

NEW SPECIES, DIMORPHIC FORMS AND EARLY STAGES
OF JASSIDÆ.

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DORYCEPHALUS VANDUZEI n. sp. (Plate VI., Fig. 2.)

Remarkably long and slender, ten times longer than wide, pale yellow with a greenish reflection. Form nearly of *D. baeri* but much longer, as long as *D. platyrhynchus* but much narrower, elytra much shorter than in either species. Length, 13-14 mm.; width, 1.25 mm.

Brachypterous form: Female, head long, foliaceous, three and one-half times the length of pronotum, nearly as wide as across eyes, very slightly narrowing before the obtusely rounding apex, apex very slightly elevated, a distinct median carina and a lesser one slightly nearer this than the eye on either side, the latter fading out anteriorly, ocelli on the margin before the eye. Front very broad and inflated on the clypeus, broadening to a point before the eyes, then narrowing slowly to near the apex of head, convexly inflated, obliquely ribbed, and thickly beset with coarse hairs on the sides; broadly, concavely, longitudinally depressed in the middle as in *baeri*. Clypeus broad, hairy, slightly longer than wide; genæ, broad at base below eye, then excavated to the lateral angles, which are almost rectangular. Pronotum one-half wider than long, two parallel longitudinal depressions near the middle, lateral margin parallel, carinated, anterior margin broadly shallowly emarginate, the lateral angles obliquely cut off against eye, posterior margin rather deeply angularly emarginate. Elytra short, reaching only to the base of the third abdominal segment, broad at the base, rapidly narrowing to the roundly divergent apices, venation simple, claval veins united posteriorly, second sector forked near base, first sector forked near apex, apical cells small, irregular; abdomen long, broader than pronotum near base, tapering to the long attenuate pygofers; legs small, inconspicuous, fore and middle femora much dilated near base, their width equalling more than half their length.

Color: Pale straw-yellow with an iridescent greenish tinge especially noticeable on the vertex, a small black spot on the vertex just inside the reddish eye on either side, another on the middle of the posterior margin and a fourth on the median carina a little over one-third the distance to the apex, a small spot near apex of scutellum, four black spots on each abdominal segment arranged in two dorsal

rows, another larger lateral one on the base of each segment on either side, forming a lateral row.

Genitalia: Ultimate ventral segment long, convex, the posterior margin very slightly produced on the middle half, pygofer remarkably long, extending beyond and entirely concealing the ovipositor, their acute tips compressed above, slightly divergent below, and fringed with fine hairs.

Described from two females collected at Little Rock, Iowa, July 1, 1897.

The genus *Dorycephalus* was founded on two female examples described as *D. baeri* from Southeastern Russia, and up to the present time the male has not been described. The only other species of the genus so far described, and the only one of which the life history or the male is known, is *D. platyrhynchus*. The examples of *D. vanduzeei* were swept from high prairie land where the only grass with a stem apparently large enough to support them was *Sporobolus cuspidatus*. If the life history is similar to that of *D. platyrhynchus* these were the last of a brood, the males having all disappeared some time before. From our knowledge of the latter species it may be inferred that the males will be smaller, dark colored and with a shorter head, long elytra and fully developed wings, and that there will also be a macrop-terous form of the female occurring in limited numbers and soon disappearing, while the brachypterous form, which is still clumsier than that of the *D. platyrhynchus*, probably rarely leaves the original host plant.

DELTOCEPHALUS IMPUTANS n. sp.

Form very similar to *albidus* or *reflexus*, vertex as long and even more sharply margined than in *reflexus*, creamy-yellow above with two small spots on the tip of the vertex and four dashes margining the reflexed veinlets, black. Length, ♀, 4mm.; ♂, 3.50 mm.

Vertex nearly half longer than wide, twice longer than against eye, acutely angled, disc flat or slightly depressed, margins sharp, tip thickened, slightly elevated, a slight transverse furrow just behind ocelli on the upper edge of the margin nearly one-fifth the distance from the eye to the tip. Front, similar to *albidus*, less than twice wider above than on clypeus, side margins nearly straight and continuous with those of clypeus, genæ rounding or but slightly angled. Pronotum two and one-fifth times wider than long, curvature of front margin, about half its length, posterior margin shallowly emarginate,

the lateral margins short and oblique. Elytra short, slightly coriaceous, equalling the abdomen in length, flaring, appendix wanting, never overlapping at rest, usually parted by the elevated tip of the abdomen. Venation similar to *reflexus* on the corium, the two outer veinlets strongly reflexed to the costa, the third at nearly right angles and with the base of the apical cells forming a line across to the apex of clavus, outer anteapical cell small, pointed behind, sometimes wanting, the second cross nervure frequently wanting, veins on clavus nearly parallel, without cross nervures.

Color: Above, creamy-yellow tinged with olive. Vertex with the median black line extending nearly to the tip, a spot on either side of the white tip and a faint narrow line on the margin between these and the red ocelli, black, eyes reddish-brown. The three reflexed veinlets broadly white, margined in front with black which also extends along the costa the same distance before them, third apical with its outer margin broadly black. Below, face black, sometimes with a light spot on the apex of front sending off a narrow line curving around the loræ to the angles of the genæ; legs, femora black except tip, tibiæ and tarsi yellow, spotted or annulated with black, tergum and venter more or less infuscated.

Genitalia: ♀, ultimate ventral segment half longer than penultimate, two and one-half times wider than long, narrowing posteriorly to the slightly acute lateral angles, posterior margin, emarginate next the angles, broadly produced in the middle with an acute notch and a black spot either side, pygofers broad at base, constricted before the tip, their sides armed with stout spines. ♂, valve triangular, over twice longer than ultimate segment, nearly as long as broad, constricted near the base and again just before the produced apex, black, narrowly margined with light, plates narrower at base than valve, elongate, twice the length of valve gradually narrowing to the divergent rounding tips which are nearly half the basal width, pygofers inflated at base, flatly compressed at the apex and extending considerably beyond the plates.

Described from thirty-two examples collected at Ames, Iowa.

Larvæ, very similar to those of *reflexus*, lighter and less distinctly marked, light-brown with three stripes and the margins white, upper half of face dark, vertex twice longer in the middle than next the eye, acutely angled, disc flattened, body long, tapering to an acute point.

Color: A median stripe from the tip of the vertex to the tip of the abdomen, widening behind, a stripe on either side margining the eyes

and extending back to the penultimate segment of the abdomen, and the broad lateral margins from the eyes back, white, the outer brown stripe on the abdomen is the darker and bears a row of hair-bearing white spots, one on each segment. Below white; eyes, the upper half of the face, a row of spots along the connexivum and spots against the spines on the hind tibiae black.

Life History: A few adults were taken in July, no more being found until the larvæ which were found in August issued in September. From this it is probable they are two-brooded, adults issuing in June and again in August, the ones taken in July being the last of the spring brood. Larvæ and adults were both found exclusively on a *Muhlenbergia* probably *glomerata* growing in a sheltered but not shaded situation.

Readily separated from any other of the reflexed-vein group by its yellow color and absence of markings above, as well as by the genitalia. Its place is evidently between *reflexus* and *producta* Walk., (given as *bilineata* in the Synopsis) as in the latter species the second cross nervure is often wanting, in which case the venation is almost identical with *Scaphoideus*, and although these are unquestionably good *Deltocephalus* species it would seem to indicate a closer relationship for these genera than has been given heretofore.

DELTOCEPHALUS CRUCIATUS n. sp.

Form of *signatifrons* nearly, but smaller, smaller than *weedi*, light-grayish with brown and white markings on vertex, forming a white cross on a brown field. Length, 2.75–3 mm.; width, 1 mm.

Vertex flat, width at base and length equal, two-thirds longer on middle than next the eye, apex nearly rectangular, margin either side nearly straight. Face longer than wide; front broad, wedge-shaped, twice longer than clypeus, less than twice wider above than below, clypeus large, margins continuous with those of front, genæ roundly angled, broadly margining the loræ below. Pronotum less than half wider than long, equalling the vertex in length, anterior margin broadly curved, posterior margin nearly straight, humeral margins rounding nearly to the eye, elytra moderately long and narrow, equalling or exceeding the abdomen, with an appendix, venation nearly as in *signatifrons*, outer claval vein with a cross nervure to the suture near the base, central anteapical cell elongate, constricted, but not divided, outer anteapical small or wanting.

Color: Vertex with brown spots leaving a light-yellowish marking as follows: A broad line on the anterior margin and extending back along the eye, a median light stripe broadest at the base, near which it gives off two branches which curve away to the middle of the eye; midway between these and the apex are two short projections at right angles, forming a Greek cross in white on a dark brown field. Front brown with light arcs, rest of the face light-yellowish with brown sutures. Pronotum yellowish-olive, irregularly marked with brown on the anterior half; sometimes four light olive stripes are evident. Scutellum yellow with black markings on the disc and inside the basal angles; elytra subhyaline, the nervures broadly white, margined inside the cells with fuscous except along the basal part of the costa; tergum black, margins yellow, below brownish.

Genitalia: ♀, ultimate ventral segment twice wider than long, anterior and posterior margin parallel, pygofers stout, moderately long, brown, with small white spots, each bearing a slender bristle: ♂, valve broad and short, rounding behind, plates broad at base, wedge-shaped to the truncate tips where they are one-third as wide as at the base, side margin straight, thickened, clothed with coarse white hairs.

Described from thirty-two specimens, Little Rock, and Ames, Iowa.

This species will fall in the second group of *Deltocephali* with *signatifrons* which it will follow; the outer anteapical cell is elliptical as in that species but smaller, sometimes wanting. It may be readily separated from *signatifrons* by the absence of the tooth on the female segment and the wedge-shaped plates of the male.

DELTOCEPHALUS OBTECTUS n. sp.

Form and ornamentation of *D. weedi* nearly, lighter in color, vertex more produced, longer and narrower than *D. compactus*. Length 3-3.5 mm. Width 1-1.25 mm.

Vertex convex, point much produced, anterior margin strongly concave either side of apex, side margins oblique, length on middle equalling width at base. Face, width and length about equal. Front large, side margins convex, clypeal suture distinct, straight, half as long as width of front, clypeus broad, sides straight, genæ emarginate below eyes, outer angle strong but rounding. Pronotum as long as the vertex, twice wider than long, humeral margin strongly oblique, side margin short, anterior margin much produced between the large straight-margined eyes. Elytra exceeding the abdomen in length,

rather narrow. Venation nearly as in *weedi*; inner claval nervure strongly arcuated, joined to the outer nervure by two cross-veins, one at the middle and another at the tip, a number of transverse veins between the outer claval nervure and the suture, central anteapical cell long, constricted in the middle and divided by a broad transverse vein, a number of irregular veins along the costa.

Color: Light grayish, maculate, with a broad interrupted crescent across the middle of the vertex and several spots on the anterior margin of the pronotum black. Vertex light-yellow, a transverse interrupted crescent across the middle of the disc, a narrow line extending back from the point of interruption on either side of a median impressed line, black, a pair of rectangular spots just inside the ocelli before the crescent, another longer pair just back of the produced white-tipped apex and a curved line on the margin either side of the apex, dark reddish-brown, a large irregular circle back of the crescent on either side brownish, ocelli red, broadly margined with white, eyes dark, their inner margin reddish. Face, brownish olive, with the suture darker and lighter arcs on the front. Pronotum grayish olive with an irregular black mark from behind either eye running towards the disc, and a concave row of points between the inner angles of the eyes black, scutellum light yellowish, a black spot just inside either basal angle and usually some markings on the disc, black. Elytra light, nervures broadly white, cells margined with fuscous, which is usually emphasized on the middle of the clavus, just inside the middle of the corium, and in three spots on the costal margin. Below, light in female, dark in the male, legs light, anterior femora annulate with black.

Genitalia: ♀ ultimate ventral segment, with an additional membrane as in *compactus* the outer one, half as long as its width at the base, the side margins rounding to the nearly truncate apex and disclosing the outer corners of the second membrane apex elevated over the base of the ovipositor and usually marked with dark: ♂, valve large, triangular; plates small, about twice the length of the valve, broad at the base, rapidly rounding to the produced attenuate points, margin with a few long light bristles; pygofers longer, the plates acuminate at the apex, densely clothed with coarse bristles.

Described from numerous specimens.

This neat little species is closely related to *weedi* and *compactus* and would fall between them in the synopsis. It may be readily separated from either by the absence of the reddish-brown color so characteris-

tic of those species. In color it approaches *cinereus*, but is quite distinct structurally. The genitalia are quite distinctive and will readily separate it from either of the above named species.

DELTOCEPHALUS COLLINUS Dahlb.

Form of *melsheimeri*, nearly related to *D. monticola* but larger, larger than *melsheimeri*. Length, ♂, 3.3 mm.; ♀, 4 mm.; width, 1 mm.

Brachypterous form: Vertex flat, obtusely angled before, width and length about equal, slightly more than half longer against eye than on middle, anterior margin concave between the ocelli and the tip, the outline, however, obscured by the rounding front, front transversely convex, twice wider above than on clypeus, one-third longer than wide, clypeus half longer than wide, genæ scarcely angled below the eyes, broadly margining the loræ below and attaining the apex of the clypeus, pronotum two and one-half times wider than long, shorter than vertex, anterior margin broadly rounding, posterior margin shallowly emarginate, side margin short, not carinate. Elytra narrow, shorter than abdomen, the tips divergent from the apex of the clavus, reaching to the base of the penultimate segment, venation irregular, the apical cells minute or wanting, the two inner anteapicals large, outer very small or wanting. Wings proper, rudimentary.

Color: Green, with brown eyes and a grayish-olive vertex, vertex with a light median stripe enclosing the usual dark impressed line, a light stripe next each eye and a short one on the middle of face on either side, face olive-brown with dark sutures and light arcs, tip of rostrum black, anterior margin of pronotum light-green, posterior portion of disc darker, sometimes longitudinally striped with fuscous, elytra green, nervures lighter, tip hyaline, posterior margin of abdominal segments light green, disc green with slight fuscous markings, under side with a silvery sheen, disc of abdominal segments black, sometimes a median light line.

Macropterous form: Structural characters as in the preceding form, except that the side margins of the pronotum are shortened, allowing more freedom to the elytra. Elytra long, narrow, reaching the tips of the pygofers, margins nearly parallel, the tips obliquely rounding and slightly reflexed, giving the insect a linear aspect. Venation distinct, slightly irregular, discoidal cell formed by the branching of the first sector, long and narrow, outer anteapical cell very small, oval, apical cells large, the second one long, wedge-shaped, curved, usually a few

irregular nervures running to the costa from the first sector, under wings as long as elytra, folded.

Genitalia: ♀, ultimate ventral segment twice wider than long, longest on the rounding lateral lobes, middle half of the posterior margin roundly emarginate, with a median roundly triangular tooth, emarginate portion four times the width of the base of the tooth, tooth and lateral lobes light, lateral margins of emargination sharply black, pygofers long, slightly exceeding the ovipositor, thickly beset with stiff bristles: ♂, valve triangular, twice wider than long, plates convexly widening from the base, then concavely narrowing to the obtuse, obliquely divergent apices; pygofers long, compressed, extending beyond the plates, their tips and sides studded with strong spines.

Described from numerous specimens swept from *Sporobolus* at Little Rock and Sioux City, Iowa, July 1-7, among which were six macropterous females. One macropterous female was received from Prof. Gillette and another is in the V. D. collection, both from Colorado.

The brachypterous form can not be confounded with any other described North American species. The macropterous form superficially resembles *melsheimeri* but may be readily separated by the genitalia, the extreme length of the abdomen or by the strikingly parallel appearance of the costal margins of the elytra. Though not agreeing in every respect with Fieber's drawings, yet on comparison of our specimens with European examples from Dr. Melichar it was found that no such differences existed, and it would seem that Fieber's drawings were not exact.

DELTOCEPHALUS OBESUS n. sp.

Form and appearance of *signatifrons* nearly, but with the vertex shorter and rounder and with a row of black spots on the anterior margin. Length of body, ♀ 2.75 mm., ♂, 2.25 mm.; width, 1.5 mm.

Brachypterous form: Vertex broad and short, width at base and length about equal, two-fifths longer on middle than at eye. Face broad, convex, broadest across antennal pits, rounding slightly above, more rapidly below to the narrow clypeus; clypeus nearly twice longer than broad, suture obsolete, genæ narrow, outer angles rounding. Pronotum broad and flat, more than twice wider than long, length equalling that of the vertex, anterior margin broadly evenly rounding, humeral margins straight, oblique, side margins distinct, carinate.

Elytra short, half longer than broad, not quite covering the fifth abdominal segment, obliquely truncate from apex of clavus, the outer corner rounding, apical cells minute or wanting; wings rudimentary. Abdomen stout, ultimate tergite much enlarged, overlapping the pygofer, a deep transverse furrow before the posterior margin in the female.

Color: Grayish olive with indistinct brownish maculations above, all dark below; vertex, basal two-thirds olive brown with a large obscure brownish spot on either basal half, a brown line anteriorly margining a white spot against either eye and continuing faintly across the disc, a broad margin before this line yellowish white, with four dark spots in a row between the prominent reddish-brown ocelli. Front dark brown with light arcs and a light dash below, clypeus light yellow with a large brown spot on the disc below, rest of face light with heavy dark-brown sutures. Pronotum nearly unicolorous, in strongly marked specimens five longitudinal light stripes appearing. Elytra sub-hyaline, the nervures light with narrow fuscous margins, usually a dark spot behind the middle of the clavus, another behind the first cross-nervure on the corium, and a third one on the costal margin in line with the other two; abdomen black, last dorsal segment broadly yellow, with two approximate black spots near the anterior margin, pygofer black on base and sides above, apex yellow; below all black except legs, which are more or less yellow on the other margins.

Macropterous form differs only in that the elytra and wings are fully developed, exceeding the abdomen by one-half mm.: Venation; veins on clavus with only one cross-nervure, apical cells long, central anteapical cell long, divided, the posterior part entirely beyond the apex of clavus, outer anteapical narrow, giving off a costal veinlet at either end.

Genitalia: ♀, ultimate ventral segment moderately long, slightly narrowing on the sides, outer angles cut off obliquely, posterior margin truncate, but so strongly elevated in the middle behind as to appear to be angularly emarginate from the outer angles, pygofer short, stout, equalling the ovipositor, clothed with a few short spines; ♂, valve twice wider than long, rounding exposed part of plates scarcely as long as valve, their tips rounding half the width of the valve, side margins nearly straight, oblique, pygofer extending much beyond the plates, their tips armed with a whorl of long bristles.

Described from three macropterous and three brachypterous examples, two examples from Texas (Aaron), three from Orizaba, Vera Cruz (Osborn), and one from Arizona (Gillette).

LONATURA n. g.

Head conical, slightly obtuse, more than three times wider across eyes than length on the middle of vertex, curvature of posterior margin about one-half that of anterior. Front two and one-half times wider than on clypeus, width and length about equal, clypeus broad, parallel-margined, thorax broad, distinctly angled within, genæ rather narrow, roundly angled, extending very narrowly below loræ to clypeus. Pronotum scarcely as long as vertex, nearly truncate behind, humeral margin straight, nearly meeting the eye, which curves around the lateral margin. Abdomen normal in form, ovipositor very long in female, extending beyond the pygofer, occurs in two forms; macropterous with fully developed elytra and wings reaching well beyond the abdomen. Elytra long and narrow, the costal margin nearly straight, appendix large, venation obscure, veins on clavus nearly parallel, united by a cross-nervure, the two branches of the outer sector again uniting after the forking of the inner branch and then forming only two anteapical cells, of which the outer is the larger, inner three apical cells greatly elongate, as long as the anteapicals, outer two on the costal margin smaller; in this form the scutellum is very large and strong. *Brachypterous form* in which the elytra only cover the second abdominal segment and the wings are rudimentary, the elytra are twice wider than long, broadest at the apex, venation obscure, the inner branch of the outer sector forking again before the apex, forming a single closed cell. In this form the pronotum covers the base of the elytra and most of the scutellum.

LONATURA CATALINA n. sp. (Plate IV., Fig. 2.)

Form and general appearance of *minuta* V. D. nearly, occurs in two short and one long-winged forms. Length of body, ♀, 2.25 mm.; ♂, 1.85 mm.; width .9 mm. Length of macropterous form, 2.75 mm.

Macropterous form. ♀, vertex convex, the anterior margin rounding to the front, breadth at base and length about equal, over half longer on middle than next eyes, whole surface coarsely granulose, front very broad, transversely convex, sides rounding, rapidly narrowing just before the clypeus, clypeus parallel-margined, nearly half the length of the front, loræ subovate angled internally, genæ narrow, angles rounding. Pronotum scarcely as long as the vertex, half its length included in the curvature of the anterior margin, posterior margin shallowly emarginate, humeral margin scarcely oblique, disc pos-

teriorly obscurely transversely rugulose, scutellum very large, broadly triangular. Elytra long and narrow, overlapping behind, apical cells greatly elongate, the apex of clavus scarcely farther from apex of scutellum than from the apex of the wing.

Color: Vertex and face obscure yellowish, ocelli and disc of eyes black, margin of eyes, pronotum, scutellum and elytra olive-buff, sometimes with a metallic-brown reflection; tergum dark; below light, except ovipositor, which is invariably black.

♂ slightly smaller than female. Color: Vertex and face yellow, pronotum and scutellum yellowish-brown, elytra a deep smoky-brown with a metallic reflection, abdomen black, legs smoky.

Brachypterous form: ♀, form as above nearly, except elytra, head slightly more pointed, pronotum longer, overlapping the bases of the elytra and scutellum, elytra short, truncate, twice wider than long, abdomen rather long, all but the first two segments exposed; ultimate dorsal segment longer than the preceding, nearly as long as the pygofers, which are exceeded by the ovipositor. Color entirely and uniformly lemon-yellow except for the ocelli, eyes and ovipositor, which are black.

♂, form of the preceding female, except for the much shorter abdomen, last dorsal segment not differing from others, pygofers above very short, tipped with a brush of coarse hairs, color entirely and uniformly orange-yellow, except for the black eyes and ocelli.

♂ var. Color: Vertex and face yellow, pronotum and elytra deep smoky-brown, abdomen brownish-black, legs and bristles on tip of pygofers yellow.

Genitalia: ♀, ultimate ventral segment over three times wider than long, posterior angles a little rounding, posterior margin shallowly emarginate with a short roundly bilobed process usually wider than long, pygofers stout, two and one-half times wider than long, slightly exceeded by the black ovipositor. ♂ valve very small, posteriorly rounding, plates small, triangular, their apices narrowly produced, about twice longer than the valve, pygofers short, armed with stout bristles that equal the plates.

Described from numerous examples of all the forms from Burlington, Ames, Sioux City and Little Rock, Iowa, and from Yankton, S. D.

Larva: Form very similar to the brachypterous female, head slightly larger for the size of the body, body tapering regularly to apex of abdomen, wing-pads inconspicuous; color, light-yellowish, almost white during the first moult.

Life History: This species appears to be confined to the species of *Sporobolus* that form mat-like patches of grass, and on these they occur in marvelous abundance. The larvæ appear before the middle of May and are similar in appearance to the short-winged females, nearly white when small, becoming a light lemon-yellow by the time they are full grown. From these larvæ both long and short-winged adults follow before the middle of June. The short-winged forms are the most abundant and remain through July, depositing eggs for the second brood. The long-winged forms only remain a few days on the spot where they issued, but disperse to start new colonies. The second brood of larvæ appear in July and become adult in August, remaining through the autumn. The long-winged forms seem to be fewer in fall than in spring.

This is the most remarkably polymorphic species of *Jassida* that has as yet been found, there being five distinct color variations, and two distinct structural types, these scarcely varying in the hundreds of examples studied. It seems remarkable that so abundant and interesting a species should have remained so long without notice.

LONATURA? MEGALOPA n. sp. (Plate IV., Fig. 1.)

Form and general appearance similar to *A. artemisiae*, but differing in venation, markings and wing length; head bluntly roundly pointed, yellow, with an interrupted black band before the eyes, pronotum and elytra grayish-olive, abdomen black with white rings. Length, 3 mm.; width, a little more than 1 mm.

Macropterous form: Vertex half the width of head, one-third wider than length on middle, twice wider than against eye, disc convex, sloping, anterior margin broadly rounding to the face, ocelli well over the margin not far from the eyes, face broad and short, front convex in both diameters, gradually narrowing with nearly straight margins to the loræ, then rounding rapidly to the long straight-margined clypeus, suture with clypeus distinct but not depressed, loræ narrow, genæ roundly angled, rather broad below the loræ. Pronotum very little longer than vertex, very broadly rounding in front, twice wider than long, side margins strong, humeral margins rounding. Elytra more than twice longer than wide, overlapping behind with a distinct appendix reaching a little beyond tip of abdomen, sub-hyaline with broad light nervures narrowly but distinctly margined with brown, apex with

a narrow fuscous band. Venation distinct, claval nervures nearly parallel, the outer one joined to the suture by a cross-nervure before the middle, inner branch of first sector joined to the second by two cross nervures, central anteapical cell elongate posteriorly, constricted in the middle and divided by a cross-nervure, posterior portion broadest, anteapicals on either side short, the inner one larger and diamond-shaped.

Color: Above grayish olive, nervures of elytra lighter with narrow brown margins, eyes black, vertex yellowish-olive; a medially interrupted transverse black band, widest at the margin, arises just before the eyes and above the white-margined ocelli; tip with two median black spots formed by the median light line and a yellowish transverse arc. Front brownish-olive with pale arcs, lower part of face decidedly yellowish, legs yellow, tergum and venter black, the posterior margins of the segments lined with white.

Brachyterous form: Structurally as above except that the elytra are scarcely longer than broad, truncate behind, only covering the third segment of the abdomen, the under wings rudimentary; the venation is nearly the same as on the basal part of the long wing, though it is cut off just back of the cross-nervure. In some examples there is a nervure just within the apical margin but no apical cells. Color as above with a slightly reddish cast; behind the elytra the abdomen is shining black with broad white margins to the segments.

Genitalia. ♀ ultimate ventral segment about three times wider than long, the lateral margin rounding in to the lateral angles, posterior margin shallowly excavated nearly its entire length with a broad truncate or slightly notched median tooth equalling the lateral angles, pygofer stout, not inflated, tipped with stout yellow hairs that exceed the ovipositor.

♂ abdomen rather long, valve broad and short, not longer than the ultimate segment, plates wider than valve at base, rapidly roundly narrowing to the long attenuate points, margined with stout hairs, pygofer broad at base, short and rounding behind.

Described from nine males and thirteen females collected from a high knoll at Little Rock, Iowa, July 2d.

This species does not appear to be strictly congeneric with *catalina*, but more nearly related here than to any existing genus. Its generic value seems still too uncertain to warrant the formation of a new genus.

DRIOTURA, n. g.

Head short, transverse, obtusely conical, vertex over twice wider than long, anterior and posterior margin nearly parallel. Eyes large, two-thirds the width of the vertex, slightly wedge-shaped, broadest next the vertex, narrowing and curving back around the sides of the pronotum. Face broad and short, front narrowing to one-half its former width on clypeus, conically inflated and slightly reflexed onto the vertex above, giving the impression of a pointed vertex with the ocelli back of the margin as in *Tinobregmus*. Clypeus short, parallel-margined, genæ broad and strongly angled. Pronotum short, slightly longer than vertex, transversely striated on posterior two thirds, posterior margin nearly straight, the lateral margin continuing around and below the eye as in *Jassus* without a lateral carina; abdomen short in male, much inflated in the female, suddenly narrowed to the long pygofers, which are considerably exceeded by the slender ovipositor. Legs stout. Elytra coriaceous, coarsely rugose, occurring in two forms:—*brachypterous*, in which their truncate tips scarcely cover the second segment of the abdomen, as wide or wider than long, the costal margin being curved around under the abdomen, extending broadly below the line of the eyes, anterior margin covered by the pronotum, — in this form the wings are rudimentary:—*macropterous*, in which they extend nearly to the tip of the ovipositor, broadly rounding behind. In this form the wings are fully developed and the pronotum is emarginate at the humeral angles, allowing freedom of motion to the elytra.

DRIOTURA ROBUSTA n. sp. (Plate IV, Fig. 4.)

Brachypterous form: Size and form of *D. gammaroidea* V. D. nearly, slightly smaller and with longer vertex, mottled-gray with a transverse light band on pronotum and another on face. Length, ♀, 3–3.5 mm.; ♂, 2.75 mm.; width, 1.25 mm.

Vertex narrow, transverse, nearly parallel-margined, twice wider than long, anterior margin rounding on the sides, confused with the produced front in the middle, surface finely granulated, eyes triangular, laterally narrowing and curving around the pronotum; face broad, rounding, moderately short; genæ broad, their outer angles distinct; front parallel-margined above, then regularly narrowed to the clypeus, broadly produced above and confused with the vertex; clypeus parallel-margined, slightly longer than broad, loræ regularly rounding, as

wide as the clypeus. Pronotum short, nearly four times wider than long, posterior margin nearly straight, slightly medially emarginated laterally, broadly rounding below and behind the eyes, touching the genæ, posterior two-thirds finely transversely striated, anterior margin finely granulated. Scutellum very small, tumid, triangular. Elytra coriaceous, coarsely shagreened, nearly square, convex, the costal margin extending down and around the pleura, anterior margin entirely concealed by the pronotum, venation obscure, apparently consisting of about eight nearly parallel slightly oblique nervures, the outer one forked beyond the middle, a broad space between it and the thickened costal margin, the third nervure from the inner margin just attaining the inner posterior angle and probably representing the claval suture. Abdomen broad, convex in both diameters, and in the female rapidly narrowing posteriorly to the narrow pygofer, which are roundly emarginate above to receive the exerted attenuate ovipositor.

Color: Vertex with variable markings of light-yellow and black; usually the following light markings may be made out: A narrow arcuated transverse line marking the boundary of the vertex and front, a median longitudinal line, a line on the posterior margin of vertex and bordering the eyes behind, an irregular line running forward from the posterior margin just inside the eye and a small spot in the middle of the disc on either side. Face light above with several concentric dark arcs, which deepen and coalesce below, forming a dark band which includes the antennal pits, below this a broad transverse light band including the apex of front and the superior half of the clypeus, and extending around on the genæ under the eye to join the band on the pronotum, the apex of clypeus, a small spot in each basal angle, the facial sutures and the lower margin of the genæ dark. Pronotum with the anterior third irregularly black, the remainder consists of a transverse light band which runs down on the lateral margin to connect with the light band on the face. Elytra, with the nervures and numerous irregular ramose lines connecting them, light, the interspaces dark with finely maculate effect. Abdomen finely maculate, darker than elytra, below dark fuscous to black, ovipositor and spines on tibiæ reddish.

Genitalia: ♀, ultimate ventral segment twice longer than penultimate, posterior angles rounding, posterior margin nearly straight, sometimes medially elevated, pygofer long, wedge-shaped, much exceeded by the narrowly compressed oviduct, which is over half the

length of the abdomen. ♂, valve short, rounding, sometimes almost concealed by the broad ultimate segment, plates broad at base, the inner margins rounding, outer margin emarginate and impressed near the middle, tips obtuse, widely separated.

Described from eight examples from Sioux City and Little Rock, Iowa, collected by the authors, and four examples from Colorado, received from Prof. Gillette.

Larva: Similar in form to adult, reddish-brown with light markings, a light band on the face as in adult and another on the fourth abdominal segment, vertex slightly longer and more angled than in the adult, reddish-brown irregularly maculate, usually a pair of light spots between three dark ones on the anterior margin and a lighter spot against either eye, pronotum dark-brown with the anterior margin irregularly light, wing-pads brownish with a light spot just inside the posterior angle. Abdomen reddish with four longitudinal rows of light-colored bristle-bearing papillæ, transverse light bands occupying fourth segment continuing obliquely backward under the margin on either side of the seventh. Below, dark, a transverse light band on face below eyes as in adult; legs dark brown or black, fore and middle tibiæ and a narrow line including the spines on posterior tibiæ yellow.

Life History: The species is probably two-brooded as larvæ and freshly issued adults were collected the first week in July, and larvæ again late in the fall, indicating a life history very similar to that of *gammarioidea*.

DRIOTURA GAMMAROIDEA V. D. (Plate IV, Fig. 3.)

Short compact form with a bluntly conical head, stout body and a broad convex abdomen, in the female tipped with a long exserted ovipositor. Length, ♀ 3.5–4 mm; ♂, 3 mm. Width, 1.25–1.5 mm.

Brachypterous form: Vertex twice wider than long, the anterior margin slightly more convex than the posterior; front obtusely convexly inflated above, not so strongly as in *robusta*, ocelli distinctly on the dorsal aspect; clypeus oblong, parallel-margined, medially carinate on the basal portion; eyes wedge-shaped, narrowing outwardly; pronotum short, transverse; posterior margin nearly straight and overlapping the elytra, lateral margin compressed anteriorly beneath the curvature of the eye, posteriorly broader and extending around to the genæ below. Elytra coriaceous, coarsely rugose, convex, their costal margin enclos-

ing the pleura, together much wider than long, widening back from the pronotum to their roundly truncate tips which scarcely cover the second abdominal segment. Abdomen beyond elytra very broad, convex, rapidly tapering posteriorly.

Color: Usually entirely glossy black, except the spines on tibiae, reddish-brown, sometimes a narrow line on posterior margin of the pronotum, a somewhat broader one in front of the ocelli, the legs and the ovipositor in the female reddish-brown.

Brachypterous var. *flava* differs from above in color as follows: elytra, last two abdominal segments, genitalia, legs and sometimes the facial suture and a narrow margin around eyes, bright tawny yellow.

Macropterous form: Thorax much stronger, the pronotum with the lateral margins shorter from the emargination of the humeral angles, allowing greater freedom to the elytra, eyes less recurved laterally. Elytra fully developed, reaching nearly to the top of the exerted ovipositor, widest before the middle, the costal margin rapidly narrowing to the humeral attachment, coriaceous in texture obscuring the apparently weak venation except for the inner apical cells, which are subhyaline with straight dark nervures; wings fully developed, as long as the elytra.

Color: Black, ovipositor and legs tinged with reddish-brown.

Genitalia: ♀, ultimate ventral segment parallel margined, two and one-half times wider than long, disc slightly convex. pygofer long, wedge-shaped, ovipositor slightly longer than in *robustus*: ♂, valve broad, rounding; plates broad at base, broadly convexly pointed, divergent from the base, outer margin medially impressed.

Specimens of both brachypterous forms are at hand from Wyoming, Colorado, Kansas, and Iowa; of the macropterous forms from Iowa only.

Larva: Form of the adult nearly, vertex slightly more pointed, depressed either side middle of the disc posteriorly, a transverse impression before the eyes, facial sutures and two anterior pair of tibiae sometimes reddish, abdomen with moderately coarse bristles, legs stout.

Life History: The species occurs only on the wild grasses of the higher prairie land, is two-brooded, the first brood appearing in early spring from larvæ that have hibernated, larvæ again appearing in June; second brood adults in July and August, larvæ again appearing in the fall, becoming nearly full grown to pass the winter.

ATHYSANUS CURTISII Fitch. (Plate V., Fig. 1.)

The life history of this species was outlined in the *Life Histories of Jasside* (Proc. Ia. Acad. Sci., IV., p. 221), but the figures presented at this time will be of service in comparing the different species.

ATHYSANUS BICOLOR Van D. (Plate V., Fig. 2.)

The life history of this species has also been discussed with that of the preceding species, but some details of life history remain to be determined. The figures will serve for comparison with related forms.

ATHYSANUS STRIATULUS Fall. (Plate V., Fig. 3.)

A rather slender species with long wings reaching well beyond the abdomen, about one-sixth of an inch to the tip of the wing in the female, the male being shorter and much smaller, testaceous-brown with dark markings on pronotum and wings, head shorter than pronotum, markings arranged in about three interrupted rows, sometimes obscure.

The larvæ are narrow brownish forms with a slightly more pointed head than the adult, the dark markings are nearer the margin except two spots near the base; there is a row of spots across the pronotum, two pair of large spots on the wing-pads and a smaller pair between the posterior ones.

This species is found abundantly over the prairie grass areas in different parts of the state. The larvæ were found very common the last of May and on into June. The males began to appear by the middle and the females a week later; the males disappeared by the second week in July, the females remaining until into August, the eggs having been deposited before the end of July.

ATHYSANUS STRIOLA Fall. (Plate V., Fig. 4.)

This species somewhat resembles the preceding in size and the striations of the head, but is otherwise quite distinct. The head is much broader than the body, which tapers back to the narrow tip of the wings.

Color: Green tinged with yellow, a narrow black line across the head between the ocelli and the margin black, sometimes a curved line on the pronotum dusky.

The larvæ are olive-brown with markings almost as in the adult, the head is more strongly pointed and there are two dots between the black spot and the margin and two more against the eyes.

This species occurs only in low swampy places; a few full-grown larvæ and an abundance of adults were found the middle of August on a low swampy meadow where a species of *Juncus* abounded.

ATHYSANUS EXTRUSUS V. D. (Plate VI., Fig. 1.)

Short and stout, over one-fifth of an inch long and nearly half that wide, head short, no longer than the pronotum, wings shorter than the body in one form which does not fly, longer with the under wings more fully developed in the other form which flies readily.

Color: Brownish-yellow to dirty straw, usually with four irregular dark marks on the head; the males are somewhat smaller than the females and have a pair of long strap-like styles extruded from the abdomen behind.

The larvæ are stout, active forms, yellowish with reddish and fuscous markings on the head and four rows of white spots on the abdomen; the legs and body are sparsely clothed with long, stiff hairs.

Life History: They are found only in shaded locations, occurring most abundantly in a rich bottom-land pasture where the underbrush had all been cleared out, leaving only the larger trees; here the larvæ were found January 1st less than one-third grown; the day was warm and they were very active. They were again observed the first of April. Spring had fairly opened up and they were a little larger than when observed in the winter. They mostly moulted April 6th and again April 14th, the first adults appearing about the first of May, these being males; the females began to appear a week later, and by the middle they had all issued. The adults were abundant from then until into July. Frequent examinations showed that the eggs were not deposited until late in June or on into July, from which the larvæ hatch late in the fall and pass the winter.

ATHYSANUS TEXANUS n. sp.

Somewhat resembling *colon* in ornamentation, slightly narrower, pale yellow with two black spots on anterior margin of vertex behind which are two broad parallel red stripes extending back across pronotum and

scutellum and three pairs of oblique ones on the clytra. Length 5 mm., width 1.75 mm.

♀ vertex narrower than in *colon*; length equalling three-fourths the width, side margins parallel, one-eighth longer at middle than at eye, disc flat, a straight transverse impression before tip, acutely angled with face, front broader than in *colon*, margins gradually roundly narrowing to the parallel-margined clypeus, outer angles of genæ rounding, margin below nearly straight. Pronotum half longer than vertex, posterior margin long, humeral margin short and strongly oblique, lateral margin rather long, somewhat thickened, anterior margin more produced than in *conima* or in *colon*. Elytra three times longer than wide, the margins nearly parallel, venation indistinct near base, strong at the apex, pattern similar to the macropterous form of *colon* slightly irregular in the antecapical cells, outer antecapical cell very long, narrow, somewhat curved, at least three-fourths of its length projecting beyond the apex of clavus, central antecapical still longer, curved, constricted in the middle, sometimes divided, inner antecapical not extending much beyond clavus, inner apical margin oblique, first apical cell elongate, narrowly margining the costa; second, length and breadth nearly equal, set obliquely against the outer corner, the margining nervures curved, parallel.

Color: Pale yellow, a narrow line on the anterior margin of the vertex, a spot either side of the tip, a curved mark on the costal margin of elytra behind the middle, a spot on the second apical, and the posterior margin of the central antecapical cell black, two broad stripes parallel across vertex, pronotum and scutellum, and three pair on the elytra parallel with the claval suture, the inner pair continuous with those from the scutellum, bright red; face dark brown, the sutures and outer margin of the genæ light-yellow, a black spot on the genæ above the loræ; legs pale, lined internally with black; tergum black on disc, margins yellow, penultimate segment yellow with a black median line, ultimate one with a median and two lateral lines black, pygofers yellow with a small black spot above.

Genitalia: ♀, ultimate segment with the lateral margins suddenly narrowed from near the base, then roundly produced, the posterior margin with three obtusely-rounding lobes, produced part of nearly equal length and breadth; from under the emarginate angles arise two lateral membranes, resembling acutely produced lateral angles to the segment.

Described from six examples from Texas (Aaron).

ATHYSANUS PUNCTATUS n. sp.

Superficially very strikingly resembling *obtus* in form and color but with a shorter head, large spots placed further apart and the ovipositor not exerted. Testaceous with two black spots on the vertex just within the ocelli. Length, macropterous form, 3.5 mm.; brachypterous form, 2.50–2.75 mm.; ♂, 2.50 mm.

Macropterous form: ♀, vertex one-fourth wider than long, two-fifths longer on middle than next the eye, sloping, rather roundly angled to the front. Front transversely convex, nearly parallel-margined to the antennæ, then roundly narrowed to the clypeus, clypeus about half longer than wide, suture indistinct, genæ much longer below angle than in *obtus*. Pronotum four-fifths wider than long, strongly rounding in front, side margins very short, posterior margin short, shallowly excavated, rounding to the long oblique humeral margin. Elytra twice longer than broad, overlapping at apex, apex nearly truncate, the outer angle rounding, the base of the apical cells equaling the tip of the pygofer. Venation weak and indistinct, appendix short, four broad apical cells and one long costal one, under wings fully developed.

Brachypterous form: ♀, elytra short and broad, reaching to the sixth abdominal segment, their tips shortly rounding from both sides, venation weak, the apical cells small and inconspicuous or wanting, under wing reaching the third or fourth segment, pygofer armed with a brush of stiff hairs.

Color: Light testaceous, vertex a little more yellow with two large round black spots on the anterior half, their diameter being about one-third the width of the vertex; before and between these on top of the vertex are two reddish-brown points. Eyes black, face and legs light testaceous. Pronotum testaceous, scutellum with a yellowish cast. Elytra sub-hyaline with a reddish metallic reflection, the black abdomen partly visible, ultimate dorsal segment broadly tipped with white, penultimate one narrowly so, venter black.

Genitalia: ♀, ultimate ventral segment scarcely twice wider at base than length on middle, the sides roundly narrowing, posterior margin broadly rounding, a flat elevated area in the middle. Pygofer rather small, scarcely inflated, oviduct very stout, little if at all exceeding the pygofer. ♂, valve broadly triangular, twice wider than long, plates broad at base, regularly concavely narrowing to the acute points, two and one-half times the length of the valve, pygofer

inflated at the base, then compressed to the acute edge, equalling the plates.

Described from four females and two males swept from *Sporobolus*, Little Rock, Iowa, July 1st, and one female taken at Ames, Iowa, August 9th, and two females from Colorado through the kindness of Prof. Gillette.

ATHYSANUS DENTATUS n. sp.

Size of *punctatus*, nearly, stouter, vertex nearly flat, wings covering the tip of the ovipositor, light testaceous, two dark spots on the scutellum and two wavy transverse lines on the head. Length, 2.75–3 mm; width, over 1 mm.

♀, vertex one-fifth wider than long, obtusely angled before, disc flat, anterior margin rounding; front long and rather narrow, the sides straight, slightly narrowing; clypeus slightly broadest at base, little longer than broad, narrower than apex of front; loræ broader than clypeus, angled internally; genæ, margin straight either side the distinct angles. Pronotum more than twice broader than long, obtusely rounding before, the posterior margin nearly straight, humeral margin rounding nearly to the eye. Elytra not quite twice longer than wide, their rounding tips inclined to be flaring, without an appendix, never overlapping. Venation of the normal *Athysanus* type, the apical cells nearly square.

Color: Obscure yellowish or reddish-brown, vertex lemon-yellow, an irregular brownish line bordering an X-shaped figure as follows: commencing just before the back margin against either eye running in one-third the distance to the center, then throwing a loop forward one-third the distance to the ocelli, between these loops margining a perfect X resting on the posterior margin of the vertex, the separation of its bases being a black median line; another wavy line on the anterior margin connecting six dots as follows: one on either side of the tip, and a pair on either side of these, dividing the distance to the eyes on a line slightly above the ocelli; face yellow, sutures, apical portion of clypeus and the tips of the loræ strongly marked with brown, front with a broad median line widest below, and about eight lateral arcs, the upper pair very strongly arched above, second pair reduced to spots beneath the arches. Pronotum testaceous on the disc, anterior margin yellowish, behind which there are a few brownish spots, of which the inner pair is the most distinct; scutellum soiled yellow,