TAXONOMIC STUDY OF THE PLANTHOPPER GENUS *CIXIUS* IN THE UNITED STATES AND MEXICO (HOMOPTERA: FULGOROIDEA: CIXIIDAE)

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ABSTRACT

This study presents the first taxonomic revision of the planthopper *Cixius* Latreille in the United States and Mexico. *Pseudocixius* Caldwell is synonymized with *Cixius*. Twenty-five species are recognized as occurring in the United States and 14 in Mexico. Seven are described as n. spp. from the U.S.: *balli* (Ariz.), *caldwelli* (Ohio), *evexus* (Cal.), *narke* (Cal.), *nike* (Maine), *prodotes* (N.C.), and *procrustes* (Ark.). Six are described as n. spp. from Mexico: *blockeri* (Morelos), *conjector* (Michoacan), *dislogicus* (Fed. Dist.), *metcalfi* (Coahuila), *nielsoni* (Fed. Dist.), and *youngi* (Hidalgo). *C. umbrosus* Walley is synonymized with *C. nervosus* (L.) and *C. guttulatus* Walley with *C. pini* Fitch. *C. bandarus* (Caldwell) is a new combination. The distribution of the genus in the Americas is transcontinental and from the Arctic Circle in Alaska south to southern Mexico. Plant associations are recorded. All critical diagnostic features are illustrated, and many new distributional records are included.

INTRODUCTION

The species of the genus *Cixius* in North America have received little serious attention by previous taxonomists. No worker in the past attempted to evaluate the entire fauna of these plant-feeding insects. Metcalf (1923:161-162) keyed the 7 species he believed to occur in eastern United States. He was unaware of the great amount of intraspecific variation in color and thus produced an unworkable tool. Osborn (1938:302-306) treated 8 species in the fauna of Ohio and was the first North American worker to illustrate the concealed male genitalia of some of the species. Osborn also did not recognize color variation, and his key to species did not im-

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prove the earlier one published by Metcalf. Beirne (1950:96-101) included 13 species in his study of the Canadian fauna and illustrated the concealed male genital structures of 6 species. Beirne, like Metcalf and Osborn, presented a key to species that included many phantom color characters; but he did acknowledge the fact that males often lack the same amount of coloration, especially in the forewings, as found in females.

None of the previous workers consulted or restudied holotypes and or lectotypes to determine exactly what the original describer had before him. As a result, in earlier works, even in cases where the male genitalia were acknowledged as important, misapplication of names is common. In Osborn (1938:305), 4 of 6 figures of male genitalia were incorrectly associated with species names: his fig. 17A is *C. angustatus* Caldwell not *C. coloepeum* Fitch; 17C is *C. nervosus* (L.), a senior syn. of *C. basalis* Van Duzee; 17D is *C. nike* Kramer, n. sp. not *C. pini* Fitch; and 17E is *C. coloepeum* Fitch not *C. angustatus* Caldwell. Four of the 6 names applied to figures of male genitalia by Beirne (1950:99) also need correcting: his fig. 13 is *C. pini* Fitch not *C. angustatus* Caldwell; 17 is *C. nervosus* (L.); 20 is *C. nike* Kramer, n. sp. not *C. pini* Fitch; and 21 is *C. quebecensis* Beirne.

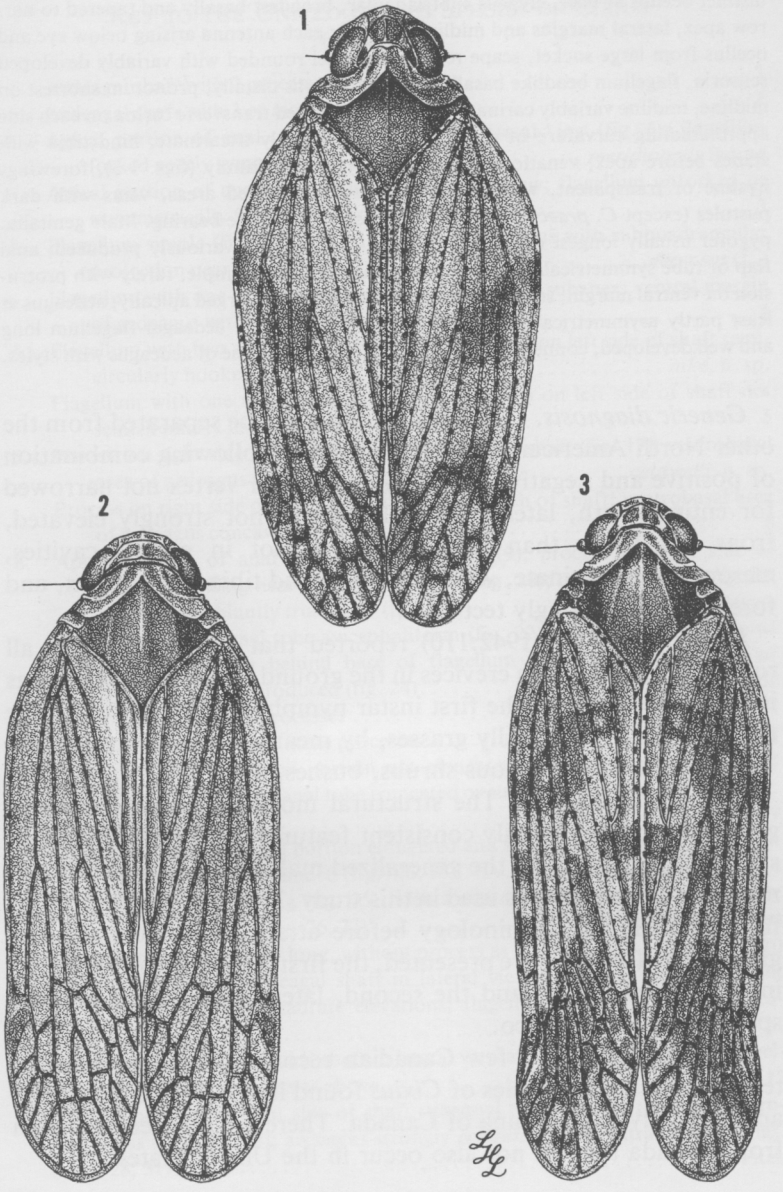
Genus CIXIUS Latreille

Cixius Latreille 1804:310. Type-species Cicada nervosa Linnaeus 1758:437, by subsequent designation of Curtis 1837:14, pl. 673.

Pseudocixius Caldwell 1950:289. Type-species *Pseudocixius bandarus* Caldwell 1950:290, by original designation. New synonymy.

Average-sized cixiids (4.8-8.0 mm); head in dorsal view (figs. 1-3) narrower than pronotum, eyes large, crown moderately broad, sides carinate, anterior margin carinate or subcarinate, with variably developed transverse carina between anterior portions of eyes, sometimes weakly developed transverse carina basad of it, longitudinal midline of crown at times partly elevated and carinate, apical portion of crown only slightly produced beyond eyes; head in lateral view, bluntly angled apically, lateral edges of vertex not more than slightly elevated above upper margins of eyes, ocellus ventrad of each eye; head in facial view, sides of frons flared and carinate on margins, widest near middle, longitudinal midline carinate with variably

FIGURES 1-3. Habitus drawings. 1, *C. vandykei* Van Duzee, female from Muir Woods, Cal. 2, *C. nike* n. sp., female from Mt. Desert, Maine. 3, *C. pini* Fitch, female from Spring Brook, Pa.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distinct ocellus at base, clypeus subtriangular, broadest basally and tapered to narrow apex, lateral margins and midline carinate; each antenna arising below eye and ocellus from large socket, scape reduced, pedicel rounded with variably developed sensoria, flagellum beadlike basally and filamentous distally; pronotum shortest on midline, midline variably carinate, variably developed transverse carina on each side approximating curvature of eye; mesonotum strongly tricarinate; hind tibia with spines before apex, venation of forewings typical of family (figs. 1-3), forewings hyaline or transparent, with or without extensive tinted areas, veins with dark pustules (except *C. praecox*), pustules at least in part setae bearing. Male genitalia: pygofer usually longest on ventral margin, hind margin variously produced; anal flap or tube symmetrical or asymmetrical, usually fairly simple, rarely with protrusion on ventral margin, styles symmetrical and usually enlarged apically; aedeagus at least partly asymmetrical and elaborated with processes, aedeagal flagellum long and well developed, connective vertical and articulating base of aedeagus with styles.

Generic diagnosis. The genus *Cixius* can be separated from the other North American cixiid genera by the following combination of positive and negative characters: crown or vertex not narrowed for entire length, lateral coronal margins not strongly elevated, frons not wider than long, antennae not in earlike cavities, mesonotum tricarinate, with spines on hind tibia before apex, and forewings not strongly tectiform.

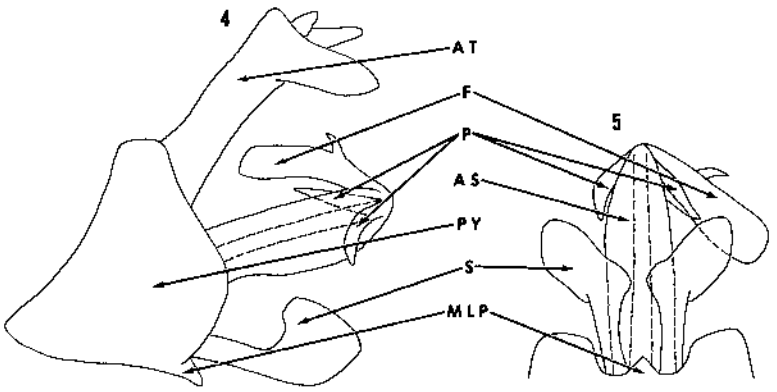
Biology. China (1942:110) reported that the nymphs are all root feeders and live in crevices in the ground. Females deposit eggs in loose clusters, and the first instar nymphs find their way to the roots of plants, especially grasses, by means of cracks in the soil. The adults feed on various shrubs, bushes, and trees.

Notes on the keys. The structural modifications of the male genitalia provide the only consistent features for the separation of species. Figs. 4-5 show the generalized male genitalia with the terminology of the parts as used in this study. The user should become familiar with this terminology before attempting to use the key given here. Two keys are presented, the first for those species found in the United States, and the second, later in the text, for those species found in Mexico.

Even though only a few Canadian records are included in the text, the key to the species of *Cixius* found in the United States will apply equally to the fauna of Canada. There are no species known from Canada that do not also occur in the United States.

KEY TO THE UNITED STATES SPECIES OF CIXIUS
(males only)

1. Aedeagal shaft with 2 processes 2
   Aedeagal shaft with 3 or more processes 7
2. Apical portion of anal tube not decurved in lateral view (fig. 6); flagellum forked nearly symmetrically at apex (fig. 6) ..... *meridionalis* Beirne
   Apical portion of anal tube decurved in lateral view; flagellum unforked or asymmetrically forked at apex 3
3. Flagellum simple (fig. 10); ventral margin of aedeagus with subquadrangular projection near base in lateral view (fig. 11) ..... *nervosus* (L.)
   Flagellum with one or two acute processes at apex or subapex; ventral margin of aedeagus without projection as above 4
4. Flagellum with two acute processes (fig. 13); process on left side of shaft semicircularly hooked distally (fig. 13) ..... *nike*, n. sp.
   Flagellum with one acute process (fig. 16); process on left side of shaft not semicircularly hooked distally 5
5. Process on right side of aedeagus nearly as long as shaft (fig. 17); ventrobasal area of aedeagus not concave (fig. 16) ..... *caldwelli*, n. sp.
   Process on right side of aedeagus half or less length of shaft; ventrobasal area of aedeagus concave 6
6. Apical portion of anal tube triangular (fig. 19); process on right side of aedeagus arising near base of flagellum (fig. 20); median lobe of pygofer broader and bluntly triangular (fig. 21) ..... *quebecensis* Beirne
   Apical portion of anal tube avicephaliform (fig. 22); process on right side of aedeagus arising behind base of flagellum (fig. 23); median lobe of pygofer roundly produced (fig. 24) ..... *apicalis* Metcalf
7. Aedeagal shaft with 3 processes 8
   Aedeagal shaft with 4 or more processes 21
8. Anal tube with proximal portion not elongated and stalklike (figs. 25, 37) or apical margin of anal tube truncated or subtruncated (figs. 28, 33) 9
   Anal tube with proximal portion elongated and stalklike and its apical margin variably acute to rounded (figs. 46, 55) 14
9. Flagellum unusually long (fig. 25), with sharp needlelike process near middle of outer margin (figs. 26, 27) ..... *stigmatus* (Say)
   Flagellum not unusually long, without process as above 10
10. Dorsal margins of aedeagal shaft in lateral view with large and prominent quadrate or subquadrate elevations; flagellum with acute process protruding at apex 11
    Dorsal margins of aedeagal shaft in lateral view at most slightly convex; flagellum without process as above 12
11. Lower process on right side of shaft subequal to or shorter than upper process (figs. 29, 32); aedeagus strongly convex at basoventral margin (figs. 28, 31) ..... *pini* Fitch



FIGURES 4-5. Generalized male genitalia. 4, Pygofer, anal flap, style, and aedeagus in left lateral view. 5, Apical portion of pygofer, styles, and aedeagus in ventral view. AS = aedeagal shaft, AT = anal flap or tube, F = aedeagal flagellum, MLP = median lobe of pygofer, P = process on aedeagal shaft, PY = pygofer, S = style.

Lower process on right side of shaft about twice length of upper process (figs. 34, 35); aedeagus convex or not at basoventral margin (figs. 33, 35) ..... *coloepeum* Fitch

12. Veins of forewings without dark pustules ..... *praecox* Van D.
    Veins of forewings with dark pustules 13
13. With only one of the aedeagal processes directed dorsally in lateral view (fig. 41); both right and left positioned processes tapered to acute apices and curved to the right in ventral view (fig. 42) ..... *cultus* Ball
    With two of the aedeagal processes directed dorsally in lateral view (fig. 43); both right and left positioned processes not as above in ventral view (fig. 45) ..... *ephratus* Ball
14. Aedeagus in lateral view stout, ventral margin indented near middle to form pair of subequal lobes (figs. 47, 50) 15
    Aedeagus in lateral view variable, ventral margin not as above 16
15. Ventral process on right side of aedeagus about half length of other aedeagal processes (fig. 47); dorsal process on right side and left side of aedeagus abruptly tapered distally (figs. 46, 47) ..... *prodotes*, n. sp.
    Ventral process on right side of aedeagus at least as long as other aedeagal processes (fig. 50); dorsal process on right and left side of aedeagus gradually tapered distally (figs. 49, 50) ..... *procrustes*, n. sp.

16. With one process on left side of aedeagal shaft 17
With two processes on left side of aedeagal shaft 18
17. Aedeagus in lateral view with broad elevation on left dorsal margin and irregular subquadrate elevation on right dorsal margin (figs. 52, 53); ventral margin of aedeagus somewhat irregular but not strongly convex (figs. 52, 53) ..... *angustatus* Caldwell
Aedeagus in lateral view with comparatively simple dorsal margins (figs. 55, 56), ventral margin of aedeagus strongly convex (figs. 58, 59) ..... *misellus* Van D.
18. Styles in ventral view bilobed apically (fig. 63); posterior margin of pygofer in lateral view bluntly angled (fig. 61) ..... *knulli* Caldwell
Styles in ventral view entire apically; posterior margin of pygofer in lateral view truncated or subtruncated 19
19. Apical portion of anal tube in lateral view not decurved (fig. 65) ..... *evexus*, n. sp.
Apical portion of anal tube in lateral view decurved 20
20. Upper process on left side of shaft short and inconspicuous (fig. 66); posterior margin of pygofer vertical (fig. 66) ..... *vandykei* Van D.
Upper process on left side of shaft long and conspicuous (fig. 69); posterior margin of pygofer oblique (fig. 69) ..... *narke*, n. sp.
21. Aedeagal shaft with 5 processes (figs. 70, 71); styles bilobed apically (fig. 72) ..... *chisosus* Caldwell
Aedeagal shaft with 4 processes; styles not bilobed apically 22
22. Apical portion of anal tube stout and not tapered to a slender tip in lateral view (figs. 73, 76, 79) ..... *cinctus* Ball
Apical portion of anal tube narrow and tapered to a slender tip in lateral view 23
23. Apex of anal tube asymmetrically notched (fig. 82); ventralmost process on right side of aedeagus extended basad beyond midlength of shaft (fig. 83) ..... *comptus* Fowler
Apex of anal tube symmetrically notched; ventralmost process on right side of aedeagus extended barely to midline of shaft 24
24. Posterior margin of pygofer not smoothly rounded in lateral view (fig. 85); longest aedeagal process sharply downturned in distal third (fig. 86) ..... *clitellus* Ball
Posterior margin of pygofer smoothly rounded in lateral view (fig. 88); longest aedeagal process bowed in distal third (fig. 89) ..... *balli*, *n. sp.*

Cixius meridionalis Beirne

Figs. 6-8

Cixius meridionalis Beirne 1950:98.

Salient features. — Length of males 6.0-7.0 mm, females 6.0-7.0 mm. Ground color of head and thorax dark tawny, intercarinal portions of crown, frons, and pronotum darkened with shades of brown to black, lateral portions of head below

eyes and sides of clypeus distally usually similarly darkened, mesonotum fuscus to black with carinae variably paler, abdomen dark. Forewings hyaline or slightly tinted brownish hyaline, veins with dark pustules, usually vague and variable brownish clouding across middle and beyond claval apices.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 8) broadly convex with styles widest distally; genital capsule in lateral view (fig. 6) with posterior margin of pygofer narrowed and bluntly subtruncate, distal portion of style rounded and about as wide as high, anal flap elongated with distal portion subquadrate; aedeagus in left lateral view (fig. 6) with single elongate acute process originating near apex, subtrianglar projection on ventral margin of shaft, flagellum forked distally; aedeagus in right lateral view (fig. 7) with single elongate acute process originating near apex.

Type. — Holotype male, Goose Bay, Labrador, 16 August 1948, H.C. Friesen, No. 5877 in the Canadian National Collection, Ottawa. The holotype has been studied, and the male genitalia agree well with figs. 6-8.

Specimens Studied. — ALASKA, Anchorage, Chitna, Ft. Yukon, Ketchikan, Mt. McKinley National Park, Tanana, Wrangle; MONTANA, Lake McDonald in Glacier National Park. Collection dates 8 June to 16 August. Total specimens studied 12 males and 11 females.

Notes. — *C. meridionalis* is readily distinguished from all of its congeners by the two simple but long processes on the aedeagal shaft and the nearly symmetrical fork at the apex of the flagellum. This is our only cixiid known to occur as far north as the Arctic Circle in Alaska. The southernmost record for the lower 48 states is still the northern northwestern part of Montana. Beirne (1950:100) lists a number of localities for this species within Canada; these records indicate that the distribution is northern trans-Canadian. No biological data are available.

Cixius nervosus (L.)

Figs. 9-12

Cicada nervosa Linnaeus 1758:437.
Cixius nervosus (L.), Curtis 1873:14.
Cixius basalis Van Duzee 1908:489.
Cixius umbrosus Walley 1932:22. N. Syn.

Salient features. — Length of males 5.5-7.1 mm, females 6.5-8.0 mm. Ground color of head and thorax tawny, intercarinal portions of crown, frons, and sides of head below eyes darkened with shades of brown to black, frons often entirely black,

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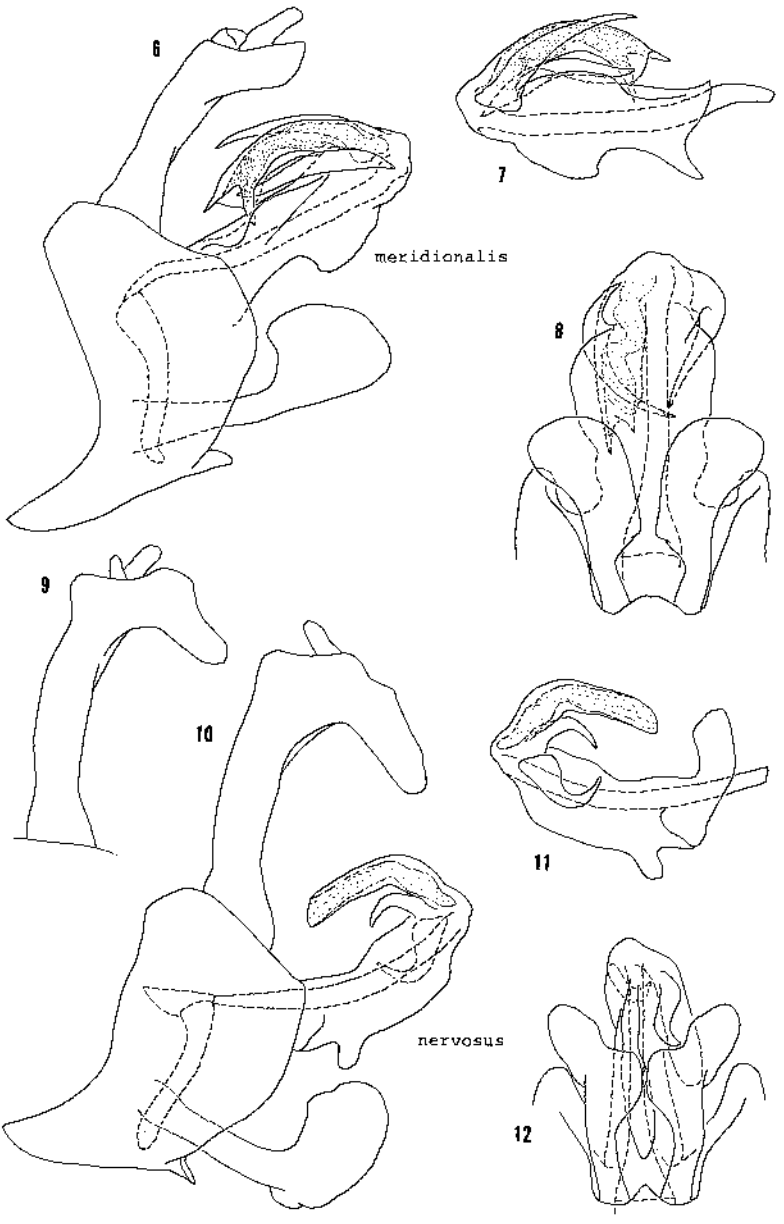
FIGURES 6-12. Male genitalia. 6-8, *C. meridionalis* Beirne, from Glacier Nat. Park, Mont. 9-12, *C. nervosus* (L.), 9 from Klamath Co., Oregon; 10-12, from Prince Georges Co., Md. 6, 10, complete lateral view. 7, 11, aedeagus in right lateral view. 8, 12, apex of pygofer, styles, and aedeagus in ventral view. 9, lateral view of anal flap.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meridionalis
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nervosus
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apex of clypeus at times darkened, pronotum often entirely pale, mesonotum fuscus to black with its carinae at least in part similarly darkened, abdomen dark. Forewings hyaline to distinctly tinted with brown, veins with darker pustules, brown clouding highly variable, from none to clouded at bases, across middle, across claval apices, and across distal crossveins.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 12) triangularly produced with styles bluntly expanded at middle of inner margins; genital capsule in lateral view (fig. 10) with posterior margin of pygofer irregularly rounded, distal portion of style rounded and higher than wide, anal flap elongated with distal portion broadly downturned; aedeagus in left lateral view (fig. 10) with single distally decurved process originating near apex, subquadrate projection on venter of shaft in basal half, flagellum simple; aedeagus in right lateral view (fig. 11) with single distally recurved process originating near apex.

Types. — The holotype of *nervosus* was not studied; I am following the interpretation of this species as rendered by the European specialists, Wagner (1939:101) and China (1942:85).

Beirne (1951:315) first reported that Van Duzee's *basalis* was identical with *nervosus*. This synonymy is confirmed on the basis of my study of the lectotype male of *Cixius basalis* Van Duzee, here selected, with labels: "Gowanda, New York, Aug. 2-9, 1907, Van Duzee" and "Lectotype *basalis*" (red paper) and "E.P. Van Duzee Collection" (yellow paper), and "Cal. Acad. Type No. 2235". The lectotype is in the collection of the California Academy of Sciences.

The holotype of *C. umbrosus* Walley was found to represent the color form in which the forewings are smoky or brown tinted. It is a large female, 8 mm, and is in the Canadian National Collection, Ottawa.

Specimens studied. — ARIZONA, Pinaleno Mt., Williams; CALIFORNIA, Angel's Camp, Bartle, Bass Lake, Berkeley, Cayton, Doyle, Echo Lake, Folsum, Graton, Hopland, Keen Camp, Kensington, Knight's Landing, Lake Tahoe, Los Altos, Los Angeles, Markleeville, Mill Valley, Orangevale, Palo Alto, Quincy, Redwood, Salmon Creek, San Bruno Mts., San Francisco, Santa Rose, Sobre Vista, Shasta, Spring Valley, Tulelake, Vallejo, Yosemite Nat. Park; COLORADO, Colorado Springs, Denver, Ft. Collins, Indian Springs, Trinidad; CONNECTICUT, Hartford, E. Karen, East River, Prospect; DELAWARE, Newark; IDAHO, Coeur D'Alene, Parma, Kuna; ILLINOIS, Elizabeth; INDIANA, Jasper, Mineral Springs, Newcastle, San Pierre, Turkey Run St. Park, West Lafayette; IOWA, Ames, Fairfax; KANSAS, Onaga; MAINE, Berwick, Paris, Saddleback Lake; MARYLAND, Beltsville, Bladensburg, Glen Echo, Oxon Hill, Plummers Island; MASSACHUSETTS, Ipswich, Pigeon Cove; MICHIGAN, Douglas Lake, counties only — Alger, Clare, Dickenson, Gladwin, Iosco, Luce, Manistee, Midland, Wayne; MINNESOTA, Eaglenest Lake, Itasca, Lake Vadnais, Northfield, counties only — Chisago, Hennepin; MONTANA, Bozeman; NEW HAMPSHIRE, Bretton Woods, Charleston, Durham, Fabyans; NEW JERSEY, Masonville, Westfield; NEW MEXICO, Ruidoso; NEW YORK, Babylon, Canton, Hamburg, Ithaca, Long Island, Ridgwood, Sabael, Salamanca, White Plains; NORTH CAROLINA, Banner Elk, Black Mts., Mt. Mitchell; OHIO, Berea, Cantwell Cliffs, Cedar

Swamp, Clifton, Columbus, Indian Lake, Urbana, Wooster, Worthington, counties only — Ashtabula, Delaware, Fairfield, Flint, Franklin, Greene, Hocking, Licking, Medina, Muskingum, Pickaway, Richland, Summit, Williams; OREGON, Dodson, Grave Creek, Newport, Klamath; PENNSYLVANIA, Davidsburg, Red Rock, Springbrook; RHODE ISLAND, Kingston; SOUTH DAKOTA, Deadwood; TENNESSEE, Smoky Mts. Nat. Park; UTAH, Maryvale, Soldier; VERMONT, Bellow's Falls; VIRGINIA, Maywood, Tazwell; WASHINGTON, Baring, Buckley, Cliffdell, Fairfax, Monroe, Mt. Ranier, Northbend, Olympia, Puyallup, Ritzville, Sumner, The Forks; WISCONSIN, Frederic. Collection dates 20 May to 24 October. Total specimens studied 248 males and 326 females.

Notes. — *C. nervosus* is immediately separated from its congeners by the simple aedeagal flagellum, the two distally curved aedeagal processes, and the subquadrate projection on the ventral margin of the shaft in the proximal half. The processes on the aedeagal shaft typically curve to produce a caliperlike appearance in lateral view. A character not mentioned in the key but highly useful for the recognition of the species is the deeply forked appearance of the apical portion of the male anal flap in posterior view.

This is our common *Cixius* in most areas of the United States. The distribution is transcontinental, with the species being more abundant in the northern part of its range. Except for the higher elevations in North Carolina and Tennessee, it is not yet known from the states of the extreme southeast. Adults feed on various trees, shrubs, and bushes and have been taken on alder, poplar, ash, willow, and cherry.

Cixius nike Kramer, n. sp.

Figs. 13-15

Salient features. — Length of males 4.8-5.6 mm, females 5.5-6.3 mm. Ground color of head and thorax tawny, intercarinal portions of crown, frons, sides of head and pronotum variably darkened with shades of brown to black, mesonotum varying from tawny with lateral portions infuscated to entirely fuscus, carinae usually slightly paler, abdomen dark. Forewings typically hyaline or nearly so without dark clouding, at times with vague clouding near apices, rarely with distinct transverse clouding across middle and near apices, veins with dark pustules.

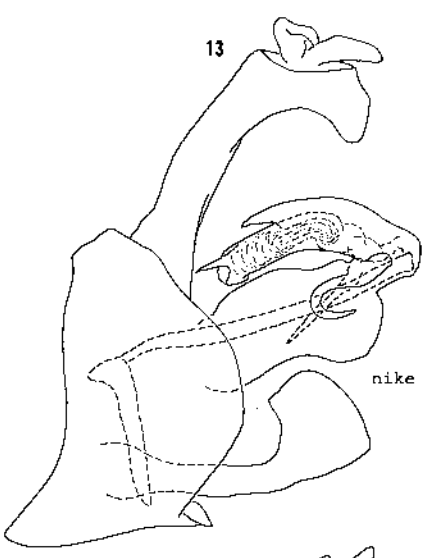
Male genitalia. — Median lobe of pygofer in ventral view (fig. 15) bluntly triangular with inner margins of styles produced; genital capsule in lateral view (fig. 13) with posterior margin of pygofer irregularly rounded, distal portion of style rounded and higher than wide, anal flap elongated with distal portion downturned; aedeagus in left lateral view (fig. 13) with single decurved and recurved process originating near apex, ventral margin of shaft roundly convex distally, flagellum with two acute projections on dorsal margin, one at apex, other subapical; aedeagus in right lateral view (fig. 14) with single straight process originating subapically.

Types. — Holotype male (USNM 76735) and allotype female, Mt. Desert, Maine, 30 July 1922, W.L. McAtee. Paratypes: (All single males unless otherwise stated) 27 males and 19 females with same data as holotype; 2 males Lime Lake, N.Y., 31 Aug. 1886, E.P. Van Duzee; 3 males Berwick, Maine, 14 July 1937, B. Markos; male and

female McLean, N.Y., 27 August 1926, collector unknown; Shippigan, New Brunswick, 14 July 1931, J.M. Aldrich; Wanakena, N.Y., 3 August 1920, C.J. Drake; Grand Rapids, Wis., 13 August 1917, E.D. Ball; Cranberry Lake, N.Y., 2 August 1917, C.J. Drake; 2 males Washington Co., Minn., 9 July 1911, CNG; 2 males Eaglenest Lake, Minn., 8 August 1942, W.V. Balduf; 3 males and 3 females Keene Valley, N.Y., 22 August 1917, H. Notman; Arenac Co., Mich., 27 July 1957, R. & K Dreisbach; Montreal, Canada, 14 July 1918, F. Ouellet; Woodstock, Vt., 6 Aug. 1898, CNG; Joliette, Quebec, Canada, 17 June 1915, F. Ouellet; Sullivan, Wis., 22 July 1917, E.D. Ball; Franconia, N.H., NOD; female Salem, N.Y., 27 July 1924, E.D. Ball; Hartwick, Vt., 30 July 1924, E.D. Ball; Amery, Wis., 14 Sept. 1917, E.D. Ball; Waterbury, Conn., 23 June 1964, C.W. O'Brien; 9 males and 4 females Ipswich, Mass., 22 July 1909, E.P. Van Duzee; female Lake Placid, N.Y., 22 Sept. 1902, E.P. Van Duzee; female Sharon, Mass., 20 July 1909, E.P. Van Duzee; Salmanca, N.Y., 20 July 1911, E.P. Van Duzee; Sunset, Colo., 19 July 1903, E.P. Van Duzee; 2 males Fabyans, N.H., 2643, WFF; female Patton, Pa., 1909, M. Wirtner; Mt. Whiteface, 2000-4000 ft., N.Y., 22-24 Aug. 1916, collector unknown; female Hill, N.H., 23 July 1923, collector unknown; Shawano, Wis., 25 July 1955, D.H. Habeck; female Cranberry Lake, N.Y., 6 Aug. 1917, C.J. Drake; female York Co., Me., 12 Aug. 1962, F.L. Roberts; male and female Indian Lake, Sabael, N.Y., 25 Aug. 1927, CNG; Jefferson Co., Wis., 12 Aug. 1927, E.P. Breakey; 2 males and female Fabyan, N.H., 2643, WFF; Franklin Co., Ohio, 5 June 1931, E.P. Breakey; 2 males and 3 females Cranberry Lake, N.Y., 4-7 August 1917, C.J. Drake; male and female same except 17-22 July 1922; Hanover, N.H., C.M. Weed; 2 males and 5 females Sault St. Marie, Canada, July-Aug. 1904, H. Osborn; Webster, N.H., 1481, Fiske; 2 males and female Conifer, N.Y., 22 July 1920, H. Osborn; 3 males Orono, Me., 5 Aug. 1913, H. Osborn; same except 12 Aug. 1913; 2 males Agric. Exp. Sta., Orono, Me., 26 July 1918, H. Osborn; same except 24 August 1914: 2 males Harpswell, Me., 12 Aug. 1913, H. Osborn; (following all females) Medomak, Me., 2 July 1938, CNG; Portland, Me., 14 Aug. 1913, H. Osborn; Grand Lake, Me., 15 Aug. 1913, H. Osborn; Orono, Me., 30 July 1913, H. Osborn; same except 23 July 1913; 2 females Saddleback Lake, Me., 2000-3000 ft., 18-20 July 1916, H. Osborn; Wanakena, N.Y., 3 Aug. 1920, Osborn and Drake; same except 25 Aug. 1920, C.J. Drake; same except 1-7 Aug. 1917; War Bonnet Canyon, Neb., H. Osborn. Paratypes deposited in USNM, California Academy of Sciences, and Ohio State University.

Specimens studied. — COLORADO, Sunset; CONNECTICUT, Waterbury; GEORGIA, Neel Gap; MAINE, Berwick, Grank Lake, Medomak, Mt. Desert, N. Harpswell, Orono, Portland, Saddleback Lake; MASSACHUSETTS, Ipswich, Sharon; MICHIGAN, Arenac Co.; MINNESOTA, Eaglenest Lake, county only —

FIGURES 13-18. Male genitalia. 13-15, *C. nike* n. sp., from holotype. 16-18, *C. caldwelli* n. sp., from holotype. 13, 16, complete lateral view. 14, 17, aedeagus in right lateral view. 15, 18, apex of pygofer, styles, and aedeagus in ventral view.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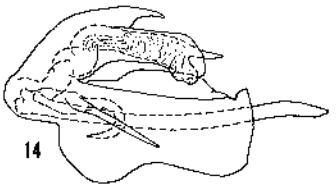
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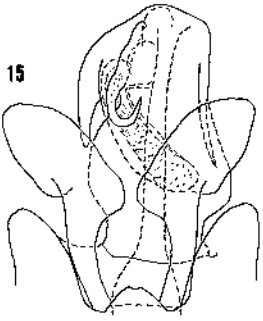
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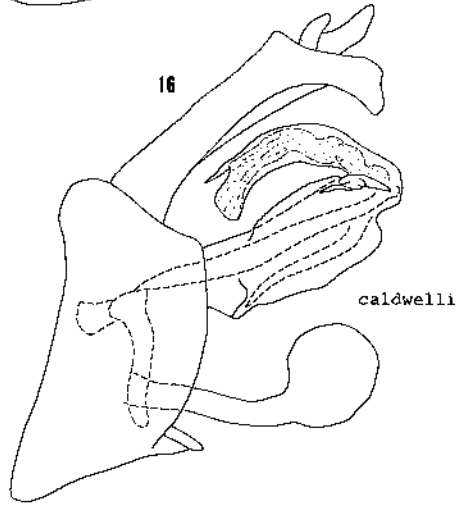
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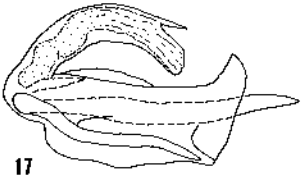
caldwelli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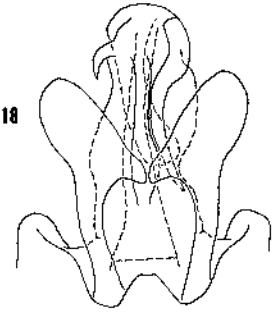

18

Washington; NEBRASKA, War Bonnett Canyon; NEW HAMPSHIRE, Fabyans, Franconia, Hanover, Hill, Webster; NEW YORK, Conifer, Cranberry Lake, Keene Valley, Lake Placid, Lime Lake, McLean, Mt. Whiteface, Sabael, Salamanca, Salem, Wanakena; OHIO, Franklin Co., PENNSYLVANIA, Patton; VERMONT, Hardwick, Woodstock; WISCONSIN, Amery, Grand Rapids, Shawano, Sullivan, county only — Jefferson. Collection dates 5 June to 22 September. Total specimens studied 186 males and 208 females.

Notes. — *C. nike* is unique in the genus on the basis of the two acute processes on the aedeagal flagellum and the semicircularly hooked process on the left side of the shaft. The specific name, a Greek noun in apposition, means victory. This is the species misidentified by Osborn (1938:305, fig. 17D) and by Beirne (1950:99, fig. 20) as *C. pini* Fitch.

This species is the most common in our New England states and upper New York but ranges westward to Nebraska and Colorado. Plant relationships are unrecorded. Generally, it should be regarded as a northern species. There are, however, 3 specimens, male and 2 females, from Neel Gap, Georgia at hand. These specimens are much darker with more heavily patterned forewings and longer heads than found in the other populations studied, but the male genitalia are identical with figs. 13-15. At least for the time being, these specimens from Georgia are considered to represent extreme intraspecific variation.

Cixius caldwelli Kramer, n. sp.

Figs. 16-18

Salient features. — Length of males 4.9-5.2 mm, females 5.1-6.1 mm. Ground color of head and thorax tawny with intercarinal portions partly or entirely darkened with various shades of brown, mesonotum often darker than other portions, abdomen at least in part dark. Forewings hyaline in males, either hyaline or uniformly tinted with brown in females, without pattern formed by dark clouding in hyaline forms, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 18) bluntly triangular with inner margins of styles produced; genital capsule in lateral view (fig. 16) with posterior margin of pygofer broadly rounded, distal portion of style rounded and slightly higher than wide, anal flap elongated with distal portion downturned; aedeagus in left lateral view (fig. 16) with single crooked process originating near apex, ventral margin of shaft indented near apex, flagellum with single acute subapical projection on dorsal margin; aedeagus in right lateral view (fig. 17) with single long process originating near apex.

Types. — Holotype male and allotype female, Delaware Co., Ohio, 21 May (no year), D.J. and J.N. Knull in collection of the Ohio State University. Paratypes: 2 males and 3 females Delaware Co., Ohio, 21 May (no year), D.J. and J.M. Knull; male same except 29 May 1949; male and female same except 30 May; female same except 30 May 1943; 11 males and 2 females same except 2 June; 5 males and 4 females same except 21 June; female same except 22 June 1947; male Franklin Co., Ohio, 5 June 1931, E.P. Breakey; female Hocking Co., Ohio, 20 May 1957, D.J.

and J.N. Knull; female same except 23 May (no year); female same except 25 May; male same except 26 May 1938; female same except 27 May 1953; 3 males and 2 females same except 2 June; male Dyke, Va., 28 May 1915, W.L. McAtee. Paratypes deposited in USNM and Ohio State University.

Specimens studied. — OHIO, counties only — Delaware, Franklin, Hocking, Scioto; VIRGINIA, Dyke. Collection dates 20 May to 22 June. Total specimens studied 25 males and 64 females.

Notes. — *C. caldwelli* is distinguished by the single acute projection on the dorsal margin of the aedeagal flagellum and by the long process on the right side of the aedeagus which is nearly as long as the shaft itself. The species is named for Dr. John S. Caldwell of Circleville, Ohio in recognition of his contributions to the field of fulgoroid taxonomy. Adults of this species have been collected only in the spring and from two states, Ohio and Virginia. Its plant relationships are unrecorded.

Cixius quebecensis Beirne

Figs. 19-21, 64

Cixius fulvus Beirne 1950:100.

Cixius quebecensis Beirne 1951:316. (New name for *C. fulvus* Beirne preoccupied by *C. fulvus* Walker 1858).

Salient features. — Length of males 5.0-5.2 mm, females 6.0-6.5 mm. Ground color of head and thorax tawny with intercarinal portions usually at least partly darkened with shades of brown, clypeus most often uniformly pale, mesonotum darker than other portions, abdomen dark. Forewings in males lightly tinted with brown, in females with highly variable and irregular dark clouding in basal and distal thirds, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 21) broadly triangular with inner margins of styles produced; genital capsule in lateral view (fig. 19) with posterior margin of pygofer broadly and irregularly rounded, distal portion of style rounded and higher than wide, anal flap elongated and decurved apically; aedeagus in left lateral view (fig. 19) with single short acute process originating near apex, ventral margin of shaft convex, flagellum with single acute subapical projection on dorsal margin; aedeagus in right lateral view (figs. 20, 64) with single, distally upturned, acute process originating near apex, ventral margin of shaft slightly indented or not.

Type. — Holotype male, Cascapedia, Quebec, 9 July 1933, W.J. Brown, No. 5878, in Canadian National Collection, Ottawa. Except for a slight indentation on the ventral margin of the aedeagal shaft in lateral view, the holotype (fig. 64) agrees with the male illustrated from Bar Harbor, Me. (figs. 19-21).

Specimens studied. — MAINE, Bar Harbor, county only — Lincoln. Collection dates 1 June to 15 July. Total specimens studied 2 males and 5 females.

Notes. — *C. quebecensis* is recognized by the single acute projection on the dorsal margin of the aedeagal flagellum together with the single moderately long but distally upturned process on the right side of the aedeagus. This is a rare or rarely collected species known in our fauna from only two localities in Maine. Even in

Canada, according to Beirne (1950:101), the distribution is limited to a relatively small area south of the St. Lawrence River. The plant associations are not recorded.

Cixius apicalis Metcalf

Figs. 22-24

Cixius apicalis Metcalf 1923:182.

Salient features. — Length of males 6.0 mm, females 6.0-6.5 mm. Ground color of head and thorax tawny with intercarinal portions of crown, frons, sides of head, and pronotum variably darkened with shades of brown to nearly black, mesonotum usually uniformly dark but discal portion sometimes shade lighter, abdomen largely dark. Forewings hyaline and typically tinted with brown except for portions slightly basad of level of stigma to apex and small portion of costal area near base, males at times with brown tinting limited to three vague bands across forewings, veins with dark pustules.

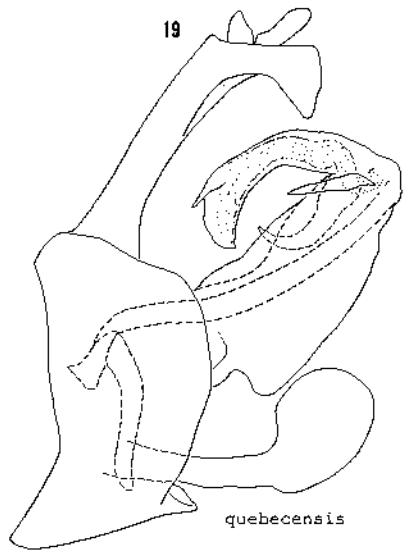
Male genitalia. — Median lobe of pygofer in ventral view (fig. 24) produced and rounded apically with inner margins of styles produced; genital capsule in lateral view (fig. 22) with posterior margin of pygofer irregularly rounded, distal portion of style irregularly rounded and about as high as wide, anal flap elongated with distal portion avicephaliform and decurved; aedeagus in left lateral view (fig. 22) with single short decurved process originating near apex, both dorsal and ventral margins convex, flagellum with single acute subapical process on dorsal margin; aedeagus in right lateral view (fig. 23) with single acute process originating much basad of apex.

Types. — Holotype male, New Haven, Conn., 25 June 1921, B.H. Walden and allotype female, Ithaca, N.Y., 8 June 1895, collector not recorded. Both of these types are on indefinite loan to the U.S. National Museum from North Carolina State University, Raleigh.

Specimens studied: — CONNECTICUT, New Haven; ILLINOIS, Schaumburg; NEW YORK, Ithaca; OHIO, Vinton, counties only — Delaware, Hocking, Scioto; PENNSYLVANIA, county only — Westmoreland. Collection dates 20 May to 25 June. Total specimens studied 2 males and 22 females.

Notes. — *C. apicalis* is separated from its congeners on the basis of the avicephaliform apex of the anal flap in lateral view, the two processes on the aedeagus, and the single subapical process on the dorsum of the aedeagal flagellum. The plant associations are not known for this rare species. The distribution ranges from Connecticut to northern Illinois, but populations are apparently quite local.

FIGURES 19-24. Male genitalia. 19-21, *C. quebecensis* Beirne, from Bar Harbor, Maine. 22-24, *C. apicalis* Metcalf, from Schaumburg, Ill. 19, 22, complete lateral view. 20, 23, aedeagus in right lateral view. 21, 24, apex of pygofer, styles, and aedeagus in ventral view.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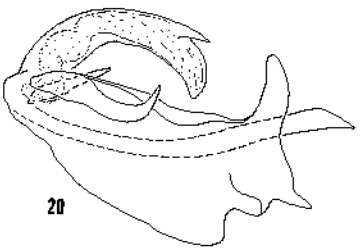
quebecensis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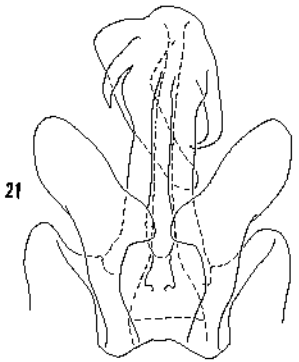
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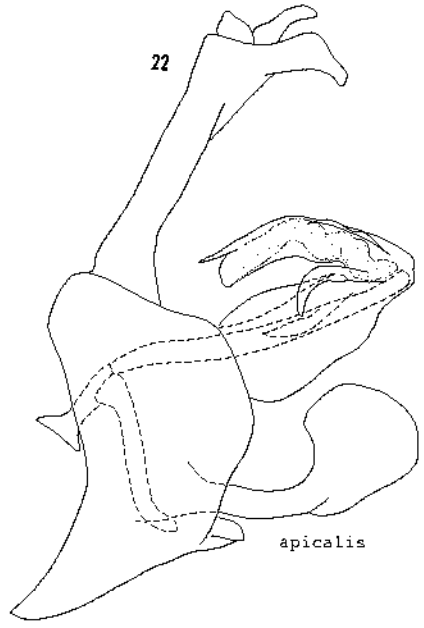
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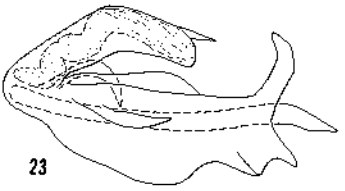
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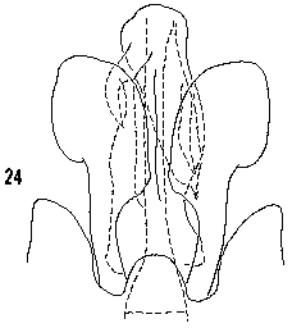
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Cixius stigmatus (Say)

Figs. 25-27

Flata stigmata Say 1825:336.
Cixius stigmatus (Say), Fitch 1851:45.
Cixius lepidus Van Duzee 1910:87.
Pseudocixius stigmatus (Say), Caldwell 1950:290.

Salient features. — Length of males 4.8-6.0 mm, females 5.3-6.6 mm. Ground color of head and thorax fuscus to black, carinae paler, some portions of crown and frons irregularly pale, mesonotum black with its carinae dark tawny, abdomen dark and often nearly black. Forewings hyaline or milky hyaline, tinted with dark brown at bases, each stigma largely dark brown, veins with dark pustules.

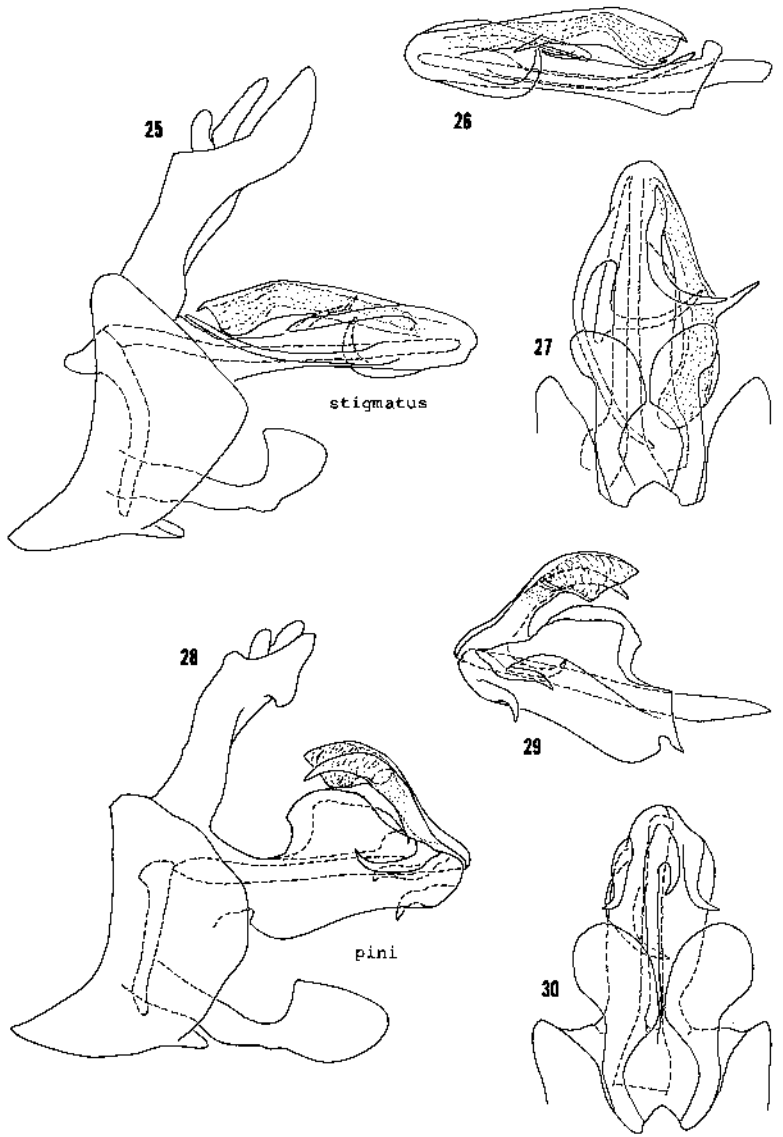
Male genitalia. — Median lobe of pygofer in ventral view (fig. 27) triangularly produced with inner margins of styles convex distally; genital capsule in lateral view (fig. 25) with posterior margin of pygofer bluntly angular, distal portion of style subtriangular, anal flap concave on ventral margin and concave on dorsal margin in distal half; aedeagus in left lateral view (fig. 25) with two processes on shaft, shorter one originating near base of flagellum, longer one originating subapically nearer ventral margin, flagellum with short toothlike projection apically on dorsal margin; aedeagus in right lateral view (fig. 26) with single process originating subapically on or near ventral margin, flagellum with slender acute process at middle of ventral margin.

Types. — None of the original type material is extant. Say stated that the species was "Very numerous at Engineer Cantonment on the Missouri". No neotype is necessary because there is no problem in placing *C. stigmatus* on the basis of the original description.

A lectotype male is here selected for *C. lepidus* Van Duzee with labels "Boulder, Colorado" and "Lectotype, *lepidus*" (red paper) and "E.P. Van Duzee Coll'n." (yellow paper) and "Cal. Acad. Type No. 2234". According to the original description by Van Duzee, this species was described from one pair taken at Boulder, Colorado in August and September by Prof. T.D.A. Cockerell. The lectotype was the only specimens seen; it is large, 6 mm, and the head is displaced to the right by the pin on which the specimen is mounted.

Specimens studied. — ARKANSAS, Hot Springs Nat. Park; ARIZONA, Chiricahua Mts., Flagstaff, Mormon Lake, Patagonia, Portal, Prescott, Tombstone, Williams; COLORADO, Boulder, Ft. Collins, Palmer Lake; INDIANA, Lafayette; IOWA, Ames, Mt. Pleasant, counties only — Buena Vista, Cherokee, Henry, Jackson, Poweshiek; KANSAS, Eureka, Garden City, Garnett, Lawrence, Manhattan, Onega, Pittsburg, counties only — Clark, Cowley, Douglas, Riley; MISSOURI, Columbia, Langdon; NEBRASKA, Lincoln, Stratton, county only —

FIGURES 25-30. Male genitalia. 25-27, *C. stigmatus* (Say), from Manhattan, Kans. 28-30, *C. pini* Fitch, from Spring Brook, Pa. 25, 28, complete lateral view. 26, 29, aedeagus in right lateral view. 27, 30, apex of pygofer, styles, and aedeagus in ventral view.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26
27
stigmatus
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29
30
pini

Custer; NEW MEXICO, Chama, Hill, Las Cruces, Tucumcari, White Sands; OHIO, Cedar Swamp; OKLAHOMA, Fairmont; SOUTH DAKOTA, Elk Point; TEXAS, Austin, Carrizo Springs, Laredo, Mesquite, Pearsall, Spur, Victoria, Wichita Falls; UTAH, Orderville; VIRGINIA, Vienna; WISCONSIN, Kenosha; Wyoming, Washakie. Collection dates 1 May to 4 October. Total specimens studied 112 males and 103 females.

Notes. — *C. stigmatus*, in addition to the features used in the key, can be recognized on the basis of the hyaline forewings that are only clouded with brown at their bases and the dark face which is irregularly paler on the lateral portion of the frons. Most of the specimens studied were collected without plant data; but some were taken on lettuce, carrot, and alfalfa. Others were found in peach orchards and corn fields. The species is widespread and occurs from Virginia westward to Utah and Arizona. It is far more common west of the Mississippi River than in the East. Most of the eastern records are limited to a single specimen.

Cixius pini Fitch

Figs. 28-32

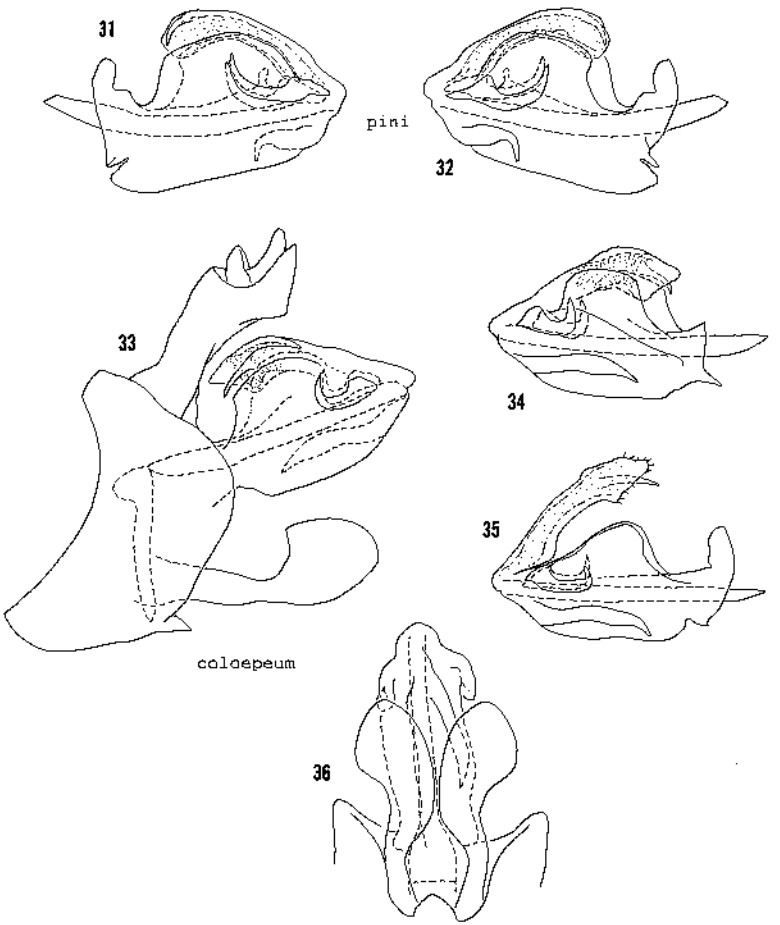
Cixius pini Fitch 1851:45.

Cixius guttulatus Walley 1932:21. N. Syn.

Salient features. — Length of males 5.3-6.0 mm, females 6.0-6.5 mm. Ground color of head and thorax tawny with intercarinal portions of crown, frons, sides of head, pronotum, and often clypeus variably darkened with shades of brown to black, mesonotum heavily infuscated or blackened laterally with discal portion largely less darkened, sometimes entire mesonotum nearly uniformly dark, abdomen dark. Forewings hyaline with coloration highly variable, brown tinting ranging from nearly absent to light or heavy and forming 2 or 3 irregular vague transverse patches; sometimes brown tinting blending to form pair of irregular longitudinal bands, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 30) bluntly triangular with inner margins of styles produced; genital capsule in lateral view (fig. 28) with posterior margin of pygofer irregularly rounded, distal portion of style narrowly rounded and wider than high, anal flap irregularly rounded at dorsal and ventral margins distally, extreme apical margin often indented; aedeagus in left lateral view (figs. 28, 31) with single short upturned process originating preapically on dorsal margin, ventral margin straight or slightly indented, dorsal margin with subquadrate elevation on middle half, flagellum with elongated tooth projecting at apex; aedeagus in right lateral view (figs. 29, 32) with two processes originating near apex, one near dorsal margin, other near ventral margin, their shapes vary somewhat, but ventral process equal to or shorter than dorsal process, dorsal margin of shaft with subquadrate elevation on middle half, ventral margin of shaft convex basally or subbasally.

Types. — Fitch's original description mentioned only two specimens, a male numbered 616 and a female numbered 617. The male, previously designated lectotype by me in McCabe and Johnson (1980:9), is missing its head and most of the



FIGURES 31-36. Male genitalia. 31-32, *C. pini* Fitch, from lectotype. 33-36, *C. coloepeum* Fitch, 33, 34 and 36 from Madison, Wis.; 35, without locality data. 31, aedeagus in left lateral view. 32, 34, 35, aedeagus in right lateral view. 33 complete lateral view. 36, apex of pygofer, styles, and aedeagus in ventral view.

thorax. Only the mesothoracic and left metathoracic legs remain. Both forewings and most of the right hindwing are extant. The specimen is very faded without any brown tinting remaining on the forewings. The aedeagus of the lectotype is shown in figs. 31-32. The female numbered 617, also with the head missing, is similarly in poor condition and lacks the abdomen as well. Fitch did not include any collecting data with his description or have any information on the pins other than the numbers given above, but it is highly probable that these specimens were collected in or in the immediate vicinity of Albany, N.Y. Both specimens are in the collection of the New York State Museum, Albany.

The holotype of *C. guttulatus* Walley was found to represent the color form in which the brown tinting of the forewings is blended to form a pair of longitudinal bands. This type is in the Canadian National Collection, Ottawa.

Specimens studied. — INDIANA, Turkey Run St. Park, W. Lafayette; MARYLAND, Plummers Island; MINNESOTA, Northfield; NEW HAMPSHIRE, Hill; NEW YORK, Buffalo, Chatauqua, Ithaca, Mt. Whiteface, Rock City, Stamford; NORTH CAROLINA, Balsam, Craggy Mts., Highlands; OHIO, Gambier, Neotoma, counties only — Ashland, Delaware, Greene, Hocking, Scioto; PENNSYLVANIA, Hazelton, Spring Brook; TENNESSEE, Great Smoky Mts. Nat. Park; VIRGINIA, counties only — Bath, Fairfax; WEST VIRGINIA, Cranberry Glades. Collection dates 1 May to 7 July. Total specimens studied 114 males and 139 females.

Notes. — *C. pini*, a highly variable species in coloration, can be recognized on the basis of the broad elevations on both the right and left dorsal margins of the aedeagal shaft, the toothlike projection at the apex of the flagellum, and the pair of subequal processes originating near the apex on the right side of the aedeagus. This is the species misidentified by Beirne (1950:99, fig. 13) as *C. angustatus*. The only species with which it might be confused is *C. coloepeum*. See couplet 11 for the features which separate them. Most of the specimens studied were taken without plant associations, but Fitch (1851:45) reported it from spruce, fir, and pine. The distribution ranges from the New England states west to Minnesota and south to the higher elevations in Tennessee and North Carolina.

Cixius coloepeum Fitch

Figs. 33-36

Cixius coloepeum Fitch 1856:452.

Salient features. — Length of males 4.8-5.7 mm, females 5.0-6.0 mm. Ground color of head and thorax tawny with intercarinal portions of crown, frons, clypeus, sides of head, and pronotum darkened with shades of brown to black, mesonotum

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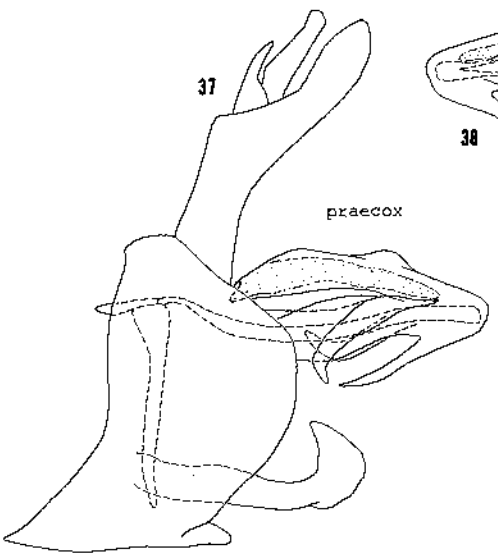
FIGURES 37-42. Male genitalia. 37-39, *C. praecox* Van D., from McMinnville, Ore. 40-42, *C. cultus* Ball, from San Clemente, Cal. 37, 40, complete lateral view. 38, 41, aedeagus in right lateral view, 39, 42, apex of pygofer, styles, and aedeagus in ventral view.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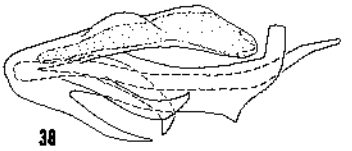
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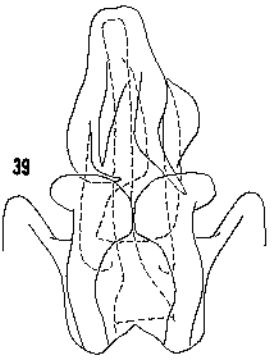
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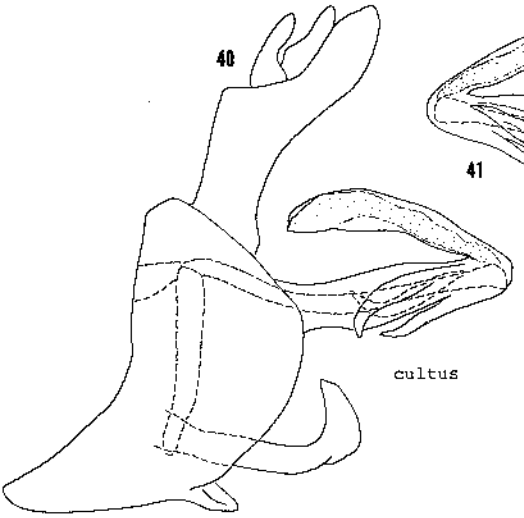
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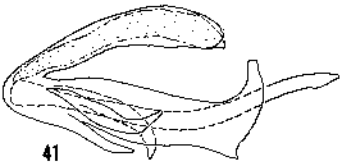
cultus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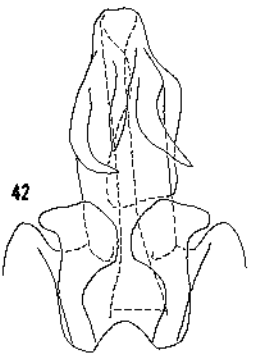
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often either completely infuscated or blackened, but sometimes with discal portion distinctly lighter in color, abdomen dark. Forewings hyaline with coloration highly variable, brown tinting usually most pronounced on clavi, across middle, and apical areas, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 36) bluntly triangular, inner margins of styles convex; genital capsule in lateral view (fig. 33) with posterior margin of pygofer roundly produced, discal portion of style rounded and about as wide as high, anal flap subangular at dorsal and ventral margins distally, extreme apical margin truncate or subtruncate; aedeagus in left lateral view (fig. 33) with single short upturned process originating preapically on dorsal margin, ventral margin straight, dorsal margin with subquadrate elevation on middle half, flagellum with elongated tooth projecting at apex; aedeagus in right lateral view (figs. 34-35) with two processes originating near apex, one upturned near dorsal margin, other straight or downturned apically near ventral margin, ventral process always longer than dorsal process, dorsal margin of shaft with subquadrate elevation on middle half, ventral margin of shaft not or slightly convex basally or subbasally.

Type. — Fitch's original description mentioned only one specimen with the code number 179. He included neither collecting data nor gender of the specimen before him. This specimen, the type, is not extant. The locality where the type was collected is unknown, but it was likely in east central New York state. To fix the identity of the species, a neotype male, Salem, New York, 26 June, no year, E.D. Ball is here selected for deposit in the collection of the U.S. National Museum.

Specimens studied. — ARKANSAS, Hot Springs Nat. Park; COLORADO, Hill's Siding; ILLINOIS, Algonquin, Charleston, Dubois, Savanna; IOWA, Henry Co.; KANSAS, Oswego; MISSOURI, Columbia; NEW YORK, Buffalo, Colden, Hamburg, Ithaca, Keen Valley, Niagara Falls, Rock City, Salem; OHIO, Clifton, Columbus, counties only — Delaware, Greene; WISCONSIN, Madison, Beaver Dam; WYOMING, Centennial. Collection dates 26 March to 23 July. Total specimens studied 86 males and 93 females.

Notes. — *C. coloepeum* can be distinguished only on the basis of the characters found in the male genitalia as delimited in the key. It is similar to *C. pini*, and the two species can be separated by the features used in couplet 11. This is the species misidentified by Osborn (1938:305, fig. 17E) as *C. angustatus*. A few of the specimens studied were collected on hickory and aspen. The distribution ranges from New York west to Colorado and Wyoming and south to Arkansas and Tennessee. The specific name, *coloepeum*, is apparently not of either classic Greek or Latin origin and must be treated as a noun in apposition.

Cixius praecox Van Duzee

Figs. 37-39

Cixius praecox Van Duzee 1925:405.

Pseudocixius praecox (Van Duzee), Caldwell 1950:290.

Salient features. — Length of males 4.2-5.2 mm, females 4.8-5.9 mm. Ground color of head and thorax tawny, intercarinal portions of crown, frons, clypeus, and

sides of head heavily blackened, intercarinal portions of pronotum usually similarly darkened, mesonotum entirely black except for brownish carinae, abdomen largely black. Forewings hyaline, usually without dark tinting, crossveins often dark, at times with irregular brown tinting at bases, middle, and apical portions, veins without dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 39) broadly triangular, inner margins of styles convex distally; genital capsule in lateral view (fig. 37) with posterior margin of pygofer roundly produced, distal portion of style narrow and much higher than wide, anal flap broadly and shallowly concave on ventral margin, distal half of dorsal margin also concave; aedeagus in left lateral view (fig. 37) with single slightly decurved process originating preapically on dorsal margin, similar process arising from broad base on ventral margin at apex, shaft simple, flagellum long and simple; aedeagus in right lateral view (fig. 38) with single distally upcurved process originating preapically on dorsal margin.

Types. — There is a slight discrepancy between the data published with the original description and that found on the holotype male. Van Duzee stated "Type: Male, No. 1773, and allotype, female, No. 1774, Mus. Calif. Acad. Sci., collected by G.F. Moznette, March 14, 1915, at Corvallis, Oregon". The specimen label gives "Childs" as the only collector. There is another label with the male holotype "Ore. Exp. Sta. Acc. 1803". These differences are slight, and mechanical error may be the explanation. The holotype is in the collection of the California Academy of Sciences, San Francisco.

Specimens studied. — CALIFORNIA, Shasta Co.; COLORADO, Cimarron, Los Pinos, North Park, Steamboat Springs; IDAHO, Franklin, Moscow, Ovid, Waka; OREGON, Burns, Camas, Corvallis, Forest Grove, McMinnville, Roseburg; UTAH, Blue Creek, Collinston, Dry Creek, Indianola, Logan, Providence, Salt Lake City, Spanish Fork; WASHINGTON, Centralia, Chehalis, Ft. Lewis, Palouse, Pullman, Seattle, Temno; WYOMING, Allred Flats. Collection dates 1 March to 26 November. Total specimens studied 53 males and 62 females.

Notes. — *C. praecox* can be recognized at once by the lack of pustules dark or otherwise, on the veins of the forewings. In all of its congeners, the dark pustules are present and readily apparent. On the basis of male genital structures, *C. praecox* and *C. cultus* Ball do not differ in any significant manner. This is a northwestern species whose distribution ranges as far east as Wyoming and Colorado. Specimens have been taken on willow and poplar.

Cixius cultus Ball

Figs. 40-42

Cixius cultus Ball 1902:151.

Pseudocixius cultus (Ball), Caldwell 1950:290.

Salient features. — Length of males 4.2-5.2 mm, females 5.0-5.8 mm. Ground color of head and thorax tawny, intercarinal portions of crown, frons, clypeus, and sides of head black, intercarinal portions of pronotum either blackened or not, mesonotum black with carinae brownish, abdomen black or nearly so. Forewings

hyaline, usually unmarked, at times with vague brownish tinting at claval apices and middle, rarely with more extensive brown tinting, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 42) bluntly triangular, inner margins of styles convex distally; genital capsule in lateral view (fig. 40) with posterior margin of pygofer roundly produced, distal portion of style narrow and much higher than wide, anal flap concave on ventral margin and concave distally on dorsal margin; aedeagus in left lateral view (fig. 40) with single, slightly decurved process originating preapically on dorsal margin, similar process arising from broad base on ventral margin at apex, shaft simple, flagellum long and simple; aedeagus in right lateral view (fig. 41) with single distally upturned process originating preapically on dorsal margin.

Types. — Lectotype male here selected with labels: "San Jose, Cal. — King" and "type" and "cotype USNM" (red paper). There are 12 additional specimens at hand from the original series. These include male and female from Onaga, Kansas; 2 males and female from Ft. Collins, Colorado; and 7 females from San Jose, California. Ball mentioned only the states in the original description and did not include the numbers of males and females before him. These omissions are common in his early works. The lectotype and other specimens are in the collection of the United States National Museum.

Specimens studied. — ARIZONA, McNary, Mormon Lake; CALIFORNIA, Alameda, Bakersfield, Caliente, Califa, Carlsbad, Carmel, Carmichael, Coalinga, Chico, Chino, Clarksburg, Convict Lake, Crystal Lake, Davis, Del Mar, Dillon Beach, Edison, Fairfield, Fresno, Grenada, Grindley, Isleton, La Grange, Los Angeles, Lodi, Lone Pine, Marina, Medota, Mills, Montague, Moss Landng, Mt. Eddy, Napa, Nicolaus, Niles Canyon, Novato, Oakland Hills, Ojai, Oroville, Oxnard, Palo Alto, Pasadena, Pittsburg, Portola Valley, Poso Creek, Redwood City, Sacramento, St. Helena, Salinas, San Clemente, San Diego, San Francisco, San Gregorio, San Jose, San Pablo, Santa Cruz Island, Soledad, Sprekels, Stockton, Visalia, Wasco, Watsonville, Weed, Whittier, Woodland, Yuba City; COLORADO, Denver, Ft. Collins, Green Horn, Loma, Los Pinos, Rocky Ford; IDAHO, Declo, Moscow, Succor Creek; KANSAS, Onaga; MONTANA, Bear Paw Mt., Billings, Glasgow Valley; NEVADA, Carson City, Mercury, Patrick, Reno, Wells; NEW MEXICO, Lamey; OREGON, Algoma, Bend, Corvallis, The Narrows; UTAH, Blue Creek, Cedar City, Delta, Elberta, Ft. Duchesne, Jensen, Logan, Milford, Monroe, Richfield, Salt Lake City, Thistle, Tropic, Vernal; WYOMING, Laramie. There are an additional two examples at hand from Waterville, Maine and College Park, Maryland; these are undoubtedly mislabeled. Collection dates 18 January to 25 November. Total specimens studied 566 males and 643 females.

Notes. — *C. cultus* can be distinguished from all of its congeners, except *C. praecox*, by the features of the male genitalia as delimited in the key. The dark pustules on the veins of the forewings, present in *cultus* and absent in *praecox*, separate the two species. This is a western species that occurs from the Pacific Coast east to Kansas and north to Montana. It is by far the most common *Cixius* in all parts of California and has been collected on many crop plants which include: alfalfa, barley, celery, clover, corn, fig, peach, potato, spinach, sugar beets, and wheat. It has also been taken on Russian thistle.

Cixius ephratus Ball

Figs. 43-45

Cixius cultus var. *ephratus* Ball 1937:179.

Salient features. — Length of males 4.8-5.3 mm, females 5.0-5.9 mm. Ground color of head and thorax tawny, intercarinal portions of crown, frons, clypeus, and sides of head black, intercarinal portions of pronotum usually blackened, mesonotum black with carinae brownish, abdomen black. Forewings hyaline, varying from unmarked to tinted with brown to form irregular clouds at bases, middle and apical portions, sometimes clouds fused to form longitudinal markings, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 45) bluntly triangular, inner margin of styles convex distally; genital capsule in lateral view (fig. 43) with posterior margin of pygofer irregularly produced, distal portion of style higher than wide, anal flap narrowed on distal half; aedeagus in left lateral view (fig. 43) with single stout process upturned distally and originating preapically on dorsal margin, similar process arising from broad base on ventral margin at apex, shaft simple, flagellum long and simple; aedeagus in right lateral view (fig. 44) with single stout process distally upturned and originating preapically on dorsal margin.

Types. — Holotype female and allotype male, Ephraim, Utah, 15 June 1904, E.D. Ball. Both types are in the collection of the U.S. National Museum.

Specimens studied. — NEVADA, Ely, Wells; UTAH, Ephraim, Garland, Milford. Collection dates 22 April to 25 June. Total specimens studied 16 males and 9 females.

Notes. — The shape of the pygofer, anal flap, and aedeagal processes in lateral view provide the differentiating features of *C. ephratus* as noted in the key. It is closely related to the common and widespread *C. cultus,* but *ephratus* is fairly rare and known from but a few localities in Utah and Nevada. Russian thistle is the only plant from which specimens have been taken.

Cixius prodotes Kramer, n. sp.

Figs. 46-48

Salient features. — Length of males 5.0-5.2 mm, female unknown. Ground color of head and thorax dark tawny, intercarinal portions of crown, except narrow portions touching eyes, frons, clypeus, and sides of head black, intercarinal portions of pronotum variably blackened, mesonotum black with its carinae usually brownish, abdomen black. Forewings hyaline, portions between veins irregularly tinted with brownish, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 48) triangularly produced, inner margins of styles convex distally; genital capsule in lateral view (fig. 46) with posterior margin of pygofer roundly produced, distal portion of style subtriangular and about as high as wide, anal flap stalklike and produced on ventral margin distally; aedeagus in left lateral view (fig. 46) with single broad process originating near apex on dorsal margin, dorsal margin of shaft strongly convex, ventral margin of shaft indented near middle, flagellum long and simple; aedeagus in

right lateral view (fig. 47) with broad process originating near apex on dorsal margin and shorter decurved process originating on ventral margin near apex.

Types. — Holotype male, Balsam, North Carolina, 1 June 1956, D.J. and J.N. Knull in collection of Ohio State University, Columbus. Paratypes (single males), Hocking Co., Ohio, 29 May, no year given, D.J. and J.N. Knull, J.S. Caldwell coll'n; Scioto Co., Ohio, 9 June 1945, D.J. and J.N. Knull, J.S. Caldwell coll'n.

Specimens studied. — NORTH CAROLINA, Balsam; OHIO, counties only — Hocking, Scioto. Collection dates 29 May to 9 June. Total specimens studied 3 males and 0 females.

Notes. — *C. prodotes* can be recognized on the basis of the following features of the aedeagus: the indentation on the ventral margin near the middle, the elevated dorsal margins, the stout and distally narrowed process on either side of the dorsal margin near the apex, and the short process on the ventral margin near the apex on the right side. It is most similar to *C. procrustes* n. sp.; the two species can be separated by the features used in couplet 15 of the key. The plant associations of this rare eastern species are unknown. The specific name, a Greek noun in apposition, means traitor.

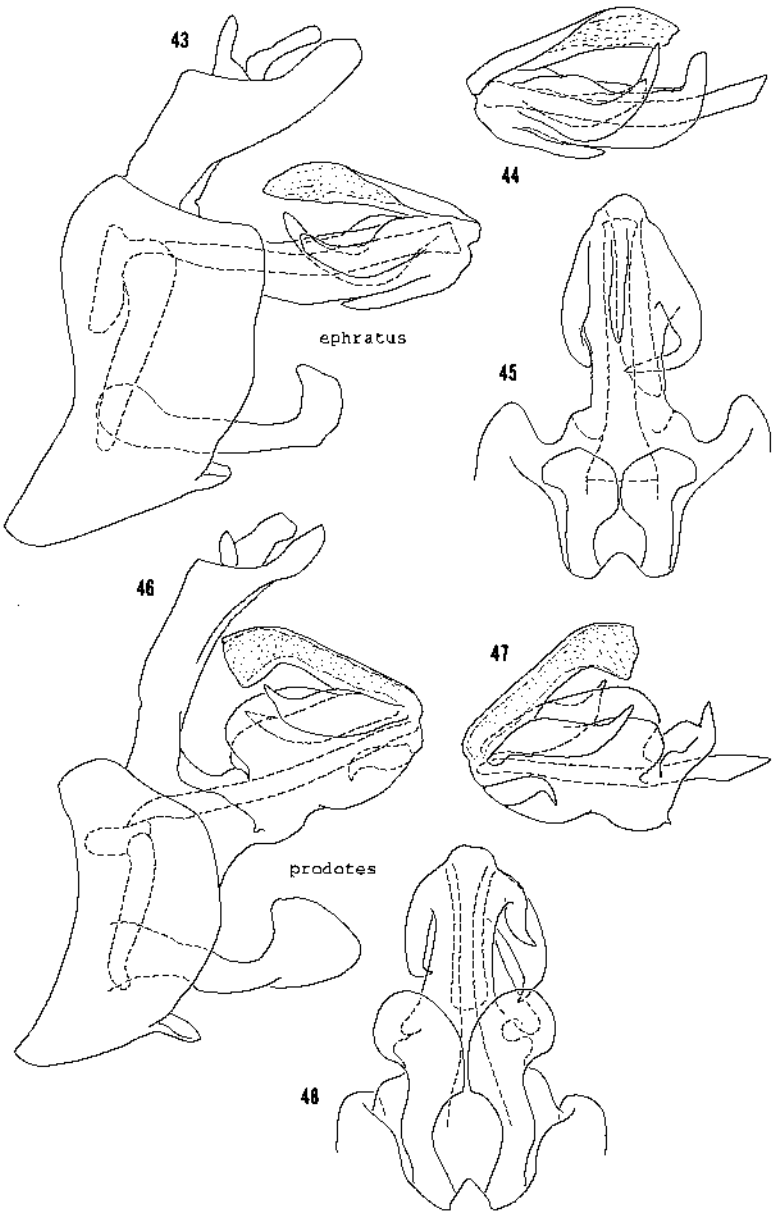
Cixius procrustes Kramer, n. sp.

Figs. 49-51

Salient features. — Length of males 4.7 mm, female unknown. Ground color of head and thorax dark tawny, intercarinal portions of crown, except narrow areas touching eyes, frons, clypeus, and sides of head black, median carina on face also black, intercarinal portions of pronotum variably blackened, mesonotum and its carinae black, abdomen black. Forewings hyaline, portions between veins moderately to heavily tinted with brown except for pale areas before each stigma, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 51) triangularly produced, inner margins of styles convex distally; genital capsule in lateral view (fig. 49) with posterior margin of pygofer broadly rounded, distal portion of style expanded and higher than wide, anal flap elongated and produced on ventral margin distally; aedeagus in left lateral view (fig. 49) with stout distally tapered process arising on dorsal margin near apex, dorsal margin convex, ventral margin indented near middle, flagellum simple; aedeagus in right lateral view (fig. 50) with stout process distally upturned arising near apex on dorsal margin, shorter and distally downcurved arising near apex on ventral margin.

FIGURES 43-48. Male genitalia. 43-45, *C. ephratus* Ball, from allotype, 46-48, *C. prodotes* n. sp., from Hocking Co., Ohio. 43, 46, complete lateral view. 44, 47, aedeagus in right lateral view. 45, 48, apex of pygofer, styles, and aedeagus in ventral view.


43
44
ephratus
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prodotes
48

Types. — Holotype male (USNM 76736), Newton Co., Arkansas, 17 June 1965, H.R. Dodge. Paratype male, Manhattan, Riley Co., Kansas, 7 May 1968, Gary F. Hevel.

Specimens studied. — ARKANSAS, Newton Co.; KANSAS, Manhattan. Collection dates 7 May and 17 June. Total specimens studied 2 males and 0 females.

Notes. — *C. procrustes* is structurally close to *C. prodotes* and shares many characters with that species. The two are separated by the features used in couplet 15 of the key. *C. procrustes*, without recorded host or food plants, is rare and known from but single localities in Arkansas and Kansas. The species name, to be treated as a noun in apposition, is that of a legendary highwayman in classic mythology.

Cixius angustatus Caldwell

Figs. 52-54

Cixius angustatus Caldwell 1938:45.

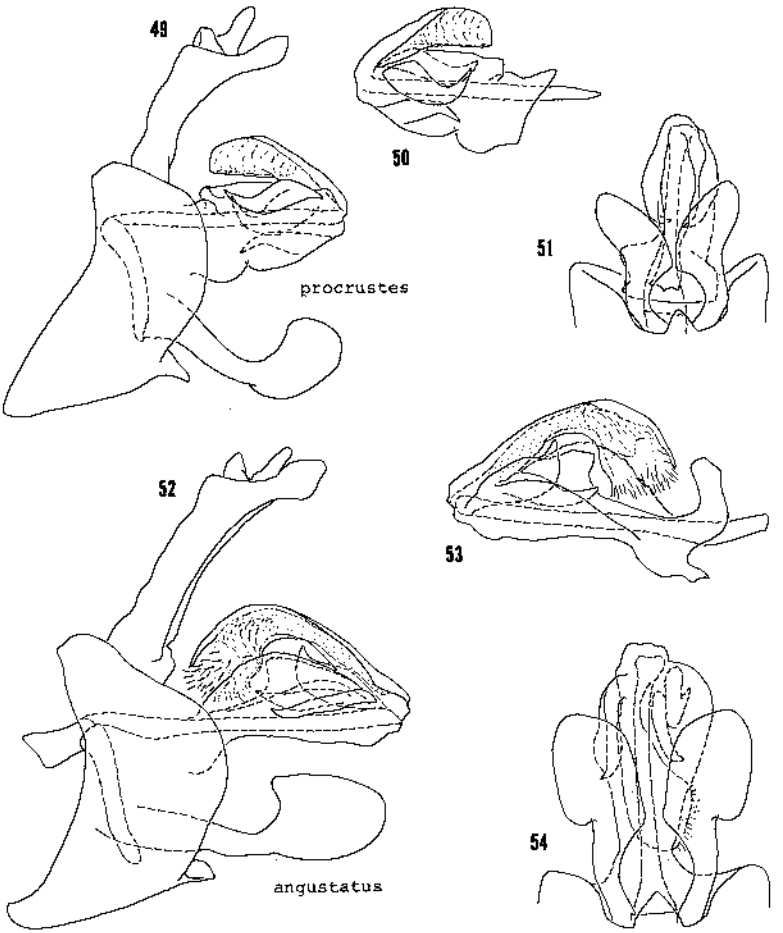
Salient features. — Length of males 5.2-5.9 mm, females 5.9-7.0 mm. Ground color of head and thorax dark tawny, intercarinal portions of crown, except for irregular pale spot near each eye, frons, clypeus, sides of head, and pronotum darkened with shades of brown to black, mesonotum either darkly fuscus or black, its discal portion at times shade lighter, abdomen dark. Forewings hyaline with variable brown tinting at bases, near middle, and distal portions, in well marked specimens transverse band across middle of forewings surrounds hyaline area on clavi, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 54) triangularly produced, inner margins of styles convex distally; genital capsule in lateral view (fig. 52) with posterior margin of pygofer produced and rounded, distal portion of style expanded and wider than high, anal flap stalklike and produced on ventral margin distally; aedeagus in left lateral view (fig. 52) with moderately long process originating on dorsal margin near apex, dorsal margin of shaft broadly convex, ventral margin slightly irregular, flagellum long with spicules at expanded apex; aedeagus in right lateral view (fig. 53) with two processes arising subapically near dorsal margin, one stout and broadly upturned distally, other mesad of first and less stout, both partly concealed by flange on shaft, dorsal margin of shaft with subquadrate elevation slightly beyond middle.

Type. — Holotype male, Scioto Co., Ohio, 10 May 1936, J.S. Caldwell, in collection of Ohio State University, Columbus.

Specimens studied. — GEORGIA, Neel Gap, county only — Peach; MISSOURI, Sam Baker State Park; NORTH CAROLINA, Balsam, McCullers, Raleigh; OHIO, Clifton, Shawnee Forest, counties only — Delaware, Franklin, Hocking, Scioto; SOUTH CAROLINA, Clemson; VIRGINIA, Arlington. Collection dates 31 March to 20 June. Total specimens studied 27 males and 29 females.

Notes. — *C. angustatus* is distinguished by the features of the aedeagus; these include the spicules at the apex of the flagellum, the two processes on the right side of the shaft which are partly concealed by a flange, and the asymmetrical right and left dorsal margins of the shaft. This is the species misidentified by Osborn (1938:305,



FIGURES 49-54. Male genitalia. 49-51, *C. procrustes* n. sp., from holotype. 52-54, *C. angustatus* Caldwell, from Arlington, Va. 49, 52, complete lateral view. 50, 53, aedeagus in right lateral view. 51, 54, apex of pygofer, styles, and aedeagus in ventral view.

fig. 17A) as *C. caloepeum*. Most of the specimens were collected without plant associations, but some from Georgia and North Carolina were taken either in peach orchards or were shaken directly from peach trees. The species is widely distributed in the East and is found from Georgia north to Ohio and as far west as Missouri.

Cixius misellus Van Duzee

Figs. 55-60

Cixius stigmatus (Say), Van Duzee 1906:408 (misdet.).

Cixius misellus Van Duzee 1916:79 (new name for *C. stigmatus* Van Duzee 1906:408, not Say 1825:336).

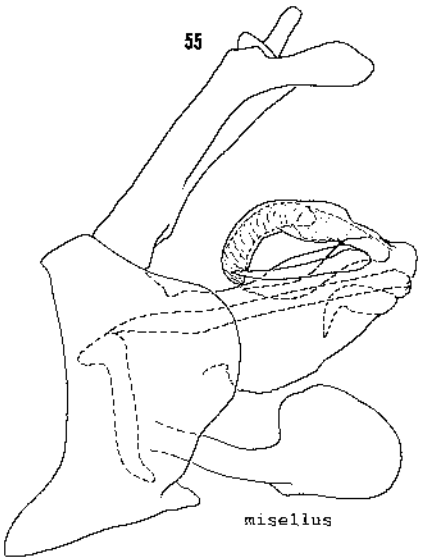
Salient features. — Length of males 5.3-7.4 mm, females 5.8-7.9 mm. Ground color of head and thorax tawny, intercarinal portions of crown, frons, clypeus, and sides of head variably darkened with shades of brown to black, pronotum with intercarinal portions less distinctly or not at all darkened, mesonotum darkly fuscus to black with its carinae usually paler, abdomen dark. Forewings hyaline with or without brown tinting, tinting usually heavier in females and often entirely absent in males, in well-marked specimens tinting occurs basally, medially, and distally in form of vague and poorly defined transverse bands, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (figs. 57, 60) weakly triangular and vaguely indented apically, styles rounded distally; genital capsule in lateral view (figs. 55, 58) with posterior margin of pygofer roundly produced, distal portions of styles expanded and wider than high, anal flap stalklike and produced on ventral margin distally; aedeagus in left lateral view (figs. 55, 58) with moderately long process originating on dorsal margin near apex, dorsal margin of shaft fairly straight, ventral margin convex, flagellum long with few crenulations near base on dorsal margin; aedeagus in right lateral view (figs. 56, 59) with two processes arising subapically, one near dorsal margin, other near ventral margin, upper process usually recurved, lower process usually decurved.

Type. — Lectotype male here selected with labels: "Lake Temagami. Ont., 12 August 1906, W.J. Palmer" and "Lectotype *misellus*" (red paper) and "E.P. Van Duzee Collection" (yellow paper) and "Cal. Acad. type no. 2237". The lectotype is in the collection of the California Academy of Sciences, San Francisco.

Specimens studied. — CONNECTICUT, Lime Rock Sta.; MAINE, Bar Harbor, Kineo, Mars Hill, Mt. Katahdin, Orono, Saddleback Lake, Tumbledown Mt. in Franklin Co.; MASSACHUSETTS, Greylock Mts. in Adams Co.; MICHIGAN, Copper Harbor, Hancock, counties only — Baraga, Marquette, Menominee; MINNESOTA, Eaglesnest, Grand Marais, Lutsen; NEW HAMPSHIRE, Crawfords;

FIGURES 55-60. Male genitalia. 55-57, *C. misellus* Van D., from Mt. Katahdin, Maine. 58-60, *C. misellus* Van D., from Great Smoky Mts. Nat. Park, Tenn. 55, 58, complete lateral view. 56, 59, aedeagus in right lateral view. 57, 60, apex of pygofer, styles, and aedeagus in ventral view.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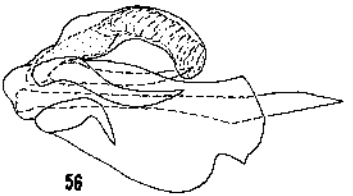
misellus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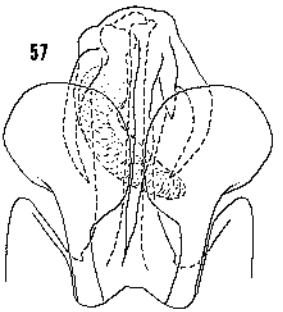
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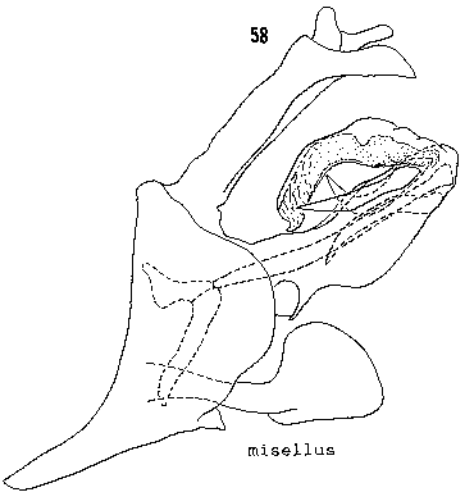
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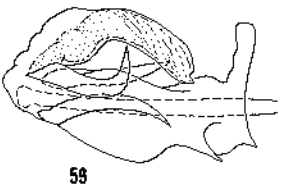
misellus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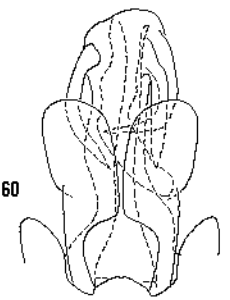
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NEW YORK, Adirondack Mts., Catskill, Cranberry Lake, Gowanda, Keen Valley, Mt. Whiteface, Olean, Onteora Mt. in Greene Co., Salamanca, Slaterville Springs, Slide Mt. in Ulster Co., The Plains, Wanakena, Wilmington, Woodworths Lake in Fulton Co.; NORTH CAROLINA, Grandfather Mt., Mt. Mitchell; PENNSYLVANIA, Red Rock; TENNESSEE, Great Smoky Mts., Nat. Park; VERMONT, Mt. Mansfield; VIRGINIA, Stony Mt. Collection dates 18 July to 11 September. Total specimens studied 124 males and 98 females.

Notes. — *C. misellus* can be distinguished by the long stalklike anal tube, the three aedeagal processes, the convex ventral margin of the aedeagus in lateral view, and the crenulate dorsobasal margin of the flagellum. The series collected in the Great Smoky Mts. Nat. Park above 6,000 ft. was taken on pin cherry. This series differs somewhat from the typical form by averaging larger in total length and size and by minor variations in the male genitalia. Compare figs. 55-57 and 58-60. *C. misellus* is known from Maine west to Minnesota and south along the Appalachian Mts. to North Carolina and Tennessee.

Cixius knulli Caldwell

Figs. 61-63

Cixius knulli Caldwell 1938a:304.

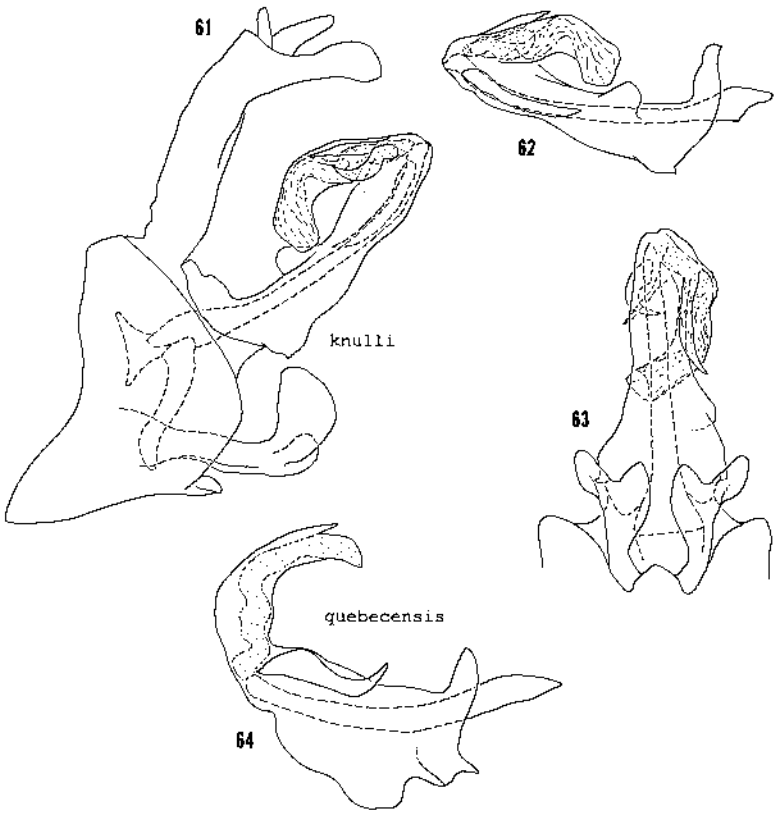
Salient features. — Length of males 5.0-5.5 mm, females 5.0-5.9. Ground color of head and thorax tawny to dark tawny, intercarinal portions of crown, face, and sides of head not darkened, intercarinal portions of pronotum sometimes slightly shaded, mesonotum dark to light tawny, abdomen at least in part darkened with blackish. Forewings hyaline and lightly to heavily tinted with shades of brown, tinting occurs as irregular transverse clouds, apical portions dark brown and usually forming dark crescent on each apex, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 63) subtriangularly produced, styles bifurcated or forked distally; genital capsule in lateral view (fig. 61) with posterior margin of pygofer rounded, distal portion of style expanded and higher than wide, anal flap stalklike and produced on ventral margin distally; aedeagus in left lateral view (fig. 61) with two fairly short processes originating near apex on dorsal margin, shaft slender and transverse, flagellum simple; aedeagus in right lateral view (fig. 62) with single process of moderate length originating apically or preapically near ventral margin, dorsal margin of shaft with finlike projection near middle.

Type. — Holotype male, Davis Mts., Texas, 22 August 1936, J.N. Knull, in collection of Ohio State University, Columbus.

Specimens studied. — TEXAS, Davis Mts. in Jeff Davis Co. Collection dates 14 May to 22 August. Total specimens studied 14 males and 9 females.

Notes. — *C. knulli* can be separated at once from all of its congeners in the United States, except *C. chisosus* Caldwell, by the distally bifurcated or forked styles, a feature best observed in ventral aspect. It can be separated from *C. chisosus* by the finlike projection on the right dorsal margin of the aedeagal shaft and by having but three aedeagal processes. The distribution is limited to the Davis Mts. in western Texas; the plant associations are not known.



FIGURES 61-64. Male genitalia. 61-63, *C. knulli* Caldwell, from Davis Mts., Texas. 64, *C. quebecensis* Beirne, from holotype. 61, complete lateral view. 62, 64, aedeagus in right lateral view. 63, apex of pygofer, styles, and aedeagus in ventral view.

Cixius evexus Kramer, n. sp.

Fig. 65

Salient features. — Length of males 5.2-5.9 mm, female unknown. Ground color of head and thorax dark tawny, most of crown except for small pale areas near eyes black or blackened, frons and clypeus except for small pale areas laterally on frontoclypeal suture irregularly blackened, sides of head blackened, intercarinal portions of pronotum blackened, mesonotum largely black but discal portion sometimes paler, abdomen largely black. Forewings hyaline with or without vague tinting in form of small irregular clouds on clavus and corium, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view produced and bluntly triangular, styles irregularly rounded distally; genital capsule in lateral view (fig. 65) with posterior margin of pygofer subtruncately produced on middle half, distal portion of style expanded and higher than wide, anal flap somewhat stalklike and produced on ventral margin distally; aedeagus in left lateral view (fig. 65) with two processes originating subapically, lower process longer and strongly upturned distally, flagellum arched but simple; aedegus in right lateral view with single long process originating subapically.

Type. — Holotype male (USNM 76737), 11 miles NW Castaic, Los Angeles Co., California, 28 January 1965, C.W. O'Brien. Two paratype males with identical data.

Specimens studied. — CALIFORNIA, Castaic. Collection date 28 January. Total specimens studied 3 males and 0 females.

Notes. — *C. evexus*, a species known only from southern California without plant associations, is similar to both *C. vandykei* and *C. narke*. The most obvious character for separating it from these two species, also known only from California, is the nondecurved apical portion of the anal flap. There are other differences as well; see notes under those species. The specific name, a Latin adjective, means rounded at the top.

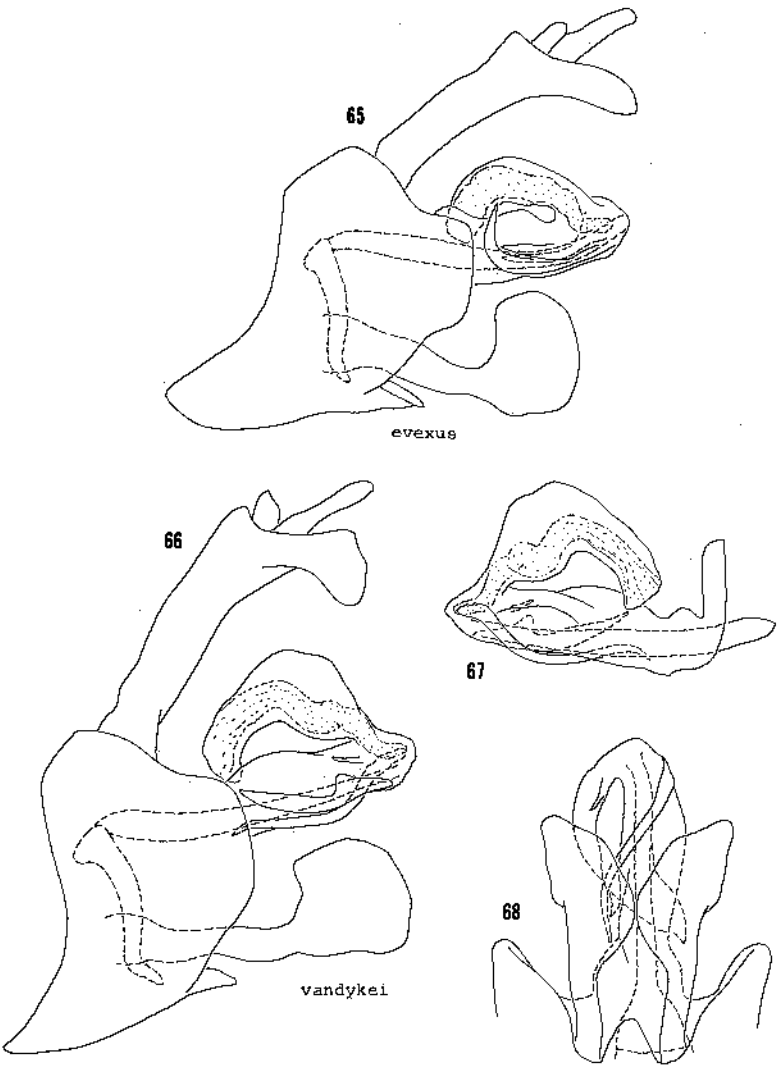
Cixius vandykei Van Duzee

Figs. 66-68

Cixius vandykei Van Duzee 1925:404.

Salient features. — Length of males 5.0-6.0 mm, females 5.5-6.0. Ground color of head and thorax tawny, most of crown except for small pale areas near eyes embrowned or blackened, frons and clypeus except for pale areas laterally on frontoclypeal suture either darkened or not with various shades of brown to nearly black, mesonotum similarly darkened and at times almost entirely fuscus, abdomen largely dark. Forewings hyaline with or without brownish tinting in form of irregular patches basally, medially, and distally, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 68) triangularly produced, inner margins of styles distally convex; genital capsule in lateral view (fig. 66) with posterior margin of pygofer subquadrately produced, distal portion of style expanded and about as wide as high, anal flap stalklike and distally decurved; aedeagus in left lateral view (fig. 66) with two processes originating subapically, up-



FIGURES 65-68. Male genitalia. 65, *C. evexus* n. sp., from holotype. 66-68, *C. vandykei* Van D., from holotype. 65, 66, complete lateral views. 67, aedeagus in right lateral view. 68, apex of pygofer, styles, and aedeagus in ventral view.

per one minute and slender, lower one large and stout, flagellum arched with strong crestlike expansion on dorsal margin; aedeagus in right lateral view (fig. 67) with single long process originating subapically.

Type. — Holotype or type male, according to the original description, Ross, California, 7 July 1921, E.P. Van Duzee, No. 1771. The male specimen bearing Van Duzee's holotype label *C. vandykei* has the data: Langunitas, Marin Co., California, 7 August 1921, E.P. Van Duzee, Cal. Acad. Sci. Type No. 1771. I am unable to explain this discrepancy. There were no specimens in the collection of the California Academy with data corresponding to that which was originally published for the holotype.

Specimens studied. — CALIFORNIA, Berkeley, Bolinas Jct., Carmel Valley, Duncan's Mills, Inverness, Lagunitas, Lake Pilarcitos, Mill Valley, Monterey, Mt. Tamalpais, Muir Woods, Oakland, Santa Cruz, Soquel Creek, county only — San Benito. Collection dates 11 May to 25 December. Total specimens studied 21 males and 21 females.

Notes. — *C. vandykei* is readily separated from all its congeners on the basis of the minute process on the left side of the aedeagal shaft; no other *Cixius* has this process so greatly reduced. Except for a few specimens taken on redwood and sequoia, the food plants are largely unrecorded. California provides our only state record.

Cixius narke Kramer, n. sp.

Fig. 69

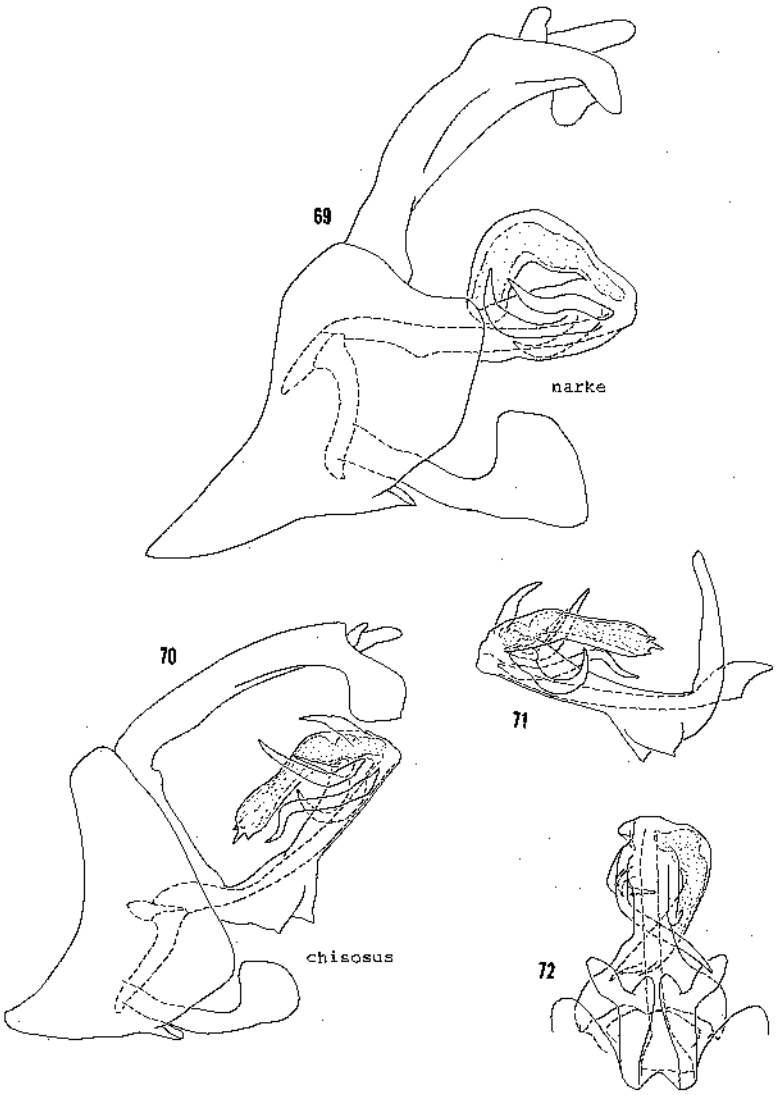
Salient features. — Length of male 7.2 mm, female unknown. Ground color of head and thorax tawny, intercarinal portions of crown, sides of head, and pronotum mainly darkened with fuscus, frons and clypeus at least partly embrowned, mesonotum black laterally and mainly dark tawny on disc, abdomen dark. Forewings hyaline, slight brown tinting apically and mesally near costal margins, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view triangularly produced, distal portions of styles irregularly rounded; genital capsule in lateral view (fig. 69) with posterior margin of pygofer produced and obliquely subtruncate or truncate, distal portion of style subtriangular and higher than wide, anal flap stalklike and decurved at apex; aedeagus in left lateral view (fig. 69) with two processes originating subapically, lower one longer than upper one and upturned distally, flagellum arched but simple; aedeagus in right lateral view with single process originating subapically.

Type. — Holotype male (USNM 76738), Alum Rock Park, Santa Clara Co., California, 14 March 1965, K.D. Johnson.

Specimens studied. — Known only from holotype.

Notes. — *C. narke* is closely allied to both *C. evexus* and *C. vandykei*. It can be separated from *evexus* by the decurved apex of the anal flap and from *vandykei* by the larger upper process on the left side of the aedeagal shaft. This species, without plant data, is known from but a single male taken in Santa Clara Co., California. The species name, a Greek noun in apposition, means numbness.



FIGURES 69-72. Male genitalia. 69, *C. narke* n. sp., from holotype. 70-72, *C. chisosus* Caldwell, from holotype. 69, 70, complete lateral view. 71, aedeagus in right lateral view. 72, apex of pygofer, styles, and aedeagus in ventral view.

Cixius chisosus Caldwell

Figs. 70-72

Cixius chisosus Caldwell 1938a:304.

Salient features. — Length of males 5.9-6.1 mm, females 6.2-6.5 mm. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum variably darkened with brownish, frons and clypeus usually not darkened, sometimes vaguely shaded, mesonotum varying from dark tawny to dark reddish brown, lateral portions often shade darker than discal portion, abdomen dark at least in part. Forewings hyaline, tinted with light or medium shades of brown in form of vague and usually transverse clouds basally, mesally, and distally, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 72) triangular, distal portions of styles forked or bifurcated; genital capsule in lateral view (fig. 70) with posterior margin of pygofer bluntly angular, distal portion of style expanded and about as high as wide, anal flap stalklike with apical portion decurved and broadened; aedeagus in left lateral view (fig. 70) with four processes originating subapically, two uppermost ones shorter than others, shaft transverse with subtriangular projection near base on ventral margin, flagellum with three short acute projections at apex; aedeagus in right lateral view (fig. 71) with single recurved subapical process.

Type. — Holotype male, Chisos Mts., Texas, 9 July 1936, J.N. Knull in collection of Ohio State University.

Specimens studied. — TEXAS. Chisos Mts. in Big Bend Nat. Park, Brewster Co. Collection dates 26 June to 19 September. Total specimens studied 8 males and 3 females.

Notes. — *C. chisosus* in the only *Cixius* in our fauna with five processes on the aedeagal shaft. The second process from the top, in left lateral view, is often partly concealed by the third and therefore can be overlooked. The distally forked styles, as seen in ventral aspect, separate *chisosus* from all of its congeners except *knulli*. *C. knulli* differs by having only three processes on the aedeagal shaft. *C. chisosus,* without biological data, is known only from western Texas.

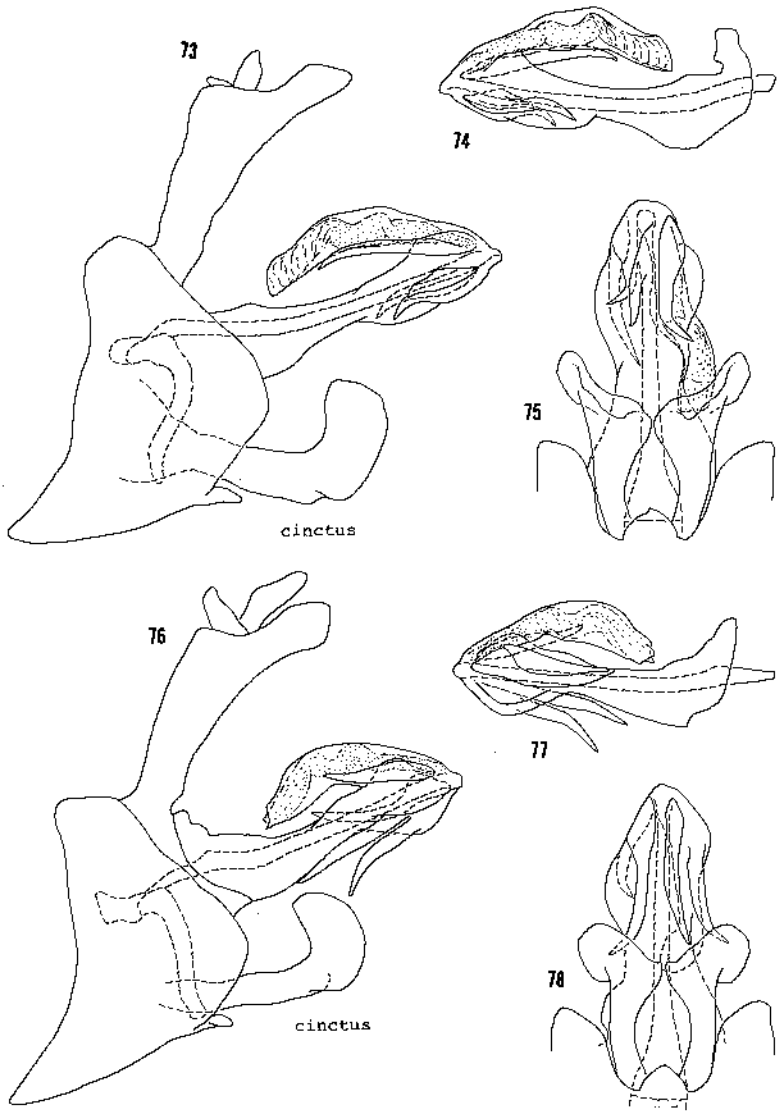
Cixius cinctus Ball

Figs. 73-81

Cixius cinctus Ball 1937:177.

Salient features. — Length of males 4.8-5.6 mm, females 5.0-5.8 mm. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum embrowned, frons and clypeus either lightly embrowned or not, sides of head usually lightly embrowned, mesonotum varying from not darkened to distinctly darkened especially on lateral portions, abdomen either darkened or only partly so. Forewings hyaline, with variable brownish tinting in form of transverse bands basally, mesally, and distally, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (figs. 75, 78, 81) roundly produced, inner margins of styles convex distally; genital capsule in lateral view



FIGURES 73-78. Male genitalia of *C. cinctus* Ball. 73-75, from Chiricahua Mts., Ariz. 76-78, from Huachuca Mts., Ariz. 73, 76, complete lateral view. 74, 77, aedeagus in right lateral view. 75, 78, apex of pygofer, styles, and aedeagus in ventral view.

(figs. 73, 76, 79) with posterior margin of pygofer convex, distal portion of style expanded and higher than wide, anal flap stout and produced on ventral margin distally; aedeagus in left lateral view (figs. 73, 76, 79) with three processes originating near apex, upper process usually longest, shaft transverse and narrowest at middle, flagellum long and with or without acute projections on apical rim; aedeagus in right lateral view (figs. 74, 77, 80) with single subapical process.

Types. — Holotype female and allotype male, Tucson, Arizona, 1 September 1929, E.D. Ball in collection of U.S. National Museum.

Specimens studied. — ARIZONA, Chiricahua Mts., Huachuca Mts., Santa Rita Mts., Tucson. Collection dates 16 August to 30 October. Total specimens studied 9 males and 6 females.

Notes. — *C. cinctus* can be recognized on the basis of the four processes on the aedeagal shaft and the moderately broad and nondecurved distal portion of the anal flap. The lengths and curvatures of the processes vary more than those in most of its congeners. The male from the Chiricahua Mts., illustrated in figs. 76-78, has longer wings than those of the other males studied and was parasitized; this probably explains or accounts for the variations found in the male genital structures of this specimen. No biological data are recorded for this species known only from the mountains of southern Arizona.

Cixius comptus Fowler

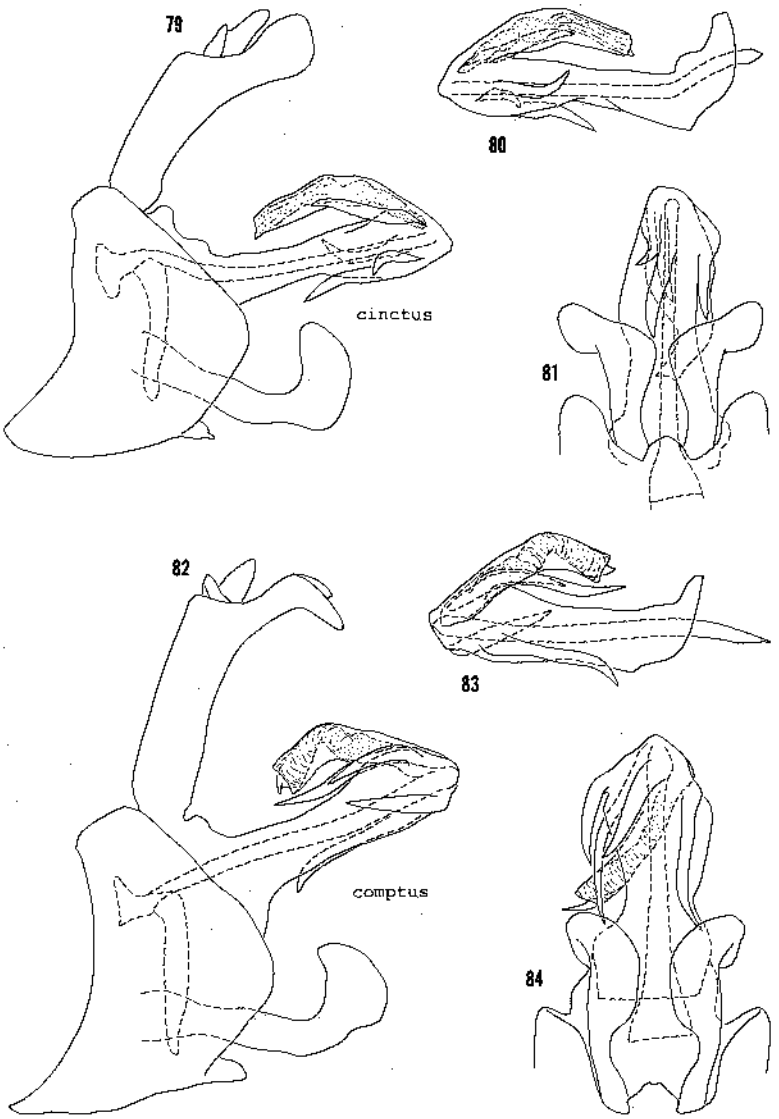
Figs. 82-84.

Cixius comptus Fowler 1904:96.

Salient features. — Length of males 4.8-5.0 mm, females 5.4-6.1 mm. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum darkened with brown or reddish brown, frons and clypeus with intercarinal portions variably darkened with shades of brown, sides of head similarly darkened or not, mesonotum medium brown, reddish brown, to nearly fuscus with lateral portions often darker than discal portion, abdomen at least partly darkened. Forewings hyaline and tinted with brown to form clouds in basal half of clavus, transverse bands at middle, subapex, and apex, total of four tinted areas on each forewing, tinted areas sometimes partly blended to form more or less continuous pattern, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 84) well produced, inner margins of styles convex distally; genital capsule in lateral view (fig. 82) with posterior margin of pygofer convex, distal portion of style expanded and higher than wide, anal flap elongated and asymmetrically forked at decurved apex; aedeagus in left lateral view (fig. 82) with three processes, upper two arising near apex on dorsal margin, lower one arising near apex on ventral margin, flagellum with small toothlike projection at apex; aedeagus in right lateral view (fig. 83) with single long process arising subapically near ventral margin.

Type. — Lectotype female here selected with labels: "female" and "Sr. Madre Mts., Mex. 9" (handwritten) and "Type" and "*Cixius comptus* Fowler, type"



FIGURES 79-84. Male genitalia. 79-81, *C. cinctus* Ball, from Santa Rita Mts., Ariz. 82-84, *C. comptus* Fowler, from Huachuca Mts., Ariz. 79, 82 complete lateral view. 80, 83, aedegus in right lateral view. 81, 84, apex of pygofer, styles, and aedeagus in ventral view.

(handwritten) and "B.C.A. Homopt. I, *Cixius comptus* Fowl." (machine printed). There is slight damage to the apex of the left forewing. The lectotype is in the collection of the British Museum (Nat. Hist.), London.

Specimens studied. — ARIZONA, Chiricahua Mts., Huachuca Mts., St. Rita Mts., Tucson. Collection dates 17 July to 1 September. Total specimens studied 5 males and 5 females.

Notes. — *C. comptus* is distinguished by the four processes on the aedeagal shaft and the decurved and asymmetrically forked apex of the anal flap. It appears to be the *Cixius* with the most consistent pattern of transverse brown tinting on the forewings in both sexes of all those found in our fauna. Nothing is recorded about the biology of this species which is known only from southern Arizona and Mexico.

Cixius clitellus Ball

Figs. 85-87

Cixius clitellus Ball 1937:177.

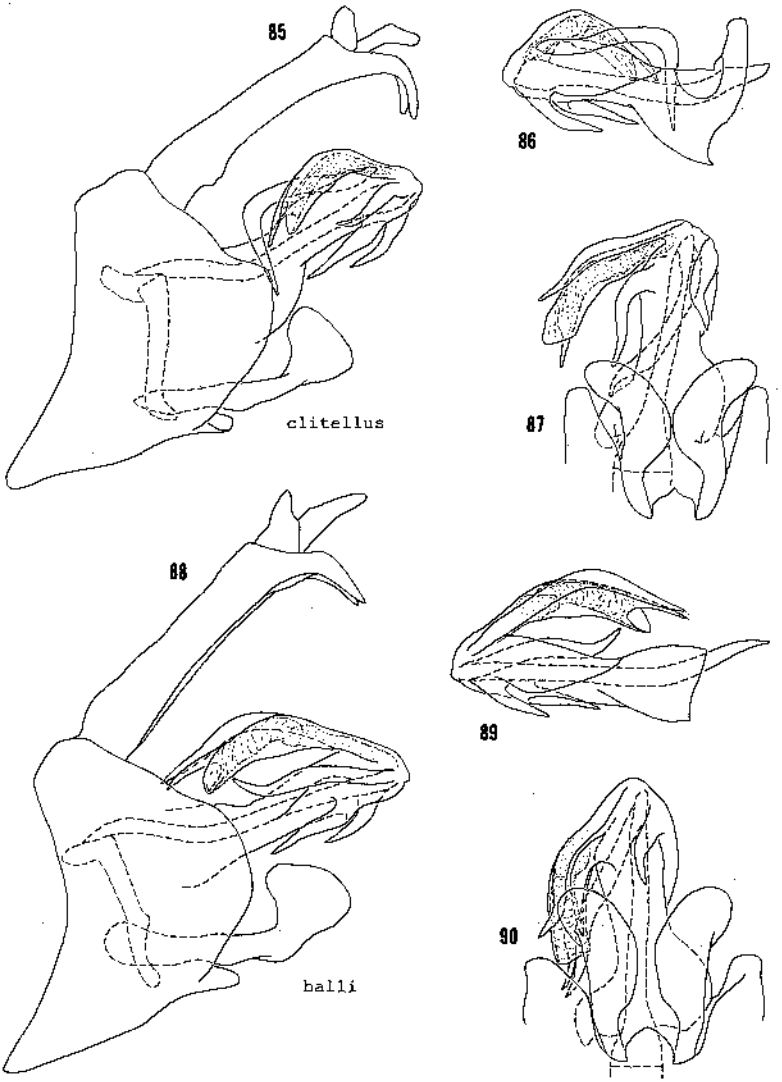
Salient features. — Length of males 5.0-5.9 mm. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum with or without variable embrowning, frons and clypeus sometimes slightly darkened, mesonotum varying from pale to almost fuscus, abdomen at least partly darkened. Forewings hyaline, males with membranous portions at least partly tinted with pale brownish and sometimes forming vague transverse bands, females with darker brown tinting in form of elongate patches in clavi, and irregular transverse bands near middle, subapex, and apex, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 87) well produced, inner margins of styles convex distally; genital capsule in lateral view (fig. 85) with posterior margin of pygofer irregularly rounded, distal portion of style expanded and higher than wide, anal flap elongated with extreme apical portion slender and slightly recurved; aedeagus in left lateral view (fig. 85) with two processes arising subapically, one near middle, other near ventral margin, their relative lengths variable, apex of flagellum with elongated tooth; aedeagus in right lateral view (fig. 86) with two processes, upper one arising near apex on dorsal margin and sharply downturned in distal third, lower one much shorter and arising on ventral margin.

Types. — Holotype female and allotype male, Chiricahua Mts., Arizona, 17 July 1933, E.D. Ball in collection of U.S. National Museum.

Specimens studied. — ARIZONA, Chiricahua Mts. Collection dates 15 July to 12 September. Total specimens studied 13 males and 24 females.

Notes. — *C. clitellus* is distinguished by four processes on the aedeagal shaft, the longest of which is sharply downturned on its distal third, and the slender and slightly recurved distal portion of the anal flap. It is very close to *C. balli;* the features for separating the two species are given in couplet 24. The species is known only from southern Arizona without recorded plant associations.



FIGURES 85-90. Male genitalia. 85-87, *C. clitellus* Ball, from Chiricahua Mts., Ariz. 88-90, *C. balli* n. sp., from holotype. 85, 88, complete lateral view. 86, 89, aedeagus in right lateral view. 87, 90, apex of pygofer, styles, and aedeagus in ventral view.

Cixius balli Kramer, n. sp.

Figs. 88-90

Salient features. — Length of males 5.4-5.9 mm, females 5.5-5.9 mm. Ground color of head and thorax tawny, intercarinal portions of crown, sides of heads, and pronotum unmarked in males and vaguely shaded in females, frons and clypeus similarly colored, mesonotum usually undarkened in males and slightly darkened in females, abdomen largely pale. Forewings hyaline, males nearly entirely tinted with pale brownish, sometimes tinting in form of vague transverse bands, usually with one or two irregular milky spots in each clavus, females with darker tinting in form of elongate patches in clavi, and irregular transverse bands near middle, subapex, and apex, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 90) well produced, inner margins of styles convex distally; genital capsule in lateral view (fig. 88) with posterior margin of pygofer rounded, distal portion of style expanded and about as high as wide, anal flap elongated with extreme apical portion slender and oblique; aedeagus in left lateral view (fig. 88) with two processes arising subapically, one near middle, other near ventral margin, upper process usually longer, apex of flagellum with elongated tooth; aedeagus in right lateral view (fig. 89) with two processes, upper one arising near apex and dorsal margin and bowed on distal third, lower one short and arising near or on ventral margin.

Types. — Holotype male (USNM 76739), Santa Catalina Mts., Arizona, 24 July 1932, E.D. Ball. Paratypes: two males and two females with same data as holotype; male with same data except 29 June 1933; four males with same data except 15 July 1965, L.B. O'Brien.

Specimens studied. — ARIZONA, Santa Catalina Mts. Collection dates 29 June to 24 July. Total specimens studied 8 males and 2 females.

Notes. — *C. balli* can be recognized by the four processes on the aedeagal shaft, the longest of which is bowed on its distal third, and the slender and oblique distal portion of the anal flap. This species, named for E.D. Ball, is close to *C. clitellus;* features for separating these two species are given in couplet 24. Pine is the only recorded plant association for this species which is known only from southern Arizona.

Distributional Notes on the United States Species

Members of the genus *Cixius* occur in all major sections of the United States. Florida provides no state records, and the genus may indeed be absent from that state and from the lower elevations in adjacent states. A few essentially northern species, *C. misellus, C. nike,* and *C. pini,* do range southward along the Appalachian Mountains into the Southeast. Populations of individual species, those that are fairly widespread, are greatest in the northern parts of their range. Only one species, *C. nervosus,* is truly transcontinental with records from Maine west to Washington and California, and south to North Carolina and Tennessee in the East, and Arizona and New Mexico in the West. *C. stigmatus* is nearly transcontinental

and is known from Virginia west to Utah, north to South Dakota, and south to Texas. *C. meridionalis*, a far northern species, occurs from the Arctic Circle in Alaska south to the Rocky Mountains in northwestern Montana. Two species, *C. chisosus* and *C. knulli*, are apparently limited to two mountain ranges in western Texas. The number of species in the genus is about equally divided between eastern and western United States.

Checklist of United States species of *Cixius* with state records.

1. *angustatus* Caldwell 1938:45. Ga., Mo., N.C., Ohio, S.C., Va.
2. *apicalis* Metcalf 1923:182. Conn., Ill., N.Y., Ohio, Pa.
3. *balli* Kramer, n. sp. Ariz.
4. *caldwelli* Kramer, n. sp. Ohio, Va.
5. *chisosus* Caldwell 1938a:304, Tex.
6. *cinctus* Ball 1937:177. Ariz.
7. *clitellus* Ball 1937:177. Ariz.
8. *coloepeum* Fitch 1856:452. Ark., Colo., Ill., Iowa, Kans., Mo., N.Y., Ohio, Wis., Wyo.
9. *comptus* Fowler 1904:96. Ariz.
10. *cultus* Ball 1902:151. Ariz., Cal., Colo., Ida., Kans., Mont., Nev., N.M., Oreg., Utah, Wyo.
11. *ephratus* Ball 1937:179. Nev., Utah.
12. *evexus* Kramer, n. sp. Cal.
13. *knulli* Caldwell 1938a:304. Tex.
14. *meridionalis* Beirne 1950:98. Alaska, Mont.
15. *misellus* Van Duzee 1916:79. Conn., Me., Mass., Mich., Minn., N.H., N.Y., N.C., Pa., Tenn., Vt., Va.
16. *narke* Kramer, n. sp. Cal.
17. *nervosus* (L.) 1758:437. Ariz., Cal., Colo., Conn., Del., Ida., Ill., Ind., Iowa, Kans., Me., Md., Mass., Mich., Minn., Mont., N.H., N.J., N.M., N.Y., N.C., Ohio, Oreg., Pa., R.I., S.D., Tenn., Utah, Vt., Va., Wash., Wis.
    = *basalis* Van Duzee 1908:489.
    = *umbrosus* Walley 1932:22. n. syn.
18. *nike* Kramer, n. sp. Colo., Conn., Ga., Me., Mass., Mich., Minn., Nebr., N.H., N.Y., Ohio, Pa., Vt., Wis.
19. *pini* Fitch 1851:45. Ind., Md., Minn., N.H., N.Y., N.C., Ohio, Pa., Tenn., Va., W. Va.
    = *guttulatus* Walley 1932:21. n. syn.
20. *praecox* Van Duzee 1925:405. Cal., Colo., Ida., Oreg., Utah, Wash., Wyo.
21. *prodotes* Kramer, n. sp. N.C., Ohio.
22. *procrustes* Kramer, n. sp. Ark., Kans.
23. *quebecensis* Beirne 1951:316. Maine.
24. *stigmatus* (Say) 1825:336. Ark., Ariz., Colo., Ind., Iowa, Kans., Mo., Nebr., N.M., Ohio, Okla., S.D., Tex., Utah, Va., Wis., Wyo.

= *lepidus* Van Duzee 1910:87.

25. *vandykei* Van Duzee 1925:404. Cal.

The Mexican Species of Cixius

Only 14 species of *Cixius* are thus far known from Mexico. Of these, two, *C. apicatus* Fowler and *C. montanus* Fowler are known from females alone and are not included in the key to species. They are, however, briefly discussed following the descriptions of the 12 other species and are included in the checklist. None of the Mexican *Cixius* have recorded plant associations. *C. dislogicus* n. sp. and *C. conjector* n. sp. are probably complexes, but the available data and specimens do not allow the matter to be resolved beyond that point. The cave-dwelling *C. orcus* Fennah is so highly modified for underground living that its relationships to other species in the genus are best indicated by features of the male genitalia. *C. comptus* Fowler and *C. stigmatus* (Say) are the only species known at this time to occur in both Mexico and the United States. The Mexican populations of *C. stigmatus* are, however, subspecifically distinct. The same admonitions apply to the following key as those that were given previously for the key to the species in the United States.

Key to the Mexican Species of Cixius

(males only)

1. Aedeagal shaft with 2 processes 2
   Aedeagal shaft with 3 or more processes 3
2. One process on either side of shaft (figs. 91, 92); with acute toothlike projection at extreme apex of shaft (fig. 91, 93) ..... *bandarus* (Caldwell)
   Both processes on right side on shaft (fig. 95); without toothlike projection at extreme apex of shaft (figs. 94, 96) ..... *nielsoni*, n. sp.
3. Aedeagal shaft with 3 processes 4
   Aedeagal shaft with 4 processes 7
4. Flagellum with conspicuous broad tooth or slender spine near middle 5
   Flagellum simple near middle 6
5. Ventral margin of anal tube with large irregular protrusion in basal half (fig. 97); flagellum with conspicuous broad tooth near middle (figs. 97, 98) ..... *flavobrunneus* Fowler
   Ventral margin of anal tube simple in lateral view (fig. 100); flagellum with slender spine near middle (figs. 101, 102) ..... *stigmatus mexicanus* (Caldwell)
6. Pygofer in lateral view with triangular projection at dorsodistal edge (figs. 103, 106, 109) ..... *dislogicus*, n. sp.
   Pygofer in lateral view simple at dorsodistal edge (figs. 112, 115, 118 ..... *conjector*, n. sp.

7. Proximal portion of anal tube elongated and stalklike (figs. 121, 124 8
   Proximal portion of anal tube not elongated and stalklike (figs. 127, 130) 10
8. Apical portion of anal tube decurved or hooked (fig. 82) ..... *comptus* Fowler
   Apical portion of anal tube neither decurved or hooked 9
9. Ventral margin of anal tube with conspicuous protrusion in basal half (fig. 121); pair of longer processes extending dorsally above upper margin of shaft in lateral view (fig. 122) ..... *diastus* Caldwell
   Ventral margin of anal tube simple (fig. 124); only one shorter process extending dorsally above upper margin of shaft in lateral view (fig. 125) ..... *youngi*, n. sp.
10. No eyes, brachypterous, cave-dwelling species (figs. 127-129) ..... *orcus* Fennah
    Normal species 11
11. Ventral portion of anal tube produced distally as slender fingerlike extension (fig. 130); shaft subquadrately elevated on dorsal margin distally (figs. 130, 131) ..... *metcalfi*, n. sp.
    Ventral portion of anal tube bluntly produced distally (fig. 133); shaft irregularly convex on dorsal margin distally (figs. 133, 134) ..... *blockeri*, n. sp.

Cixius bandarus (Caldwell), new combination

Figs. 91-93

Pseudocixius bandarus Caldwell 1950:290.

Salient features. — Length of males 4.5 mm, females unknown. Ground color of head and thorax tawny, intercarinal portions of head irregularly darkened with shades of brown, pro- and mesonotum with intercarinal portions black, abdomen dark. Forewings hyaline, each with strong brown tinting in form of three clearly defined markings as follows: first oblique band on most of clavus, except apical portion, and adjacent part of corium, second oblique transverse band near middle broken by pale spot mesally on costal margin, third v-shaped on distal portion, apex of v-shape broadly touching anal margin, all tinted markings darkest at edges, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 93) subtriangular, inner margins of styles convex distally; genital capsule in lateral view (fig. 91) with posterior margin of pygofer broadly rounded, apex of style enlarged and subtriangular, anal flap stout and concave on distal half of dorsal margin; aedeagus in left lateral view (fig. 91) with single massive process arising at apex, process with short toothlike projection at base and broadly upturned distally, flagellum with two short acute projections on distal rim; aedeagus in right lateral view (fig. 92) transverse, indented near middle of ventral margin with single process arising subapically near ventral margin.

Types. — Holotype male, Zacapu, Michoacan, Mexico, 10 April 1941, DeLong, Good, Caldwell, and Plummer. The holotype was not found, and my interpretation

of the species rests on two male paratypes in the collection of the U.S. National Museum.

Specimens studied. — CHIAPAS, San Cristobal, Suchiate. Collection dates 10 April to 16 November. Total specimens studied 2 males and 0 females.

Notes. — *C. bandarus,* with only two aedeagal processes, is immediately recognized by the massive left aedeagal process which has a small toothlike upright structure at its base near the apex of the aedeagal shaft. Externally this species greatly resembles *Pachyntheisa concinna* Fowler (1904:100, plate 11, fig. 3) in general coloration and pattern of the forewings. *Pachytheisa* Fowler is most readily distinguished from *Cixius* by lacking a well-defined carina on the midline of the frons. The male genitalia of *P. concinna* are shown in figs. 136-138.

Cixius nielsoni Kramer, n. sp.

Figs. 94-96

Salient features. — Length of male 6.5 mm, female unknown. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum darkened with reddish brown, abdomen pale. Forewings hyaline, without tinting except narrowly so on distal crossveins and as usual on each clavus, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 96) quadrately produced and broadly rounded apically, inner margins of styles convex near middle; genital capsule in lateral view (fig. 94) with posterior margin of pygofer broadly rounded, apex of style subtriangular, anal flap long and stalklike with apical portion irregularly rounded; aedeagus in left lateral view (fig. 94) transverse, narrowest near middle, without processes, flagellum with small toothlike projection on dorsal margin at apex; aedeagus in right lateral view (fig. 95) with two processes, one arising dorsally near apex, other arising preapically near ventral margin.

Type. — Holotype male (USNM 76740), Mexico City, Mexico, M.B. 168.

Specimens studied. — Known only from holotype.

Notes. — *C. nielsoni* is unique in having no processes arising on the left side of the aedeagal shaft and but two on the right side. The species is named for my colleague Dr. Mervin W. Nielson in recognition of his numerous contributions to the taxonomy of the Cicadellidae.

Cixius flavobrunneus Fowler

Figs. 97-99

Cixius flavobrunneus Fowler 1904:97, plate 10, fig. 27.

Salient features. — Length of male 7.0 mm, female unknown. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum darker, edges

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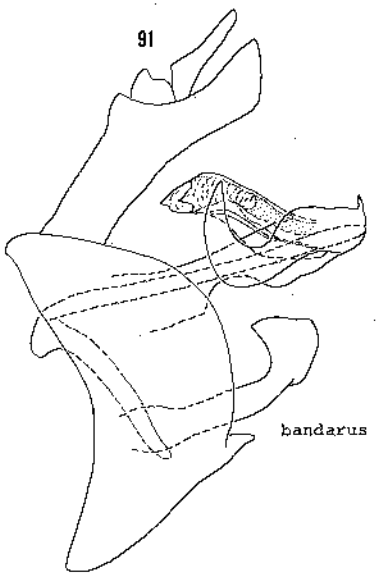
FIGURES 91-96. Male genitalia. 91-93, *C. bandarus* (Caldwell), from paratype. 94-96, *C. nielsoni* n. sp., from holotype. 91, 94, complete lateral view. 92, 95, aedeagus in right lateral view. 93, 96, apex of pygofer, styles, and aedeagus in ventral view.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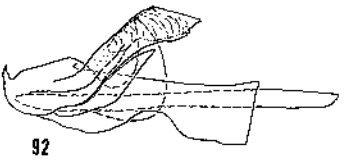
bandarus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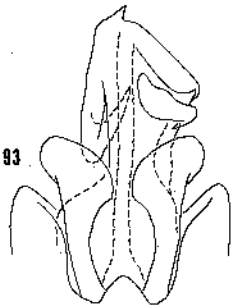
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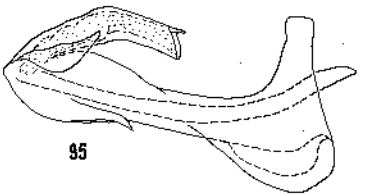
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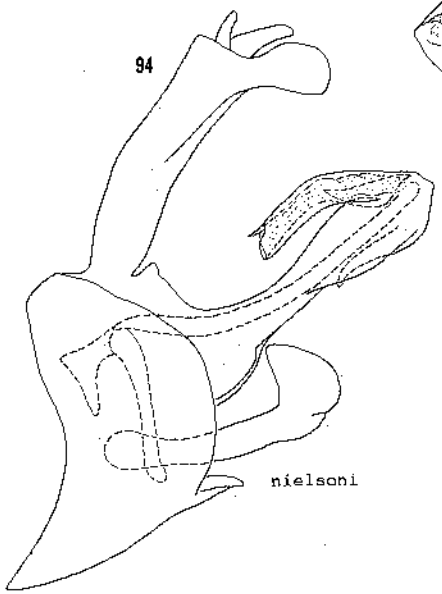
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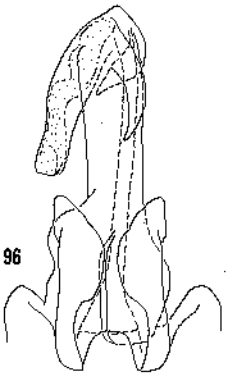

96

of frons and clypeus yellowish, mesonotum brownish tawny except apical angle, abdomen pale. Forewings hyaline without tinting, distal crossveins darkened, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 99) triangularly produced, inner margins of styles expanded above bases; genital capsule in lateral view (fig. 97) with posterior margin of pygofer broadly rounded, distal portion of style enlarged and slightly wider than high, anal flap much elongated with large irregular protrusion on ventral margin near base, distal portion irregularly rounded; aedeagus in left lateral view (fig. 97) with two processes, one arising subapically on dorsal margin, other subapically on ventral margin and partly concealed by finlike expansion on shaft, flagellum downturned near middle with short but moderately broad toothlike structure near middle of dorsal margin; aedeagus in right lateral view (fig. 98) narrowest near middle and with one process arising subapically near middle of shaft.

Type. — Holotype male, Omilteme, Guerrero, Mexico, 8,000 ft., July H.H. Smith in British Museum (Nat. Hist.), London.

Specimens studied. — Known only from holotype.

Notes. — *C. flavobrunneus* is distinguished by the three processes on the aedeagal shaft, the large and irregular protrusion on the ventral margin of the anal flap, and the toothlike structure on the dorsal margin of the aedeagal flagellum.

Cixius stigmatus mexicanus (Caldwell), new combination

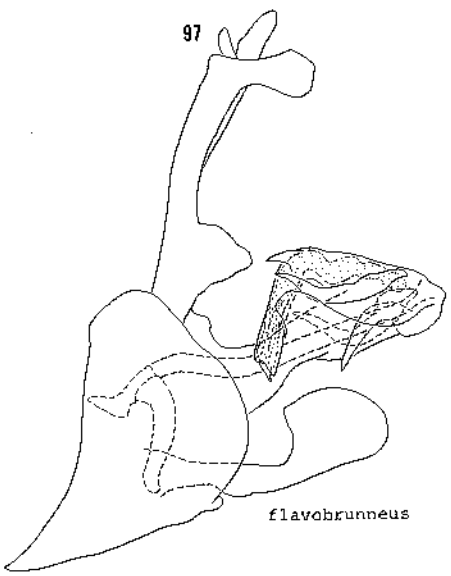
Figs. 100-102

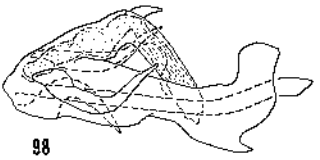
Pseudocixius stigmatus mexicanus Caldwell 1950:290.

Salient features. — Length of males 4.6-5.2 mm, female 5.5 mm. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum variably embrowned or blackened, frons and clypeus similarly darkened, lateral margins of frons irregularly pale, mesonotum black with carinae pale, abdomen largely black. Forewings hyaline, tinted with brownish at or near bases and sometimes at middle, crossveins usually darkened, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 102) well produced, inner margins of styles convex distally; genital capsule in lateral view (fig. 100) with posterior margin of pygofer triangularly produced, distal portion of style enlarged and higher than wide, anal flap concave on ventral margin and concave on dorsal margin distally; aedeagus in left lateral view (fig. 100) with two processes, one stouter and arising near apex dorsally, other slender arising preapically near middle, flagellum with acute projection dorsally and ventrally on apical rim; aedeagus in right lateral view (fig. 101) with single process arising apically or subapically on ventral margin, flagellum with needlelike process at middle.

FIGURES 97-102. Male genitalia. 97-99, *C. flavobrunneus* Fowler, from holotype. 100-102, *C. stigmatus mexicanus* (Caldwell), from holotype. 97, 100, complete lateral view. 98, 101, aedeagus in right lateral view. 99, 102 apex of pygofer, styles, and aedeagus in ventral view.


97
flavobrunneus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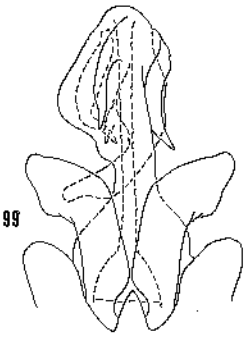
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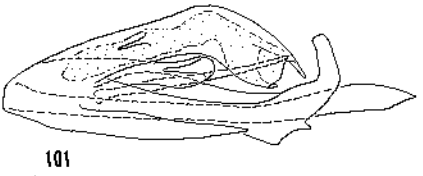
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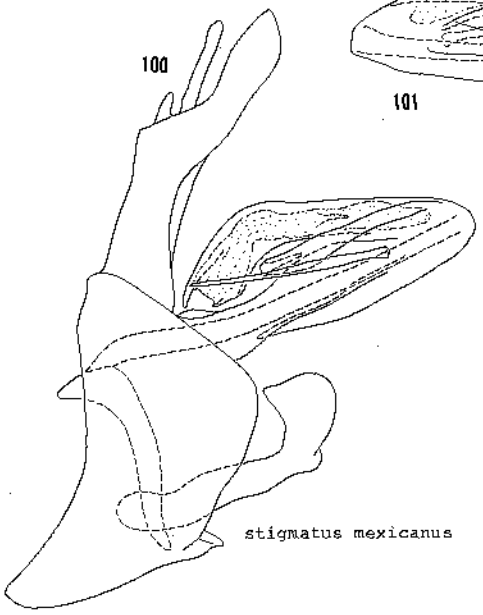
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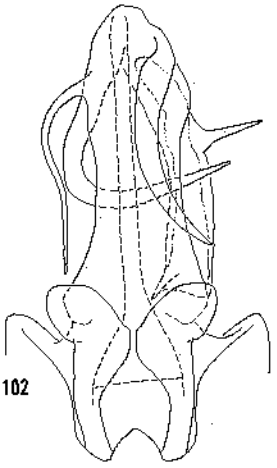
stigmatus mexicanus


102

Type. — Holotype male, Mexico City, D.F., Mexico, 20 November 1938, J.S. Caldwell in collection of U.S. National Museum.

Specimens studied. — FEDERAL DISTRICT, Chapingo, Chapultepec Park, Deserto Leones, Mexico City; HIDALGO, Langunilla; VERACRUZ, La Foresta, Orizaba. Collection dates 30 April to 20 November. Total specimens studied 12 males and 1 female.

Notes. — *C. s. mexicanus* can be separated from all of its Mexican congeners by the needlelike process near the middle of the aedeagal flagellum. This needlelike process is most easily observed in ventral aspect (fig. 102). This subspecies differs from the nominate subspecies by lacking a knob at the point where the upper process on the left side of the aedeagus crosses the shaft in ventral view; compare figs. 27 and 102.

Cixius dislogicus Kramer, n. sp.

Figs. 103-111

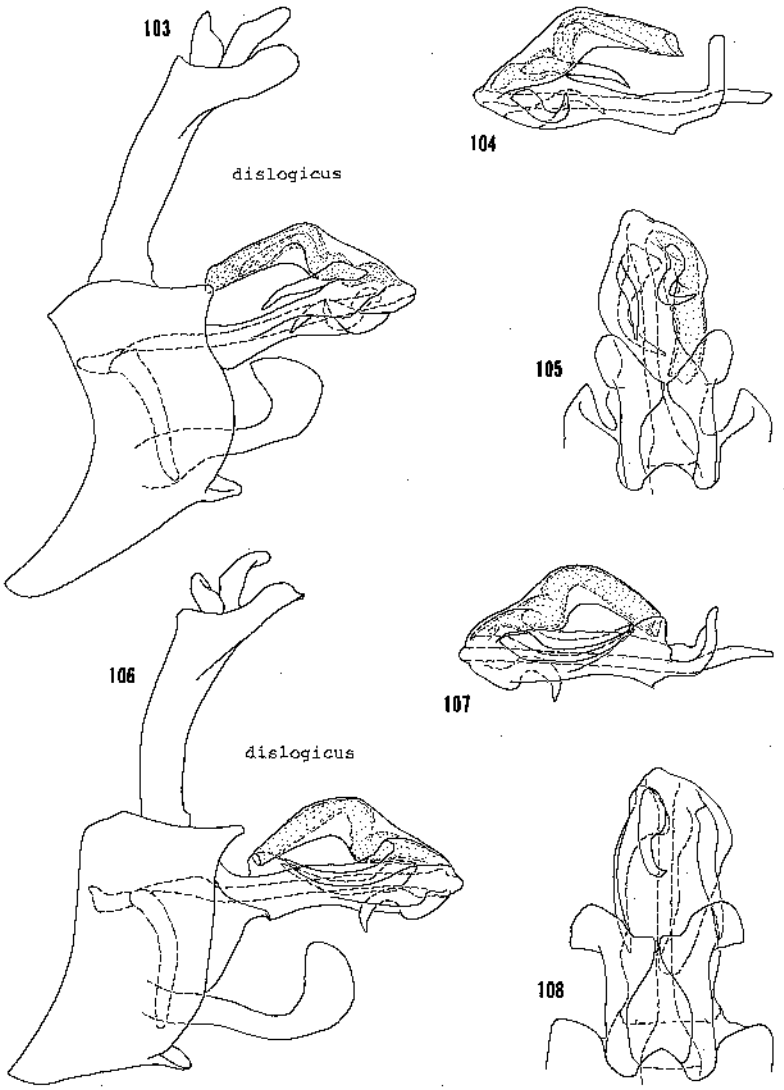
Salient features. — Length of male 5.0-5.8 mm, females 5.8-6.2 mm. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum unmarked or darkened with pale brownish, frons usually shaded with brownish, mesonotum unmarked or shaded with brownish, abdomen at least partly darkened. Forewings hyaline, without tinting, crossveins usually dark, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (figs. 105, 108, 111) roundly produced, inner margins of styles convex distally; genital capsule in lateral view (figs. 103, 106, 109) with posterior margin of pygofer triangularly produced on dorsodistal angle, distal portion of style enlarged and higher than wide, anal flap stalklike and concave on dorsal margin distally, aedeagus in left lateral views (figs. 103, 106, 109) with two processes, one arising preapically near dorsal margin, other arising preapically below first, flagellum broadest near middle; aedeagus in right lateral view (figs. 104, 107, 110) with single process arising subapically near middle.

Types. — Holotype male (USNM 76741) and allotype female, Mexico City, D.F., Mexico, 13 September 1939, D.M. DeLong, J.S. Caldwell coll'n. Paratypes, four males and female with same data as holotype.

Specimens studied. — FEDERAL DISTRICT, Mexico City; HIDALGO, Jacala; MICHOACAN, Zacapu; MORELOS, Cuernavaca; PUEBLA, Huachningo, Necata; VERACRUZ, Orizaba. Collection dates 11 August to 25 October. Total specimens studied 22 males and 2 females.

Notes. — The triangularly produced dorsodistal angle of the male pygofer in lateral view separates *C. dislogicus* from all of its Mexican congeners. The species name, a Latin adjective, means unreasonable. As interpreted here, this is a highly variable species. Intergrades exist that render the differences found among some of the populations open to question as meaning anything more than intraspecific variation.



FIGURES 103-108. Male genitalia of *C. dislogicus* n. sp. 103-105, from holotype. 106-108, from Zacapu, Michoacan. 103, 106, complete lateral view. 104, 107, aedeagus in right lateral view. 105, 108, apex of pygofer styles, and aedeagus in ventral view.

KEY TO THE FORMS OF *C. dislogicus*

1. Process on right side of aedeagus short and strongly upturned distally (fig. 104) ..... *typical form*
   Process on right side of aedeagus long and broadly U-shaped 2
2. Dorsodistal angle of pygofer narrow (fig. 106); apical portion of style not tapered distally (fig. 106) ..... *form A*
   Dorsodistal angle of pygofer broad (fig. 109); apical portion of style tapered distally (fig. 109) ..... *form B*

Cixius conjector Kramer, n. sp.

Figs. 112-120

Salient features. — Length of males 5.0-5.5 mm, females 5.6-5.9 mm. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum darkened with shades of brown, frons and clypeus either not darkened or darkened with shades of brown, mesonotum varying from not darkened to entirely darkly fuscus to almost black, abdomen largely black. Forewings hyaline, not tinted in males, vaguely tinted with poorly defined transverse clouds medially and subapically in females, distal crossveins darkened in both sexes, veins with dark pustules.

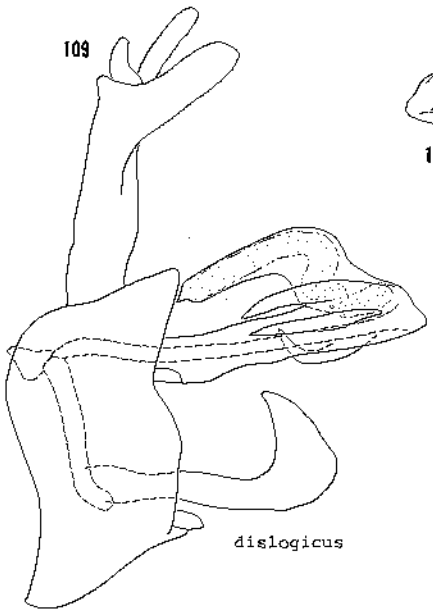
Male genitalia. — Median lobe of pygofer in ventral view (figs. 114, 117, 120) well produced, inner margins of styles convex near middle; genital capsule in lateral view (figs. 112, 115, 118) with posterior margin of pygofer convex, distal portion of style enlarged and higher than wide, anal flap elongated and stalklike; aedeagus in left lateral view (figs. 112, 115, 118) with two processes, one arising subapically on dorsal margin, other apically on ventral margin, shaft narrowest at middle, flagellum with one or two short toothlike projections on apical rim; aedeagus in right view (figs. 113, 116, 119) with single process arising preapically nearer to ventral than to dorsal margin.

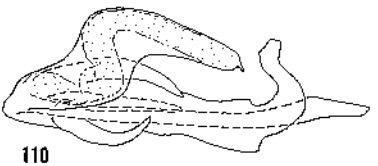
Types. — Holotype male (USNM 76742) and allotype female, Quiroga, Michoacan, Mexico, 15 July 1956, R. and K. Dreisbach. Paratypes, two males with same data as holotype.

Specimens studied. — FEDERAL DISTRICT, Mexico City; MICHOACAN, Quiroga; MORELOS, Zempoalo. Collection dates 15 July to 21 October. Total specimens studied 10 males and 7 females.

Notes. — *C. conjector* can be recognized in the Mexican fauna by the three processes on the aedeagus, the simple dorsal margin of the flagellum, and the simple posterior margin of the pygofer. The species name, a Latin noun in apposition, means soothsayer or seer. As is the case with *dislogicus*, this species appears to be highly variable with intergrades of the forms keyed below.

FIGURES 109-114. Male genitalia. 109-111, *C. dislogicus* n. sp., from Jacala, Hidalgo. 112-114, *C. conjector* n. sp., from holotype. 109, 112, complete lateral view. 110, 113, aedeagus in right lateral view. 111, 114, apex of pygofer, styles, and aedeagus in ventral view.


109
dislogicus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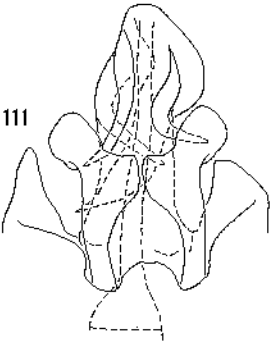
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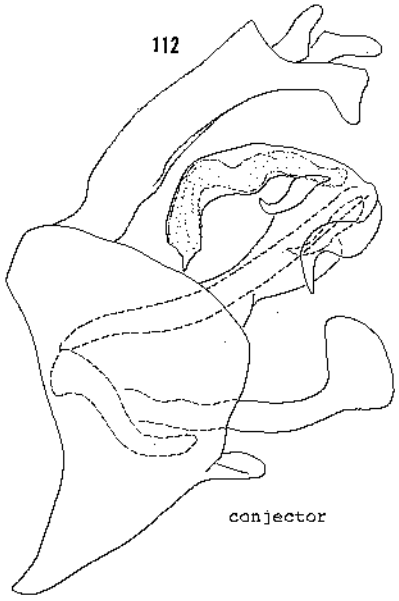
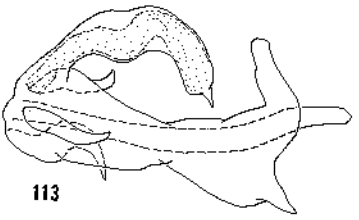

112
conjector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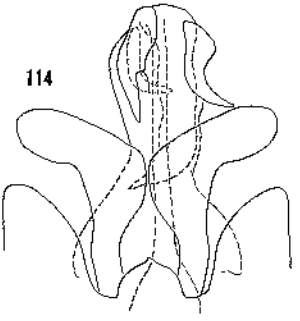

114

KEY TO THE FORMS OF *C. conjector*

1. Apical portion of style in lateral view with smoothly rounded distal margin (fig. 112) ..... *typical form*
   Apical portion of style in lateral view with convexity on distal margin 2
2. Extreme apex of style in lateral view rounded (fig. 115), apex of anal tube concave (fig. 115) ..... *form A*
   Extreme apex of style in lateral view produced as a nib (fig. 118), apex of anal tube truncate (fig. 118) ..... *form B*

Cixius comptus Fowler

Figs. 85-87

See previous discussion of Salient features, Male genitalia, Type, and Notes as treated with the United States records.

Specimens studied. — SONORA, Sierra Madre Mts. Collection date September. Total specimens studied 0 males and 2 females.

Cixius diastus Caldwell

Figs. 121-123

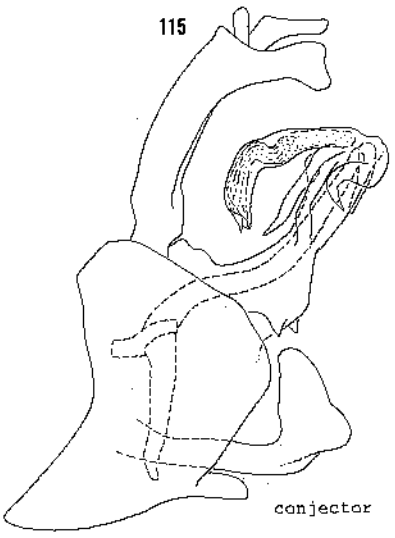
Cixius diastus Caldwell 1947:77.

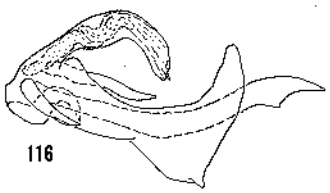
Salient features. — Length of males 6.0-6.5 mm, females 6.2-7.0 mm. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum not darkened or shaded with light brownish, frons and clypeus usually not darkened, mesonotum ranging from not darkened to fuscus on discal portion with lateral areas at least partly blackened, abdomen largely pale. Forewings hyaline, varying from with but vague yellowish-brown tinting at apices to irregular transverse brownish clouds basally, medially, and distally, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 123) subtriangularly produced, inner margins of styles convex near middle; genital capsule in lateral view (fig. 121) with posterior margin of pygofer irregularly rounded, distal portion of style enlarged and higher than wide, anal tube elongated with irregular protrusion on ventral margin in basal half; aedeagus in left lateral view (fig. 121) with two processes arising near apex, upper one short, lower one about twice length of upper one; aedeagus in right lateral view (fig. 122) with two processes similar to those on left side, but upper one strongly recurved, flagellum with elongated toothlike projection at apex.

Type. — Holotype male, Mexico City, D.F., Mexico, 1 September 1939, DeLong and Plummer, in collection of U.S. National Museum.

FIGURES 115-120. Male genitalia of *C. conjector* n. sp. 115-117, from Cuernavaca-Mexico City Road. 118-120, from Mexico City, D.F. 115, 118, complete lateral view. 116, 119, aedeagus in right lateral view. 117, 120, apex of pygofer, styles, and aedeagus in ventral view.


115
conjector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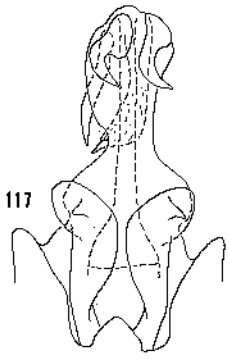
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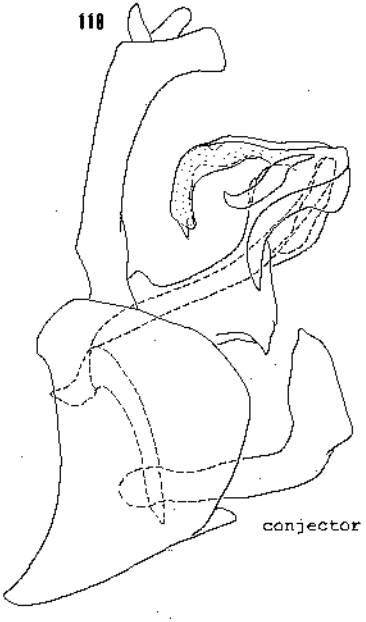
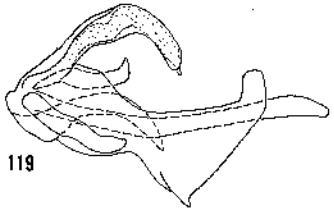

118
conjector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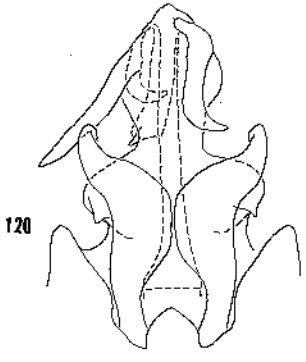
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Specimens studied. — FEDERAL DISTRICT, Mexico City. Collection dates 1-2 September. Total specimens studied 10 males and 11 females.

Notes. — *C. diastus* is readily distinguished by the four aedeagal processes and the irregular protrusion on the ventral margin of the anal flap in its basal half. The only other Mexican *Cixius* with a similar protrusion on the anal flap is *C. flavobrunneus;* it has but three aedeagal processes and a moderately broad, toothlike structure near the middle of the dorsal margin of the flagellum.

Cixius youngi Kramer, n. sp.

Figs. 124-126

Salient features. — Length of male 6.5 mm, female unknown. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum shaded with brown, frons and clypeus lightly shaded with pale brown, mesonotum uniformly darkly fuscus, abdomen partly darkened. Forewings hyaline without tinting, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 126) triangular, inner margins of styles convex near middle; genital capsule in lateral view (fig. 124) with posterior margin of pygofer roundly produced, distal portion of style enlarged and higher than wide, anal flap elongated and stalklike; aedeagus in left lateral view (fig. 124) with two subapical processes, one arising near dorsal margin, other arising on ventral margin, flagellum with acute projection dorsally on apical rim; aedeagus in right lateral view (fig. 125) with two subapical processes, one arising on dorsal margin, other arising near middle of shaft.

Type. — Holotype male (USNM 76743), 10 miles south of Jacala, Hidalgo, Mexico, 1 June 1941, J.C. Caldwell coll'n.

Specimens studied. — Known only from holotype.

Notes. — *C. youngi* can be recognized by the four aedeagal processes and the elongated and stalklike anal flap which is not decurved apically. The species is named for Dr. David A. Young in recognition of his major contributions to the classification of the family Cicadellidae.

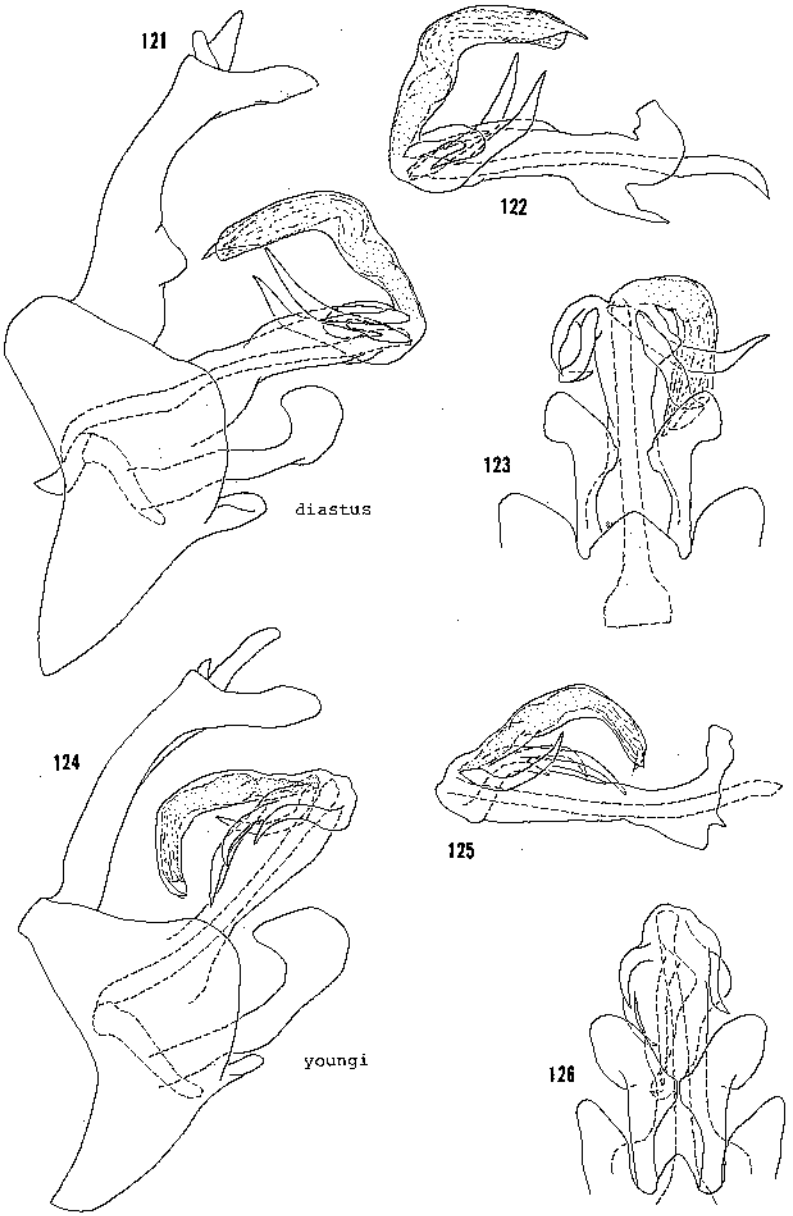
Cixius orcus Fennah

Figs. 127-129

Cixius orcus Fennah 1973:440, figs. 1-10.

Salient features. — Length of male 2.5 mm, female unknown. Ground color of head and thorax stramineous without any darker coloration. Forewings hyaline and untinted, veins with few tan pustules.

FIGURES 121-126. Male genitalia. 121-123, *C. diastus* Caldwell, from paratype. 124-126, *C. youngi* n. sp., from holotype. 121, 124, complete lateral view. 122, 125, aedeagus in right lateral view. 123, 126, apex of pygofer, styles, and aedeagus in ventral view.


121
122
123
diastus
124
125
126
youngi

Male genitalia. — Median lobe of pygofer in ventral view (fig. 129) subtriangular, inner margins of styles convex near middle; genital capsule in lateral view (fig. 127) with posterior margin of pygofer roundly angular, apical portion of style enlarged and higher than wide, anal flap moderately stout and concave on dorsal margin distally; aedeagus in left lateral view (fig. 127) with two subapical processes, one arising near middle of shaft, other on venter of shaft and partly concealed by flange; aedeagus in right lateral view (fig. 128) with two processes similar to those found on left side of shaft.

Type. — Holotype male, 14 km. NNW Ahuacatlan, Cueva de Emilia, Queretaro, Mexico, 24 December 1972, R. Jameson, in collection of U.S. National Museum.

Specimens studied. — Known only from holotype.

Notes. — *C. orcus* is a small pale cave-dwelling species structurally modified for living in darkness. The eyes and ocelli are wanting. The forewings and hindwings are much reduced and barely cover more than the basal portion of the abdomen. Fennah (1973:440) provided a highly detailed description which is not repeated here. Rootlets which penetrate the wall of the cave are the likely source of food.

Cixius metcalfi Kramer, n. sp.

Figs. 130-132

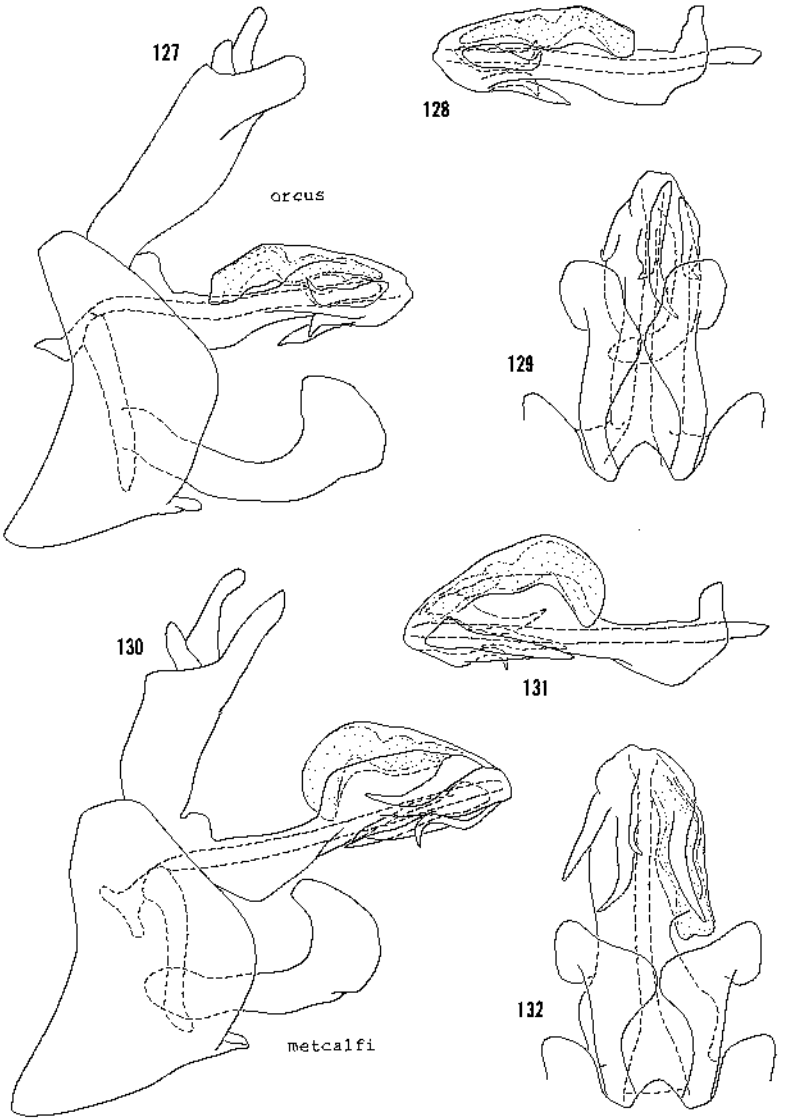
Salient features. — Length of males 4.4-4.8, female 4.9 mm. Ground color of head and thorax tawny, intercarinal portions of crown and pronotum at most only shade darker, frons and clypeus with intercarinal portions darkly embrowned, mesonotum dark tawny, abdomen slightly darkened. Forewings hyaline, without tinting, crossveins usually dark, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 132) subtriangular, inner margins of styles convex near middle; genital capsule in lateral view (fig. 130) with posterior margin of pygofer rounded, distal portion of style enlarged and higher than wide, anal flap moderately stout with its ventral margin prolonged distally as slender extension; aedeagus in left lateral view (fig. 130) with three processes, upper one arising on dorsal margin near apex, middle one arising mesally and mainly concealed by flange, lower one arising on ventral margin, shaft narrowest at middle; aedeagus in right lateral view (fig. 131) with single process arising subapically near middle of shaft.

Type. — Holotype male (USNM 76744) and allotype female, Saltillo, Coahuila, Mexico, 23 September 1941, DeLong, Good, Caldwell, and Plummer. Paratypes, five males with same data as holotype.

Specimens studied. — COAHUILA, Saltillo. Collection date 23 September. Total specimens studied 6 males and 1 female.

Notes. — *C. metcalfi* is distinctive on the basis of the four aedeagal processes and the moderately stout anal flap which is produced on its ventral margin distally as a slender fingerlike extension. Coloration appears to be helpful as well; the dark face constrasts sharply with the tawny body color. This species is named for Dr. Z.P. Metcalf whose catalogues of the Homoptera of the World remain basic to all workers in plant-feeding insects.



FIGURES 127-132. Male genitalia. 127-129, *C. orcus* Fennah, from holotype. 103-132, *C. metcalfi* n. sp., from holotype. 127, 130, complete lateral view. 128, 131, aedeagus in right lateral view. 129, 132, apex of pygofer, styles, and aedeagus in ventral view.

Cixius blockeri Kramer, n. sp.

Figs. 133-135

Salient features. — Length of males 5.7-6.0 mm, females unknown. Ground color of head and thorax tawny, intercarinal portions of crown variably embrowned except for pale area near each eye on lateral carina, intercarinal portions of pronotum, frons, clypeus variably embrowned, face with small pale area around median ocellus and on lateral margins near base of frons, mesonotum undarkened to embrowned on disc with lateral portions partly or entirely black, abdomen dark. Forewings hyaline, with or without brownish tinting at bases, with two or three small elongated spots on anal margin similarly tinted, crossveins darkened, veins with dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 135) triangular, inner margins of styles convex near middle; genital capsule in lateral view (fig. 133) with posterior margin of pygofer roundly produced, apical portion of style enlarged and higher than wide, anal flap with slight angulation on ventral margin beyond middle; aedeagus in left lateral view (fig. 133) with three processes, upper one arising near apex on dorsal margin, next two arising directly below it in sequence, flagellum simple; aedeagus in right lateral view (fig. 134) with single process arising preapically near ventral margin.

Type. — Holotype male (USNM 76745), Zempoalo, Morelos, Mexico, 21 October 1945, J.S. Caldwell coll'n. Paratypes, two males, Mexico City, D.F., Mexico, 13 September 1939, D.M. DeLong.

Specimens studied. — FEDERAL DISTRICT, Mexico City; MORELOS, Zempoalo. Collection dates 13 September and 21 October. Total specimens studied 3 males and 0 females.

Notes. — *C. blockeri* is distinguished by the four aedeagal processes, the moderately stout anal flap which is not decurved apically, and the slight angulation on the ventral margin of the anal tube just beyond the middle. This species is named for Dr. H. Derrick Blocker in recognition of his many fine taxonomic studies of the Cicadellidae.

Species known from Females only

Cixius apicatus Fowler

Cixius apicatus Fowler 1904:97, plate 10, fig. 28.

Lectotype female here selected with labels: "female" and "Type" and "*Cixius apicatus* Fowler, Type" (handwritten) and "B.C.A. Homopt. I, *Cixius apicatus* Fowler" (machine printed) and "Senahu, Vera Paz, [Guatemala], Champion". The lectotype, 6.2 mm long, is mounted on a cardboard rectangle. It is in the collection of the British Museum (Nat. Hist.), London

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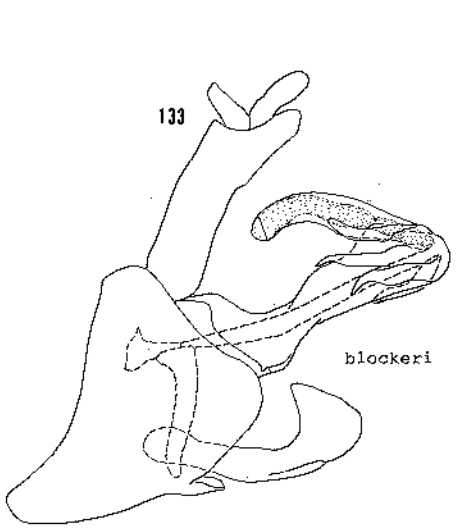
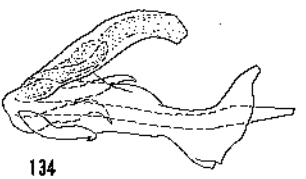
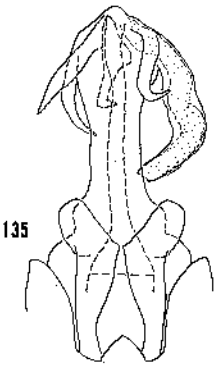
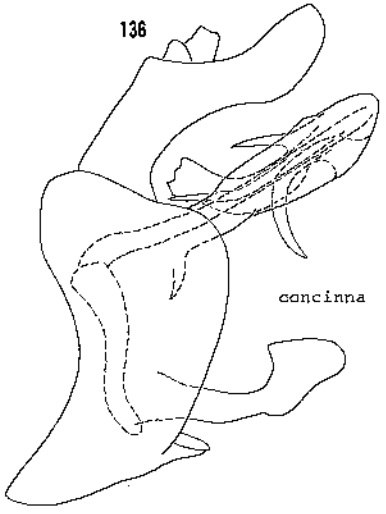
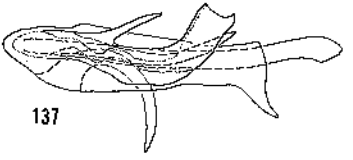
Figures 133-138. Male genitalia. 133-135, *C. blockeri* n. sp., from holotype. 136-138, *Pachyntheisa concinna* Fowler, from lectotype. 133, 136, complete lateral view. 134, 137, aedeagus in right lateral view. 135, 138, apex of pygofer, styles, and aedeagus in ventral view.

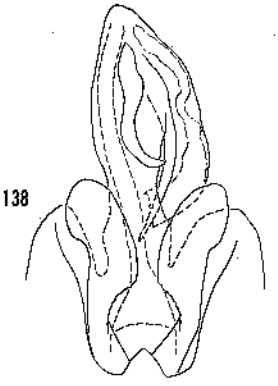

133
blockeri


134


135


136
concinna


137


138

The lectotype agrees with Fowler's illustration except the brownish clouding at each anterior costal margin and on each clavus is very faint. In the absence of associated males, *C. apicatus* can not be further distinguished at this time.

Cixius montanus Fowler

Cixius montanus Fowler 1904:96, plate 10, fig. 25

Lectotype female here selected with labels: "female" and "Type" and "*Cixius montanus* Fowler, type" (handwritten) and "B.C.A. Homopt. I, *Cixius montanus* Fowl." (machine printed) and "Omilteme, Guerrero, [Mexico], 8000 ft., Aug., H.H. Smith". The lectotype, 7.2 mm in length, is mounted on a cardboard rectangle with another female. The lectotype is on the left side and is perfect; the other female is on the right side and is missing a small portion of the left forewing. Both specimens are in the collection of the British Museum (Nat. Hist.), London.

The lectotype agrees with Fowler's illustration except there is no anterior line of spots on the forewings, just a single darkened area anteriorly in each clavus. The saddlelike marking at the middle of the forewings is not two toned and is generally less well delineated. The crossveins are not as uniformly darkened. In the absence of associated males, *C. montanus* can not be further distinguished at this time.

Checklist of the Mexican species of *Cixius* with state records.

1. *apicatus* Fowler 1904:97. (Known only from Guatemala).
2. *bandarus* (Caldwell) 1950:290. Chiapas, Michoacan.
3. *blockeri* Kramer, n. sp. Federal District, Morelos.
4. *comptus* Fowler 1904:96. Sonora.
5. *conjector* Kramer, n. sp. Federal District, Michoacan, Morelos.
6. *diastus* Caldwell 1947:77. Federal District.
7. *distogicus* Kramer, n. sp. Federal District, Hidalgo, Michoacan, Morelos, Puebla, Veracruz.
8. *flavobrunneus* Fowler 1904:97. Guerrero.
9. *metcalfi* Kramer, n. sp. Coahuila.
10. *montanus* Fowler 1904:96. Guerrero.
11. *nielsoni* Kramer, n. sp. Federal District.
12. *orcus* Fennah 1973:440. Queretaro.
13. *stigmatus mexicanus* (Caldwell) 1950:290. Federal District, Hidalgo, Veracruz.
14. *youngi* Kramer, n. sp. Hidalgo.

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