STUDIES ON THE GENUS CICADULA (HOMOPTERA, CICADELLIDAE)

BY

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The writer became interested in the genus Cicadula during the summer of 1929, when many specimens were caught in the light trap. A number of these specimens were sent to different Cicadellid authorities and with some species the determinations did not agree. A great deal of variation seemed to occur in the species determined as **Cicadula sexnotata.** In face of the economic importance of at least one species of the genus it was felt that proper identification should be assured before control measures were considered. It was thought that the internal genitalia of the males might give some clue to the proper identification. With this thought in mind, the writer has attempted to settle the identity of several species of Cicadula found in North America.

In general, the members of this genus are small and quite elongate. The vertex is longer on the middle than next the eye but not strongly produced. The pronotum is short, the anterior margin more or less convex, the posterior margin generally slightly concave. The elytra are long, exceeding the abdomen, overlapping apically, with a distinct appendix and with the inner sector not forked, there being only two anteapical cells, with four apical cells. The hind wings have three closed apical cells. The external male genitalia are characterized by the elongation of the plates into attenuated finger-like processes. The oedagus usually has two processes apically.

Cicadula punctifrons

Through the courtesy of Dr. Lawson specimens of **C. punctifrons** from Europe were loaned the writer. These proved to be quite distinct from the specimens of that species from the Western States. The markings on the vertex of the European species did not agree with specimens found in Kansas and Minnesota, the latter being larger and more robust, with no markings on the posterior margin of the vertex to correspond with those

*Contribution from the Department of Entomology, University of Kansas.

on the specimens from Europe. The plates of the European species were covered with many more hairs than were found in the Kansas specimens. The internal male genitalia of the European species are quite different from those of the American species, having the foot of the style extended into a sharp toe and the two finger-like processes of the oedagus arising at the apex of the shaft. In contrast, in the American specimens the foot of the style is not extended into a sharp toe and the finger-like processes of the oedagus arise before the end of the shaft. Then the genitalia of **C.punctifrons** from New York state were studied and these were found to agree exactly with the genitalia of the specimens from Europe. This showed conclusively that two species had been confused in the United States and that the western one was new to science while the eastern one has been correctly identified as **C. punctifrons.** In the writer's experience the color markings of the variety **repleta** vary so much that a distinct variety cannot be recognized. The black spots in the basal angle of the scutellum and the black marks on the anterior portion of the vertex might ordinarily distinguish the variety from the species, but the spots on the scutellum vary from large black spots to two dark patches showing through the pronotum and the patches on the anterior margin of vertex vary from black or brown to an entire absence of color. Apparently no distinguishing line can be drawn.

Cicadula sexnotata

Specimens of **Cicadula sexnotata** from Russia were loaned the writer by E. W. Davis of Richfield, Utah. The specimens appeared to be more stoutly built than the American specimens. The spots on the posterior margin of the vertex were larger and more rounded than in the American specimens. A large number were dissected and the internal genitalia of the males were found to be different from those of the American specimens. The oedagi are of about the same size but in the European specimens a distinct bend occurs at the apex of the shaft where the two finger-like processes arise. The processes of the oedagus of the American specimens are compressed dorso-ventrad. The characteristic curve in the oedagus of the European specimens is a constant character that held true in the large number dissected. **C. sexnotata** was originally described in Europe, consequently the specimens in America which

have been found to be different must receive another name.

The American specimens have a great many color variations. The colorings are not clear cut, for all extremes can be found. In many specimens the middle pair of marks on the vertex are absent; in others they are very small. In some the pronotum is yellow, while in others it varies to dusky black. In some the basal angles of the scutellum are yellow; in others they are black or the black only shows through the posterior part of the pronotum. In some the elytra are yellow; in others they are spotted with dusky brown. In some the frons is very lightly marked; in others the markings are heavy and black. Nevertheless, the writer attempted to find some internal male genitalia differences that could be used to separate variously colored specimens. A large number of each color were dissected but no internal variations could be detected. The species seems to be one with many slight variations in color.

In 1877 Uhler described a form of **Cicadula sexnotata** and called it **C. divisa.** No types can be found at the present time. After examining the internal male genitalia of specimens conforming to the description of **C. divisa,** it seems clear that this was a name given to what we have been calling **C. sexnotata** and since the latter name can be applied now only to European specimens, **Cicadula divisa** becomes the name for what has hitherto in the United States been called **C. sexnotata.**

Cicadula snowi sp. n.

Figs. 1—1a.

A yellow species with two spots on vertex, allied to **C. punctifrons.** Length 4 to 5 mm.

Form:

Vertex bluntly angulate, one-fourth to one-fifth longer on middle than next the eye, about three times wider than long. Pronotum more than twice as wide as long, anterior margin broadly convex, lateral margins distinctly shorter than humeral margin, posterior margins broadly emarginate. Scutellum equal to width of vertex. Elytra exceeding abdomen; appendix distinct.

Color:

Yellow or yellowish green. Vertex with two large black spots near anterior border. Pronotum yellow.

Scutellum yellow. Elytra whitish hyaline, smoky at apex; nervures light. Face yellow.

External genitalia:

Male valve large, rectangular in shape, apex obtusely rounded; plates projecting beyond valve length of valve, then produced to two attenuated finger-like processes which exceed length of pygofer, bristles on plate extending over margin of pygofer.

Internal male genitalia:

Style with finger-like anterior processes; widest at point of attachment to connective, then slightly constricted either side of middle, suddenly narrowed to apical foot which bears a number of short stout spines on inner margin, the inner angle of apex being obtuse and the other acute. Oedagus equal to length of style, shaft moderately long, terminating in two short finger-like processes, compressed dorso-ventrally and ending in sharp points.

Described from one male specimen collected at Hamilton County, Kansas, elevation 3350 feet, by F. H. Snow. Type deposited in Snow Entomological Collection.

Cicadula obsoleta sp. n.

Figs. 2—2f

A yellow species with two black spots on vertex, allied to **C. pallida**... Length 3 mm.

Form:

Vertex, one-half wider than long; one-fourth longer on middle than next to eye; broadly rounding with front. Pronotum short, more than twice as wide as long, anterior margin broadly convex, lateral margins distinctly shorter than humeral margin, posterior margin about straight. Scutellum equal to vertex in width. Elytra exceeding abdomen by one-fifth their length; appendix distinct.

Color:

Yellow. Vertex yellow with two small brown spots near anterior margin; brown spots between ocelli and eye. Pronotum yellow. Scutellum yellow with transverse line black; frontal arcs brown; antennal sockets brown; brown spots on inner margin of eye.

External genitalia:

Female last ventral segment equal to preceding seg-

ment, slightly emarginate on posterior margin on middle; pygofer slightly shorter than black ovipositor, white spines on apical third. Male valve large, triangular; plates extending beyond valve apically in two finger-like processes, outer margin of plates with white spines.

Internal male genitalia:

Style with finger-like anterior process, widest at point of attachment to connective, then slightly constricted on either side of middle, suddenly narrowed to apical foot which bears a number of short stout spines on inner margin, the inner angle of apex being obtuse, the outer acute. Oedagus equal to style in length, shaft moderately elongate, terminating in two short finger-like processes with branch on inner margin of each process.

Holotype, male, Aransas County, Texas, June 6, 1928, by A. M. James.

Allotype, female, Aransas County, Texas, June 6, 1928, by A. M. James.

Paratypes, 7 females, Aransas County, Texas, June 6, 1928, by R. H. Beamer and A. M. James.

Orange County, Texas, September 14, 1928, by R. H. Beamer.

Douglas county, Kansas, 1927, by P. B. Lawson.

Allotype deposited in Dr. Osborn's collection;

All other types in Snow Entomological Collection.

Cicadula major sp. n.

Figs. 3—3f.

A large robust greenish-yellow species with two black spots on vertex, allied to **C. snowi.** Length of female 5.5 mm. to 7 mm.; length of males 4.5 mm. to 5.5 mm.

Form:

Vertex nearly parallel margined, very slightly longer on middle than next to eye, broadly rounding with front. Pronotum twice as wide as long, anterior margin broadly convex, posterior margin shallowly emarginate, lateral margins distinctly longer than humeral margin. Scutellum slightly greater than width of vertex. Elytra exceeding abdomen by more than one-third

their length; appendix distinct.

Color:

Dirty yellow. Vertex with two large black spots, sometimes two black or brown patches on or near anterior margin, sometimes small brown marks on apex. Pronotum dirty yellow. Scutellum yellow except for black transverse line, basal angles sometimes black. Elytra dirty yellow, sometimes with gray stripes; nervures light. Frons yellow, sometimes with light markings.

External genitalia:

Female last ventral segment about as long as preceding, posterior margin slightly produced. Pygofer large, widest at middle; equal to or slightly exceeding the ovipositor; apices of pygofer clothed with white spines. Male valve large, rounded posteriorly, about three-fourths as long as last ventral segment; plates broad basally, about twice as long as valve, margin bare narrowing to somewhat divergent apices; pygofer broad, exceeding the length of plates.

Internal male genitalia:

Styles narrowed slightly below attachment of connective, with distinct conical caudo-lateral protuberance which bears a number of fine hairs; foot rather elongate and scaly, with obtuse inner angle and acute outer angle. Oedagus shorter than style, shaft large with dorsal midway process, two curved sword-like processes near apex of shaft, apex of shaft blunt.

Holotype, male, Ramsey county, Minnesota, February, 1922.

Allotype, female, Douglas county, Kansas, June 18, 1929.

Paratypes, 3 males and 26 females—

Douglas, county, Kansas, June 6, 1929, by P. B. Lawson.

Hamilton county, Kansas, by F. H. Snow.

Ramsey county, Minnesota, July, 1922.

Ducheane, Utah, July 1926 by Vasco M. Tanner.

Allotype deposited in Dr. Osborn's collection; all other types in Snow Entomological Collection.

Cicadula borealis sp. n.

Figs. 4—4c.

A dirty-yellow species with black vertex and yellow median line, allied to **C. slossoni.** Length 3.5 mm. to 4.5 mm.

Form:

Vertex one-half wider than long, one-fourth longer on middle than next the eye, broadly rounding with front. Pronotum more than twice as wide as long, anterior margin broadly convex, lateral margin slightly shorter than humeral margin, posterior margin about straight. Scutellum about equal to vertex in width. Elytra exceeding abdomen by one-fifth their length; appendix distinct.

Color:

Dirty yellow. Vertex black with wide yellow median line continuing from margin of vertex across pronotum and scutellum; pale ocelli very conspicuous. Dark markings on anterior margin of pronotum extending toward posterior border on each side of yellow band. Scutellum with basal angles black, sometimes other markings. Elytra smoky with light spot on claval suture in male; nervures dark. Frons with black arcs somewhat convergent; sutural lines black; black spot under each eye.

External genitalia:

Female last ventral segment equal to preceding segment slightly emarginate on middle; pygofer slightly shorter than black ovipositor, very much narrowed on apical fifth, clothed with white spines. Male valve large, triangular; plates extending beyond valve ending in two finger-like processes; outer margin of plates with white spines; spiny pygofer extending beyond plates.

Described from a male (holotype) and female (allotype) collected at Everett, Washington, September 1, 1909 by J. A. Hyslop.

Holotype, deposited in Dr. Osborn's collection.
Allotype, deposited in Snow Entomological Collection.

Cicadula osborni sp. n.

Figs. 5—5a.

A black species with vertex black except for yellow

ocelli and yellow median line, allied to **C. potoria.** Length 4 mm.

Form:

Vertex more than twice as wide as long, one-sixth longer on middle than next the eye, broadly rounding with front. Pronotum short; twice as wide as long; anterior margin broadly convex, lateral margin distinctly shorter than humeral margin, posterior margin almost straight. Scutellum equal to vertex in width. Elytra exceeding abdomen by one-fifth their length; appendix distinct.

Color:

Black. Vertex practically solid black; sometimes with fine yellow median lines; ocelli yellow and conspicuous; posterior margin sometimes with slight yellow border. Pronotum solid black with small median yellow line on anterior third; sometimes two yellow spots on anterior margin widely divided. Scutellum black or with black basal angles and broad black transverse line. Elytra black, somewhat lighter toward tip, sometimes with light spot on claval suture; nervures dark; Frons with black convergent arcs; sutural lines black; black spot below eye; antennal sockets black.

External genitalia:

Male valve extra large, shape of isosceles triangle; plates large extending beyond valve about length of latter, terminating apically in two finger-like processes that extend beyond spiny pygofer; plates apparently bare of spines.

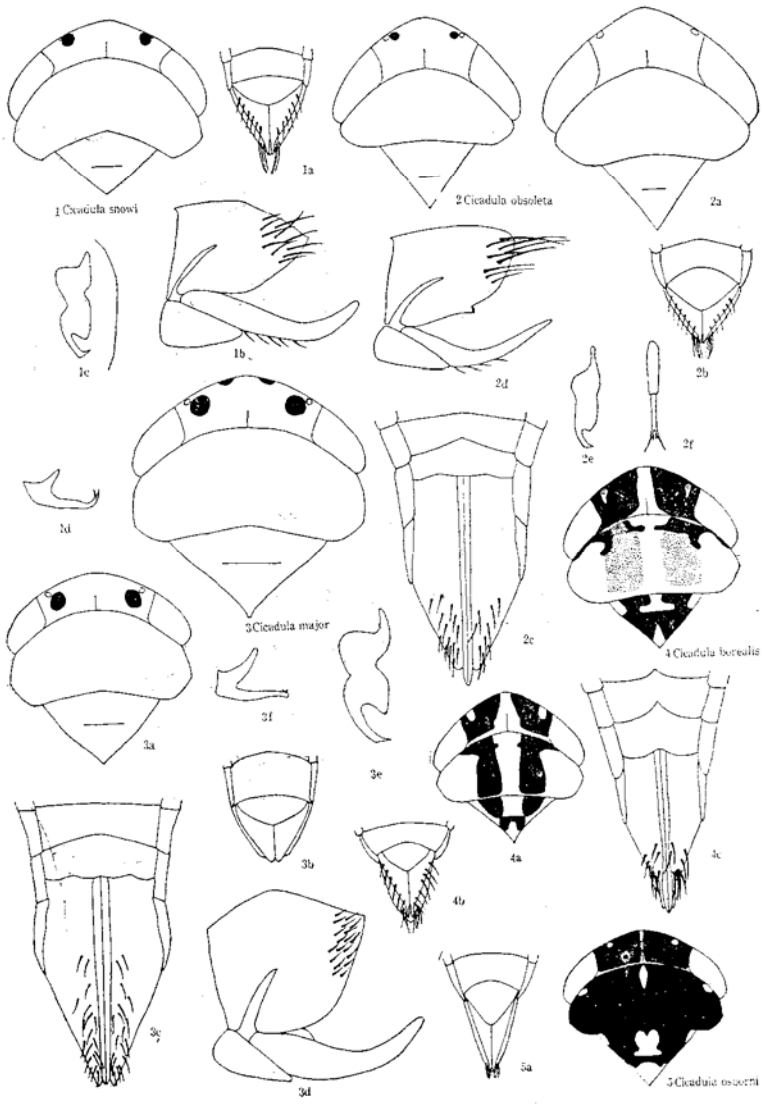
Holotype, male, Savonaski, Naknek Lake, Alaska, July 31, 1919.

Paratype, male, Savonaski, Naknek Lake, Alaska, July 31, 1919.

Holotype deposited in Dr. Osborn's collection.

Paratype deposited in Snow Entomological Collection.

The writer is justly indebted to Dr. Herbert Osborn for the generous loan of type specimens for study and especially for the specimens from which the last two species were discribed.


1 Cicadula snowi
1a
1b
1c
1d
2 Cicadula obsoleta
2a
2b
2c
2d
2e
2f
3 Cicadula major
3a
3b
3c
3d
3e
3f
4 Cicadula borealis
4a
4b
4c
5 Cicadula osborni
5a

Explanation of Plate

1. Cicadula snowi
1a. Cicadula snowi male genitalia
1b. Cicadula snowi pygofer
1c. Cicadula snowi clasper
1d. Cicadula snowi oedagus
2. Cicadula obsoleta, male
2a. Cicadula obsoleta, female
2b. Cicadula obsoleta, male genitalia
2c. Cicadula obsoleta, female gentilia
2d. Cicadula obsoleta, pygofer
2e. Cicadula obsoleta, clasper
2f. Cicadula obsoleta, oedagus
3. Cicadula major, female
3a. Cicadula major, male
3b. Cicadula major, male genitalia
3c. Cicadula major, female genitalia
3d. Cicadula major, pygofer
3e. Cicadula major, clasper
3f. Cicadula major, oedagus
4. Cicadula borealis, female
4a. Cicadula borealis, male
4b. Cicadula borealis, male genitalia
4c. Cicadula borealis, female genitalia
5. Cicadula osborni
5a. Cicadula osborni, male genitalia

SOME BIOLOGICAL NOTES ON THE CERCOPIDAE NORTH OF MEXICO (HOMOPTERA).

BY

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Philaenus as a Greenhouse Pest.

During the spring of 1928 Mr. Edward P. Breakey, Field Entomologist for the Wisconsin Department of Agriculture, was able to make some interesting observations on certain species of Cercopidae found on Baby Rambler roses, growing in the greenhouses of C. C. Pollworth, West Allis, Milwaukee County, Wisconsin.

He very kindly sent the specimens he was able to collect and the following notes to the writer. As Mr. Breakey and the writer have seen no records in the literature at our command concerning Cercopidae as greenhouse pests we thought that it might be advisable

*Contribution from the Department of Entomology, Lawrence, Kans.

to record the data.

Mr. Breakey's notes contained the following statements: "The roses had been secured from the Jackson and Perkins Company of Newark, New Jersey, and were brought into the greenhouses in December 1927 while dormant. Collecting was by the picking method for the use of the net was not only impracticable but impossible. Several mating pairs were taken. Three species are apparently in the lot collected. A large portion of the Cercopid population was still in the immature stages at this time. The presence of numerous large white masses of spittle on the small potted roses was an interesting sight. According to the workmen at the greenhouses it was not a new thing nor an unusual sight with them. They were asked to explain how they rid the plants of the insects and spittle before taking them to the Milwaukee store. They demonstrated by turning a strong stream of water on the plants. This seemed to be effective in washing away both spittle and insects unless the spittle had been invaded by a fungus in which case it was blackened and in such a state that it wouldn't wash off."

The species and varieties involved in Mr. Breakey's data according to determination by the author are **Philaenus leucophthalmus** var. **spumarius, Philaenus leucophthalmus** var. **marginellus** and **Philaenus leucophthalmus** var. **pallidus.**

Mr. Breakey stated that he was unable to follow up the investigation by further observations himself. However Mr. Adams of the Wisconsin office visited the greenhouse in 1929 and saw no sign of the infestation on the roses. This probably was due to the fact that the control measures were effective enough to get rid of the pests.

Molting of Aphrophora permutata Uhler.

In the February issue of the Entomological News Volume XXXIX, 1928, Doctor E. D. Ball gave an interesting description of the molting of **Monecphora bicincta** Say. Following this discussion of the molting habits of Cercopidae by Doctor Ball it appears to be well to add the notes taken by Doctor R. H. Beamer, University of Kansas, in regard to the molting of **Aphrophora permutata** Uhler.

During the summer of 1929 Doctor Beamer and his biological survey party were collecting in Sequoia National Park, Tulare, California. There they found

Aphrophora permutata Uhler to be very abundant both as nymphs and adults. The nymphs appeared to be living on perennials of various sorts such as legumes and others, which were growing in the Crescent and Log Meadows. Fortunately the party was able to observe the transformation of the fifth-instar nymphs to adults. This took place about eight o'clock in the morning. The nymph crawled out of the spittle mass and fastened itself to the stem. Then the skin burst along the dorsomedian line after which the insect entirely let go its previous hold with its legs, and flexed its body backward so that it remained connected to the old nymphal skin only by the tip of the abdomen. Later it stretched forward again, clinging to a new area of support with its legs while the tip of the abdomen was freed from the molted skin. By 10:30 o'clock many adults were fully colored and many were captured by using the net.

These observations check very accurately with Doctor Ball's statement of the molting of most Cercopidae. However the writer disagrees with Doctor Ball's statement to the effect that all the other genera but **Monecphora** crawl out of the spittle mass to make their transformation to adults. In the case of **Lepyronia quadrangularis** Say the author has found that the last molt takes place in the spittle mass in much the same manner as **Monecphora.** (See Kans. Univ. Sci. Bull. Vol: XIV, No. 21, p. 527.).

The Occurrence of Clastoptera laenata Fowl. in North America.

During the summer of 1928 Doctor R. H. Beamer and his survey party collected six specimens of what apparently is **Clastoptera laenata** Fowler hitherto known from Mexico and South America. Two females and one male from Bowie Co. Texas, and one female and two males from Polk Co. Arkansas, were taken. The writer first determined the specific idenity by reading Fowler's description. For confirmation two specimens were sent to Mr. China of the British Museum for comparison with the types. Mr. China reported that they were undoubtedly **Clastoptera laenata** as nearly as he could ascertain without dissecting out the genitalia.

Curious Walking Habits of Lepyronia gibbosa Ball.

While collecting **Lepyronia gibbosa** Ball in large numbers in Scott County, Kansas, during the summers of 1925 and 1926, Doctor R. H. Beamer noted a peculiar

habit of these rather large sized Cercopids. The insects were found on the prairie and not in particularly sandy places as is commonly thought to be their natural habitat. When collecting them Doctor Beamer observed that they were able to run backward as swiftly and efficiently as they did forward. This pecular habit was striking in that it was such a rapid movement, comparable to an automobile suddenly put in reverse.

Clastoptera xanthocephala Germar As a Biter.

While collecting **Clastoptera xanthocephala** Germar near Lake Charles, La., during the summer of 1928, Doctor R. H. Beamer and his survey party were much surprised to discover that this small insect was a vicious biter. Mrs. Beamer first made the discovery when she was repeatedly bitten by these insects in the process of taking specimens from her sweep net. When she placed her hand in the net insects alighting on her arm almost immediately proceeded to bite. This very interesting experience was soon reported by other members of the party. This species was breeding in countless numbers on a yellow Composite.

NOTE ON THE EMERGENCE OF TIBICEN PRUINOSA (SAY). (Homoptera—Cicadidae).

BY

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A living female of **Tibicen pruinosa** (Say) was brought into the laboratory January 5, 1931. It had emerged the morning of January 4 from a flower pot containing a geranium. The specimen is small and the wings slightly crumpled, but is normal otherwise. The interesting data on this freakish emergence of a cicada was obtained by Doctor Philip A. Readio through an aquaintance.

The geranium was removed from a cemetery east of Lawrence, Kansas, and potted with the addition of a little garden soil in the fall of 1927. The cicada nymph, probably then in the 5th instar, doubtless was transplanted with the geranium. It is interesting to

*Contribution from the Department of Entomology, University of Kansas