 3.25 mm.

Pickaway Co. IV-9-34 J.S.C., VI-12-34 J.S.C.; Portsmouth IV-29-34 J.S.C.; Columbus IV-19-34 J.S.C.; Hancock Co. VIII-18-34 M.A. *Salix*, IX-30-34 M.A. and D.M.J. *Salix*.

**Erythroneura rufostigmosa** var. *subnila* Beamer

Ann. Ent. Soc. Am. XXIII, pp. 429-30, 1930.

Like the species but with the dorsal stripe consisting of dark red vittae bound interiorly with fuscous and with the following distinct notches: a pair on the vertex and one on the pronotum; outer apical cells dusky, inner semihyaline; below fuscous, anterior border of face bright red.

Length: 3.25 mm.

Marietta IX-13-05 H.O.; Circleville IV-3-34 J.S.C.; Pickaway Co. IV-5-34 and III-31-34 J.S.C.; Canal Winchester IV-3-34 J.S.C.; Portsmouth IV-29-34 J.S.C.

**Erythroneura lawsoniana** Baker Pl. I, Fig. 10

*Typhlocyba obliqua* var. *dorsalis*, Gillette, C. P., Proc. U. S. Nat. Mus. XX, p. 757, 1898.

*Erythroneura dorsalis*, Lawson, P. B., Sci. Bul. Uni. Kans. XII, No. 1, p. 260, 1920.

*Erythroneura lawsoni*, Baker, C., Phil. J. Sci. XXVII, p. 537, 1925.

*Erythroneura lawsoniana*, Baker, C., Phil. J. Sci. XXVIII, p. 347, 1926.

Ground color opaque white; vertex with inverted triangle scarlet red, not quite touching eyes at base; continued across pronotum covering most of disc; over clavi except for small basal area and coria beginning at middle of costal plaque and extending to crossveins, scarlet red. This dorsal stripe may be quite fumose discally, entirely so in immature specimens. White borders the stripe and the costal margin is semihyaline suffused with orange; dark spot before the M-Cu crossveins and cell  $M_1$  is quite dark, the other apical cells fuscous semihyaline, inner veins white; below, face orange to yellow, clypeus fuscous, legs pale, thorax and abdomen to pale pygofer dark; outer row of spines of hind tibiae dark.

Genitalia: Styles with small foot; heel large, a right angle; base short, straight; posterior point about as long as base, joining it at more than right angle, fairly sharp; anterior point a third as long and wide as posterior, projecting laterad and slightly cephalad; oedagus with heavy basal horns from which pend lateral processes ending in sharp triangular tips, about as long as shaft; shaft narrow, expanded laterally at tip into small curved wings.

Length: 3 mm.

Marietta VII-20-21 H.O.; Athens IX-12-05 H.O.; Knox Co. V-8-33 M.A. *Carpinus*; Pickaway Co. III-31-34, IV-3-34 J.S.C.; Chillicothe VII-1-31 H.O. *Malus*; Columbus IV-19-34 J.S.C., IV-29-33 M.A. and D.M.J. *Salix*, VIII-17-33 H.O. *Vitis*, VIII-27-31 E.P.B. *Malus*, VIII-30-34 M.A. and D.M.J. *Malus*; Franklin Co. VII-1-34 M.A., Brown's Fruit Farm V-20-33 D.M.J., *Malus*; Adams Co. IX-1-31 E.P.B. *Malus*; Hancock Co. VI-23-34 H.O., VIII-18-34 D.M.J.; Williams Co. IX-5-31 E.P.B.

**Erythroneura harpax** Beamer Pl. I Fig. 12

Vertex and pronotum smoky gray: vertex with a clover-shaped gray median area enclosed by scarlet vittae, projections of which extend on outer margin toward eye from base and after middle, leaving oval gray space near eye; pronotum gray with rectangular red vittae on disc separated by the width of one of them, not attaining either margin; scutellum scarlet with a fuscous spot in each



basal angle and white median vitta between them; elytra smoky hyaline with scarlet narrow vittae along clavus and corium and costal area suffused with scarlet before and behind white plaque, darker before pale or reddish cross-veins, and apical cells uniformly smoky hyaline.

Genitalia: Style with large foot; sharply projecting long heel; base straight; anterior point a right angle; posterior point longer than foot, sickle-shaped, curved to base at 45° angle: oedagus swollen at base, narrowed before apex, slightly curved dorsad at apex in lateral view, pair of processes arise ventrad of base, follow shaft rather closely and diverge slightly at tip.

Length: 2.75 mm.

Cedar Swamp IV-24-34 J.S.C.; Pickaway Co. III-31-34, IV-3-34, IV-5-34, VII-28-34, VIII-4-34 J.S.C.; Columbus IV-19-34 J.S.C.; IV-29-34 M.A. & D.M.J. *Aesculus*; Rocky Fork X-1-98; Adams Co. IX-1-81 E.P.B. *Salix*.

***Erythroneura kanza* Robinson Pl. I Fig. 12**

Can. Ent. LVI, p. 58, 1924.

Vertex and pronotum slate gray, the usual vittae obscure, maroon: vertex with two light spots on anterior margin mid-way between apex and eyes; pronotum, anterior border paler, disc darker; scutellum, basal angles dark, remainder fuscous; elytra dusky semihyaline, the usual oblique vittae narrow, maroon, area before pale crossveins and apical cells smoky semihyaline; below, head and legs drab, thorax and abdomen black.

Genitalia: Style with foot large; heel slightly projecting; base straight; anterior point about right angle; posterior point longer than base, sickle-like, evenly curved to base at 45° angle: oedagus long, tip curved slightly dorsally in lateral view, with lateral processes swollen apically and diverging at right angles just before tip.

Length: 2.75 mm.

Antiquity, Meigs Co. IX-16-29 C.C.B.M.; Knox Co. V-8-33 D.M.J. *Carpinus*; Pickaway Co. III-31-34 J.S.C.; Ashland Co. VIII-14-34 M.A.; Coal Grove IV-8-34 J.S.C.; Columbus V-6-34 D.M.J. *Ulmus*; Franklin Co. IX-2-34 D.M.J. *Salix*; Hancock Co. IX-30-34 M.A. *Salix*.

***Erythroneura brundusa* Robinson Pl. I Fig. 13**

Can. Ent. LVI, No. 7, p. 155, 1924.

Morocco red: vertex with two pale yellow spots on anterior margin; pronotum dusky maroon, paler on anterior margin; scutel-

lum with pale short median vitta; elytra fuscous semihyaline in regions of red crossveins; below, face and clypeus morocco red, thorax and abdomen to pygofer dusky, plates and pygofer in female fuscous, sometimes washed with red, legs and spines fuscous. Some specimens are entirely dark below.

Genitalia: Foot large; heel prominent; base sinuate; anterior point projecting laterad; posterior point thick, half as long as base which it joins in a smooth curve at about right angle: oedagus three-pronged, the shaft thicker, and the lateral prongs starting at half length of shaft, are turned out at the tips.

Length: 3.5 mm.

Marietta VII-20 H.O., IX-13-05 H.O.; Duncan VIII-22 H.O.; Pickaway Co. III-31-34 J.S.C., VI-24-34 J.S.C.; VII-1-34 D.M.J. *Robinia*; Columbus IV-29-33 M.A. & D.M.J. *Aesculus*, V-6-34 D.M.J. *Prunus serotina*, V-11-33 M.A. & D.M.J. *Aesculus*, V-13-99 H.O., IX-11-01; Franklin Co. V-14-33 H.O. *Aesculus*, VI-3-31 E.P.B. *Salix*, IX-24-31 E.P.B. *Gleditsia*; Hancock Co. VIII-18-34 M.A. & D.M.J., IX-30-34 D.M.J. Hickory; Oxford IX-8-15 H.O.

***Erythroneura diffisa* Beamer Pl. I Fig. 14**

Ann. Ent. Soc. Am. XXIII, p. 434, 1930.

Ground color yellowish white to semihyaline on whitish elytra; vittae orange chrome, paler anteriorly: vertex with inverted V-shaped vitta widening at eyes but not touching them; pronotum with vittae rapidly diverging, touching posterior and sometimes anterior margin, disc dusky especially posteriorly; scutellum, basal angles gray with narrow orange border interiorly, tip orange, a median white vitta thicker apically; elytra with three broad parallel vittae, apical cells and small area anterior to crossveins smoky semihyaline; dark dorsum of abdomen visible through elytra; below face broadly orange-margined, only a discal streak pale, clypeus, thorax and legs cream, abdomen dark in male, pygofer in female pale, ovipositor dark-tipped.

Genitalia: Styles large, foot long; heel prominent, sharp; base straight; anterior point half as long as posterior, directed cephalad; posterior point meeting base at more than right angle, outer edges almost forming straight line with anterior point, both points sharp: oedagus straight, heavy, processes arise close to tip and turn out even with it, tip broad and rounded.

Length: 3.25 mm.

Coal Grove IV-8-34 J.S.C.; Cedar Swamp IV-24-34 J.S.C.; Pickaway Co. III-31-34, IV-4,5,9-34 J.S.C.; Columbus IV-28-34

M.A. & D.M.J. *Aesculus*, V-11-33 M.A. and D.M.J. *Aesculus*, V-19-33 M.A. *Gleditsia*, V-26-31 E.P.B. *Platanus occidentalis*; Franklin Co. V-14-33 D.M.J. *Aesculus*; Hancock Co. IX-30-34 M.A. Hickory, *Crataegus*.

***Erythroneura caldwelli* n. sp. Pl. I Fig. 15, Pl. V Fig. 3**

Ground color carbon gray especially anteriorly, of elytra whitish semihyaline; vittae scarlet anteriorly becoming deeper on elytra; vertex with vertical impressed line half its length from base and two horizontal impressed dashes separated by the width of one of them at middle of disc, these more or less darkened; inverted V widened at eyes not touching them, with lateral extension toward anterior margin of eye; pronotum dusky discally with indistinct pale vittae touching both margins; scutellum with basal angles black bordered except basally with scarlet, median vitta slate gray, tip scarlet; elytra with apical third evenly dusky, crossveins and adjacent longitudinal veins pale, three usual vittae, the inner one often very wide sometimes occupying almost entire clavus, the outer one along the costal margin often yellow before the plaque and scarlet behind it; below, face fuscous but for small pale discal area, a narrow black border at sides, clypeus fuscous, remainder of head pale straw yellow, thorax and abdomen to pygofer in female, and plates in male dark, legs straw, male plates especially dark apically.

Genitalia: Style slender; heel prominent, sharply projecting; base straight meeting posterior point at slightly more than right angle; anterior point less than right angle, short, as broad as sharp posterior point which is three-fourths length of base: oedagus straight, tip slightly enlarged and truncate, with spines arising from shaft just before tip and turning out flush with tip.

This was probably included by Beamer in his description of *clavata* (torra) "Oedagus long, straight, slightly enlarged toward tip with lateral processes just before tip, these may be quite broad and blunt or very thin and spine-like. Some variation is apparently present here." (Ann. Ent. Soc. Am. XXIII, p. 435, 1930).

Length: 3.1 mm.

One male (holotype) Chesapeake IV-29-34 J.S.C.; one female (allotype) Columbus V-6-34 D.M.J.; paratypes—Columbus V-11-33 two females, three males M.A., three males D.M.J. *Aesculus*, one specimen D.M.J. (abdomen missing); one female V-19-33 M.A. *Gleditsia*; Franklin Co. one female V-14-33 D.M.J. *Aesculus*, one male IX-24-31 E.P.B. *Gleditsia*; Hancock Co. one male VIII-18-34 M.A., one male IX-30-34 M.A. *Salix*; Pickaway Co. fourteen males,

one female III-31-34 J.S.C., one male IV-9-34 J.S.C. One male and two female paratypes from Clarkesville, Tenn., are included in the collection of D. M. DeLong.

***Erythroneura clavata* DeLong Pl. I Fig. 16**

*Erythroneura obliqua* var. *clavata* DeLong, Tenn., St. Bd. Ent., Bul. 17, V No. 2, p. 105, 1916.

*Erythroneura obliqua* var. *clavata*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 278, 1920.

*Erythroneura torra* Robinson, W., Can. Ent. LVI, p. 155, 1924.

*Erythroneura obliqua* var. *clavata*, Robinson, Uni. Kans. Sci. Bul. XVI, No. 3, p. 112, 1926. (*torra* Robinson, p. 113)

*Erythroneura torra*, Beamer, Ann. Ent. Soc. Am. XXIII, p. 435, 1930.

Background carbon white, of elytra whitish semihyaline, more hyaline near crossveins; vittae of anterior dorsum and clavus grenadine red, of remainder of elytra from orange to apricot yellow; vertex with very heavy inverted V, the arms widened to eyes, median pale area very narrow; pronotum with broad irregular vittae reaching margins, almost parallel on inner margin and diverging rapidly on outer; scutellum, basal angles dark olive-buff outlined except basally with red, tip red, median vitta cream; elytra, broad vittae almost fill clavi; corial vittae usually paler, plaque and costal margin pale lemon yellow, apical cells and three roundish spots anterior to crossveins semihyaline; below, straw color, face with reddish border anteriorly, venter of abdomen slate-gray, apices of plates in male and pygofer and ovipositor except tip in female pale, first four spines of outer row on hind tibiae dark.

Length: 3 mm.

Genitalia: Style large; heel a right angle; base straight; anterior point less than right angle, projecting laterad, its outer edge joining that of posterior point at obtuse angle; posterior point sharp, narrow, meeting base at slightly more than right angles; oedagus heavy, straight, apex broad with blunt, broad lateral extension almost equalling it in width.

Coalgrove IV-8-34, IV-29-34 J.S.C.; Irontown V-26; Hancock Co. IX-30-34 M.A. Hickory.

This species breeds upon *Gleditsia* from which it was taken in quantity in Illinois by Dr. DeLong.

***Erythroneura aenea* Beamer Pl. II, Fig. 17**

Ann. Ent. Soc. Am. XXIII, pp. 436-7, 1930.

Ground color white anteriorly, of elytra whitish semihyaline; vittae of over-wintering forms orange, of summer forms lemon

chrome: vertex with more or less darkened impressed median line extending half length and two horizontal dashes before apex, inverted V quite irregular, usually enlarged at eyes, with projections to front and hind margins enclosing small pale area next eyes; pronotum, disc sordid, vittae large irregular, joining basal angles of scutellum; scutellum, basal angles buff outlined inside with orange, tip orange, broad pale median vitta enlarged apically; elytra with oblique vittae broad, sometimes occupying most of area before crossveins, small spots before pale crossveins and apical cells smoky semihyaline; below, face and clypeus fuscous with narrow dark lines on lateral margins, genae and lorae pale, legs straw-colored, thorax and abdomen dusky, pygofer in female and anterior half of plates of male pale.

Genitalia: Style with moderately projecting heel; straight base; posterior point half as long as base, meeting it at slightly more than right angle, outer edge almost in line with that of anterior point, points of equal size: oedagus long, straight, broad, narrower toward bifid tip, the ends of which bend laterally at right angles to shaft.

Length: 3 mm.

Chesapeake IV-29-34 J.S.C.; Ironton IV-8-34 J.S.C.; Pickaway Co. III-31-34 J.S.C., VII-14-34 D.M.J. *Robinia*; Port Clinton V-4-34 J.S.C.; Columbus IV-29-33 M.A. & D.M.J. *Aesculus*, V-6-34 D.M.J. *Ulmus*, V-8-34 D.M.J. *Aesculus*, V-11-33 D.M.J. *Aesculus*, V-19-33 M.A. & D.M.J. *Gleditsia*, VII-18-22 G.D., VII-28-28 H.O., VIII-10-33 D.M.J. *Celtis* and *Gleditsia*, IX-11-01, IX-16-34 H.O. *Ulmus*, X-10-33 M.A.; Franklin Co. V-14-33 M.A. *Aesculus*; Hancock Co. VI-23-34 H.O. *Gleditsia*, VIII-18-34 D.M.J., IX-30-34 D.M.J. Hickory and *Crataegus*.

***Erythroneura gleditsia* Beamer Pl. II Fig. 18**

Ann. Ent. Soc. Am. XXIII, p. 437, 1930.

Ground color white, of elytra whitish semihyaline; vittae of overwintering specimens orange, of summer, lemon chrome; vertex with inverted V broad, widened toward but not touching eyes, pale median area almost parallel-sided and very narrow; pronotum with disc carbon gray, vittae thick, diverging, narrow at anterior and broad at posterior margin; scutellum, basal angles smoke-gray, outlined with yellow or orange on interior margin, tip yellow to orange, pale median vittae; elytra with vittae becoming very wide in summer forms, apical cells and small area anterior to crossveins smoky semihyaline; dorsum of abdomen black, face and clypeus red or

base, meeting it at right angle curve, sides converging to blunt tip: oedagus curved in lateral view, lateral wings arise at sides of base, remain joined to shaft half its length, outer edges gradually diverge until even with opening, bluntly pointed, inner margins curve in evenly and concavely to the shaft; tip moderately keeled.

Length: 2.75 mm.

Male (holotype) Knox Co. V-8-33 M.A. *Carpinus*, female (allotype) same data, five male and three female paratypes same data and the following paratypes: one male, Allen Co. VIII-19-34 D.M.J., three males and one female Richland Co. X-6-34 *Carpinus* M.A.; one male Pickaway Co. IV-9-34 J.S.C.; other specimens not perfect enough for types are from Knox Co. V-8-33 M.A. *Carpinus*; Allen Co. VIII-19-34 D.M.J.; and Coal Grove IV-8-34 J.S.C. One male and one female paratype from Harrisburg, Pa., in the collection of D. M. DeLong.

*Carpinus* is evidently a host. This species is named in honor of Dr. Mary Auten who first collected it on the Auten farm in Knox Co.

***Erythroneura penenoeva* Beamer**

Ann. Ent. Soc. Am. XXIII, p. 438, 1930.

Ground color white, semihyaline on elytra, color markings yellow. Scutellum dark brown, the basal angles and tip darker, posterior border and disc of pronotum dusky, apical cells and spots anterior to crossveins smoky; dorsum very dark, venter dark, legs pale, face sordid yellow, dark bordered below antennal sockets, clypeus dark, and ovipositor pale, black-tipped.

Length: 3 mm.

One female specimen from Adams Co., IX-1-31 E.P.B. *Carpinus* evidently belongs here.

***Erythroneura noeva* (Gillette) Pl. II Fig. 22**

*Typhlocyba obliqua* var. *noevus* Gillette, C. P., Proc. U. S. Nat. Mus. XX, pp. 757-8, 1898.

*Erythroneura obliqua* var. *noevus*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, pp. 280-1, 1920.

*Erythroneura noevus*, Beamer, R. H., Ann. Ent. Soc. Am. XXIII, p. 439, 1930.

Ground color pearly white with pale yellow to bright red markings; scutellum and posterior disc of pronotum dusky, angles often darker; face orange, thorax fuscous, abdomen pale but for dusky anal plates of male.

Genitalia: Style with small foot; heel sharp, projecting; base straight; anterior point less than right angle, short, directed ceph-

yellow with pale medium strip on face, lorae and genae pale, legs pale, venter of thorax and abdomen dusky, margins pale.

**Genitalia:** Styles with long foot; heel large, prominent, base convexly curved; anterior point a right angle; posterior point a third length of foot, sides sharply converging, inner side meeting base in curve at more than right angle, outer meeting that of anterior point at obtuse angle: oedagus short, broad, straight, lacking projections or processes.

Length: 3.5 mm.

Bellaire VIII-28 to 31-00; Marietta VII-20; Hocking Co. VII-1-23 H.O.; Chesapeake IV-29-34 J.S.C.; Cedar Swamp IV-17-34 J.S.C.; Pickaway Co. III-31-34 J.S.C., VII-14-34 D.M.J. *Robinia*; Columbus IV-29-33 M.A. & D.M.J. *Aesculus*, V-11-33 M.A. & D.M.J. *Aesculus*, V-19-33 M.A. *Gleditsia*, G.D. VII-28-28 H.O., VIII-20-27, IX-9-34 D.M.J. *Cercis*; Franklin Co. V-14-33 M.A., IX-24-31 E.P.B. *Gleditsia*; Magnetic Springs IX-6-14; Hancock Co. VIII-18-34 D.M.J., IX-30-34 M.A. Hickory and *Crataegus*.

***Erythroneura alternata* n. sp. Pl. II Fig. 19, Pl. V Fig. 4**

Alternately light and dark beginning with pale vertex. Background cream on anterior dorsum, of elytra white semihyaline, vittae scarlet: vertex with inverted V broadly touching eyes, median pale longitudinal area oval; pronotum, disc gray, vittae broad, diverging, not touching either margin; scutellum, basal angles tawny heavily margined with scarlet except basally, median vittae pale, narrow, tip scarlet; elytra with usual vittae narrow, distinct, plaque fumose, three almost square spots before pale crossveins, and apical cells smoky semihyaline; below, head orange, prothorax black, meso- and metathorax pale, abdomen black, legs translucent sulphur yellow.

**Genitalia:** Foot small; heel prominent; base straight; anterior point short, less than right angle, projecting laterad; posterior point half length of base, meeting it at curve more than right angle, sharp; oedagus curved in lateral view, tip rather heavily keeled, lacking processes.

Length: 3 mm.

Two males (holotype and paratype) Richland Co., M.A.; one male paratype from each of the following localities: Knox Co., V-8-33, D.M.J. *Carpinus*; Pickaway Co., III-31-34 J.S.C. and Coal Grove IV-8-34, J.S.C. One male and one female paratype in the collection of the Illinois Natural History Survey from Thebes, Ill

**Erythroneura fulvocephala** Robinson Pl. II Fig. 20

Can. Ent. LVI, pp. 155-6, 1924.

Ground color of head and pronotum cream, of elytra whitish semihyaline, vittae orange: vertex, inverted V broadly touching eyes; pronotum, disc below middle dusky, vittae short, broad, irregular; scutellum basal angles buff outlined in orange except basally, median vittae white, tip orange; elytral vittae narrow, plaque white, three faint small spots before pale crossveins and apical cells smoky hyaline; venter, head pale orange, prothorax fuscous discally, mesothorax and metathorax cream, abdominal segments dusky discally, legs and pygofer cream, ovipositor dark-tipped.

Genitalia: Foot small; heel projecting slightly; base straight; anterior point a right angle; posterior point narrow, straight, two-thirds length of base which it meets at a right angle: oedagus short, very broad and curved in lateral view, with a pair of thin straight processes arising ventrad to shaft and extending half its length; tip of shaft strongly keeled, very narrow in ventral view.

Length: 3 mm.

Coal Grove IV-29-34 J.S.C.; Portsmouth IV-9-34 J.S.C.; Cedar Swamp IV-17-34, IV-24-34 J.S.C.; Pickaway Co. III-31, VII-28, VIII-4, 7-34 J.S.C.; Columbus IV-29-33 M.A. & D.M.J. *Aesculus*, IV-19-34 J.S.C., V-6-34 D.M.J. *Ulmus* and *Prunus*, V-8-34 D.M.J., V-11-33 M.A. & D.M.J. *Aesculus*, VIII-17-30 H.O. *Vitis*, IX-9-34 D.M.J. *Cercis*, X-1-33 H.O. *Ulmus*, X-7-33 D.M.J. *Alnus*, X-7-34 H.O.; Franklin Co. V-14-33 H.O. and M.A. *Aesculus*, VII-1-34 M.A. & D.M.J. *Aesculus* and *Robinia*, IX-2-34 M.A. *Salix* and *Juglans*; Adams Co. IX-1-31 E.P.B. *Carpinus*.

**Erythroneura auteni** n. sp. Pl. II Fig. 21, Pl. V Fig. 5

Ground color cream, of elytra whitish semihyaline; vittae orange, paler on head: vertex with narrow vitta forming inverted V, arms slightly enlarged near eyes; pronotum, vittae narrow, irregular, parallel, reaching hind margin; scutellum, basal angles pellucid yellow narrowly orange margined on inner side, broad pale median area, tip orange; elytral vittae broad, indeterminate, plaque hyaline, costal margin before and after plaque orange, three round dusky spots before pale crossveins, apical cells smoky semihyaline; below, face orange, venter pale cream, disc of prothorax and mesothorax dusky, discs of abdominal segments before pygofer sordid; dorsum of abdomen to pygofers dark discally.

Genitalia: Foot small; heel large, sharply projecting; base sinuate; anterior point a right angle; posterior point as long as



alad, continuous on outer margin with broad blunt posterior point which is as long as foot, the base of which it meets in a smooth curve at a little less than a right angle: oedagus, shaft strongly keeled and curved dorsad, a pair of thick processes arises more than its width ventrad of shaft and diverges rapidly, in lateral view it curves dorsad and crosses shaft before tip.

Length: 3 mm.

Richland Co. VII-7-34 M.A.; Knox Co. V-8-33 M.A. & D.M.J. *Carpinus*; Buckeye Lake V-18-33 D.M.J. *Quercus*; Pickaway Co. III-31 and VIII-4-34 J.S.C.; Attica V-4-34 J.S.C.; Columbus IV-29-33 M.A. & D.M.J. *Aesculus*, V-8-34 D.M.J., V-11-33 D.M.J. & M.A. *Aesculus*, V-19-33 M.A. *Gleditsia*, VIII-10-33 M.A., IX-9-34 D.M.J. *Acer pictum*, IX-11-01 H.O., IX-12-34 D.M.J. *Acer pictum*, IX-18-31 E.P.S. *Juglans*, IX-29-19 H.O.; Franklin Co. V-14-33 H.O. *Aesculus*, VIII-5-31 E.P.B., VIII-15-31 E.P.B. *Juglans*, VIII-24-31 E.P.B., IX-2-34 M.A. *Juglans*; Brown Fruit Farm V-20-33 D.M.J. *Malus*; Piketon, IV-29-34 J.S.C.; Hancock Co. VI-23, VIII-18, IX-30-34 M.A. & D.M.J. *Juglans* (*Salix* in Oct.); Adams Co. IX-1-31 E.P.B. *Carpinus*.

*Juglans* is doubtless a host as this species was taken in all stages on it during August. Immature specimens were found on *Acer pictum* also.

***Erythroneura rubens* Beamer Pl. II Fig. 23**

Ann. Ent. Soc. Am. XXIII, pp. 439-40, 1930.

Dark abdomen showing through subhyaline elytra is conspicuous contrast to general pale color. Background cream, subhyaline on elytra, vittae orange becoming deeper reddish orange on elytra. Distinguished especially by a series of impressed dots, a pair on margin of vertex between apex and eyes, a second close together on anterior disc of pronotum between vittae, and a third in center of pale lateral spaces of pronotum. Vertex, inverted V heavy, arms widened touching eyes from below inner apex to base; continued across pronotum as broad diverging vittae, posterior disc carbon gray; scutellum but for broad pale median area, orange; elytra with usual vittae unevenly colored, more hyaline toward costal margin, three sooty black round spots before cream-colored crossveins, apical cells fumose, subhyaline; below, face, clypeus and prothorax pale orange, remainder cream, abdomen dusky, legs pale, outer row of spines especially in male of hind tibiae black.

Genitalia: Foot small; heel sharply projecting; base straight; anterior point as long as base, narrow, blunt, outer edge almost in

line with that of posterior point; posterior point half as long as anterior, of same width, meeting base at a little less than right angle: oedagus curved in lateral view, strongly keeled, a pair of thin processes arises ventrad of shaft and extends slightly over half its length.

Length: 2.75 mm.

Pickaway Co. VI-24-34 J.S.C.

***Erythroneura rubrataeniensis* Beamer Pl. II Fig. 24**

Ann. Ent. Soc. Am. XXIII, p. 440, 1930.

Characterized by very broad even-sided grenadine red vittae and dark pre-genital abdominal segments showing through semihyaline elytra. Ground color milky white, vittae grenadine red; inverted V of vertex stout, even-sided, arms touching eyes for basal half; vittae continued across pronotum, parallel inside, diverging slightly on outer margins; scutellum orange, pale median vitta narrow; vittae of elytra broad, distinct and evenly colored, plaque pale lemon yellow, three small indistinct fumose spots before red crossveins, apical cells smoky subhyaline; below, face red, clypeus fuscous, abdomen before pygofer dusky, remainder of venter cream suffused near margins with red, outer spines of hind tibiae black.

Genitalia: Foot small; heel bluntly projecting; base straight; anterior point as long as base, sharp; posterior point short, sharp and broad, a third length of anterior, outer edges of points meet at obtuse angle, inner margin of posterior meets base at about 120° angle; oedagus long, almost straight in lateral view, a pair of narrow processes arises just ventrad of base, extends length of shaft, the apices diverge before slightly widened truncate tip of shaft.

Length: 3 mm.

Hocking Co. IV-28-34 J.S.C.; Coal Grove IV-8-34 J.S.C.; Cedar Swamp IV-17-34 J.S.C.; Williams Co. IX-5-31 E.P.B. *Cornus*.

***Erythroneura plena* Beamer Pl. II Fig. 25**

Ann. Ent. Soc. Am. XXIII, p. 442, 1930.

Ground color yellowish white, of elytra whitish semihyaline, color markings scarlet; vertex with inverted V even-sided, enlarged slightly at eyes touching them near base; sides of V continued over pronotum as basally thickening parallel vittae, disc and posterior part of pronotum between them carbon gray; scutellum with basal angles dark olive buff margined with a scarlet line except basally and tip scarlet; elytra with three distinct vittae, color of outer diffuse, interrupted by the lemon yellow costal plaque, crossveins red,

elongate dusky indefinite spots before them and apical cells smoky semihyaline; below, face fuscous, anterior margin orange, sides narrowly dark lined, clypeus fuscous, genae, lorae, legs straw, abdomen and thorax black, pygofer pale, outer anterior spines of hind tibiae dark.

Genitalia: Foot long; heel projecting; base straight; upper margin of short sharp anterior point in straight line with base; posterior point three times size of anterior, quite thick at base, meeting base of foot at right angle, outer margins of points in line; oedagus very broad in lateral view with dorsal side slightly concavely curved near middle, then evenly rounded to broad tip, widest just before tip; two processes arise just ventrad of shaft, swell to twice basal width near middle, curve away from shaft, then back to shaft, ending at tip.

Length: 2.8 mm.

Hocking Co. IV-28-34 J.S.C.; Chesapeake IV-8-34 J.S.C.; Coal Grove IV-8-34 J.S.C.; Pickaway Co. III-31-34, VII-28 and VIII-4-34 J.S.C.; Port Clinton V-4-34 J.S.C.; Columbus IV-19-34 J.S.C., IV-29-33 M.A. & D.M.J. *Aesculus*, V-1-34 J.S.C., V-6-34 D.M.J. *Prunus serotina*, V-11-33 M.A. *Aesculus*, V-19-34 J.S.C., VII-27-21 H.O., IX-9-34 D.M.J. *Cercis*, IX-12-34 D.M.J. *Acer pictum*.

***Erythroneura funesta* Beamer Pl. II Fig. 26**

Ann. Ent. Soc. Am. XXIII, p. 441, 1930.

Ground color opaque white, whitish semihyaline on elytra; vittae scarlet; vertex with inverted V broad, inner margins parallel, outer touching eyes; continued across pronotum as broad even-sided vittae parallel on inner margin, diverging slightly on outer; scutellum, basal angles pellucid yellow narrowly margined with orange on interior border, tip orange, white antero-median area broad; elytra, claval and corial vittae broad, scarlet, costa suffused with lemon yellow; three small dark distinct round spots before scarlet crossveins, apical cells smoky semihyaline; below, head and thorax pellucid orange, abdomen and legs dirty cream, some spines of hind tibiae on outer row black.

Genitalia: Large foot; heel a right angle; base forming an even concave curve with posterior point which is subequal to it in length; anterior point projecting laterad, a fourth size of posterior point which is very wide at base with the sides converging to a sharp point; oedagus straight in lateral view, two processes arise

lateroventrad to base of shaft, follow it and terminate in scalpel-like tips, the blade-side in, tip rather bluntly swollen.

Length: 2.75 mm.

Athens September 12, 1905, H.O.

***Erythroneura repleta* n. sp. Pl. II Fig. 27, Pl. V Fig. 6**

Ground color white, color markings scarlet, paler orange chrome anteriorly in some specimens: vertex with broad even-sided inverted V, the outer edges broadly touching eyes; arms continued across pronotum as broad parallel stripes, the orange yellow basal angles of the scutellum serve as further continuations; these extended arms of the V have between them a long distinct white area, tapering to a sharp point on the vertex and ending in the base of the scutellum, the tip of which is orange; elytra with three oblique orange vittae, the interior almost filling the clavus, three distinct dark spots before the pale to red crossveins, these spots much darker than smoky semihyaline apical cells; below, face pale lemon yellow, anterior border orange, margined laterally by thin dark line, clypeus fuscous, dorsum and venter entirely dark, legs pale, yellow orange, translucent, pygofer of female pale.

Genitalia: Small foot; base evenly concavely curved; heel sharply projecting; short sharp anterior point meeting posterior point which is twice as thick and the same length at obtuse angle: oedagus short, thick in lateral view, straight, a pair of slender processes arising at base curves slightly ventrad at middle where it is finely toothed on ventral surface, and back to tip.

Length: 2.9 mm.

Male (holotype) IX-30-34 D.M.J. Hancock Co. *Crataegus*; female (allotype) Hancock Co. VIII-18-34 D.M.J. *Crataegus*; and the following paratypes: 18 males, 12 females, Hancock Co. VIII-18-34 M.A. *Crataegus*, 6 male and 2 female D.M.J.; 4 males IX-30-34 D.M.J., 1 male M.A. One male from Chambersburg, Pa., in the collection of D. M. DeLong, and four females from Shawneetown, Ill., in the collection of the Illinois Natural History Survey are paratypes.

***Erythroneura stylata* n. sp. Pl. II Fig. 28, Pl. V Fig. 7**

Small, vittae orange chrome on cream background; vertex long, inverted V with arms widened against eyes; pronotum, vittae continued across, wide and almost parallel; scutellum orange, antero-median pale area square; vittae of clavi almost filling them, those of coria broad, costa pale orange, subhyaline, apical cells subhya-

line; below creamy white, anterior spines of outer row on hind tibiae dark.

**Genitalia:** Styles small, stout; heel large, prominently projecting; base convexly curved; anterior point a right angle; posterior point longer than base, narrow, sharp at apex, forming a U with base: oedagus short, moderately keeled, broad, and slightly curved in lateral view; two processes arise ventrad of base and diverge rapidly before tip.

Length: 2.5 mm.

One female (holotype) Knox Co. V-8-33 M.A. *Carpinus*; one male (allotype) same data; one male not good enough for type, same data; one male (paratype) Decatur, Georgia X-8-33 M.A.

***Erythroneura albescens* Beamer Pl. II Fig. 29**

Whitish semihyaline on elytra, opaque white anteriorly, vittae scarlet: vertex, inverted V with inner margins parallel, outer touchings eyes, anterior evenly rounded; continued over pronotum as narrow diverging vittae reaching both margins; scutellum, basal angles pale lemon yellow narrowly outlined except basally with scarlet, tip scarlet, antero-median pale area broad; elytral vittae of medium width, not definite, costal margin pale orange, pale lemon yellow plaque, hazy spots before crossveins, that before  $R_{4+5}$  larger, apical cells subhyaline, faintly dusky; below, face orange, deeper color on anterior margin, remainder cream.

**Genitalia:** Style short, stout, foot large; heel bluntly projecting; base sinuate; anterior point a right angle; posterior point longer than base, broad, sharply pointed, its inner margin forming a U with base: oedagus long, heavy, parallel-sided and evenly curved in lateral view.

Length: 3 mm.

Portsmouth IV-29-34 J.S.C.; Jackson IV-1-34 J.S.C.

***Erythroneura cruciformis* Beamer Pl. II Fig. 30**

Ann. Ent. Soc. Am. XXIII, pp. 443-4, 1930.

Background white with scarlet markings: V of vertex thin apically with broad sides touching eyes; vittae on pronotum diverging, irregular; scutellum, basal angles lemon yellow narrowly outlined except basally with orange, tip orange, broad median white vitta; elytra with three pair of orange vittae, plaque faint yellow, three distinct dusky spots before red crossveins, apical cells smoky subhyaline; below, creamy white flushed with orange especially on face, clypeus and genae, lorae and disc of frons pale.

Genitalia: Style with foot heavy; heel sharp, less than right angle; anterior point right angle; posterior point as long as base, broad, tapering to sharp point: oedagus short, broad in basal half, large lateral projections forming diamond at middle with attenuate tips dorsally curved; shaft slightly curved in lateral view, narrowing gradually from base to round tip.

Length: 3 mm.

Pickaway Co. III-31-34 J.S.C., IV-5-34; Knox Co. V-8-33 M.A. *Carpinus*; Chesapeake IV-8-34 J.S.C.

***Erythroneura dowelli* Beamer Pl. II Fig. 31**

J. Kans. Ent. Soc. V, No. 2, p. 62, 1932.

Ground color opaque white with spectrum red distinct markings; vertex with inverted V widening at eyes touching them at base; continued across pronotum as diverging slightly thickening vittae; meeting red basal angles of scutellum which are in turn joined by the red tip; clavus half occupied by stripe along claval suture in basal two-thirds, apical third of terminal suture with thin streak, cubitus with stripe arising opposite middle of clavus and extending to red crossvein where it spreads considerably, narrow stripe on costal margin anterior to white plaque, and dash posterior to plaque, two diffuse dark blotches before crossveins, apical cells smoky semihyaline; below, white flushed with red especially anteriorly, the anterior margin of the face and a stripe from below the eye to the posterior margin of mesopleura red, legs white, outer row of spines of hind tibiae conspicuously black.

Genitalia: Heel about right angle; base straight; anterior point short, thick, blunt, projecting laterad posterior point three-fourths as long as base, curved to meet it at less than right angle, slightly wider at middle and blunt-tipped; oedagus dorsally curved in lateral view, slightly narrowed at tip with a pair of processes arising distinctly ventrad to shaft, following parallel with it to the tip where it diverges slightly.

Length: 3 mm.

Athens, IX-12-05 H.O.; Hocking Co. IV-15-34 J.S.C.; Pickaway Co. III-31-34 J.S.C.; Brown Fruit Farm V-20-33 D.M.J. *Malus*; Columbus V-6-34 D.M.J. *Prunus*, VIII-30-34 M.A. & D.M.J. *Malus*; Adams Co. IX-1-31 E.P.B. *Malus*; Waterville IX-11 H.O.

This species is common on apple throughout the summer. The inner male genitalia have not previously been illustrated.

**Erythroneura spatulata** Beamer Pl. II Fig. 32

Ann. Ent. Soc. Am. XXIII, p. 444, 1930.

Ground color opaque white, vittae broad, scarlet red; vertex with broad inverted V, arms enlarged before base but not touching eyes, inner margins of pronotal vittae almost parallel, outer widening, notched at middle and diverging again to posterior margin; scutellum, basal angles deep orange outlined except basally with scarlet, tip orange, broad antero-median pale area; elytral vittae broad, plaque lemon yellow, three small distinct round spots black before red crossveins, apical cells fumose, subhyaline; below, head, orange, venter cream, hind tibiae with outer row of spines conspicuously black entire length.

Genitalia: Moderate foot; slightly projecting heel; straight base; anterior point a right angle; posterior point longer than base, broad, sides converge sharply near tip; oedagus very long, narrow, parallel-sided, slightly curved in lateral view, tip round, two narrow lateral projections arise before tip and extend its length.

Length: 2.75 mm.

Hocking Co. IV-15-34 J.S.C., V-27-34 D.M.J. *Viburnum*; Hancock Co. IX-30-34 M.A. *Hicoria*.

**Erythroneura gargantua** n. sp. Pl. III Fig. 33, Pl. V Fig. 8

Distinctly the largest of the pale members of this group: background white, opaque, vittae light orange yellow on head, pronotum and clavus, lemon yellow on corium; vertex with inverted V broad and thick, arms broadened at middle touching eyes; vittae of pronotum thick, diverging slightly; angles of scutellum all light orange yellow; elytra, claval vittae rather narrow, more orange toward suture, corial vittae distinctly lighter, costa whitish semihyaline, no dusky spots before pale crossveins, apical cells light drab subhyaline.

Genitalia: Very large style; heel more than right angle, base straight; anterior point, outer margin parallel with base, as long as base, blunt; posterior point a third length of base, outer margin in line with that of anterior point, inner meeting base at about 45°, narrow and blunt: oedagus very long, narrow, terminating in round, much widened tip with two sharp lateral projections almost equaling it in width.

Length: 3.5 mm.

One male (holotype) Pickaway Co. VIII-4-34 J.S.C.

*Erythroneura sinua* n. sp. Pl. III Fig. 34, Pl. V Fig. 9

Dorsum and elytra shining, background of head and pronotum cream, of elytra whitish, vittae scarlet: vertex with inverted V narrow and round at apex, arms broadened before half its length, touching eyes; pronotum with narrow irregular diverging vittae; scutellum, basal angles pale lemon yellow, tip scarlet, broad white antero-median area; elytra, vittae very narrow, costal margin especially anteriorly red, sides below eyes also broadly spectrum red, three dusky small spots before pale crossveins, apical cells smoky subhyaline; below, face and clypeus orange, lorae whitish, genae orange, legs and venter cream suffused with pale orange.

Genitalia: Style large, long, narrow, sinuate foot; heel prominent, projecting; base sinuate; anterior point as long as base, projecting laterally and slightly forward at apex; posterior point short, sharp, hook-like, curved at less than right angle to base: oedagus strongly curved in lateral view, of moderate length; two short lateral processes arise before tip and diverge slightly, in lateral view slightly swollen before sharp tips; apex of shaft pear-shaped, in lateral view at right angles to shaft.

Length: 3 mm.

One male (holotype) Pickaway Co. III-31-34 J.S.C.

*Erythroneura celebrata* n. sp. Pl. III Fig. 35, Pl. V Fig. 10

Small, background of anterior dorsum carbon gray, of elytra whitish semihyaline, vittae red; vertex with inverted V narrow at apex, sides enlarged below middle, not touching eyes; pronotal vittae roughly parallel, lateral margins, adjacent thorax and costa red; scutellum, angles pellucid orange; square antero-median pale area; elytral vittae narrow, plaque white subhyaline, posterior to plaque suffused with red, three elongate dusky spots before pale crossveins, subhyaline apical cells faintly smoky; below, head, prothorax, genital segments orange, remainder cream, antennae cream.

Genitalia: Style with long narrow foot; heel sharply projecting; base straight; anterior point not quite as long as base, sharp, narrow, its outer margin in line with that of posterior point; posterior point a third length of base, sharp, meeting base at 45° angle, not as wide as anterior point: oedagus long, very narrow, straight, two processes arise latero-ventrad to base and follow shaft closely to tip, terminating in sharp points.

Length: 2.5 mm.

Three males (holotype and paratypes) and one female (allotype) Cantwell Cliffs, Hocking Co. X-23-32 D.M.J.



***Erythroneura volucris* Beamer Pl. III Fig. 36**

Ann. Ent. Soc. Am. XXIII, p. 445, 1930.

Background white, semihyaline on elytra, vittae scarlet; vertex with narrow inverted orange V, the outer margin an even curve, the inner enclosing triangular white space; pronotal vittae narrow, diverging; scutellum, basal angles yellow, tip orange, square anteromedian area, three dusky spots before crossveins subhyaline, apical cells slightly fumose; below, head orange, venter pale, a row of dark spines on hind tibiae.

Genitalia: Stout style; small sharp heel; base straight; anterior point very small and sharp; posterior point broad, as long as base, sides converging rapidly to sharp tip, meets base at right angle: oedagus long, curved in lateral view, broad at base, tapering to slightly swollen, blunt, unadorned tip.

Length: 3 mm.

Hocking Co. IV-28-34 J.S.C.; Pickaway Co. III-31-34 J.S.C.

***Erythroneura tenuispica* Beamer Pl. III Fig. 37**

Ann. Ent. Soc. Am. XXIII, pp. 444-5, 1930.

Ground color yellowish white, color markings lemon yellow to orange; vertex with inverted V widened at half length, touching eyes; continued across pronotum as narrow, irregular, diverging stripes; scutellum with orange tip and basal angles yellow; elytra with three medium-sized oblique vittae, plaque white, color bright red anterior and posterior to it, crossveins scarlet, three spots before crossveins, that before  $M_{3+4}$  longer and more distinct, apical cells smoky subhyaline; below, cream, face suffused with red, spines of hind tibiae pale.

Genitalia: Style moderate: heel large; base straight, meeting posterior point at less than a right angle; anterior point less than right angle; posterior point as long as base, enlarged near middle where inner margin is more or less toothed, sides converge to blunt point: oedagus heavily keeled, broad, evenly curved in lateral view; two sharp spines latero-ventrad to shaft diverge abruptly just before tip.

Length: 3 mm.

Indian Pt. Lake Co. IX-19-28 C.C.B.M.; Knox Co. V-8-33 M.A. & D.M.J. *Carpinus*, VII-8-34 M.A. *Vitis*; Athens IX-11-05, IX-17-29; Chesapeake IV-8,29-34 J.S.C.; Hocking Co. IV-15,28-34 J.S.C., IX-16-33 D.M.J.; Coal Grove IV-29-34 J.S.C.; Attica V-4-34 J.S.C.; Cedar Swamp IV-24-34 J.S.C.; Pickaway Co. III-31-34 J.S.C., IV-5,

30-34 J.S.C.; Worthington III-27-34 J.S.C.; Adams Co. IX-1-31 E.P.B. *Juniperus*; Hancock Co. VIII-18-34 D.M.J.

***Erythroneura eluta* McAtee Pl. III Fig. 38**

*Erythroneura obliqua* var. *eluta*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 277, 1920.

*Erythroneura eluta*, Beamer, R. H., Ann. Ent. Soc. Am. XXIII, pp. 445-6, 1930.

Ground color yellowish white on head and pronotum, white on basal part of elytra, semihyaline posteriorly; color markings orange; vertex with thin inverted V-shaped vitta with lateral projections to anterior margin of eyes in touch with eyes to base, wide at half their length; arms of V continued across pronotum as diverging stripes reaching both margins; scutellum with basal angles yellow narrowly margined except basally with orange, tip orange; elytra with three narrow vittae, that on clavus discontinuous two-thirds of way down where streak follows tegminal suture to apex, three small dark spots before orange crossveins, apical cells smoky subhyaline; no dark spines on tibiae, body cream, face orange.

Genitalia: Small style, narrow foot: prominent heel, projecting; base straight; anterior point slightly less than right angle; posterior point narrow, acuminate, as long as base which it meets in an even curve less than right angle; oedagus in lateral view thick for basal two-thirds, narrowing to a small keel, curved, with small diamond-shaped processes on ventral side before opening.

Length: 3 mm.

Knox Co. V-8-33 M.A. & D.M.J. *Carpinus*; Hocking Co. IV-15, 25, 28-34 J.S.C.; Worthington III-27-34 J.S.C.

***Erythroneura hamata* Beamer Pl. III Fig. 39**

Ann. Ent. Soc. Am. XXIII, p. 446, 1930.

Ground color cream on vertex and pronotum, opaque white to semihyaline on elytra, apices hyaline: color markings narrow, orange; vertex with thin inverted V-shaped vitta, arms slightly enlarged even with eyes; pronotum, thin vittae diverging posteriorly not reaching hind margin; scutellum, basal angles pale yellowish outlined very narrowly with orange, tip orange; elytra with very narrow vittae, that on clavus often discontinuous, and only a suggestion of the third before and behind the pale costal plaque; apical cells hyaline, no dark spots before crossveins; below, cream, face and spot above antennal socket orange, sides of thorax red.

Genitalia: Small style; heel large, projecting; base straight;

anterior point right angle; posterior point narrow, acuminate, curved, meeting base at about 45° angle, about two-thirds length of base: oedagus straight, two sinuate processes tapering to blunt apices arise latero-ventrad to shaft, diverge at half their length, continue parallel with shaft and extend three-fourths length of shaft.

Length: 3 mm.

Little Mt., Lake Co. IX-18-28 C.C.S.M.; Coal Grove IV-29-34 J.S.C.; Hocking Co. IV-15-34 J.S.C.; Jackson Co. IV-1-34 J.S.C.; Pickaway Co. III-31, IV-9,30, VI-12,24, VII-28, VIII-4-34 J.S.C.; Indian Springs, Columbus, VIII-1-28 C.C.B.M.

***Erythroneura latapex* Beamer Pl. III Fig. 40**

Ann. Ent. Soc. Am. XXIII, pp. 447-8, 1930.

Ground color cream on vertex and pronotum, elytra white; color markings broad, scarlet: vertex, inverted V narrow at apex and arms suddenly thickened at half their length to twice apical width, touching eyes; continued across pronotum as wide, slightly diverging irregular vittae reaching both margins; scutellum, basal angles yellow outlined except basally with narrow orange, tip orange; claval stripe broad in basal two-thirds, narrowly following suture in apical third to apex, corial vittae narrow, costal margin red-tinged especially before plaque, three distinct dusky spots before crossveins, the inner small, apical cells smoky semihyaline; below, head and thorax orange, sides of thorax red, hind tibiae with outer row of spines black.

Genitalia: Foot heavy, heel large, sharply projecting; base straight; anterior point a right angle; posterior point broad, parallel-sided with rounded blunt tip, meeting base sharply at 45° angle: oedagus in lateral view very heavy basally, straight on dorsal side, tapering to apical keel on ventral side, a pair of heavy leaf-like processes arise latero-ventrad to base of shaft and diverge in even lateral curve, toothed on inner margin and swollen near middle.

Length: 3 mm.

Pickaway Co. III-31-34 J.S.C.; Worthington, Brown Fruit Farm VIII-1-28 C.C.B.M.

***Erythroneura modica* Beamer Pl. III Fig. 41**

Ann. Ent. Soc. Am. XXIII, p. 448, 1930.

Small, ground color cream anteriorly, whitish semihyaline on elytra; color markings orange chrome: vertex, sides of inverted V widened at but not touching eyes except at base; broad and irregu-

**Erythroneura tridens** Beamer Pl. III Fig. 45

Ann. Ent. Soc. Am. XXIII, p. 450, 1930.

Ground color cream, elytra whitish semihyaline, glistening, vittae orange chrome: vertex, inverted V narrow at apex, arms widened at half length to twice apical width, touching eyes; continued across pronotum as distinctly diverging vittae; scutellum, tip orange, basal angles light pellucid lemon yellow; elytra shining, vittae rather narrow, dark spot before  $R_{3+4}$ , apical cells subhyaline, fumose; below entirely yellowish white.

Genitalia: Style stout; heel large, prominent, projecting; base straight beyond heel; anterior point a right angle; posterior point short, narrow, a fourth length of base: oedagus, shaft long, narrow, keeled, curved in lateral view; two processes arise latero-ventrad to shaft, diverge slightly, converge after middle, and diverge again at apices.

Length: 2.75 mm.

Pickaway Co. IV-30-34 J.S.C.

**Erythroneura bicornis** Beamer Pl. III Fig. 46

Ann. Ent. Soc. Am. XXIII, p. 450, 1930.

Cream background, elytra white, semihyaline toward costa and apex; vittae scarlet; inverted V, arms interrupted near apex by pale ocelli-like spots, twice apical width from middle to base, touching eyes with forward projection next eyes; pronotum, vittae diverging, extending from anterior margin two-thirds length; scutellum, basal angles pale lemon yellow, tip orange; elytra, vittae distinct, very narrow, indistinct short dark spots before crossveins, apical cells smoky subhyaline; below, face orange, remainder deep cream.

Genitalia: Style stout; heel projecting moderately; base sinuate; anterior point a right angle; posterior point as long as foot, meeting base at right angle curve, narrow, acuminate: oedagus short, stout at base, heavily keeled, curved on dorsal side in lateral view, on ventral side roughly toothed before middle; two thick blunt processes arise at sides of base and extend two-thirds length of shaft, diverging very slightly.

Length: 2.75 mm.

Hocking Co. IV-15-34 J.S.C.; Pickaway Co. IV-3, 5-1934 J.S.C.; Knox Co. V-8-33 D.M.J. *Carpinus*.

lar vittae on pronotum reaching both margins; scutellum with basal angles and tip light orange, three dusky spots before faintly smoky subhyaline apical cells; below cream white, face and sides of thorax pale orange.

Genitalia: Foot small; heel large, blunt, prominent; base convex; anterior point narrow, sharp, projecting latero-cephalad; posterior point same length, broader, projecting hook-like; oedagus in lateral view slightly curved, narrowed and flattened at slightly bifid tip, with lateral blunt teeth about three-fourths distance to tip.

Length: 2.5 mm.

Knox Co. V-8-33 M.A. *Carpinus*; Columbus VII-1-34 D.M.J. *Malus*.

***Erythroneura cornipes* Beamer Pl. III Fig. 42**

Ann. Ent. Soc. Am. XXIII, p. 449, 1930.

Ground color of head, pronotum cream, of elytra whitish semi-hyaline, markings flame scarlet; vertex with inverted U-shaped vitta even-sided, arms widened to about twice apical width at eyes but not touching them; continued across pronotum as medium-sized diverging vittae; scutellum with basal angles yellow, orange lined on inner margin, three dusky spots before crossveins, apical cells smoky subhyaline; below, face narrowly scarlet-margined on apex with median projection over border, face and sides of thorax orange, remainder cream.

Genitalia: Broad foot; base heavy, slightly convex; heel large; anterior point less than right angle; posterior point a fourth length of foot, narrow, sharp, meeting base at less than a right angle; oedagus with long heavy shaft, curved in lateral view, with very large lateral lobes, hoof-shaped, at apex.

Length: 3 mm.

Athens IX-12-05 H.O.; Hocking Co. IV-15,28, V-13, VI-7-34 J.S.C.; Cedar Swamp VII-29-34 J.S.C.; Pickaway Co. III-31-34 J.S.C.

***Erythroneura intricata* n. sp. Pl. III Fig. 43, Pl. V Fig. 11**

Ground color pale cream, elytra whitish semihyaline, vittae scarlet: vertex, inverted U-shaped vitta even-sided, arms with jog toward eyes at half their length, but on outer margins not touching eyes before base; pronotum with arms continued reaching both margins, separated by twice the width of one of them and almost parallel; scutellum, basal angles pale yellow, tip orange; elytra with broad vittae, plaque hyaline, three small round dusky spots before

crossveins, the outer most prominent, apical cells faintly fumose, subhyaline; below, cream, face orange, anterior margin scarlet with median projection over border, sides of thorax orange.

Genitalia: Style small; heel large, prominent, sharp; base of foot with convex hump from heel to concave curve with which it joins short, sharp, broad posterior point; anterior point half as broad as posterior, turned up sharply: oedagus with bifurcate base from which pend two narrow processes diverging from base to half their length where they are elbowed and converge, as long as shaft; shaft straight, narrow, with round tip.

Length: 2.75 mm.

Two males (holotype and paratype) Pickaway Co. III-31-34 J.S.C.; two females (allotype and paratype) same data; one male (paratype) Marietta VII-20 H.O.

***Erythroneura complicata* n. sp. Pl. III Fig. 44, Pl. V Fig. 12**

Head and pronotum cream, elytra white subhyaline, scarlet vittae well defined: vertex, inverted U-shaped vitta, parallel-sided with very slight bulge toward eyes at half length of arms, not touching eyes; pronotum, arms of U continued, reaching both margins and diverging definitely in posterior half; scutellum, basal angles pale lemon yellow margined interiorly by narrow orange border, median pale vitta cream, tip orange with oval spot in mid-anterior half, costal margin red, plaque white, indistinct dark spot before crossvein  $R_{4+5}$ , apices almost hyaline; below, head, thorax pale orange, legs and abdomen cream.

Genitalia: Style small; heel large, sharp; base straight; anterior point projecting latero-cephalad, small and sharp; posterior point half length of base which it meets at little more than a right angle, its outer margin curved and inner straight, acuminate; oedagus straight, short, stout, with two inverted shields at base from which hang two stout processes, narrow at base, broad toward apex, evenly curved to sharp point on outer margin, inner margin concavely curved from tip to second sharp point even with opening of shaft, from there to base faintly sinuate; tip of shaft slightly flattened dorso-ventrally.

Length: 2.9 mm.

From Pickaway Co. collected by J.S.C.: one male (holotype) one female (allotype) IV-9-34; two males (paratypes) III-31-34; one male (paratype) IV-3-34; one male (paratype) and two male specimens IV-30-34; from Coal Grove J.S.C.—one male (paratype) IV-8-34, and one male and one female (paratypes) IV-29-34; one male (paratype) Knox Co. V-8-33 D.M.J *Carpinus*.

**Erythroneura obliqua** (Say) Pl. III Fig. 47

*Tettigonia obliqua*, Say, J. Acad. Nat. Sci., Phila. IV, p. 342, 1825.

*Erythroneura obliqua*, Fitch, A., Homop. N. Y. St. Cab. Nat. Hist., p. 63, 1851.

*Erythroneura obliqua*, Beamer, R. H., Ann. Ent. Soc. Am. XXIII, p. 451, 1930. (Establishes neotype from Kansas)

Vittae scarlet, ground color white, elytra whitish semihyaline, eyes black; inverted U narrow and rounded at apex, sides greatly expanded from just below pale ocelli to anterior margin of eyes, in touch with eyes, and forming squares; vittae continued across pronotum as narrow, diverging irregular vittae often not touching posterior margin; scutellum, basal angles pale lemon yellow very narrowly lined on interior margin with scarlet, tip scarlet; vittae of elytra narrow, distinct, costal plaque, crossveins, adjacent longitudinal veins, apical veins and costa often red, very small inconspicuous dusky spot before crossveins  $R_{4+5}$ , apical cells fumose, subhyaline; below, head and sides of thorax orange, remainder pale cream.

Genitalia: Small style; heel small, sharply projecting; base straight; anterior point a right angle; posterior point as long as base, narrow, moderately sharp, meeting base at slightly less than right angle; oedagus short, narrow, straight, keeled; two small sharp processes arise ventrad of base and follow shaft closely half its length.

Length: 3 mm.

Knox Co. V-8-33 M.A. *Carpinus*; Hocking Co. IV-15-34 J.S.C.; Jackson Co. IV-1-34 J.S.C.; Chesapeake IV-3-34 J.S.C.; Portsmouth IV-29-34 J.S.C.; Cedar Swamp IV-24-34 J.S.C.; Pickaway Co. III-31, IV-5, VII-28, and VIII-4-34 J.S.C.; Columbus IV-29-33 M.A. and D.M.J. *Aesculus*, X-1-33 H.O. *Ulmus*; Franklin Co. V-14-33 D.M.J. *Aesculus*; Worthington III-27-34 J.S.C.; Allen Co. VIII-19-34 M.A.; Williams Co. IX-5-31 E.P.B.

**Erythroneura magnacalx** Beamer Pl. III Fig. 48

Ann. Ent. Soc. Am. XXIII, pp. 451-2, 1930.

Ground color white, elytra semihyaline, vittae orange chrome; vertex, inverted V with arms enlarged at half their length, not touching eyes; pronotum, vittae narrow, irregular, divergent, reaching margins; scutellum, basal angles pale lemon yellow, tip orange; elytra, vittae narrow, three elongate diffuse dusky spots before crossveins, apical cells drab, subhyaline, below yellowish white, face more or less orange, usually pale.

Genitalia: Style stout, small, with large foot; heel very

large, bluntly prominent; base straight; anterior point large, blunt, projecting lateral, less than right angle; posterior point short, triangular with outer side longer, meeting base at right angle: oedagus narrow, of medium length, heavily keeled, curved in lateral view; two delicate processes arise their width before base of shaft and extend half its length, slightly diverging.

Length: 2.75 mm.

Knox Co. V-8-33 M.A., VIII-28-34 M.A.; Licking Co. VI-30-34 M.A.; Hocking Co. VII-15-34 D.M.J., VII-14-34 M.A., X-15-33 D.M.J.; Cedar Point IX-3-33 M.A. *Vitis*; Pickaway Co. III-31-34 J.S.C.; Columbus IV-29-33 M.A. and D.M.J. *Aesculus*, V-6-34 D.M.J. *Ulmus*, V-11-33 D.M.J. *Aesculus*, III-23-01, VIII-15-31 E.P.B. *Crataegus*, IX-12-34 D.M.J. *Acer pictum*, IX-18-31 E.P.B. *Carpinus*, X-7-33 D.M.J. *Viburnum*; Franklin Co. V-14-33 M.A. *Aesculus*, VII-1-34 M.A., VIII-15-31 E.P.B. *Juglans*; Worthington III-27-34 J.S.C., V-20-33 D.M.J.; Adams Co. IX-1-31 E.P.B. *Castanea*, *Vitis*; Hancock Co. VI-23, VIII-18, IX-30, X-14-34 M.A. and D.M.J. *Crataegus*; Allen Co. VIII-19-34 M.A.

***Erythroneura unicuspidis* Beamer Pl. IV Fig. 49**

Ann. Ent. Soc. Am. XXIII, pp. 452-3, 1930.

Ground color white, semihyaline on elytra, vittae flame scarlet; vertex, inverted V very narrow in apical half, arms widened on outside touching eyes in basal half; vittae continued across pronotum, irregular, narrow, diverging; scutellum, base almost unicolorous, cream, scarlet tip; elytral vittae narrow, distinct, three small rounded dots before crossveins, apical cells smoky subhyaline; below, face, clypeus and spot below antennae orange, remainder cream buff, lorae and genae whitish.

Genitalia: Style small with large foot; heel large, acuminate; base straight; anterior point a little less than right angle; posterior point half length of base, narrow, sharp, curved on inner margin meeting base at right angle: oedagus short, stout, slightly curved in lateral view; lateral processes arise before base and follow shaft closely to tip; moderately keeled.

Length: 3 mm.

Hocking Co. IV-15-34 J.S.C.; Pickaway Co. III-31-34 J.S.C.

***Erythroneura inconspicua* n. sp. Pl. IV Fig. 50, Pl. V Fig. 13**

Small, background white, elytra semihyaline, tips subhyaline; vittae orange; vertex, inverted V broad, widened at and touching eyes; vittae continuous over pronotum, broad, diverging slightly;



scutellum, basal angles and tip pale orange-yellow; elytral vittae broad, three diffuse smoky spots before crossveins, apical cells faintly smoky, subhyaline; below, pale yellow-orange, immaculate.

Genitalia: Stout style with small broad foot: heel small; base straight; anterior point large, blunt, less than right angle; posterior point short, outer margin in line with that of anterior point, tip blunt, inner margin curving to meet base at  $45^\circ$ , about a third length of anterior point and a fifth length of base: oedagus long, broad, sides parallel, tip slightly keeled, distinctly curved in lateral view.

Length: 2.75 mm.

All specimens from Fulton Co., Oak Openings VI-24-34; one male (holotype) M.A., one female (allotype) D.M.J., and eight female paratypes, one H.O., 3 M.A., 4 D.M.J.

***Erythroneura rubrotincta* n. sp. Pl. IV Fig. 51, Pl. V Fig. 14**

Large highly colored species, elytra shining, especially apically, background white, vittae scarlet; vertex, inverted V heavy, arms expanded laterally before middle, not quite touching eyes before base, eyes black; pronotum, vittae continued across, broad, diverging in posterior half; scutellum, basal angles pale yellow rather broadly and conspicuously margined except basally by scarlet, tip scarlet; elytral vittae bright, distinct, costal plaque pale yellowish, three small dark roundish spots before crossveins, apical cells smoky subhyaline; below, pale cream, face orange, scarlet bordered on anterior margin with median projection meeting apex of V, scarlet streak from base of antennae narrowing between genae and lorae, sides of thorax red, a few dark spines on hind tibiae; dorsum of abdomen often red discally.

Genitalia: Very stout short style; heel sharp, projecting; base straight; anterior point very sharp, directed cephalad, its outer margin about in line with that of posterior point; posterior point half as long as base, blunt, meeting base at  $45^\circ$  angle, same length as anterior point: oedagus long, two narrow, blunt processes arise ventrad to base, follow shaft half its length where they diverge suddenly and continue parallel to shaft to its tip.

Length: 3.25 mm.

One male (holotype) Hocking Co. IV-15-34 J.S.C.; one female (allotype), three males (paratypes), and three imperfect specimens Jackson Co. IV-1-34 J.S.C.; one male, Knox Co. V-8-33 M.A. *Carpinus*. One male paratype from Heathesville, Ill., is in the collection of the Illinois Natural Historical Survey.

***Erythroneura nondescripta* n. sp. Pl. IV Fig. 52**

Ground color white, elytra suffused with pale yellow, vittae pale yellow-orange, ill-defined; eyes gray with brownish tinge; inverted V of vertex with sides expanded to eyes below middle; continued across pronotum as irregular broad diverging vittae; scutellum, basal angles and tip pale yellow; elytra with broad poorly defined vittae, tips subhyaline; below face and fore-tibiae pale orange, remainder yellowish white.

Genitalia; Style moderate; heel large and very sharply projecting; base straight; anterior point narrow, sharp, projecting latero-cephalad; posterior point broad, blunt, at right angles to base: oedagus short, stout, heavily keeled; two thick, blunt processes arise ventrad to base of shaft and extend half its length, slightly divergent.

Length: 2.75 mm.

One male (holotype) Athens, IX-11-20 H.O.

***Erythroneura minima* n. sp. Pl. IV Fig. 53, Pl. V Fig. 15**

Smallest member of Obliqua Group: background cream, of elytra whitish semihyaline; vittae a brighter color on pronotum, clavus and corium scarlet, on vertex and costa orange; vertex, even-sided broad inverted V with apex on margin of head, arms touching eyes basally; continued across pronotum, broad, even-sided almost parallel; basal angles and tip of scutellum pale yellow-orange, the former narrowly lined except basally by scarlet; elytra, medium-sized distinct vittae, costal margin pale or suffused with pale orange-yellow, apices subhyaline, fumose; below, conspicuous row of dark spines on hind tibiae, face pale orange-yellow, remainder cream suffused with orange.

Genitalia: Very small style with broad foot; heel sharp, small; base straight; anterior point less than right angle, outer margins of points in line; posterior point short, one-third length of base, narrow, acuminate, meeting base at right angle: oedagus heavily keeled, curved in lateral view; two processes arise ventrad to shaft and follow it almost to tip.

Length: 2.35 mm.

Male (holotype), female (allotype), one male and two female paratypes and one male specimen from Cedar Swamp, O., VII-29-34 J.S.C.

***Erythroneura minuta* n. sp.** Pl. IV Fig. 54, Pl. V Fig. 16

Stout, opaque white background, vittae orange; vertex, inverted V, short, stout, arms expanded laterally against eyes; pronotum, vittae irregular, reaching margins; scutellum, basal angles pale yellow, tip orange yellow, elytral vittae narrow, distinct, apices subhyaline, faintly fumose; below, face pale orange yellow, orange below antennal sockets and on sides of thorax, remainder of venter pale yellowish white, legs white, translucent.

Genitalia: Small style; heel very sharply projecting; base straight; anterior point projecting cephalad, a trifle less than right angle, outer edges of points forming even curve; posterior point acuminate, inner margin straight, curving to meet base at 45° angle; oedagus very short and stout, keeled heavily, twice as long as broad at base in lateral view, slightly curved; two processes arise ventrad of base and extend two-thirds length of shaft.

Length: 2.9 mm.

Male (holotype) and female (allotype) Portsmouth IV-29-34 J.S.C.

***Erythroneura fragilis* n. sp.** Pl. IV Fig. 55, Pl. V Fig. 17

Ground color white, elytra semihyaline, vittae light orange yellow; inverted V of vertex narrow apically, inner margins parallel, outer in touch with eyes entire length; pronotum, vittae broad, irregular, reaching margins; scutellum, basal angles and tip pale orange yellow; elytra with thin even vittae, three round black spots before crossveins, apical cells subhyaline, faintly smoky, below pale lemon yellow, legs white, translucent.

Genitalia: Style narrow with narrow foot; heel inconspicuous; base concavely curved; anterior point a right angle; posterior point curved on outer edge, straight on inner, about as long as base, meeting it in curve at less than right angle; oedagus fairly long, narrow, distinctly keeled, curved in lateral view, a short, thin pair of processes arises ventrad to shaft and follows it about half its length.

Length: 3 mm.

Male (holotype), female (allotype), three females (paratypes) and two broken specimens, abdomens missing, Ashland Co. VIII-14-34 M.A.; one male (paratype) Hancock Co. IX-30-34 M.A. *Salix*; one male (paratype) Hocking Co., IV-15-34 J.S.C.; one male (paratype) Pickaway Co. IV-15-34 J.S.C.; one male (paratype) Knox Co. V-8-33' M.A. *Carpinus*. One male paratype from Cave-in-Rock, Ill., in the collection of the Illinois Natural History Survey.

**Erythroneura sincera** n. sp. Pl. IV Fig. 56, Pl. V Fig. 18

Vittae scarlet-red, background white, semihyaline elytra; inverted V of vertex with arms enlarged at half their length touching eyes; pronotal vittae broad, parallel, reaching margins, separated by the width of one of them; scutellum, basal angles and tip pale orange yellow, antero-median pale area very narrow; elytral vittae narrow and very distinct, costal margin subhyaline, pale orange yellow, plaque colorless, two small dark spots before crossveins, one before Cu, the other  $R_{4-5}$ ; below, pale green, row of dark spines on hind tibiae, sides of thorax pale orange.

Genitalia: Style with moderately broad foot; heel projecting slightly, small; base straight; anterior point short, sharp, projecting laterad; outer margin meeting that of posterior point at obtuse angle; posterior point narrow, acuminate, meeting base at right angle, a little less than half length of base: oedagus long, narrow, in lateral view dorsal margin sinuate, curved, small keel very narrow in ventral view, no processes.

Length: 2.75 mm.

Male (holotype) Franklin Co. VIII-18-31 E.P.B. One male paratype from Springfield, Ill., taken from *Quercus alba*, is in the collection of the Illinois Natural History Survey.

## VULNERATA GROUP

A small group as to number of species contained, but which includes some very common forms. Taken on grape, Virginia creeper, and Boston ivy.

Characteristic in this group is the angulate base of the fourth apical cell. There is generally a pale median line on vertex, pronotum and scutellum. Most of the species are dark with pale veins. Five species and two varieties are included here.

## KEY TO SPECIES OF THE VULNERATA GROUP

- |        |   |                                 |
|--------|---|---------------------------------|
| 1.     | Greenish brown to fulvous or maroon on dorsum.....  | 2                               |
| 1'.    | Dorsum gray to black.....   | 3                               |
| 2(1).  | Basal angles of scutellum pale, reddish or yellowish.....                                       | <i>vulnerata</i>                |
| 2'.    | Basal angles black, markings of elytra chocolate maroon and gray-<br>ish white.....             | <i>pulchella</i>                |
| 3(1'). | Vertex very long and narrow, or pale at apex.....   | 6                               |
| 3'.    | Vertex with black markings; larger forms, 2.75-3 mm.....  | 4                               |
| 4(3'). | Clavus with conspicuous white spot at inner base.....   | <i>nigra</i>                    |
| 4'.    | Clavus lacking conspicuous white spot.....  | 5                               |
| 5(4'). | Dorsum black on head, paler gray posteriorly with rather extensive<br>pale areas on elytra..... | <i>nigra</i> var. <i>decora</i> |

- 5'. Dorsum more nearly unicolorous, pale areas inconspicuous  
 ..... *nigra* var. *nigerrima*  
 6(3). Vertex very long, black and narrow; few inconspicuous pale spots  
 on elytra ..... *atra*  
 6'. Vertex pale at apex; very small form, 2.5 mm. .... *atrata*

**Erythroneura vulnerata** Fitch Pl. IV Fig. 57

N. Y. St. Cab. Nat. Hist., pp. 62-3, 1851 (The Wounded Leaf Hopper).

Ground color greenish brown to fulvous or maroon with a pale median light mark common to vertex, pronotum and scutellum, and one bordering each eye. Pronotum with four lateral pale spots above middle; elytra with whitish semihyaline areas, of irregular shape, on clavus and corium; large plaque, yellowish white with oblique black vitta at each end; veins white,  $R_1$  and small part of adjacent veins bright red.

Inner male genitalia: Style with large foot, base curved, anterior point short, a right angle, posterior point narrow, sharp, half as long as base; oedagus gradually widening from narrow base to broad bifurcate apex in heavy lateral teeth, short median square projection; pygofer hook small, bifurcate at apex, the upper tooth shorter and curved toward lower.

A very common form on vines, especially grape.

Mentioned as occurring in Ohio by Osborn, Ohio Biol. Surv. Bul. XIV, p. 360, 1928.

**Erythroneura pulchella** Robinson Pl. IV Fig. 58

Can. Ent. LVI, p. 155, 1924.

Markings of same general pattern as in *vulnerata*; light areas emphasized by dark brown outline; basal angles of scutellum black; elytra with grayish white and chocolate maroon markings of about equal size alternating on clavus and corium; plaque white on inner half, red on outer; crossveins and apical veins pinkish white.

Inner male genitalia: Style with long narrow foot, base straight, anterior point a right angle, posterior point sharp, more than half length of foot; oedagus broad, about parallel-sided, indented slightly before heavy lateral teeth of apex; slight projection in middle between teeth, bearing two small delicate teeth; hook as in *vulnerata*, with upper tooth shorter and heavy, with very slight curve.

Adams Co. IX-1-31 E.P.B. Vitis; Coal Grove IV-8-34 J.S.C.; Ironton IV-29-34 J.S.C.

**Erythroneura nigra** (Gillette) Pl. IV Fig. 59

*Typhlocyba vulnerata* var. *niger*, Gillette, C. P., Proc. U. S. Nat. Mus. XX, 765, 1898.

*Typhlocyba nigradorsum*, DeLong, D. M., Bul. 17, Tenn. St. Bd. Ent. 110, 1916.

*Erythroneura niger*, Robinson, W., Uni. Kans. Sci. Bul. XVI, pp. 116-17, Pl. III, p. 150, 1926.

Dark brown, black on vertex with usual pale areas inconspicuous but for large yellowish white spot on inner base of clavus.

Inner male genitalia: Foot of style long, heel prominent, anterior point a right angle, posterior point heavy, short, sharp, almost equilaterally triangular: oedagus short, stout, in ventral view with short sharp lateral points turned cephalad at apex of shaft, in lateral view a dorsal spur subequal in length to points is visible; pygofer hook, single, straight, pointed process,肘ed at base.

A common form on grape.

Mentioned as occurring in Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 360, 1928.

**Erythroneura nigra** var. *decora* McAtee

*Erythroneura vulnerata* var. *decora*, McAtee, W. L., Trans. Am. Ent. Soc. XVI, p. 116, 1926.

Vertex and pronotum with yellowish white background, usual vittae limited to broad black inverted U with narrow apex and pale narrow median strip; elytra rather pale gray with more extensive pale areas than in *nigra*; that at inner base of clavus present but inconspicuous, due to presence of other light spots.

Columbus IV-29-33 M.A. & D.M.J.; Pickaway Co. III-31-34 J.S.C.; Athens VIII-25-32 W. C. Stehr.

**Erythroneura nigra** var. *nigerrima* McAtee

*Erythroneura vulnerata* var. *nigerrima*, McAtee, W. L., Trans. Am. Ent. Soc. XVI, p. 117, 1926.

Very dark with the pale areas much reduced. Vittae of vertex black, of elytra dark gray.

Cedar Swamp IV-17-34 J.S.C.; Magnetic Springs IX-6-14; Coal Grove IV-8-34 J.S.C.; Columbus V-13-99; Pickaway Co. III-31-34 J.S.C.

**Erythroneura atra** n. sp. Pl. IV Fig. 60

Small and narrow, with a long, bluntly pointed vertex entirely black but for a very narrow pale median line; pronotum black be-

coming dark gray posteriorly with median and two lateral pale spots; median pale stripe in scutellum; elytra, oval pale spot at inner base of clavus, two smaller ones before tip; corium entirely dark gray but for two spots near claval suture corresponding to those on clavus; plaque small, outlined in black with pale spot posterior to it; apical cells dark bordered by pale crossveins and at apex with white, with pale spots in middle  $M_4$  and posterior part of  $R_1$ . Below, face and legs pale, thorax and abdomen dark.

Length: 2.75 mm.

Inner male genitalia: Quite similar to those of *nigra*. Foot large with prominent heel, strongly curved base, anterior point a right angle, posterior point  $\frac{2}{3}$  length foot, slight incurved, sharp-pointed: oedagus short and stout with long lateral upturned spines from ventral view, longer than shaft, from lateral view as in *nigra* but longer.

Holotype male, Conkle's Hollow, Hocking Co. IV-15-34 J.S.C.

***Erythroneura atrata* n. sp. Pl. IV Fig. 61**

Very small stout dark species. Vertex dark brown, broadly yellow bordered, the pale area extending down middle a short distance, two lateral pale spots before eyes; pronotum entirely brown but for short antero-median pale dash; scutellum dark with suggestion of pale median vitta; elytra—clavus and corium entirely dark but for two pale spots, one at middle of clavus, the other just below it on corium; plaque bright yellow, small white area posterior to it; apical cells dark, crossveins and apical veins at tip pale, semi-hyaline areas at outer middle of  $M_1$  and outer part of  $R_1$ . Below, head and legs pale, thorax and abdomen dark.

Length: 2.25 mm.

Inner male genitalia: Styles very large, heel prominent, base straight, anterior point inconspicuous, posterior point very long, twice length of foot, curved in beyond heel: oedagus very short with very small lateral spines and dorsal keel; pygofer hook with heavy quadrilateral base and long heavy spine curved in, parallel-sided to tip where it is abruptly narrowed to a fine point.

Male (holotype), female (allotype) and three males (paratype) Marietta VII-20-21 H.O.; one paratype Marietta IX-13-05 H.O.; three females (paratype) Adams Co. IV-1-31 H.O. One male paratype from New Haven, Conn., one female paratype from Waynesburg, Pa., and one female paratype from Moscow, Tenn., are included in the collection of D. M. DeLong.

## SCUTELLERIS GROUP

But two members of this group are mentioned here. They are rather intermediate between the *Vulnerata* and *Maculata* Groups. The color markings are rather indefinite in their boundaries; base of cell *M*<sub>1</sub> angulate. The clypeus is entirely black, in strong contrast to the pale face, a characteristic which readily separates these from all other forms. The vertex is rather short and rounded.

*Erythroneura rosa* Robinson Pl. IV Fig. 62

Can. Ent. LVI, p. 58, 1924.

Uni. Kans. Sci. Bul. XVI, 120, Pl. III, p. 150, 1926.

Ground color yellowish white, markings yellow to rose red. Vertex, three pale, more or less circular, areas completely bounded by colored vittae, the median a little longer and more narrow than the lateral, margin pale; pronotum dark posteriorly, median U-shaped vitta with heavy base, arms not attaining anterior margin, broad red vitta behind each eye; scutellum, basal angles dusky with narrow red borders except basally, tip red, median inverted T-shaped pale area; elytra with vittae occupying most of space but for the following pale areas: heart-shaped area at inner base of clavus, irregularly diamond-shaped area including colored apices of clavi, areas above and below costal plaque and plaque itself which is longer than that of *portea*; crossveins red, a large dark splotch at base of cell *M*<sub>1</sub>, remainder of cell pale, and other apical cells smoky. Clypeus, cheeks, and narrow lateral border of frons black, remainder pale, more or less flushed with red.

Inner male genitalia: Foot small, base curved, points small and sharp, scarcely projecting; oedagus heavy, with rounded apex, a pair of slender processes arise considerably ventrad of base, extend two-thirds length of shaft, from ventral view approach each other then diverge slightly at tip, from lateral view oedagus is wide, sinuate on both dorsal and ventral sides and with a large dorsal keel, the processes curved dorsal; pygofer hook very large and stout, rounded base, and long parallel-sided structure, narrowed toward sharp-pointed apex, and with slight S-curve.

Common on willow throughout the State.

*Erythroneura tecta* McAtee Pl. IV Fig. 63

Trans. Am. Ent. Soc. XLVI, 288, 1920.

Robinson, W., Uni. Kans. Sci. Bul. XVI, p. 122, Pl. IV, p. 151, 1926.

Vertex yellow, two brownish spots on disc more or less connected with each other, base, eyes, and apex by narrow red lines;



pronotum pale yellow on anterior margin, dark posteriorly; remainder brown with pale median dash and two round spots on each side; scutellum, basal angles black, tip red, median vitta white; elytra dark brown but for large, opaque white area at inner base of clavus, outlined in red, and diamond-shaped pale area around red apex of clavus, costal plaque large, yellow, a few small indistinct pale spots on corium. Below, clypeus and sides of frons black, remainder pale, cheeks yellow, legs pale and body dark.

Inner male genitalia: Style small, straight base, heel inconspicuous, anterior point sharp, projecting laterad, no posterior point: oedagus stout, sides sinuate, narrower at apex, from lateral view heavy ventral processes very close to shaft with minute claw at apex, and dorsal small keel; pygofer hook with stout base, long, slightly curved, tapering to blunt tip.

West Jefferson, X-3-18; Vinton VI-5,12-00; Cedar Swamp IV-17-34 J.S.C.

Mentioned as occurring in Ohio, H. Osborn, Ohio Biol. Surv. Bul. XIV, p. 362, 1928.

#### MACULATA GROUP

Characterized by absence of M-Cu crossvein and by oblique base of cell  $M_4$  with dark spot at inner margin near tip of clavus.

This group contains the largest number of species of any in the genus and consists of inhabitants of deciduous trees and shrubs. Dr. Beamer has recently dealt extensively with this group (1931-32). The Ohio species will be listed here with locality records following the order in Beamer's work, and with numbers corresponding to his preceding the specific name. His work should be consulted for more detailed information.

A few of the species are readily recognized by external characters, but the majority must be determined on the basis of the inner male genitalia. The foot of the style, pygofer hook and oedagus (which generally lack processes) are of diagnostic value in the order mentioned. Fifty-five species and one variety are included in the Ohio fauna.

1. *maculata* (Gillette) Pickaway Co. III-31, IV-9-34 J.S.C.; Columbus III-10-97, III-25-96, X-5-96 J. S. Hine; V-11-33 M.A. *Aesculus*, v-18-33 D.M.J., V-19-28 H.O.  
Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 362, 1928.
3. *noncuspidis* Beamer, Buckeye Lake v-11-33 M.A.

95. **hymac** Robinson, Mentioned as occurring in Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 363, 1928, Athens, Deer Creek, Madison Co. and Columbus.
96. **carmini** Beamer, Columbus IX-29-19 H.O., Indian Spring VIII-1-28 C.C.B.M.; Franklin Co. VIII-16-31 E.P.B. *Vitis*.
97. **campana** Robinson, Common everywhere, especially on elm.
98. **basilaris** (Say), Common, especially on elm throughout State.
99. **affinis** Fitch, Athens IX-12-05 H.O.; Pickaway Co. III-31-34 J.S.C.; Columbus V-11-33 M.A. *Aesculus*, IX-28-30 H.O. *Ulmus*, X-1-33 H.O. *Ulmus*.
100. **bigemina** McAtee, Columbus IV-29-33 M.A. & D.M.J. *Aesculus*, X-1-33 H.O. *Ulmus*; Adams Co. IX-1-31 E.P.B. *Castanea*.
104. **certa** Beamer, Columbus VIII-27-31 E.P.B. *Carpinus*; Worthington, Brown Fruit Farm VIII-21-28 C.C.B.M.; Adams Co. IX-1-31 E.P.B. *Carpinus*.
105. **mirifica** Beamer, Columbus VIII-20-27 C.C.B.M.
107. **marra** Beamer, Waterville IX-11 H.O.
108. **aculeata** Beamer, Knox Co. V-8-33 D.M.J. *Carpinus*.

## COMES GROUP

In this group the fourth crossvein of the elytra is continuous with or parallel to the third, meeting the margin at about a right angle; there is usually a dark area in the base of cell  $M_4$  and another in the apex of  $R_3$ ; often a black dash borders the posterior margin of the plaque.

The majority of the members of this group live on grape, Virginia creeper, Boston ivy, and related hosts. They are commonly called grape leafhoppers. Twenty-four species and twelve varieties are included in the Ohio fauna.

## KEY TO SPECIES AND VARIETIES OF THE COMES GROUP

|        |   |                          |
|--------|---|--------------------------|
| 1.     | With longitudinal median vitta on vertex.....   | 25                       |
| 1'.    | Vertex unicolorous or without median longitudinal vitta.....  | 2                        |
| 2(1'). | Elytral markings continuous from humerus to crossveins.....   | 9                        |
| 2'.    | Elytral markings discontinuous.....   | 3                        |
| 3(2'). | Elytra with elongate vitta in basal half of clavus, spot at apex; oblique streak on base of corium and angulate vitta bordering inner margin of plaque..... | 4                        |
| 3'.    | Markings in form of transverse bands.....   | 20                       |
| 4(3).  | Upper surface of abdomen white or pale.....   | 5                        |
| 4'.    | Upper surface of abdomen dark.....  | 6                        |
| 5(4).  | Vittae red, distinct, apices of elytra dusky semihyaline.....   | comes                    |
| 5'.    | Black median basal vitta on scutellum; dark spot at inner mid-clavus.....   | comes var. <i>compta</i> |

5. **lunata** McAtee, Wauseon VIII-10-96 J. S. Hine *Quercus alba*.
6. **contracta** McAtee, Pickaway Co. III-31, IV-9-34 J.S.C.; Buckeye Lake V-18-33 M.A. & D.M.J.
7. **gemina** McAtee, Pickaway Co. III-31-34 J.S.C.
14. **triangulata** Beamer, Pickaway Co. III-31-34 J.S.C.
15. **bispinosa** Beamer, Piketon IV-29-34 J.S.C.
16. **calamitosa** Beamer, Pickaway Co. III-31-34, IV-5-34 J.S.C.
19. **turgida** Beamer, Pickaway Co. III-31-34 J.S.C.
20. **parallela** McAtee, Columbus X-2-19 H.O.
22. **clavipes** Beamer, Pickaway Co. III-31-34 J.S.C.; Columbus V-6-34 D.M.J. *Prunus*.
23. **penesica** Beamer, Adams Co. IX-1-31 E.P.B. *Castanea*.
25. **tantilla** Beamer, Pickaway Co. III-31-34 J.S.C.
27. **dira** Beamer, Pickaway Co. III-31-34 J.S.C.; Knox Co. V-8-33 M.A. & D.M.J. *Carpinus*; Hancock Co. VI-23-34 D.M.J. *Crataegus*.
30. **arta** Beamer, Portsmouth IV-29-34 J.S.C.; Ashley VIII-12 H.O.; Columbus IX-20-19 H.O.; Franklin Co. VIII-15-31 E.P.B. *Vitis*; Adams Co. IX-1-31 E.P.B. *Platanus occidentalis*.
31. **rotunda** Beamer, Athens VIII-27-32 W.C. Stehr.
32. **abjecta** Beamer, Jackson IV-1-34 J.S.C.; Pickaway Co. III-31-34 J.S.C.
34. **separata** Beamer, Columbus V-11-33 D.M.J. *Aesculus*
36. **propria** Beamer, Athens IX-12-05 H.O.
37. **dumosa** Beamer, Jackson IV-1-34 J.S.C.
39. **usitata** Beamer, Adams Co. IX-1-31 E.P.B. *Platanus occidentalis*; Cedar Swamp IV-17-34 J.S.C.
41. **sancta** Beamer, Knox Co. V-8-33 M.A. *Carpinus*.
44. **mira** Beamer, Columbus IX-18-31 E.P.B. *Carpinus*.
46. **aesculi** Beamer, Hocking Co. IV-28-34 J.S.C.
47. **adunca** Beamer, Pickaway Co. III-31-34 J.S.C.
50. **retusa** Beamer, Hancock Co. VI-23-34 H.O. & D.M.J. *Crataegus*.
59. **unica** Beamer, Portsmouth IV-29-34 J.S.C.
60. **manus** Beamer, Pickaway Co. III-31-34 J.S.C.
61. **minor** Beamer, Camp Perry, W. L. McAtee (paratype) Recorded for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.
64. **crinita** Beamer, Columbus IX-11-20 H.O.
66. **curta** Beamer, Fulton Co. VI-24-34 H.O., M.A. & D.M.J.
68. **knighti** Beamer, Columbus IX-16-33 D.M.J.

70. **pyra** McAtee, Pickaway Co. III-31, IV-3,5-34 J.S.C.; Columbus IV-27-34 J.S.C., IV-29-33 M.A. & D.M.J. *Aesculus*, VIII-10-33 D.M.J. *Celtis*, IX-9,12-34 D.M.J. *Acer pictum*, IX-20-19 H.O. X-4-33 D.M.J. *Viburnum*.  
Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 361, 1928.
71. **confirmata** McAtee, Pickaway Co. III-31, IV-9-34 J.S.C.; Wooster X-4-96 A.C. 2621. Mentioned as *mitella*, Osborn, H., Ohio Biol. Surv., Bul. XIV, p. 361, 1928.
73. **accola** McAtee, Columbus III-22-94; IX-11-01.
74. **osborni** (DeLong), Crown City, Gallia Co. VIII-23-15 C. J. Drake; Franklin Co. VIII-5-31 E.P.B.; Adams Co. IX-1-31 E.P.B. *Carpinus*; Oxford IX-3-15 H.O. Reported for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.
75. **bella** McAtee, Pickaway Co. III-31-34 J.S.C.
77. **trivittata** Robinson, Wooster X-14-96 A.C. 2621; West Jefferson X-3-14; Madison Co. IX-25-31 E.P.B. *Vitis*; Pickaway Co. III-31-34, IV-5-34 J.S.C. Reported for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.
80. **torella** Robinson, Columbus IV-8-33 D.M.J., IX-28-30 H.O. *Vitis*; Pickaway Co. III-31-34, IV-9-34 J.S.C.
81. **kansana** Baker, Very common on elm throughout the State. Recorded for Ohio as *scutelleris*, Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 360, 1928.
86. **morgani** (DeLong), Pickaway Co. III-31, IV-9-34 J.S.C.; Columbus X-5-96 J.S. Hine.
87. **lawsoni** Robinson, Very common on sycamore throughout the State. Mentioned as *mediana*, Osborn, H., Ohio J. Sci., XXXII, p. 515, 1932; as *lawsoni*, Ohio Biol. Surv. Bul. XIV, p. 363, 1928.
88. **ligata** McAtee, Columbus V-19-28 H.O., IX-11-01, Gregg Dam VII-28-28 C.C.B.M.; Wooster X-20-96 A.C. 2638; Perry Co. McAtee. Mentioned as occurring in Ohio: Osborn, H., Ohio J. Sci., XXXII, p. 515, 1932.
91. **illinoiensis** (Gillette), Coal Grove IV-29-34 J.S.C.; Pickaway Co. III-31-34 J.S.C.; Adams Co. IX-1-31 E.P.B. *Cercis*. Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 361-2, 1928.
93. **illinoiensis** var. **spectra** McAtee, Athens VI-14-32 W.C. Stehr.
94. **hartii** (Gillette), A common form on apple throughout the State.

- 6'. Markings narrow, attenuate, tips of elytra smoky subhyaline  
.....*attenuata*
- 6(4)'. Black median vitta in base of scutellum and black spot at inner  
mid-clavus..... 7
- 6'. Without black markings on scutellum and clavus..... 18
- 7(6)'. Vittae unicolorous .....*nigroscuta*
- 7'. Vittae of basal half crimson, of posterior half yellow orange  
.....*nigroscuta* var. *rufomaculata*
- 8(6)'. Background whitish subhyaline; basal angles of scutellum yellow  
gray outlined with red.....*omaska*
- 8'. Background whitish semihyaline; markings orange, indefinite...*vaga*
- 9(2)'. Upper surface almost entirely dark brown or black..... 15
- 9'. Not entirely dark..... 10
- 10(9)'. Apex of clavus colored..... 11
- 10'. Apex of clavus pale..... 21
- 11(10)'. Vittae narrow ..... 12
- 11'. Vittae broad and darker..... 14
- 12(11)'. Vittae bright red or yellow; mesosternum pale.....*beameri*
- 12'. Vittae darker; mesosternum black..... 18
- 13(12)'. Vittae dark red to bluish red.....*vitifex*
- 13'. Vitta of anterior half of clavus and short vitta on adjacent cori-  
um at its apex black.....*palimpsesta*
- 14(11)'. Broad blood brown vittae of uniform width throughout; tip of  
clavus pale red or yellow.....*ziczac*
- 14'. Stripes not of uniform width..... 17
- 15(9)'. Upper surface almost entirely dark, pronotum entirely so..... 16
- 15'. Dark angulate stripe pointed on vertex, widening toward apex,  
with pale border on vertex and pronotum.....*aclys*
- 16(15)'. Smoky brown to black; mid-base of scutellum and few small  
semihyaline spots along suture pale.....*infuscata*
- 16'. White spaces anterior and posterior to plaque and spots surround-  
ing dark apex of clavus.....*infuscata* var. *prosata*
- 17(14)'. Vittae reddish brown, extending from humerus to plaque, thence  
to crossveins, leaving large pale median diamond-shaped area  
.....*cancellata*
- 17'. Markings of vertex pale yellow orange to red; elytral vittae wid-  
ening to cover anteapical area except pale spots around tip of  
clavus.....*portea*
- 17'. Vertex with dark to black vittae on pale background  
.....*portea* var. *breakyi*
- 18(6)'. Background semihyaline, dark abdomen showing through..... 19
- 18'. Background milky white, red spots attenuate, often separate...*delicata*
- 19(18)'. Very broad red markings, darker interiorly.....*rubra*
- 19'. Markings less extensive, uniform color.....*rubrella*
- 20(10)'. Small, white with narrow red markings.....*acuticephala*
- 20'. Broad bluish red vittae occupying most of clavus.....*elegans*
- 21(3)'. Bands broad, more or less connected..... 22
- 21'. Bands narrow, distinct, anterior band not including base of elytra  
.....*tricincta*
- 22(21)'. Saddle spot large, round, bordered by immaculate whitish band  
.....*vitis*

- 22'. Saddle spot bordered by wreath of pale spots.....*vitis* var. *corona*  
 22". Saddle spot not round..... 23  
 23 (22"). Dorsum almost entirely bright red with pale spots at inner base  
           and apex of clavus.....*bistrata*  
 23'. Markings less extensive..... 24  
 24 (23'). Three distinct crossbands, the anterior including humeral area  
           of elytra.....*bistrata* var. *stricta*  
 24'. Median crossband connected with anterior on clavus  
           .....*bistrata* var. *rubranotum*  
 25 (1). Median vitta vertex very narrow, other markings present..... 26  
 25'. Median vitta broader, consisting of two narrow vittae roughly  
           fused.....*kanwaka*  
 26 (25). Apical markings of vertex brownish to black.....*corni*  
 26'. Markings of vertex bright red on yellowish background.....*ontari*

### ***Erythroneura comes* (Say)**

*Tettigonia comes*, Say, Journal Acad. Nat. Sci. Phila., IV, p. 243, 1825;  
 Compl. Writ. II, p. 259, 1859.

Mentioned as occurring in Ohio:

Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 365, 1928.

McAtee, Kelly's Island, O., July 18, 1911 (Q. No. 6938), Trans.  
 Am. Ent. Soc. XLVI, pp. 313-14, 1920.

Background yellowish white on vertex, pronotum and scutellum; elytra whitish semihyaline. Markings pale yellow to scarlet, paler on vertex and pronotum, discontinuous on elytra consisting of elongate vitta in basal half of clavus and spot at tip, oblique streak in base of corium and angulate vitta more or less completely bordering inner margins of costal plaque. The crossveins and adjacent longitudinal veins are scarlet. Apical cells strikingly dusky discally. In female, apex of ovipositor black and disc of abdominal segments somewhat dusky; male, black apices of plates slightly divergent, exposing black claspers.

This is a very common species on grape, both cultivated and wild, upon which it breeds. Reference to natural enemies of this species has been made in the introduction.

### ***Erythroneura comes* var. *compta* McAtee**

Trans. Am. Ent. Soc. XLVI, p. 318, 1920.

The markings are similar to those of *comes* with, in addition, a black spot at the inner mid-clavus, a black median vitta on scutellum basally, and the apex of scutellum more or less darkened.

Specimens very close to *nigroscuta* in external appearance but with inner male genitalia identical to those of typical *comes*.

Columbus V-11-33 and V-20-34 D.M.J.

**Erythroneura nigroscuta Johnson**

Ohio J. Sci. XXXIV, pp. 258-9, Fig. 1, 1934.

Like *comes* var. *compta* with definite black markings and rather indefinite color markings. The processes of the oedagus in the male are double, making the oedagus from dorsal view appear to bear four apical spines.

In addition to previous records, J.S. Caldwell has taken hibernating specimens from Columbus, Coal Grove, Hocking Co., Portsmouth, Pickaway Co. and Attica.

**Erythroneura nigroscuta var. rufomaculata McAtee**

*Erythroneura comes* var. *rufomaculata*, McAtee, Bul. Div. Nat. Hist. Surv., Ill., XV, p. 43, 1924.

*Erythroneura nigroscuta* var. *rufomaculata*, Johnson, D. M., Ohio J. Sci. XXXIV, pp. 259-60, 1934.

Differing from the species in that the vittae of the basal part of the elytra are crimson while those of the posterior part are pale yellowish.

Haunck's Pond, Middle Bass Island, VII-22-33 M.A. & D.M.J.; South Bass Island, VIII-3-20 C.I. Bliss.

**Erythroneura attenuata Johnson**

Ohio J. Sci. XXXIV, p. 260, Fig. 2, p. 259, 1934.

Ground color opaque white; color markings scarlet to orange, narrow, distinct and discontinuous. Dark spots of apical cells small, discs of cells smoky subhyaline.

Described from specimens from Cantwell Cliffs, Hocking Co. X-23-1932 D.M.J., paratypes from Adams Co., IX-1-31 E.P.B. *Vitis*; Richland Co. V-8-33 M.A.; specimens from Athens, IX-11-20 H.O.; Knox Co. V-8-33 M.A. & D.M.J. *Carpinus*; and Williams Co. IX-5-31 E.P.B.

**Erythroneura vaga Johnson**

Ohio J. Sci. XXXIV, pp. 260-1, Fig. 3, 1934.

Ground color white, color markings vague, orange in *comes* pattern; dorsum of abdomen dark discally showing through elytra. In the male the narrow oedagus is bifurcate apically, the prongs bent slightly dorsad.

Mineral Springs VIII-31-31 H.O. (male holotype); Chesapeake, IV-29-34, J.S.C. (paratype).

**Erythroneura omaska Robinson**

Can. Ent. LVI, p. 62, 1924.

Uni. Kans. Sci. Bul. XVI, p. 146, Pl. VII, p. 154, 1926.

Background yellowish white with orange markings much in

pattern of *comes*. The narrow irregular inverted U-shaped vitta of vertex has two lateral extensions to eyes. The dorsum is dark and visible through semihyaline elytra.

There is a pair of processes or spines dorso-laterad of bifurcate oedagus which are not shown in Robinson's figure. However his description fits the specimens at hand very well.

A series from Pickaway Co. III-31-34 J.S.C.

### ***Erythroneura vitifex* Fitch**

*Erythroneura vitifex*, Fitch, Vine-destroying leaf hopper. Trans. N. Y. Agr. Soc. XVI, pp. 392-3, 1856.

A part of Fitch's description is quoted: "Yellowish white, the wing covers with oblique confluent blood red bands and a short oblique black line on the middle of their outer margin; thorax commonly with three red stripes, the middle one forked anteriorly and confluent with two red stripes on the crown of the head. When the wing covers are close they appear red with a cream colored spot shaped like a heart anteriorly, and on their middle a large diamond-shaped spot with a small red spot in its center." The thorax and dorsum of abdomen are dark.

This very common leafhopper is taken on vines whenever and wherever swept. A rather puzzling situation arises in connection with the shape of the processes of the oedagus in the males. Two distinct forms of genitalia are found. However males possessing these differences cannot be separated upon the basis of external characters. They are consistently taken at the same time from the same plant, and even from the same leaf.

Both types of inner male genitalia are described in detail:

(a) Styles small; posterior point short, sharp, more than a right angle from base of foot; anterior point about as long as posterior, not as large, and forming with it an obtuse angle: oedagus large, gradually widening from base two-thirds its length where it is convexly rounded to blunt apex, processes thick, curved tong-like at the apices which do not attain apex of oedagus.

(b) Styles as in (a). Oedagus almost equilaterally triangular with blunt angles, the tube protruding slightly at apex; processes narrow from base and parallel for two-thirds length, then abruptly diverging and expanded leaf-like, sharp-pointed. Pygofer hook, inner point more than twice as long as outer, at right angles to base; outer rounded at base; small hump at outside of inner hook.

The (b) type seems to be a little more common.

Mentioned as occurring in Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 366, 1928. "Doubtless common all over the State."



**Erythroneura palimpsesta McAtee**

*Erythroneura comes* var. *palimpsesta*, McAtee, W. L., Bul. Civ. Nat. Hist. Surv. Ill., XV, Art. II, p. 43, 1924.

Similar to *vitifex*. Vittae of vertex bright red, of pronotum dark red; scutellum, basal angles usually black outlined narrowly with red, red in some, tip red; elytra, vitta of anterior of clavus except for small humeral area and short vitta on corium adjacent to its apex, black, other markings red to fuscous, oblique black vitta at posterior end of plaque broad, apices dusky.

The inner male genitalia differ distinctly from those of *comes*; therefore this is given specific rank.

Taken in Pickaway Co., III-31-34 J.S.C.

**Erythroneura beameri Robinson**

Can. Ent. LVI, p. 61, 1924.

Uni. Kans. Sci. Bul. XVI, p. 141, Pl. VI, p. 153, 1926.

Creamy white with bright even red markings of much the same pattern as in *vitifex*. The body is entirely pale or with red markings, which readily separates this from *vitifex*.

Taken very commonly on grape.

Reported for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.

**Erythroneura ziczac Walsh**

The Prairie Farmer (Illinois) 10, No. 10, p. 149, 1862.

Background pale yellowish; blood brown on posterior half of pronotum, base of scutellum, and on elytra broad angulate vitta from humerus, covering basal two-thirds of clavus but not reaching suture, back to costal plaque and from posterior margin of plaque to base of cell  $M_2$ ; apices dark with angulate vittae appearing as continuations from base of cell  $M_1$  to dark spot in apex of  $R_3$ . Red to pale yellow markings on vertex, pronotum, tip of scutellum and apex of clavus.

A very common species on Virginia Creeper, Boston Ivy, and Grape, and present wherever these vines are found.

The foot of the style is hatchet-shaped rather than with a long posterior point as figured by Robinson (Pl. VII, Uni. Kans. Sci. Bul. XVI, p. 154, 1926).

Mentioned for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 366, 1928.

**Erythroneura infuscata** (Gillette)

*Typhlocyba comes* var. *infuscata*, Gillette, C. P., Proc. U. S. Nat. Mus. XX, p. 764, 1898. (Description of *aclys* but type *infuscata*).

*Erythroneura infuscata*, Robinson, W., Uni. Kans. Sci. Bul. XVI, p. 136, 1926.

Smoky brown to black, except for pale anterior margin of vertex, median base and anterior third of apex of scutellum yellow occasionally with suggestion of red margins, plaque white, area posterior to plaque dark reddish, and very small rather round semihyaline spots at base, middle and apex of clavus, middle of outer part of cell  $M_4$  and before apex of  $R_3$ . Below pale yellow, head and legs, somewhat suffused with red, remainder chiefly dark.

Pickaway Co. III-31-34, V-5,9-34; Hocking Co. IV-15-34; Port Clinton V-4-34; Portsmouth IV-29-34 J.S.C.

**Erythroneura infuscata** var. *prosata* n. var.

With more extensive light markings than in the species. Apical margin of vertex pale, pronotum and base of elytra entirely dark, a large quadrilateral white space below humerus to plaque and extending to claval suture, another posterior to plaque from margin to base of cell  $M_2$ , three small white spots surrounding dark mark at apex of clavus. Below, dorsum dark, venter pale but for genital segments and prothorax. Inner male genitalia same as in species.

Male (holotype) Pickaway Co. III-31-34 J.S.C.; two females (allotype and paratype) Coal Grove IV-29-34 J.S.C.

**Erythroneura aclys** McAtee

Trans. Am. Ent. Soc. XLVI, p. 200, 1920.

A broad brown to black stripe extends the length of the insect, margined distinctly by pale yellow and with a pale diamond-shaped spot surrounding orange-tipped claval apex. Outer crossveins bright red; apices of elytra dark with semihyaline areas in middle of outer  $M_4$ , outer part of  $R_3$  and adjacent  $R_1$ .

This is the most common species found on *Cercis canadensis* throughout the summer and has been taken from numerous localities in Ohio.

Mentioned as occurring in Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 366, 1928; Ohio J. Sci. XXXII, p. 515, 1932.

**Erythroneura cancellata** McAtee

*Erythroneura comes* var. *cancellata*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 325, 1920.

*Erythroneura cancellata*, Robinson, W., Uni. Kans. Sci. Bul. XVI, p. 141, 1926.

A large white diamond-shaped area ornamented by bright red vittae extends from the white median area of the scutellum to the apex of the clavus, and is surrounded by broad, dusky, sanguineous vittae often with red edges. Traces of the usual red markings are visible through the duskiness of the vertex.

However, the background of the vertex and pronotum in *break-eye* is opaque white and there is no suggestion of underlying brown areas. Since it was described a number of additional specimens have been taken, males dissected, and the inner male genitalia found to correspond with those of *portea*, usually rather bluish red outlined in bright red, and the black of the vertex may be confined to the inner margin of the inverted U of the vertex, or cover most of the disc and base, leaving a narrow median pale area.

Female (holotype) Adams Co. IX-1-31 E.P.B. *Vitis*; Chesapeake IV-29-34 J.S.C.; Pickaway Co. III-31, III-26, VII-28-34 J.S.C.

**Erythroneura rubra** (Gillette)

*Typhlocyba comes* var. *rubra*, Gillette, C. P., Proc. U. S. Nat. Mus. XX, p. 764, 1898.

*Erythroneura comes* var. *rubra*, McAtee, W. L., Trans. Am. Sci. Ent. Soc. XLVI, pp. 314-15, 1920.

*Erythroneura rubra*, Robinson, W., Uni. Kans. Sci. Bul. XVI, p. 135, Fig. Pl. VI, p. 153, 1926.

Mentioned as occurring in Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932. Perry and Adams Counties.

With very broad red markings of the *comes* type. The dark dorsum of the abdomen shows through the semihyaline elytra giving the insect a grayish cast.

Athens IX-12-95 H.O.; Marietta IX-13-05 H.O.; Columbus IV-29-33 M.A. & D.M.J. *Aesculus*, V-11-33 M.A. *Aesculus*, V-19-28 H.O., VII-28-28 H.O., VIII-17-30 H.O. *Vitis*; Hancock Co. VIII-18-34 M.A. & D.M.J. *Vitis*; Adams Co. IX-1-31 E.P.B. *Vitis*.

**Erythroneura rubrella** McAtee

*Erythroneura comes* var. *rubrella*, McAtee, W., Trans. Am. Sci. Ent. Soc. XLVI, p. 316, 1920.

Like *E. rubra* but with red markings of uniform deep red color and much less extensive. Vertex dark red but for anterior

margin, a median narrow strip and oval spots midway between center of vertex and eyes.

The inner male genitalia are entirely different from those of *rubra*. The style has a long thick posterior point, longer than the foot; the processes of the oedagus are heavy, rough and parallel, not very long.

Hocking Co. IV-3-34 J.S.C., X-15-33 D.M.J. *Prunus*; Pickaway Co. III-31-34 J.S.C.; Coal Grove IV-29-34 J.S.C.

#### ***Erythroneura delicata* McAtee**

*Erythroneura comes* var. *delicata*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 317, 1920.

*Erythroneura lacta*, Robinson, W., Can. Ent. LVI, p. 62, 1924.

*Erythroneura scripta*, Robinson, W., Can. Ent. LVI, p. 290, 1924.

Milky white, ivory on vertex; markings scarlet to red, narrow and discontinuous, often with small indistinct to large distinct black spot on inner angle of roughly triangular red spot at middle of clavus. Crossveins and adjacent longitudinal veins deep red, apical cells smoky but for pale area next to crossveins, discs lighter. Below, venter of abdomen green, dorsum dusky, thorax dark, head ivory, legs white. Last ventral segment in both sexes dark, ovipositor and plates dark-tipped, pygofer and plates pale.

Taken commonly from grape.

In some specimens the markings of the vertex and pronotum are obscure and the red markings become paler posteriorly. The black spot on the clavus is variable, in some cases it is present on one elytron and absent on the other. According to Dr. Beamer, who has examined the type material, *scripta* and *lacta* of Robinson are synonyms of *delicata* McAtee.

Reported for Ohio: Osborn, H. O., Ohio J. Sci. XXXII, p. 515, 1932 as *scripta*.

#### ***Erythroneura acuticephala* Robinson**

Can. Ent. LVI, p. 61, 1924.

Uni. Kans. Sci. Bul. XVI, pp. 146-7, Pl. VIII, p. 155, 1926.

Small, yellowish white with light narrow delicate but continuous red markings, in pattern as in *beameri* but tip of clavus not or very faintly marked with red. Dorsum of abdomen in males dark before pygofer, remainder of body yellowish white.

Cedar Swamp IV-17, 24-34 J.S.C.; Hocking Co. IX-17-33 D.M.J.; Pickaway Co. III-31-34, IV-9-34 J.S.C.; Portsmouth IV-29-34 J.S.C.; Columbus V-11-33 M.A. *Aesculus*; Franklin Co. VIII-15-31 E.P.B. *Juglans*.

**Erythroneura elegans McAtee**

*Erythroneura comes* var. *elegans*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 315, 1920.

*Erythroneura elegans*, Robinson, W., Uni. Kans. Sci. Bul. XVI, p. 137, Pl. VIII, p. 156, 1926.

Background white; tip of clavus unmarked; elytral vittae broad, bluish red to dusky outlined with red, extending to suture of elytra and covering clavus but for white heart-shaped area at base and roughly diamond shaped area at apex.

Taken commonly on Virginia Creeper, Grape and Boston Ivy in numerous localities.

The inner male genitalia are not at all like those figured by Robinson as the posterior points of the style are short and sharp, the processes of the oedagus rather thick and parallel, not exceeding the shaft in length.

**Erythroneura vitis (Harris)**

*Tettigonia vitis*, Harris, T. W., Encyclopedia Americana VIII, p. 43, 1831.

*Erythroneura vitis*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 308, 1920.

Anteapical elytral area from just below base to just anterior to apex of clavus occupied by circular reddish brown to dusky saddle spot entirely bordered with white; posterior part of pronotum, base of scutellum and humeral area of elytra also dark; apices of elytra smoky semihyaline; apex of scutellum pale.

Common everywhere on grape.

Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 367-8, 1928.

**Erythroneura vitis var. corona McAtee**

*Erythroneura vitis* var. *corona*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, pp. 304-5, 1920.

"Similar to variety *vitis* Harris, but middle cross-band on tegmina connected by red lines along longitudinal veins to anterior crossband and to ramose marking on cross-veins, so that the saddle mark appears to be surrounded by a wreath of pale spots" (McAtee).

This seems to be an even more common form on grape than *vitis*.

Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 368, 1928.

**Erythroneura bistrata McAtee**

*Erythroneura vitis* var. *bistrata*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 305, 1920.

*Erythroneura bistrata*, Johnson, D. M., Ohio J. Sci. XXXIV, p. 262, 1934.

Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 368, 1928.

Almost entirely bright red to brownish red with the exception of the yellowish border of vertex, tip of scutellum, white spot on elytra adjacent to tip of scutellum, at apex of clavus and small pale areas before and after costal plaque.

This species and its varieties, of which *stricta* is the more common form, is taken on *Cercis canadensis*.

Coal Grove IV-29-34 J.S.C.; Pickaway Co. IV-30-34 J.S.C.; Columbus VII-22-21, VII-22-28 H.O.; IV-29-33 M.A. & D.M.J. *Aesculus*, V-11-33 M.A. *Aesculus*, O.S.U. Campus VII-28-33 D.M.J. *Cercis*; Oxford W. H. Stehr.

**Erythroneura bistrata var. stricta McAtee**

*Erythroneura vitis* var. *stricta*, McAtee, W. L., Trans. Am. Ent. Soc. XLVI, p. 305, 1920.

*Erythroneura bistrata* var. *stricta*, Johnson, D. M., Ohio J. Sci. XXXIV, pp. 262-3, 1934.

Ground color creamy white; vertex chiefly yellow with touches of red near posterior margin; pronotum reddish brown but for one or more pale spots at anterior margin; scutellum reddish brown basally with paler narrow median vitta, and pale tip; tegmen with three crossbands, anterior red, margin not exceeding scutellum, middle red, occupying central third of clavus and extending transversely to costal plaque which is black for more than half its length; apex dusky; crossveins red, the areas between them anterior to central cells washed with red.

Chesapeake IV-29-34 J.S.C.; Ironton IV-8-34 J.S.C.; Coal Grove IV-29-34 J.S.C.; Franklin Co. VI-15-34 M.A.; Columbus V-11-33 M.A. *Aesculus*, V-20-34 D.M.J. *Cercis*, VII-28-33 D.M.J. *Cercis*, V-19-28, VII-22-01, VII-27-21, VII-28-28 H.O.; Adams Co. VI-19-27 C.C.B.M.; Williams Co. IX-5-31 E.P.B.

Reported for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1928.

**Erythroneura bistrata var. rubranota Robinson**

*Erythroneura rubranotum*, Robinson, W., Can. Ent. LVI, 60, 1924.

*Erythroneura fusco-clava*, Beamer, R. H., Can. Ent. LIX, 31, 1927.

Like *stricta* but with fuscous stripes connecting first and second crossbands on clavus. Coloring dark; tip of scutellum and ad-

toward apex; just before middle of vertex two transverse brown dashes, not quite joining longitudinal marks; at base two small lateral triangular red marks; pronotum with large brownish heart-shaped median spot and two reddish lateral spots. Elytra whitish semihyaline with rather broad scarlet markings of *comes* type. Black dorsum shows through elytra, giving gray appearance.

Port Clinton V-4-34 J.S.C.; Pickaway Co. III-31, IV-9, VI-1-34 J.S.C.; Cedar Point IX-3-33 M.A. *Vitis*.

The inner male genitalia of the type from New Bremen VII-18-27 W. M. Boesel, *E. ornata* Osborn, correspond in every detail with those of *corni*.

#### **Erythroneura ontari** Robinson

Can. Ent. LVI, p. 60, 1924.

Uni. Kans. Sci. Bul. XVI, pp. 136-7, Pl. VIII, p. 155, 1926.

Vertex yellow with median and two lateral thin streaks red; pronotum heavy Y-shaped median vitta and spots behind eyes; elytra whitish semihyaline with bright red markings as follows: "broad vitta on clavus in touch with basal half of claval suture and barbed at caudal end, and spot in apical third; corium, broad stripe with five lateral extensions running length of cubitus, three inner extending toward claval suture at base, middle and tip, and two outer touching anterior and posterior parts of costal plaque; red streaks between costal plaque and red crossveins; base and tips of cells smoky" (Robinson).

Hocking Co. IV-15,28-34 J.S.C., X-15-33 D.M.J.; Jackson IV-1-34 J.S.C.; Castalia V-4-34 J.S.C.; Cedar Swamp IV-17-34 J.S.C.; Port Clinton V-4-34 J.S.C.; Portsmouth IV-29-34 J.S.C.; Columbus V-1-34 J.S.C.; Williams Co. IX-5-31 E.P.B.

#### **Erythroneura kanwakae** Robinson

Can. Ent. LVI, p. 292, 1924.

Uni. Kans. Sci. Bul. XVI, p. 143, Pl. VIII, p. 155, 1926.

Ivory vertex with bright red median stripe consisting of two vittae fused more or less perfectly; median stripe on pronotum weakly bifurcate anteriorly, and one behind each eye; elytra with fairly broad red angulate stripes arising in humeral area extending two-thirds length of clavus, back to plaque and thence to base of cell  $M_4$ . The spot at tip of clavus is paler than other markings.

The pygofer hook is very large and has an intermediate spine.

Cedar Swamp IV-17-34; Chesapeake IV-29-34 J.S.C.; Coal Grove IV-8,29-34 J.S.C.; Oxford W. H. Stehr.

jacent claval area white, also pale area before crossveins.

The inner male genitalia correspond with those of *bistrata* and this form is taken from *Cercis* with the other two, so it is here made a variety of the highly colored *bistrata*.

Cedar Cwamp IV-17-34 J.S.C.; Coal Grove IV-28-34 J.S.C.; Chesapeake IV-29-34 J.S.C.; Pickaway Co. VII-7-34 J.S.C.; Columbus V-6-34 D.M.J. *Prunus*, VIII-30-34 D.M.J.; X-4-33 D.M.J. *Viburnum*.

### ***Erythroneura tricineta* Fitch**

Cat. St. Cab. N. Y., p. 63, 1851, Lintner's Reprint, p. 403, 1893.

Pale yellow with three crossbands, anterior dark, covering base of scutellum and all of pronotum but small mid-anterior region; second ferruginous to dark brown, black at plaque; third over apices, dark, smoky; longitudinal red or yellow color streaks may be present.

Very common on grape and other vines.

Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 367, 1928.

#### KEY TO VARIETIES OF *ERYTHRONEURA TRICINCTA*

- |        |   |                  |
|--------|---|------------------|
| 1.     | Anterior crossband including base of scutellum.....   | 2                |
| 1'.    | Anterior crossband confined to pronotum.....  | 5                |
| 2(1).  | Anterior crossband covering all of pronotum except small part of<br>anterior margin .....                         | 3                |
| 2'.    | Anterior disc of pronotum uncolored.....  | 4                |
| 3(2).  | Crossbands one and two sanguineous to black.....  | <i>tricincta</i> |
| 3'.    | Bands bright red.....   | <i>diva</i>      |
| 4(2'). | Crossband one continuous across posterior margin of pronotum<br>.....   | <i>calycula</i>  |
| 4'.    | Crossbands one and two broken in center.....  | <i>noncincta</i> |
| 5(1'). | Crossband one dark, bordering hind margin of pronotum and sides,<br>leaving large part of anterior disc pale..... | <i>cymbium</i>   |
| 5'.    | Crossband one dark, covering most of pronotum; second band bright<br>red .....                                    | <i>integra</i>   |

### ***Erythroneura tricineta* var. *diva* McAtee**

Trans. Am. Ent. Soc. XLVI, p. 308, 1920.

Reported for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932, Franklin Co.

First and second crossbands bright red, first darker (Fitch's var. a).

Athens IX-11-05 H.O.; Columbus V-11-33 M.A. & D.M.J. *Aesculus*, V-19-28 H.O.



***Erythroneura tricineta* var. *calycula* McAtee**

Trans. Am. Ent. Soc. XLVI, pp. 308-9, 1920.

Reported for Ohio: Osborn, H., Ohio Biol. Surv. Bul. XIV, p. 367, 1928.

Broad U-shaped dusky to black coloring on base of scutellum and sides of pronotum; second band sanguineous to dusky; longitudinal color streaks red to yellow.

This form and *tricincta* are more common than the others.

***Erythroneura tricineta* var. *noncincta* Johnson**

Ohio J. Sci. XXXIV, p. 261, 1934.

No true crossbands; basal angles of scutellum, sides of pronotum and eyes dark; dark reddish triangular spot at side of plaque, no markings on clavus.

Adams Co., (male holotype) IX-1-31 E.P.B. *Vitis*; Hocking Co. IV-15,16-34 J.S.C.

***Erythroneura tricineta* var. *integra* McAtee**

Trans. Am. Ent. Soc. XLVI, p. 309, 1920.

Reported for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.

Marietta IX-13-05 H.O.; Athens IX-12-05 H.O.; Coal Grove IV-24-34 J.S.C.; Portsmouth IV-29-34 J.S.C.; Franklin Co. VIII-16-31 E.P.B.

***Erythroneura tricineta* var. *cymbium* McAtee**

Trans. Am. Ent. Soc. XLVI, p. 310, 1920.

First crossband confined to posterior margin and sides of pronotum, anterior disc uncolored; second band sanguineous to red.

Put-in-Bay IX-10-28 C.C.B.M.; Haunck's Pond, Middle Bass Id., VII-22-33 D.M.J. *Vitis*; Hancock Co. VIII-18-34 D.M.J.

Reported for Ohio: Osborn, H., Ohio J. Sci. XXXII, p. 515, 1932.

***Erythroneura corni* Robinson**

Can. Ent. LVI, p. 60, 1924.

Uni. Kans. Sci. Bul. XVI, p. 138, Pl. VII, p. 154, 1926.

*Erythroneura ornata*, Osborn, Ohio Biol. Surv. Bul. XIV, p. 364, 1928.

Vertex grayish white background with T-shaped brownish median vitta, the arms of which curve down at apex of vertex, narrow brown longitudinal vittae arise next eyes at base and curve in

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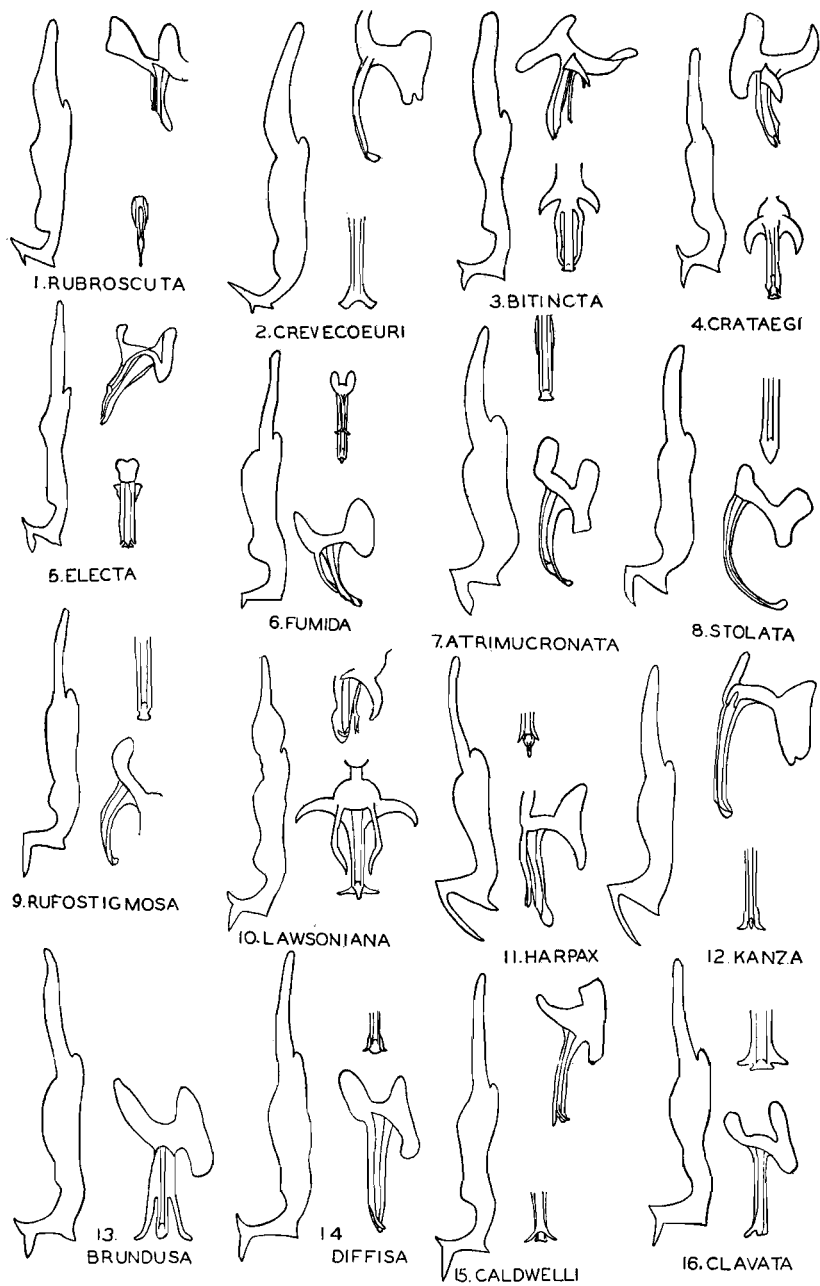


PLATE I

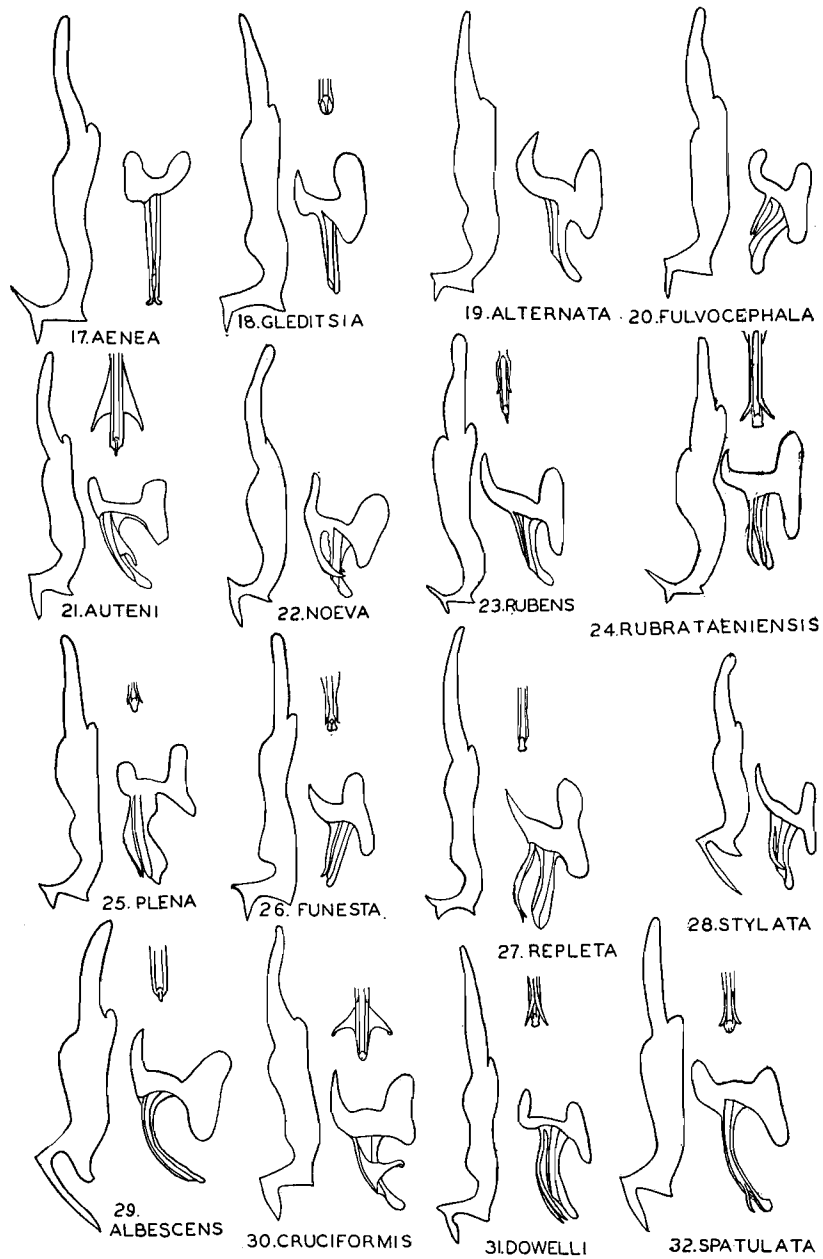


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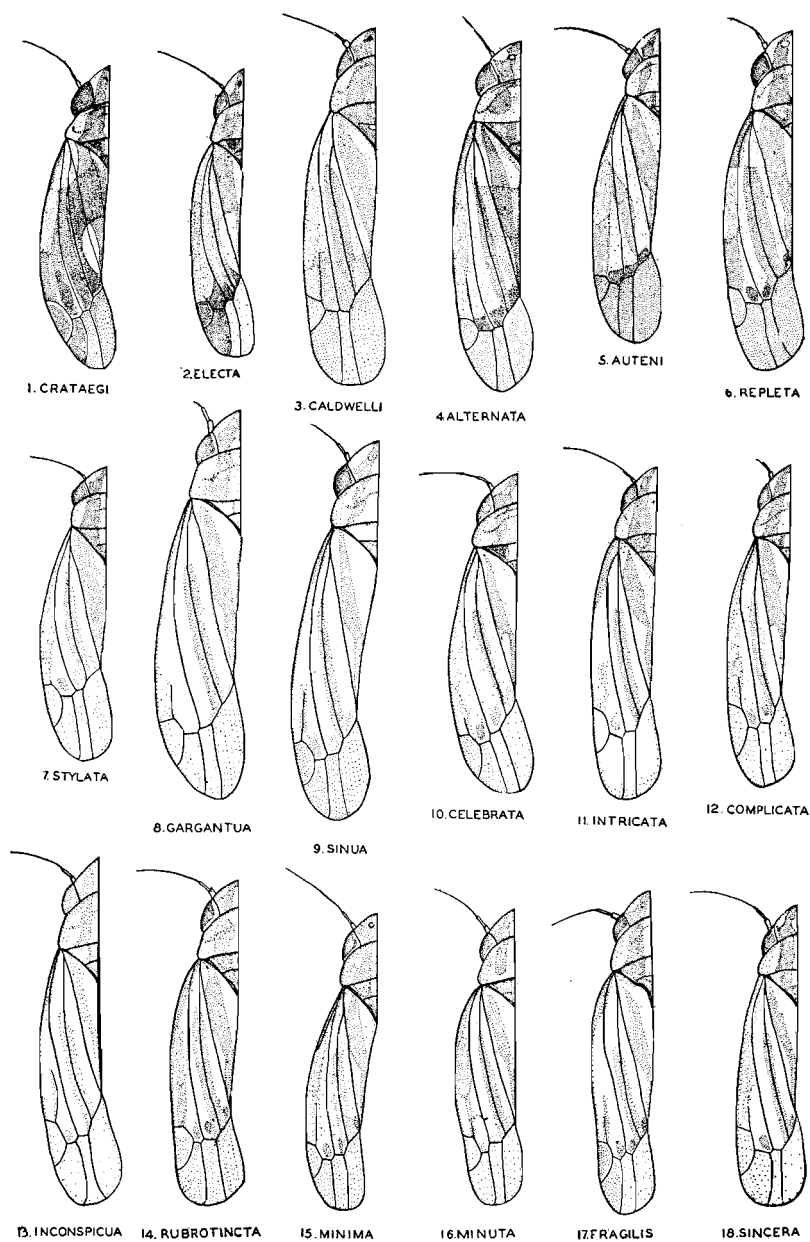


PLATE V

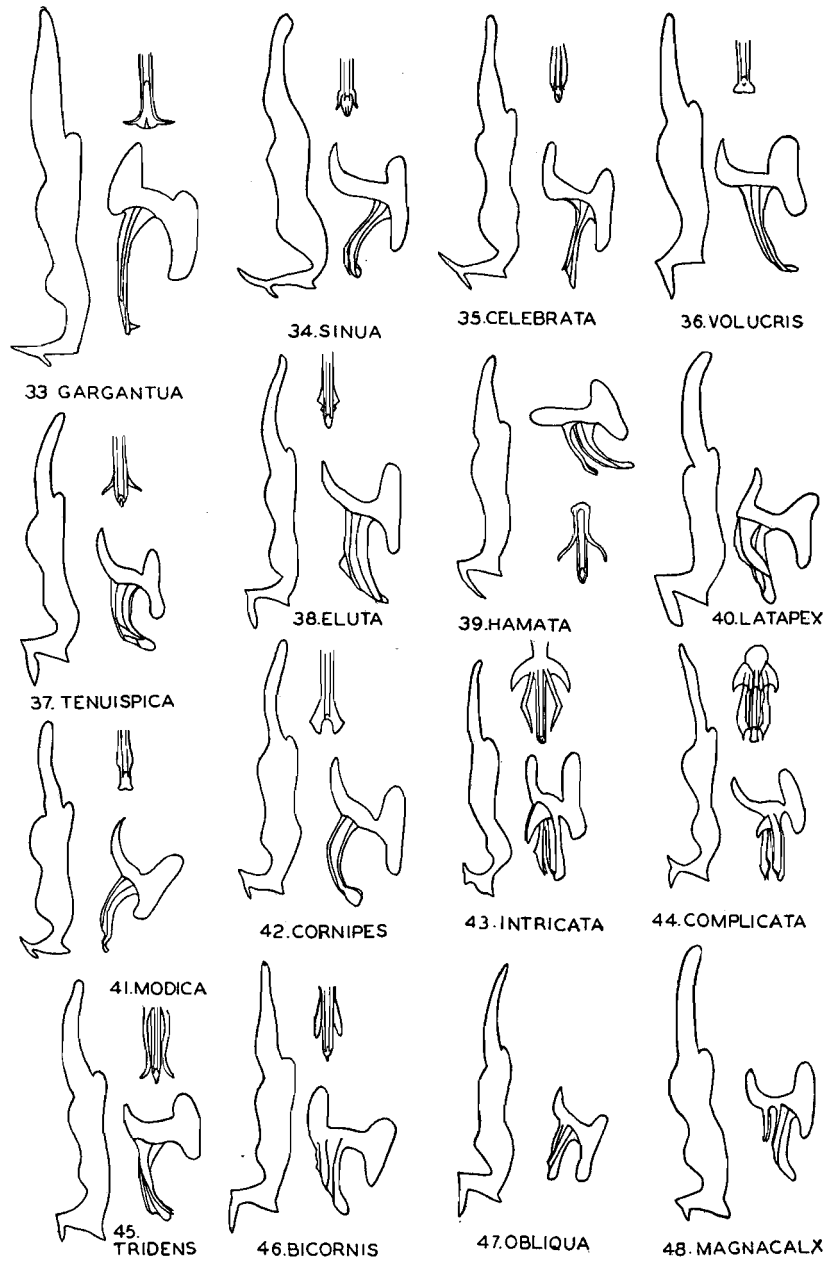


PLATE III

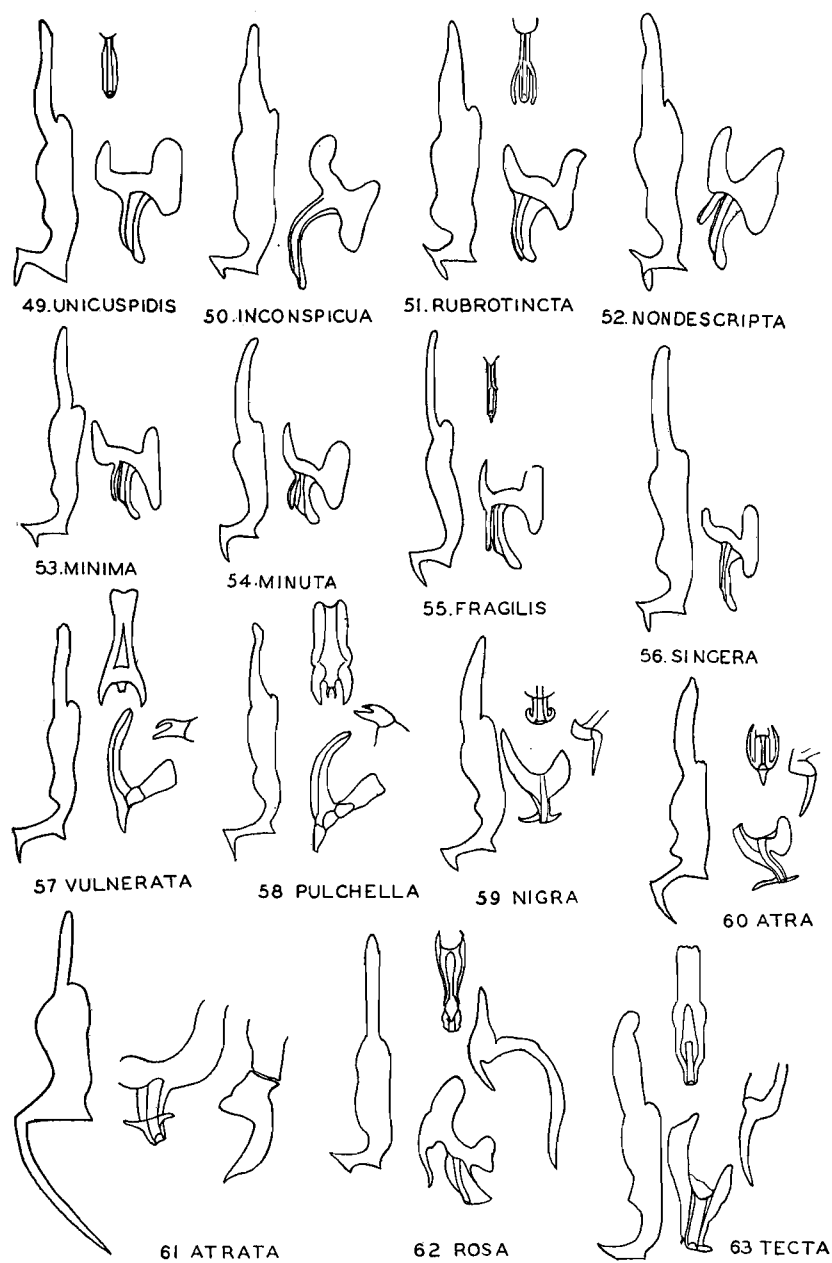


PLATE IV









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