

STUDIES OF NORTH AMERICAN JASSOIDEA.

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THE studies recorded in this paper may be considered a continuation of those presented before the Iowa Academy of Sciences and published in Vol. IV., p. 172, (1897) under the title "Contributions to the Hemipterous Fauna of Iowa."

As in that paper, the special effort has been to detail the life-histories of the various species and is mainly concerned with common species occurring in Iowa; but in a number of instances it has been necessary, in order to present a systematic arrangement of the known forms, to include the species occupying all portions of North America and in some instances to describe those which are new to science. The studies have been prosecuted primarily for the purpose of determining the economic relations and importance of this group of insects and securing such facts as may furnish a scientific basis for dealing with those that are injurious to crops of the State. A paper dealing more particularly with the practical questions involved will appear in the report of the Iowa Experiment Station for 1897.

A REVIEW OF THE NORTH AMERICAN SPECIES OF AGALLIA.

The members of this genus are all small and sombre-colored; the individuals of a species vary little in pattern, but much in depth of color; the males are invariably smaller and darker than the females. They are all single-brooded as far as known, the larvæ being usually found in the rubbish on the ground around the base of their respective food plants from which they emerge to feed, those of the first two groups maturing in the fall and passing the winter as pupæ to issue as adults in early spring; those of the third group occurring in early summer, the adults appearing in July and August and hibernating to deposit eggs in early spring.

The genus may be characterized as follows: Head, together with the eyes, wider than elytra at base; vertex transverse, crescentiform; ocelli on the face between the eyes; antennæ long, inserted under a feeble ledge, their bases partly visible, clypeus longer than wide, nearly rectangular; face as long or longer than width across eyes; pronotum long, anterior margin strongly rounding and extending forward below the eyes, side margin short or obsolete; elytra without an appendix; five apical and three antepical cells; second transverse nervure sometimes present; marginal nerve of wing continued around apex, forming a supernumerary cell; color varying from whitish to dark fuscous, scarcely ever more than a trace of red, yellow or green, two round black spots on vertex rarely wanting.

The North American representatives of the genus may be readily divided into three groups, easily separable on adult characters, but which are even more strongly marked in those of the larvæ and in the life histories.

The species of the first group have the pronotum finely granulated without transverse striations, ornamented with two large spots near the posterior margin; the vertex is nearly parallel, the front expanded on the basal part; elytra brownish with light nervures, the base of the apical cells in a transverse line. The known larvæ are compact, reddish brown forms with long wing pads and compressed, dorsally, serrately carinate abdomen. Eyes much wider than the pronotum, which they partly enclose. The vertex is nearly flat above with two lobe-like projections arising from the anterior margin against the eyes and extending forward, or forward and inward, giving the insect a very grotesque appearance. They are found in the rubbish around the base of different plants, but only in moist and shady places. Of the group, *A. punctata* and *constricta* are typical representatives in their respective habitats and are closely related to the European *sinuata*.

In the second group the pronotum is finely granulated as in the first, but the two round spots are near the middle. The posterior margin of the vertex is elevated and carried forward between the eyes, appearing as a transverse line in the middle, front wedge-shaped, broad but not distinctly lobed above. The elytra are long and narrow and the apices of the antepical cells are nearly in line. The larvæ are reddish-brown in color like those of the first group and are similar in form except the vertex. The entire posterior margin of the vertex is elevated and carried obliquely upward and forward before the eyes on the same plane as the face, the upper carinate margin being shallowly

roundingly bilobed. They are found in similar situations with those of the first group, and while in appearance the lobate form of the vertex in the two groups is not strikingly different, yet when it is borne in mind that in the first case the lobe is simply an inflation of the anterior margin, while in the second it is the reflexed and elevated posterior margin, the difference in form of the adult vertices is readily understood.

The third group is characterized by a transversely striated pronotum on which the dark markings, if any, are in longitudinal bands and not in round spots on the posterior half. The front is very broad and suddenly constricted to meet the clypeus. The elytral nervures in the terminal portion are usually darker and more or less irregular, the central antecapical cell extending beyond the others. The larvæ are light-colored with dark lines, small, compact form, with a rounded parallel-margined vertex very similar to that of the adults, and short, elevated abdomen. They apparently prefer dry and exposed situations. This group includes the last five species, of which *sanguinolenta* is abundant and widely distributed and is closely related to the European *venosa* and the South American *signata*.

SYNOPSIS OF THE SPECIES.

- A. Pronotum very finely, evenly granulated, posterior half of disc with two round black spots slightly farther apart than those on the vertex.
- B. Posterior margin of vertex a regular curve or nearly so, vertex very narrow or obsolete behind the eyes, spots on pronotum close to posterior margin, sutural margin of elytra unicolorous.
- C. ♀ segment slightly narrower behind than in front, without an abrupt constriction; posterior margin truncate; ♂ plates broad at base, regularly narrowing to an acute tip. Specimens usually unicolorous except for the four black spots.
- D. Broad and stout, nearly 2 mm. wide; elytra convex, short.
..... *punctata*, Prov.
- DD. Narrower, wedge-shaped, elytra longer proportionately.
..... *modesta*, n. sp.
- CC. ♀ segment suddenly constricted and depressed near the middle; ♂ plates constricted in the middle, the tip enlarged, rounding; specimens usually with strong accessory markings.
- D. Small, less than 4 mm. long, ♀ segment broadly rounding behind..... *constricta*, V. D.
- DD. Larger, over 4 mm. long, elytra over 1 mm. longer than body; ♀ segment with the posterior margin much produced, side concave.... *producta*, n. sp.

- BB. Posterior margin of vertex elevated and carried forward in the middle, vertex margining the eye behind, narrowing away toward the outer margin, spots on pronotum nearer the middle than the posterior margin, sutural margin of elytra usually light.
- C. Species narrow, little more than 1 mm. in breadth, only one spot on vertex next eye.
- D. ♀ segment deeply roundly emarginate, central apical cell of elytra parallel margined. *novella*, V. D.
- DD. ♀ segment roundly produced, the apex with a shallow notch, elytra very long with the central apical cell wedge-shaped. *tenella*, n. sp.
- CC. Species broader, nearly 2 mm. in width, three dark points on vertex next each eye, elytra maculate. *oculata*, V. D.
- AA. Pronotum coarsely transversely rugulose except for two spots on the anterior margin, dark markings absent or in the form of longitudinal bands.
- B. Species light cinereous or whitish, spots on vertex small, elytra subhyaline, nervures light.
- C. Elytra much longer than abdomen, narrow behind, costa nearly straight, ♀ segment long, deeply cleft. *uhleri*, V. D.
- CC. Elytra short and convex, only slightly exceeding abdomen, ♀ segment short, only slightly notched, *cinerea*, n. sp.
- BB. Species darker, the spots on vertex large, usually with other markings, elytra subhyaline or fuscous, the nervures distinctly darker.
- C. ♀ segment with posterior margin deeply cleft, (♂ plates narrow, tubular).
- D. Species stout, elytra broadly convex, ♀ segment with four triangular points, ♂ plates narrower behind. *bigelovia*, Bak.
- DD. Species smaller, wedge-shaped, ♀ segment with two lateral points, ♂ plates tubular. *gillettei*, n. sp.
- CC. ♀ segment nearly truncate behind, slightly notched, (♂ plates broad, nearly flat). *sanguinolenta*, Prov.*

*The *peregrinans* of Stal if, as believed, belonging to *Agallia* and including specimens we have from California, would fall in this synopsis next to *sanguinolenta*, but differing from that species, particularly in the form of the male plates.

AGALLIA 4-PUNCTATA PROV. (Plate I., Fig. 1.)

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

Ulopa canadensis, V. D. (nymph). Trans. Amer. Ent. Soc., XIX., p. 301, 1892.

Short and stout; elytra broad, convex, at rest wider than across the eyes; uniformly smoky-gray above except for two black spots on the

vertex and two near posterior margin of pronotum. Length of ♀ 4 mm., width, 1.75 mm; ♂ slightly smaller.

Vertex short, transverse, more than five times wider than long, posterior edge crescentiform, slightly arcuated and elevated from the pronotum, anterior edge rounding to the face. Face broad and short, outer angle of the genæ prominent. Front broad and short, superior third abruptly expanded over the antennal bases, suture above nearly transverse, slightly arcuated and angled medially. Pronotum very finely punctured, more than twice wider than long, anterior margin strongly produced between the eyes, broadly depressed either side of the middle, lateral margin obsolete, the humeral margin touching the eye, posterior margin slightly emarginate. Scutellum equilaterally triangular, the apex produced. Elytra broad, convex, slightly longer than abdomen; at rest the costal margins are wider than across eyes, giving the insect a very compact appearance; venation very constant with the exception of the second cross nervure, which is often wanting, the bases of the four inner apical cells in a transverse line. Abdomen slightly crested.

Color: Above, obscure yellowish-brown, vertex yellowish-brown with two oblique black spots equidistant from each other and eyes, a faint brownish median line extending down to frontal suture, below which is lined with darker, antennal pits broadly black, facial sutures and tip of clypeus dark brown, sometimes brownish arcs on front, emphasized in two lateral rows of fuscous points. Pronotum yellowish-brown, darker in front, two distinct black spots near the posterior margin slightly larger and farther apart than those on the head. In highly colored examples there appears a median brown line, an oblique crescent near the humeral margin, and the anterior depressions become much darker. Elytra uniformly smoky subhyaline with lighter nervures, tergum and venter varying from yellow to fuscous, last ventral segment and genitalia light-yellow in both sexes.

Genitalia: ♀, ultimate ventral segment broad, slightly narrowing behind, anterior and posterior margins parallel, posterior margin usually arcuated or angularly elevated, giving it an emarginate appearance; pygofer broad and short, less than twice the length of the ultimate segment. ♂: Valve large, twice broader than long, lateral margin enclosing base of plates, posterior margin obtusely medially produced, plates together forming a triangle slightly longer than wide at the base, one-half longer than valve.

Specimens are at hand from Ont., N. Y., N. H., D. C., Ia., Kans., Ky., Ark., Neb., and Colo.

Nymph: Compact, reddish-brown, with prominent eyes, stout, short legs, vertex prolonged on either side of the middle third into a flat process, abdomen with a median notched carina; length, 3 mm.

Vertex nearly flat, projecting forward, parallel-margined for more than half of its length in front of the eyes, middle third of anterior margin cleft half-way to base, leaving two flat "horns" longest on lateral margins, where they equal their width at base, their anterior margins obliquely rounding to the medial cleft, face similar to adult, upper part of front projected on either side into an elevated rounded lobe which overhangs the base of the long antennæ, thoracic shield equalling the abdomen in length, medially carinate, abdomen short and narrow, above compressed into a high keel, each segment being elevated most on the posterior margin, giving it a serrate appearance. Legs stout, more adapted to walking; whole surface roughly and irregularly pitted.

While at first sight this appears to be a very distinct form it agrees with the *Pediopsis* larva in the crested abdomen and except for the projections on the vertex bears a striking resemblance to the larva of *Tettigonia bifida*.

Life history: Larvæ and pupæ were collected first October 12 of last year and were determined to be *U. canadensis*, V. D., and so reported in the "Additions to List of Hemiptera of Iowa."* They were again collected from sheltered situations January 1, 1897, (a very warm day). Early in May they were again found and placed in breeding cages and soon emerged as *Agallia 4-punctata* females, the males probably having issued before. They are single-brooded, the adults appearing in early spring, the females remaining until into July. The eggs are probably all deposited by the middle of June, from which the larvæ appear in July and by fall are nearly or quite full grown, passing the winter and issuing as adults again early the next spring. They have been found on a great variety of plants, mostly pertaining to the composite, horse-radish, beet, *Helianthus*, *Eupatorium*, etc. The larvæ remain on or near the ground and conceal themselves in the rubbish and humus for which their color and appearance is peculiarly adapted. They only occur in shaded locations or on such plants as horse-radish, beets, etc., that furnish a deep shade and a moist humus. The adults are usually found on the younger portions of the stems and may be taken in abundance from *Eupatorium* in May.

*Proc. Iowa Acad. Sci., Vol. IV., p. 231.

AGALLIA MODESTA n. sp.

Form of *constricta* nearly but smaller, smaller and narrower than *4-punctata*, superior portion of front less dilated; elytra much narrower. Length, ♀ 3.75-4 mm.; ♂, 3 mm.

Vertex narrow, rounding from the elevated posterior margin, giving it the appearance of a crescentiform elevated ridge; margin behind eye very narrow, nearly obsolete. Face narrower than in *4-punctata* or *constricta*, the outer angle of the genæ farther from eye, more obtuse. Front with the superior third widest at base, from which it rapidly and evenly narrows instead of being parallel-margined and abruptly narrowing, remainder of front slightly narrower and longer than in *4-punctata*. Pronotum finely punctured, twice wider than long, lateral margin obsolete, humeral margin short, posterior margin straight, very long, whole outline very nearly a semicircle as in *constricta*. Elytra long and narrow, similar to those of *constricta*; at rest they are folded at an acute angle above; costal margin not convex, giving a wedge-shaped appearance to the insect; venation similar to *4-punctata*, apical cells longer, entirely beyond tip of abdomen.

Color: Light yellowish-brown with four round black spots located as in *4-punctata*. Vertex and face light-yellowish, with a pair of large rounded spots on the superior margin equidistant from each other and eyes, a narrow margin around the ocelli and the antennal pits black, a narrow median line on the vertex, one either side next eye, light ferruginous, clypeus and all of front except a narrow median stripe on inferior half, and a spot near superior margin reddish-brown. Pronotum light-yellow with two round spots slightly farther apart than those on the vertex and less than their own diameter from posterior margin, black, an indistinct median line, two spots in the depression of the anterior margin and sometimes a mark on the humeral margin, reddish-brown. Elytra smoky and hyaline, nervures lighter; very dark examples may have the reddish-brown marking on the clypeus, front and pronotum changed to a dark chestnut and the elytra to a dark smoky, the black spots on the back of the pronotum enlarged, and the reddish-brown markings on the anterior margin localized into two small approximate round dots.

Genitalia: ♀, ultimate ventral segment slightly longer than penultimate, the sides parallel, posterior margin truncate, posterior part of segment curved around base of ovipositor, ovipositor proportionately longer and narrower than in *4-punctata*. ♂, ultimate segment short,

light-yellow, valve long encircling the base of the plates; plates together wedge-shaped, somewhat longer than their width at base, slightly constricted one-third the distance from tip.

Described from seventeen examples collected in Mexico (Osborn). Readily separable from *4-punctata* by the narrower form and from *constricta* by the truncate ♀ segment.

AGALLIA CONSTRICTA V. D.

Can. Ent., XXVI., p. 90, 1894.

Size of *modesta* nearly, but with shorter elytra, smaller than *4-punctata*, elytra less convex, light testaceous with four black spots as in the former species. Length, ♀ 3.50-4 mm; ♂ considerably smaller.

Vertex proportionately wider than *4-punctata*, posterior margin slightly elevated, anterior margin rounding to the face. Front broad at the base, suddenly narrowing before the middle, from there convexly narrowing to the clypeus. Pronotum similar to *modesta*, longer than in *4-punctata*, humeral margin more oblique than in *modesta*, posterior margin truncate or very slightly excavated. Elytra longer and narrower than in *4-punctata*, folded perpendicularly together at the tip, obliquely at base, only slightly convex.

Color: Light testaceous yellow, two round spots on vertex, two more on posterior margin of pronotum and the antennal pits black, a narrow median line on pronotum and vertex, the facial sutures, a narrow line next each eye, an oblique mark on the humeral margin of pronotum and two approximate spots near the anterior margin brownish testaceous.

Genitalia: ♀, ultimate ventral segment long, nearly parallel-margined, posterior half abruptly constricted, roundly depressed on either side a carinate median line, posterior margin obtusely rounding. ♂, valve long, compressed; plates long and narrow, broadest at the base, constricted in the middle, widening again to the rounding tip; pygofer prominent, laterally compressed, about equaling the plates.

Specimens are at hand from Long Island, N. Y., D. C., N. J., Ky., Fla., La., Miss., and Texas. Readily separable from the two preceding by the constricted ♀ segment.

AGALLIA PRODUCTA n. sp.

Form of *constricta* but longer, as large as *4-punctata*, with longer, narrower elytra. Dark smoky-brown, with larger black spots arranged

as in the preceding species. Length, ♀, 4.5 mm., width, 1.50 mm.; ♂ smaller.

Vertex: Width as in *constricta*, over six times wider than long, posterior margin roundly angular as in *Pediopsis*, slightly elevated. Face broad and short, genæ parallel-margined below eyes one-third the length, then sharply angulate and straight-margined to the clypeus. Front intermediate in form between *modesta* and *constricta*, broad at base, roundly narrowing on basal third, abruptly constricted, then slightly, convexly narrowing to the clypeus. Pronotum convex, finely granulose, twice wider than long, humeral margin long, posterior margin truncate. Elytra much longer than in *f-punctata*, costal margin less curved, less convex, apical and anteapical cells longer. Second cross nervure not present in any of the specimens in hand.

Color: Dark fuscous-brown and light-gray in strong contrast. Vertex and face light-yellow, with the round spots on vertex and antennal pits black, facial sutures, margins of ocelli, a band on either side of the front and the lower half of clypeus, dark reddish-brown, median line of vertex and one margining either eye light reddish-brown. Front, above and outside of dark band, suffused with reddish. Pronotum and scutellum light-yellowish, a pair of roundly triangular spots near posterior margin of pronotum black, a median line sometimes expanded on posterior margin of pronotum and again near tip of scutellum, an oblique mark on humeral margin of pronotum, a spot on either side of the median line on its anterior part and a spot near the basal angle of scutellum reddish-brown. Elytra dark smoky-brown with pale nervures and sutural margin in strong contrast.

Genitalia: ♀, ultimate ventral segment very long, posterior part constricted more strongly than in *constricta*, the division often appearing as a fold or "tuck," which is deepest at the margin, growing shallower and curving backwards near the median line, posterior margin strongly concavely produced from the lateral angles, tip of produced part truncate but often angularly elevated, giving the impression of a slight median notch, the produced part being two-thirds of the whole constricted portion, pygofer about three times longer than wide. ♂ genitalia similar to those of *constricta*, the valve shorter and more prominent, the plates broader at the tip and less constricted medially. Described from ten examples collected January 12, at Orizaba, V. C., Mexico, (Osborn).

Readily separated from *f-punctata* by the length of the elytra and

the genitalia; from *constricta* by the larger size and the much more produced ♀ segment.

A larva collected at the same time evidently belongs to this section of the genus, and from its large size apparently to this species, and will be described here.

Larva: Form very similar to that of *4-punctata*, slightly larger with the anterior "horns" much more produced, resembling the structure found in the beetle, *Boletotherus bifurcus*. Length, 3.25 mm. Vertex much narrower than the prominent eyes which margin the pronotum on the sides, median third of vertex consisting of a thin, slightly elevated plate with a broadly rounding anterior margin; between this and the eye, on either side, arises a long obovate anterior process over three times longer than width at base; these are slightly inclined toward each other so that their elevated inner margins almost touch at the broadest point. Pronotum over three times wider than long, anterior and posterior margins parallel, wing pads very long and narrow, abdomen short, laterally compressed, carinate as in *4-punctata*, the whole surface armed with bristle-bearing papillæ, largest on abdomen and on the margins of the anterior processes.

Color: Obscure reddish-fuscous above, marked with white as follows: A narrow margin on the anterior processes, a large triangle on the vertex, its base including all the anterior margin between the horns, the apex continuous with a median line across the thorax, a narrow line on the lateral margin of the pronotum extended back to inner angle of the wing pads, a curved line just inside of these and a few oblique lines on the wing pads; beneath, fuscous, legs and genitalia lighter.

AGALLIA NOVELLA, Say. (Plate I., Fig. 2.)

Jassus novellus Say. Jour. Acad. Nat. Sci., Phila., VI., p. 309, 1831.
Macropsis nobilis Forbes. Fourteenth Rept. Ill. St. Ent., p. 22, 1884.

Narrow, wedge-shaped, testaceous-brown with four points on anterior margin of vertex and two small spots just back of the middle of the pronotum, black, the sutural margin of the elytra light, twice interrupted with dark. Length, ♀ 3.75 mm.; width, 1.25 mm. ♂ slightly smaller.

Vertex very short, extended broadly around behind eyes until just before the outer margin, where it is suddenly constricted, posterior margin with the middle half abruptly elevated and carried forward.

Face moderately long, genæ slightly constricted below eyes then rounding to the middle of loræ. Suture above the front angulated, front long, rapidly concavely narrowing on basal third, then slowly convexly to clypeus, loræ twice longer than broad. Pronotum finely granulated twice wider than long, half the length within the curve of the vertex, side margin entirely wanting, humeral margin short, rounding, posterior margin truncate, long, anterior margin elevated and produced on the middle half, laterally depressed and covered by the vertex. Elytra long and narrow, extending over one-third their length beyond the tip of ovipositor.

Color: Light-testaceous, sometimes varying to slate color on the elytra, especially in the males. Pronotum testaceous with a dark-brown median line, a small round black spot just behind the middle of either side. Vertex testaceous or yellowish with a median line extending to the angle of the frontal sutures, a pair of round spots on posterior (superior) margin slightly farther from each other than from the eyes, black, facial sutures testaceous to light slate, nervures and sutural margin light, tips of the claval nervures broadly white with a dark saddle them which interrupts the light sutural line. Below, variable from between yellow to black except the genitalia, which are light-yellow.

Genitalia: ♀, ultimate ventral segment very long on lateral margins, posterior margin deeply circularly excavated from the lateral angle over half way to the base, pygofers narrow, moderately long, slightly exceeded by the oviducts. ♂, valve two-thirds as long as width at base, truncate behind; plates long, nearly as wide as the valve, parallel-margined, nearly truncate behind; pygofers large, inflated, convex, forming a hollow, box-like organ as seen from below, with a nearly square opening, which the plates close like a lid; seen from the side they are very broad at the base, hollowed out near the middle below and near the top above.

Specimens are at hand from Can., N. Y., Va., D. C., Mich., Ky., Ia., Kan., Colo., Mex., and Vancouver's Island, indicating a very wide and general distribution.

Larva: Larvæ very similar to those of *≠punctata*; vertex extending upwards and slightly forward as a transverse carina, not deeply lobed.

Vertex very short, appearing as a transverse carina projecting slightly upwards and forwards, divided by a shallow median excavation into two broadly-rounding lobes. Face very flat, front wedge-shaped with a distinct suture just below the obscure ocelli, very

slightly expanded over the antennal pits. Pronotum broad and short, wing pads long, oblique, abdomen compressed and carinate dorsally as in *4-punctata*, in color reddish-brown, margins of segments and of facial pieces slightly lighter, an oblique fuscous band from base of crest to the venter on third segment and another from the crest of the fourth segment to the venter on sixth.

Life History: Larvæ were found with those of *4-punctata* in January and again in May. They continued to be found for some time after the latter had all issued. The adults were common, both males and females, nearly through July. The larvæ appeared in August, a few weeks later than those of *4-punctata*, with which they were found constantly associated. They become nearly full grown by fall and pass the winter under the leaves and rubbish to pupate in early spring and later appear as adults.

AGALLIA TENELLA n. sp.

Similar to *novella* in appearance, elytra longer and more pointed behind, spots on pronotum obscure brownish. Length, 4.25 mm.; width, 1.25 mm.

Vertex similar to *novella* in shape, margin behind eyes narrower, less constricted outwardly, face broad, short, genæ parallel-margined below the eye, then slightly inflated before rounding to the loræ. Front broad and short, width at base nearly equal to length, narrowing nearly uniformly throughout to the clypeus, loræ twice longer than wide, frontal suture obtusely angulate, the apex reaching nearly the level of the ocelli. Pronotum finely granulated much as in *novella*, humeral margins longer, less rounding, elytra long and very narrow, two transverse nerves between the first and second sector, veins on clavus approaching very closely on the middle half.

Color: Light-gray with vertex and scutellum yellow, spots on vertex and pronotum dark. Face light-yellow, sutures dark-brown, inner pair of spots on vertex small, outer pair larger than in *novella*, not as far behind eye, as large as the inner pair. Pronotum light-gray with a median line and two obscure spots near the middle on either side reddish-brown, scutellum yellow with a triangular spot near the basal angle on either side, two spots and a transverse line on the disc black. Elytra smoky sub-hyaline with light nervures and light sutural margins interrupted by a dark saddle between the claval nervures and another at the base of the inner apical cells.

Genitalia: ♀, ultimate ventral segment long, lateral margins parallel, posterior margin produced one-half the length of the segment on the middle, sloping away to the lateral angles, tip slightly but distinctly notched; pygofer stout, two and one-half times the length of the segment, slightly exceeded by the oviducts.

Described from three females, Vera Cruz, Mex. (Osborn). Readily separated from the other two of the section by the genitalia and length of elytra.

Larva: Form similar to that of *novella*, vertex longer, nearly equaling the pronotum in length, reddish-brown with light spots in four longitudinal rows. Vertex widening from eyes obliquely upward and forward in a plane with the face, upper margin acute, roundly lobed. Vertex, front and clypeus forming a concave-margined wedge, thorax much as in *novella*, abdomen with two weak lateral carinae, reddish brown with a light upper margin to the vertex, four white bristle-bearing tubercles on the posterior margin of each thoracic and abdominal segment.

AGALLIA OCVLATA V. D.

Ent. Amer., VI., p. 38, 1890.

Species large, stout, much broader than *tenella*, resembling *producta* in form and size but easily distinguished by the central position of the pronotal spots, and the curvature of the vertex. Length, 4.50 mm.; width, 1.50 mm.

Vertex rather broad against the eye, nearly regularly narrowing to the middle, where it is simply a line, posterior margin produced around behind the eye, then slightly expanded and convexly rounding to loræ. Frontal suture slightly curved, front very broad at base, three times width on clypeus, wider than long, sides slightly constricted above the middle. Pronotum long, the posterior margin short, truncate, humeral margin long rounding to the eye, more than half the length of the pronotum within the curve of the vertex. Elytra long convex in front, narrow behind, veins on clavus approaching in the middle.

Color: Fulvous-brown, spots on vertex and pronotum black, nerves of elytra light, interrupted by dark-brown bands, vertex light-fulvus with a median line, two large spots on the disc, a pair of smaller ones against each eye, black; sides of front, tip of clypeus and facial sutures dark-brown. Pronotum fulvous, a large spot near the center of either side, black, a median line, a small spot on either side of it near

the anterior margin, and another small spot on the humeral margin back of either eye dark-brown. Elytra testaceous-brown with light nervures interrupted with dark-brown before the middle.

Genitalia: ♀, ultimate ventral segment nearly twice wider than long, posterior margin slightly curved, pygofer long, stout, four times longer than the ultimate segment, tip of ovipositor exceeding the pygofer, reaching the base of the apical cells.

AGALLIA SANGUINOLENTA, Prov. (Plate I., Fig. 3.)

Bythoscopus sanguinolenta Prov. Nat. Can., IV., p. 375, 1872.

Bythoscopus siccifolius Uhl. Bulletin U. S. Geol. and Geog. Survey, II., p. 359, 1876.

Small and compact, broader and flatter than any of the preceding species, vertex short and broad, two large dark spots slightly farther from each other than from the eye, pronotum transversely rugulose, short and broad, without distinct spots, elytra sub-hyaline with dark nervures except at the base. Length, 3 mm.; width, 1.50 mm.

Vertex about four times wider than long, over one-third the length of the pronotum, margins broadly rounding, nearly parallel, posterior margin not elevated, touching the pronotum throughout. Face broad, genæ very slightly angular. Front, width at base equaling length, slightly narrowing to the middle where it is nearly parallel-margined, roundly narrowing to the clypeus where it is still very broad, clypeus half longer than broad, sides parallel. Pronotum transversely rugulose except a small area just behind the inside corner of the eye, over twice wider than long, humeral margin long, side margin short but distinct, anterior margin broadly and regularly curved, curve including nearly one half the length of pronotum, scutellum large, triangular, tip long, attenuate, partly concealed beneath the elytra. Elytra broad, convex, scarcely narrowed before the broad apex, a little longer than the abdomen.

Color: Light gray, with a very variable amount of dark fuscous markings. Vertex yellowish with a pair of large round spots slightly farther from each other than from eyes, black, a median line and one next each eye, dark reddish-brown. Face yellow with sutures, six or seven short arcs on each side of the front, and a longitudinal line on the clypeus, reddish-brown. Pronotum light-gray with a series of impressed points back of the anterior margin, a median line enclosing

a narrow light one and two lateral longitudinal lines reddish-fuscous. Elytra with the first sector as far as the first fork and the veins on clavus broadly light, interrupted on the outer claval veins before the tip, remainder of nervures, the claval suture, the internal areas on clavus and a more or less definite saddle extending across the back between the apices of the two claval nervures, brownish-fuscous. The color is subject to great variation but the two round spots on the vertex persist in almost black forms.

Genitalia: ♀, ultimate ventral segment twice wider than long, the posterior margin very slightly sinuate either side of a shallow median notch; pygofers short, broad, scarcely twice longer than width of base. ♂, valve short, truncate; plates broad, half longer than wide, truncate at apex, the bases enclosed by the inflated pygofers whose tips, slightly exceeding the plates, are thickly set with coarse hairs.

This is a widely distributed species. Specimens are at hand from Ont., N. Y., D. C., Ky., Ala., Miss., Ia., Kan., Neb., Wyo., Colo., Arizona, Cal., and Vera Cruz, Mex.

The larvæ somewhat resemble the adult in form; very short and plump, head slightly wider than thorax, wing pads flaring, in the pupæ reaching the fourth abdominal segment, abdomen short, plump, the tip elevated so that the visible part of each segment is narrowest above.

Color: Creamy-white with heavy fuscous spots and bands. Vertex with the two round spots and median band as in adult, the markings next eye heavier. Face with the sutures and a few arcs on the front fuscous as in adult, thorax with a narrow median light line between two broader dark ones that expand on the anterior margin of each segment, an irregular dark blotch behind each eye extending as a band back to the inner angle of the wing pad, then obliquely outward along the inner margin, a pair of narrow wedge-shaped lines between these and the median one on the posterior segment, an oblique line on the wing pad and a marginal line on the outer and posterior margin, brownish-fuscous. Each abdominal segment with a broad brownish dark band on the anterior margin, venter light. Length of pupæ about 2mm.

AGALLIA UHLERI V. D.

Can. Ent., XXVI, p. 91, 1894.

Slightly longer and narrower than *sanguinolenta*, the elytra much longer, less convex, light grayish-brown, almost unicolorous above but

for the spots on the vertex and scutellum and the terminal nervures. Length, ♀, 3-3.25 mm.; width, 2.25 mm. or over.

Vertex distinctly broader and shorter than in *sanguinolenta*, the eyes much wider than the pronotum. Face somewhat longer than wide, the genæ scarcely angulate, frontal suture strongly arcuated, indistinct. Front longer than breadth at base, scarcely wider than the clypeus below. Pronotum more than twice wider than long, humeral margin nearly straight, touching eye, posterior margin long. Elytra long and narrow, portion of corium extending beyond tip of clavus being longer than its width at base, apical cells long, central anteapical cell extending posteriorly much farther than adjacent ones.

Color: Pale grayish-brown tinged with yellowish on pronotum and vertex, two sharp round spots on vertex and two triangular ones just inside the basal angle of scutellum projected forward and slightly visible through the semi-transparent pronotum, black, sometimes a transverse line on scutellum and an irregular impressed one back of anterior-margin of pronotum, dark-brown. Face pale-yellowish, sometimes suffused with reddish-brown, a few pale arcs on the front, ocelli red, basal two-thirds of elytra light-gray with indistinct nervures, apical third subhyaline with distinct dark nerves, usually an interruption on the outer claval nerve and a narrow line margining the light sutural line, fuscous.

Genitalia: ♀, ultimate ventral segment as long as breadth at base, very slightly narrowed posteriorly, the posterior margin with a deep roundly triangular notch reaching over one-third the distance to the base, pygofers short and stout, scarcely exceeding the apex of the clavus; ♂ valve short, posterior margin truncate, lateral margin oblique, plates longer than broad, slightly narrowing and cupping to the truncate tip, their base enclosed by the inflated pygofers, which slightly exceed them in length and meet behind in a slight keel.

Specimens are at hand from Wyoming, Colorado, New Mexico, and it was collected at Sioux City, Iowa, from hill-top, July 7th.

Readily separated by the length of the elytra and by the single deep notch in female segment.

AGALLIA GILLETTEI n. sp.

Form narrower and more wedge-shaped than *sanguinolenta*, elytra narrower and longer, pattern of ornamentation similar but less distinct, elytra without transverse bands. Length, ♀, 2.75-3 mm., width, less than 1.25 mm.; ♂ slightly smaller.

Vertex narrower next eye than in *sanguinolenta*, more produced and rounded between the ocelli, face more rounding, genæ scarcely angulate. Front similar to *sanguinolenta*, the basal suture more rounding, pronotum similar to *sanguinolenta*. Elytra longer, less convex, apical cells longer.

Color: Grayish-brown tinged with yellowish. Vertex with two round black spots smaller than in *sanguinolenta*, a broad median line enclosing a narrow light line, an arcuated line on either side arising from a spot at the inner posterior angle of the eye, then curving out to a point near the ocelli, with which it is connected by a short line, then back to the margin of the eye and obliquely down to the frontal suture above the antennæ, reddish-brown, ocelli bright red. Face marked much as in *sanguinolenta*, the frontal suture much more arcuated, less distinct. Pronotum cinereous-brown, an arcuated row of coalescent dots back of the anterior margin, three pairs of more or less distinct dark-brown longitudinal lines, the inner pair enclosing a narrow light line. Elytra, base fuscous with light nerves, remainder hyaline with dark nerves; no indication of transverse bands as in *sanguinolenta*.

Genitalia: ♀, ultimate ventral segment broad, laterally parallel-margined from the base one-half its length, then the surface depressed and the margin roundly narrowing one-fourth the entire width, posterior margin excavated from the acute lateral angles by three successive steps, the first being strongly oblique, to the bottom of a narrow median notch reaching over half-way to the base of the segment. ♂, valve twice wider than long, anterior and posterior margins parallel, side margin straight, oblique; plates nearly three times the length of the valve, the margins rolled up forming a half cylinder with a diameter slightly greater than the truncate apex of the valve, the ends of the plates convexly folded closing the end; pygofers only appearing from below as a fold around the base of the plates. Suture between the plates broadly dark, towards apex.

Described from numerous examples collected in Arizona by Prof. Gillette, to whom it is dedicated as a slight acknowledgment of the favor extended in placing all of his available material at our disposal.

A very distinct little species, slightly smaller and of more uniformly fuscous than *sanguinolenta*, shorter and darker than *uhleri*. Readily separated from either by the very distinct genitalia of either sex.

AGALLIA BIGELOVIA Bak.

Psyche, VII., 240, Sup., p. 26, 1896.

Form similar to *sanguinolenta*, but broader, more robust, color pale-grayish, obscurely marked with fuscous, spots on vertex and scutellum large, black. Length, 3 mm., width, 1.50 mm.; ♂ slightly smaller.

Vertex very broad and full, nearly half as long as pronotum, eyes much wider than pronotum. Face broad, genæ with a very slight constriction, then almost straight-margined to the clypeus. Front broad above and nearly parallel-margined, rounding below, but much broader than clypeus. Pronotum short and broad, lateral margin obsolete, humeral margin rounding, very oblique, elytra broad, not as strongly convex as in *sanguinolenta*, somewhat exceeding the abdomen. Venation slightly irregular.

Color: Pale yellowish-gray, vertex light, with two large round spots as in *sanguinolenta*, black, sometimes a broad, indistinct median line and a triangular spot next each eye connected with the ocelli by a slender line, reddish-brown, face pale, sutures and frontal arcs indistinctly reddish-brown. Pronotum gray, sometimes with indistinct longitudinal brown bands, scutellum with two black triangles just within the basal angles and extending forward under pronotum. Elytra pale-gray with fuscous nerves on the corium beyond the branching of the first sector, a few narrow fuscous lines on clavus.

Genitalia: ♀, ultimate ventral segment broad and short, posterior margin consisting of two lateral rounding lobes and two intermediate acuminate ones slightly narrower and shorter, their median incision reaching nearly to the base, pygofers broad and short. ♂ valve narrow, not more than half wider than long, margins parallel, disc inflated, convex, plates three times the length of the valve, sub-cylindrical at base, laterally compressed at apex, giving them a long, triangular appearance, pygofers much inflated, enfolding the base of the plates, rapidly narrowing to a point before the apex of the plates.

Lower California, Mexico; Winslow, and Albuquerque, New Mexico.

The original description was from a single female with much shorter elytra than the average. Readily distinguished by its stouter appearance and distinct genitalia.

AGALLIA CINEREA, n. sp.

Form of a small *sanguinolenta*, the vertex slightly longer and stronger, elytra even shorter and broader, about equaling the abdomen, pale-

yellowish cinereous above with two small points on vertex and sometimes the angles of scutellum black. Length, 2.5 mm., width, 1.25 mm.

Vertex stout and broad, one-half the length of the pronotum, slightly inflated in the middle, the posterior margin touching the pronotum. Face convex, moderately broad, the outer angle of the genæ obscure, frontal suture strongly rounding. Front broad, roundly narrowing, much broader than clypeus, clypeus narrow, parallel-margined, loræ more than twice longer than wide, longer than clypeus. Pronotum coarsely transversely rugose posteriorly, finely granulated just behind the eye, much narrower than eyes, more than twice wider than long, anterior margin broadly rounding, including two-thirds of the length, humeral margin very oblique attaining eyes, posterior margin short, roundly emarginate. Elytra short, slightly exceeding abdomen, the venation weak, apical cells short, the second often not separated from the first antepical, forming a long, narrow, slightly curved cell.

Color: Pale cinereous, much paler than in *uhleri*. Vertex touched with yellowish, two small round dots slightly farther from each other than from the eyes, black. Face pale creamy-yellow above with dark red ocelli, reddish below. Pronotum pale cinereous, unmarked. Elytra pale, sub-hyaline gray with light indistinct nervures.

Genitalia: ♀, ultimate ventral segment short and broad, shorter than in *sanguinolenta*, posterior margin slightly rounding with a faint median notch; ♂, valve very short and broad, posterior margin rounding, often nearly concealed under the ultimate segment, plates nearly twice longer than broad, roundly narrowing to the truncate dark-tipped apex.

Described from numerous examples from Iowa and Colorado.

The Iowa examples were taken at Little Rock and Sioux City in July, from high gravelly points where plants characteristic of the plain region, such as *Bouteloa*s and *Artemisia*s predominated and from which several other species of western Hemiptera were taken. The Colorado specimens were received through the kindness of Prof. Gillette.

Larva: Form of the larva of *sanguinolenta* nearly, head somewhat stronger, the dark bands almost wanting. Head broad, somewhat inflated, eyes wider than thorax, thorax narrow, the wing pads shorter, abdomen slightly carinate and curved upwards; color, creamy-white, two distinct spots on vertex as in adult. Face pale-reddish, pronotum light, a single oblique line on either wing pad, abdomen paler, not banded. Length scarcely 2 mm.

AGALLIA PEREGRINANS Stal.

Bythoscopus peregrinans Stal. Freg. Eugen. Resa. Ins., p. 291, 1859.
Berg Hemipt. Argent., p. 276, 1879.

Agallia peregrinans Berg. Addend. et Emend. ad. Hemip. Arg., p. 176,
1884.

While this species seems quite certainly to be an *Agallia*, especially from the description of Berg, lack of access to the original description of Stal leaves some doubt as to the specific determination. A species represented in our material by a number of examples from Southern California and Palo Alto, Cal., should probably be referred here and they would fall under the third division of the synopsis next to *sanguinolenta*, from which they may be separated by the larger size, longer elytra, and female segment and the tubular plates in the male.

 DESCRIPTIONS OF EARLY STAGES AND NEW SPECIES
OF BYTHOSCOPIDÆ.

MACROPSIS APICALIS n. sp. (Plate II., Fig. 1.)

Form of *robustus* nearly, somewhat larger, elytra longer; green, the elytra sub-hyaline with green pubescence, infuscate at the apex. Length, ♀, 5 mm.; ♂, 4.5 mm.; width, ♀, 1.8 mm.; ♂, 1.3 mm.

Vertex over three times wider than long, as long as the eye, margins parallel, slightly curved, anterior margin rounding to the face, face half wider than long, front tumid, clypeus and genæ flat. Pronotum large, two and one-half times the length of the vertex, twice wider than long, side margins very long, carinate, surface with fine but distinct transverse striations, scutellum large, transversely striate, elytra full three times longer than wide, margins nearly parallel, less convex than in *robustus*, clavus with the apex obliquely truncate, inner apical cell wanting, confluent with the broad appendix, the marginal nerve becoming obsolete not far from the base, fourth apical cell narrow at the apex, next two short, broad behind, three antepical cells, the outer one smallest, whole surface of elytra except the broad appendix clothed with short, remote hairs.

Color: Bright-green, pronotum shiny, elytra appearing lighter from the reflection of the light-green hairs, the apex of clavus, tip of