

THE GENUS AGALLIA—EXTERNAL CHARACTERS USED TO DISTINGUISH THE SPECIES INJURING ECONOMIC CROPS.

DWIGHT M. DeLONG AND RALPH H. DAVIDSON,
Ohio State University.

The species of *Agallia* are primarily pests of grasses, grains, and forage crops. They are very common and abundant upon clover, alfalfa, soy beans and similar forage crops, while meadows and pastures normally support large populations. Field workers engaged in population or disease transmission studies have found it almost impossible to distinguish and determine these species occurring on economic plants with the present treatments in literature. The only previous treatment of the Genus was by Osborn and Ball in 1898¹. At that time they illustrated three of these species and treated eight of the species included in this discussion. Since that time Baker² (1898) has described two and Van Duzee³ (1909) has described one, which are treated here. In view of the fact that at the present time there is no key dealing with all of these economic species and not more than half have previously been illustrated in any way, this brief discussion is contributed to assist field workers in recognizing them. Line drawings have been included so as to illustrate the external genital characters. The character of the male genitalia, especially the size and shape of the male plates is the best external character available for separation, although the character of the posterior margin of the last ventral segment of the female is very good in several species. In a few cases the posterior margin of the female segment is quite variable.

Examination of the internal genital characters of the male show them to be very similar in closely related species. Since other workers are examining the internal genitalia with the expectation of treating all the species of the genus and in view of the fact that the external characters are adequate for separating practically all of the economic species, the internal characters are not illustrated nor described at this time. It

¹Osborn and Ball. Proc. Dav. Acad. Sci., Vol. VII, pp. 45-64. 1898.

²Baker. Psyche VIII, p. 199. 1898.

³Van Duzee. Bul. Buf. Soc. Nat. Sci. IX, p. 210. 1909.

may be possible that through a study of these internal characters species of economic importance will be found that have not yet been described, but the internal characters examined, although differing, seem to be within the range of possible variation.

There are two rather distinct groups of species from the standpoint of distribution. One group occupying the eastern and central states and another group found almost entirely in the western mountain states and the Pacific coast. With the exception of *sanguinolenta*, which extends into the western mountain states, these two groups scarcely overlap.

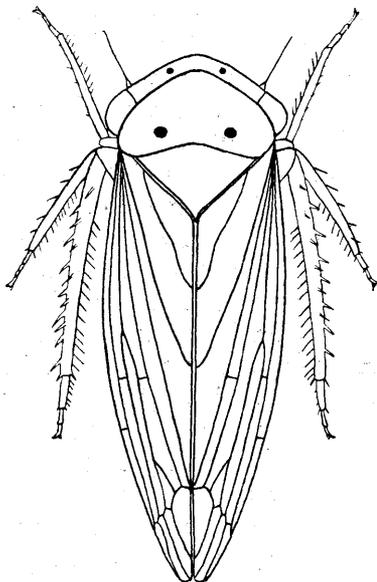


FIG. 1. *Agallia 4-punctata* Prov.

Dorsal view showing general appearance of the species of the genus.

The eastern group is composed chiefly of *sanguinolenta*, *constricta*, *4-punctata*, *novella*, *deleta* and *cinerea*. The western group is composed of *uhleri*, *californica*, *lyrata*, *bigeloviae*, *gillettei* and partially of *sanguinolenta*. Of these species, *sanguinolenta* is the most widespread and abundant and lives upon a wide range of hosts. For many years it has been known to occur abundantly upon grains, grasses, forage crops and truck crops. It has been recognized as a pest especially of clover and alfalfa and the populations upon these crops are frequently large.

More recently rather large populations have been found on potatoes, sugar beets, beans and many other truck and field crops in varying abundance. It occurs as far west as Utah and Idaho, but its occurrence in California and other Pacific coast states is doubtful, although it has previously been recorded for California. It may be found that the insect at present called *sanguinolenta* belongs to more than one species. The writers have interpreted the large amount of material examined from the eastern and western United States as representing a quite variable species rather than two or more very closely related species. Biologic work has not been carried out to date to prove or disprove this point. Three other species in the eastern United States are frequently found with *sanguinolenta* on clover and alfalfa. These species are *novella*, *constricta*, and *4-punctata*, all of which extend as far west as Kansas and Colorado. *A. constricta* is recorded for Texas and *4-punctata* for California. There is some question concerning the authenticity of this latter record, although two specimens are at hand from Southern Idaho. Although not as abundant as *sanguinolenta*, these species have frequently been found in sufficient abundance to be of economic importance. These occur in small numbers also upon several of the truck crops and are very abundant in grasses and meadows. *A. deleta* occurs only in the southeastern United States (South Carolina, Georgia, and Florida) and may not be a species of economic importance. No economic food plants have been found or reported. *A. cinerea* is a Mississippi valley species occurring originally on native grasses and now feeding upon cultivated grasses, small grains and forage plants. It has been found as far west as Colorado and Arizona and is also recorded for California, but with a doubtful identification. Of the western species *uhleri* is most widely distributed, occurring from Iowa and Missouri to the Pacific coast, while the other species, *californica*, *lyrata* and *bigeloviae* occur only in the Pacific coastal states and the southwest, if we may judge from available material and known records.

In California *lyrata* is found upon more crops, but usually in smaller numbers. It has been taken from 22 different crops, among which are alfalfa, sugar beets, potato, beans, carrots, and turnips. Large populations occasionally occur on sugar beets. *A. uhleri* is the most abundant species on alfalfa and the populations are quite large. It occurs on several other crops of which potato, carrots, beans and melon are the most important.

A. californica also is found abundantly upon alfalfa and occurs in greater abundance upon such crops as potato, bean, carrots, parsnip, squash and sugar beets. *A. bigeloviae* occurs only occasionally upon economic crops.

KEY TO THE SPECIES AGALLIA ATTACKING ECONOMIC CROPS.

- A. Posterior portion of pronotum with two round black spots.
Large, robust or rather long and wedge-shaped.
- B. Broad (almost 2 mm.) and robust; female segment almost truncate posteriorly, male plates short and narrow.....*4-punctata*
- BB. Much narrower, wedge-shaped, female segment deeply emarginate or strongly produced, male plates longer and broader.
- C. Posterior margin of vertex regularly curved, female segment suddenly constricted near the middle then strongly roundly produced, male plates rather long bluntly rounded.....*constricta*
- CC. Posterior margin of vertex produced anteriorly at the middle, female segment deeply roundly emarginate, male plates broad, bluntly rounded, fitting into a box formed by apices of pygophers.....*novella*
- AA. Spots if present on anterior portion of pronotum or markings longitudinal in general form. Species usually short and robust.
- D. Female segment with long pointed inwardly projecting lateral angles or with four rather prominent lobes, male plates lyrate or greatly elongate.
- E. Apical half of female segment narrowed about one-fourth entire width forming inwardly set, long pointed lateral angles. Male plates long and narrow.....*gillettei*
- EE. Female segment not narrowed apically and with a four-lobed condition, male plates lyrate or elongate.
- F. Female lobes conspicuous, separated by deep and rather broad incisions; male plates long and narrow.....*bigeloviae*
- FF. Female lobes rather short, separated by broad shallow indentations, male plates convexly then concavely curved to truncate tips forming lyre-like structures.....*lyrata*
- DD. Female segment sinuate or notched, but without conspicuous lobes. Male plates neither lyrate nor greatly elongate.
- G. Female segment shallowly roundly emarginate with a minute tooth at middle, male plates short but strongly narrowed to narrow, but blunt tips.....*deleta*
- GG. Female segment truncate or slightly notched at middle, male plates rather broad at apex, not strongly narrowed.
- H. Female segment shallowly emarginate and slightly notched at middle, male plates most strongly produced on outer angles.....*uhleri*
- HH. Female segment truncate or produced and notched at middle, male plates more strongly produced on middle line.
- I. Female segment truncate and rather strongly notched at middle, male plates shorter than combined width at base, apices broad and bluntly rounded.....*californica*
- II. Female segment slightly produced between lateral angles, male plates longer.
- J. Male plates narrowed from base to form broad, bluntly rounded tips.....*sanguinolenta*
- JJ. Male plates with outer margins almost straight. Posterior margins sloping obliquely to produced inner margins.....*cinerea*

Agallia 4-punctata (Prov.)

Bythoscopus 4-punctata. Prov. Nat. Can. IV, p. 376, 1872.

Easily distinguished from the other eastern species by the broader more robust form and the genitalia. Length, 4 mm. Last ventral segment of female with posterior margin shallowly concavely rounded. Male valve large, broad. Plates rather short and broad, triangular, apices rather blunt. Plates slightly longer than combined width at base.

Known to occur rather generally throughout the eastern United States and recorded for Iowa, Kansas, Nebraska, Arkansas, Colorado and California. In addition two specimens are at hand collected in southern Idaho during the summer of 1930. If it occurs in California the species is apparently very scarce.

Agallia constricta V. D.

Agallia constricta V. D. Can. Ent. XXVI, p. 90, 1894.

Resembling *novella* in form and appearance, but without the intermittent dark and light markings along the sutural line. Length, 3.5-4 mm.

Female last ventral segment long, sides almost parallel margined, abruptly constricted at about half its length. The median line carinate and the posterior margin strongly produced and obtusely rounded. Male valve about twice as broad as long, plates long and narrow, slightly constricted about middle then again widening and produced to the rounded tips.

Ranking second in abundance to *sanguinolenta* in the eastern United States. Also recorded for Kansas, Missouri, and eastern Texas.

Agallia novella (Say).

Jassus novella Say. Jl. Acad. Nat. Sci. Phila. VI, p. 309, 1831.

Resembling *constricta* in size and general form, but easily distinguished from it by the elevated and anteriorly produced posterior margin of the vertex and the dark interruptions on the sutural line of the wings. Length, 3.75 mm.

Female last ventral segment with lateral angles long, well produced, posterior margin roundedly excavated from the lateral angles more than half way to the base. Male valve short, truncated, plates long, rather blunt at tips. Pygophers rather large, convexly inflated, forming an almost square opening posteriorly into which the plates fit like a lid.

A common species in the eastern United States and recorded for Kansas, Missouri, Colorado and Vancouver Island.

Agallia gillettei Osb. and Ball.

Agallia gillettei Osb. and Ball. Proc. Dav. Acad. Sci. VII, p. 60, 1898.

Usually narrower than *sanguinolenta*. Length, 2.75–3 mm.

Female last ventral segment narrowed about one-fourth the width of posterior half, forming prominent, rather pointed posterior angles. Between these the posterior margin is excavated by three rather abrupt, successive steps. The median notch at the apex reaches over half way to the base of the segment. Male valve twice wider than long, plates almost three times as long as valve, margins rolled up, giving them a cylindrical appearance and which causes them to appear narrow. The ends of the plates upturned.

Although *gillettei* is usually not of importance economically, it occurs through the southwest on native vegetation. It is interesting to note that specimens were collected in Florida on Sanibel Island, in April, 1921, by the senior author. This adds greatly to the known range of this species.

Agallia bigeloviae Bak.

Agallia bigeloviae Baker. Psyche VII, Suppl. 1, p. 26, 1896.

Resembling *lyrata* in general appearance, but easily distinguished by the genitalia of both sexes. Length, 3 mm.

Last ventral segment of female short and broad, posterior margin consisting of four prominent rounding lobes, the incisions between them reaching more than half way to the base. Male valve short and narrow, plates long and narrow, slightly constricted at base and with apices laterally compressed.

Specimens have been collected in California, Colorado, New Mexico and Arizona.

Agallia lyrata Bak.

Agallia lyrata Baker. Psyche VIII, p. 199, 1898.

Form and general appearance of *sanguinolenta*, but slightly larger. Length, 3.5 mm.

Female last ventral segment rather short and broad, lateral margins roundly produced, posterior margin formed into four distinct, but rather shallow lobes. A V-shaped notch at the middle separates the two inner lobes and a shallow rounding emargination either side separates the outer from the inner lobes. Male valve short and broad, plates strongly roundedly widened at base, then concavely rounded to broad blunt apices which are upturned and slightly wider at tips. Together these give the appearance of a lyre.

Records at present are from California and Vancouver Island only.

Agallia deleta V. D.

Agallia deleta V. D. Bul. Buf. Soc. Nat. Sci. IX, p. 210, 1909.

General form of *sanguinolenta*, but slightly smaller and without dark markings. Length, 2.5–3 mm.

Female last ventral segment with posterior margin slightly concave with a very minute tooth at middle. Male valve rather long and broad, plates as broad as valve at base, gradually tapering to rather blunt apices.

Known only from the southeastern United States. Recorded for Florida, South Carolina, and Georgia.

Agallia uhleri V. D.

Agallia uhleri V. D. Can. Ent. XXVI, p. 91, 1894.

A little longer than *sanguinolenta* and less robust, but similar in color and general appearance. Length, 3–3.25 mm.

Female last ventral segment about three-fourths as long as basal width. Posterior margin sloping from prominent angles to form a central deep triangular notch reaching about one-third the distance to the base. Male valve short, truncate posteriorly, plates longer than combined width at base, lateral margins tapered to blunt apices which are slightly obliquely truncate, the outer angles longer than inner margins, tips usually dark margined.

A typically western species occurring from Iowa and Missouri to California.

Agallia californica Baker.

Agallia californica Baker. Psyche VIII, p. 199, 1898.

Resembling *sanguinolenta* in size and appearance, but with female segment more deeply notched and male plates shorter and more truncate. Length, 3–3.25 mm. Markings as in *sanguinolenta*.

Female last ventral segment more than twice as broad as long with a distinct notch at center extending about one-third the distance to base. Male valve very short and broad, truncate, plates a little shorter than combined width, apices truncate, outer margins rather strongly produced and not narrowed toward apex. Inner margins with a very slight tooth at apex either side of median line.

Recorded only for California.

Agallia sanguinolenta (Prov.)

Bythoscopus sanguinolenta Prov. Nat. Can. IV, p. 376, 1872.

This is the most common and widespread species of the genus and probably is of more importance economically, although there is a possi-

bility that it may be confused with other closely related, but undescribed, species. Length, 3 mm.

Female segment somewhat variable. Usually slightly sinuate and with a weakly produced lobe either side of a shallow median notch. Male valve short, almost truncate, plates broad, truncate at apex, one-half longer than wide.

Probably the most widely distributed of all the species of the genus. It occurs abundantly throughout the eastern United States and has been recorded generally throughout the western United States to California. The identity of the species is the most important question in regard to these records of distribution.

***Agallia cinerea* Osb. and Ball.**

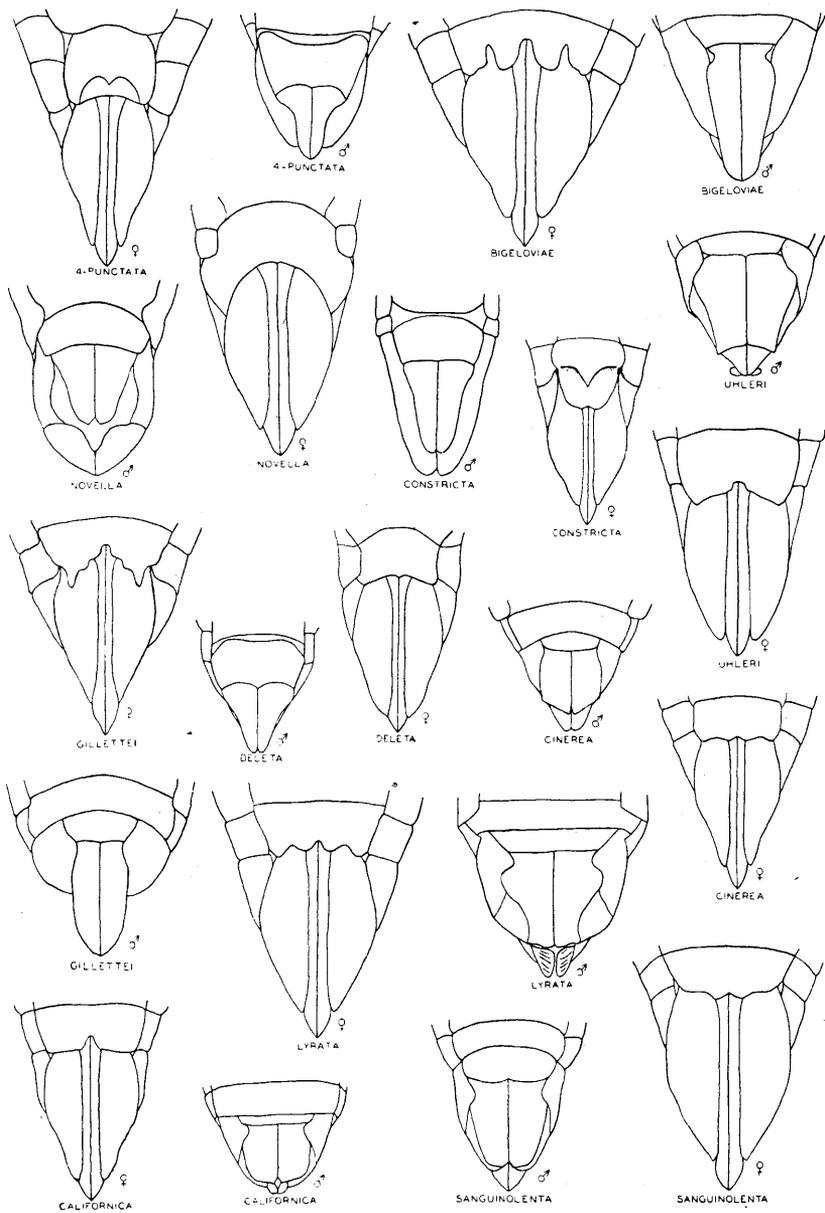
Agallia cinerea Osb. and Ball. Proc. Dav. Acad. Sci. VII, p. 62, 1898.

Resembling *sanguinolenta* in size and structures, but pale cinereous in color and with distinct male genitalia. Length, 2.5 mm.

Female last ventral segment short and broad, shorter than in *sanguinolenta*. Posterior angles produced and rather prominent. Posterior margin slightly sinuated and faintly notched at middle. A transparent portion extending almost to base permits the ovipositor to be visible through the segment and causes it to appear deeply notched. Male valve short and broad, truncated or slightly concavely rounding. Plates about as long as combined width, outer margins almost straight, posterior margins sloping from rather prominent angles to inner margins which are slightly divergent and pointed.

The female genitalia are very similar to *sanguinolenta*, but the males of the two species are quite different and easily distinguished.

Chiefly a Mississippi valley species. Recorded for Tennessee, Iowa, Kansas, Colorado, Arizona, and California. If it occurs in the southwest and California it is very rare.



External genital characters of the species of the genus *Agallia* which are of economic importance.