

PSYCHE.

NEW NORTH AMERICAN ODONATA.

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Calvert, in his catalogue of the Odonata of Philadelphia, lists the following eight species of *Enallagma* from the northeastern States: *aspersum*, *civile*, *divagans*, *durum*, *exsulans*, *hageni*, *pollutum*, *signatum*. Other forms reported by various authors from this district are: *annexum*, *ebrium*, *traviatum*. To these Calvert (Ent. news, Oct. 1894) adds *doubledayi*; and in the following pages two more are added, making fourteen species of the genus to be found in New England. One of the latter (and two additional new species described here) is found in Nevada also. A note is added on the diagnostic differences of *aspersum* and *traviatum*. Descriptions are also presented of an *Ophiogomphus* from the eastern States, a *Tetragoneuria* from Massachusetts and a case of variation in venation in *Erythromma conditum*.

In consideration of the fact that the species of *Enallagma* approach each other so closely that sketches of anatomical details are almost imperatively demanded, the author intends to present in a subsequent paper diagnostic drawings of all the New England species and of as many other North American forms as it may be possible to obtain.

Being a firm believer in the desirability of assembling the types of closely allied species in order to facilitate comparative study, the writer proposes to ultimately present the types here described to the Hagen collection in the Museum of Comparative Zoology at Cambridge, Mass.

Enallagma minusculum, sp. nov.

Abd. 20 mm., hind wing, 14-15 mm. Cuneiform post-ocular spots small, more or less rounded. Posterior lobe of pronotum black, unspotted, margined with yellow; anterior lobe with pale transverse band. Thorax with the following black: a wide mid-dorsal stripe, widest in front; a wide humeral (wider than pale ante-humeral) stripe, widest below, expanded on and just behind its crossing of the humeral suture. Abdomen black as follows: dorsum of 1, divided by an apical spot of blue or purple; posterior half of 2, third of 3, two-fifths of 4, half of 5, three-fifths of 6, four-fifths of 7, and all of 10; 8 and 9 blue.

Superior appendages half as long as 10, in profile broader than long, equalling in depth (on expanded portion) one-half that of 10, very broadly bifid, the posterior margin shallowly excavate, the lower branch projecting a little beyond the upper, much expanded, laminate, directed downward and inward; the upper branch one-third as broad, directed slightly upward, and bent inward claw-like. Inferior appendages equal in length to the superior, broad at base, narrowed and tapering in the

middle portion, the upper margin of which runs directly backward, bent upward and slightly inward at the tip.

7 ♂, Sherborn, Mass., July 16. Collected by A. P. Morse.

Enallagma calverti, sp. nov.

Abd. 23-25 mm., hind wing 17-19.5 mm. Prothorax greenish black, the following pale (bluish): sides; a transverse line on anterior lobe; the hind margin and a cuneiform spot on each side of posterior lobe. Thorax with a rather narrow mid-dorsal stripe (sometimes divided by a mere line of blue, most distinct anteriorly) and a very narrow humeral stripe, wider in front, especially at the suture, and a spot on second lateral suture, black. A wide ante-humeral stripe, equal to or wider than the mid-dorsal black stripe, blue. Abdomen blue, the following black: a spot on base of 1; a transverse lunule (convex side forward, doubly concave behind) near apex and a narrow marginal band on 2; an apical spot connected with marginal band on 3 and 4; apical third of 5, two-thirds of 6, five-sixths of 7, and all of 10.

Superior appendages short, one-fourth to one-third as long as 10, blunt, with the apex directed downward and slightly notched in profile; the upper limb thick and rolled inward, the lower limb thin, rolled inward and upward, appearing like a small, rounded, inwardly projecting shelf on the lower edge of the apex of the appendage. In profile the upper apical angle is very obtusely rounded, the lower slightly notched. Inferior appendages longer, two-thirds as long as 10, rather slender, tapering, slightly curved upward, directed upward and backward, the lower margin convex throughout.

9 ♂, Franktown, Nev., June (coll. by S. W. Denton).

To this species I also refer 1 ♂, Wellesley, Mass., May 12; 1 ♂, prob-

ably from Wellesley, presented by S. F. Denton; and 1 ♂, eastern U. S., exact locality uncertain, the only difference apparent being that the inferior appendages in profile seem to be somewhat more slender and less strongly convex below.

I take pleasure in naming this species for Mr. P. P. Calvert, whose "Introduction" to this group of our fauna fills a long-felt want and will do much to promote the study of these interesting insects.

Enallagma carunculatum, sp. nov.

Abd., 22.5-27; hind wing, 17-20 mm. Prothorax with the anterior lobe transversely lineate with pale; posterior lobe with pale margins and cuneiform lateral spots; the latter are small, narrow, or even may be wanting. Thorax with the mid-carina black or lineate with pale; mid-dorsal dark stripe broad; humeral stripe of moderate width, variable, widest just behind suture; ante-humeral pale stripe moderate to narrow, varying from nearly twice as wide to only two-thirds as wide as the humeral dark stripe. Abdomen black as follows: a quadrate spot on base of 1; an apical orbicular spot broadly connected to posterior marginal band on 2; apical half to three-fifths of 3, 4, 5 with a longitudinal band, pointed anteriorly, widened before margin; two-thirds to three-fourths of 6; all of 7 except a narrow basal ring; all of 10, widest on basal and apical margins; 8 and 9 blue.

In profile the superior appendage, including the projecting tubercle, is half to two-thirds as long as 10, the inferior appendage shorter, equal to sup. app. without tubercle, stout, directed moderately upward, the upper margin concave, the lower strongly convex. Superior appendage as broad at base as the

inf. app., about as broad as long, the sides equal, nearly straight, the upper slightly convex, the lower slightly concave, the apical margin concave, bearing a large, yellow or brown tubercle, rounded apically, two-thirds as long as the appendage; the groove separating it from the end of the appendage is more distinct in the dorsal portion, appearing like a slight notch, recalling *E. civile*. Seen from above the superior appendages are somewhat divaricated, cylindrical, terminating apically in a rounded right-angle in the mid-line of the appendage; the tubercle projecting beyond, narrower, longer than broad, rounded apically; the inner margin of the appendage forms a minute tooth, very slightly recurved, at the obtuse inner apical angle. Seen from behind the dorsal and ventral edges of the superior appendage are seen to be rolled inward, the tubercle occupying this inner channel and (in dry specimens) slightly rolled, also, at its tip.

12 ♂ (1 headless, 1 teneral), Franktown, Nev., June. Collected by S. W. Denton.

***Enallagma clausum*, sp. nov.**

Abdomen 25-28; hind wing, 19-21 mm. Prothorax with the anterior lobe transversely lineate with pale; posterior lobe greenish black, with pale margins and triangular or cuneiform lateral spots. Thorax with the mid-carina black or lineate with pale; mid dorsal dark stripe rather narrow; humeral stripe very narrow, widest and more or less broken at the suture. Pale ante-humeral stripe at least two-thirds as wide as mid-dorsal dark stripe. Abdomen black as follows: a quadrate spot on base of 1; a large apical orbicular spot, pointed anteriorly and broadly connected to narrow band on apical margin of 2; apical two-fifths to two-thirds of 3, 4, 5 with a longitudinal stripe narrowed submarginally (narrowest and pointed anteriorly on 3); apical two-thirds of 6, four-fifths of 7, and all of 10, on the latter

broadened marginally, especially on basal margin; 8 and 9 blue.

In profile the inferior appendage is the longer, two-thirds as long as 10, stout, directed nearly straight backward, the lower margin strongly convex, the upper strongly concave, the apex stout, upturned, about on a level with the upper part of the broadened base; the whole appendage very similar in shape to a cat's claw, but less acute at tip. Superior appendage two-thirds as long as inferior, directed downward, the lower margin slightly descending toward apex, the upper margin convex basally, slightly sinuate at apex, somewhat recalling that of *E. divagans* but less hollowed near apex and less convex toward base. In dorsal view the hind margin of 10 is deeply excised, with a deep depression in the middle between the dorsal border and the superior appendages. Superior appendages short, blunt, very broad, contiguous at base for nearly half their length, the line of separation often visible only with difficulty,—the contiguous portion with rugose inner margin terminating apically in a larger, slightly recurved tooth; beyond the tooth the appendage is suddenly narrowed on the inner margin for a third of its width, the re-entrant angle nearly square, the distal inner margins of the pair of appendages diverging moderately to the rounded apices; the outer margin is convex basally, nearly straight apically.

6 ♂, Franktown, Nev., June. Collected by S. W. Denton.

***Ophiogomphus aspersus*, sp. nov.**

Abd., ♂, 30 mm.; ♀, 30-32. Hind wing, ♂, 24; ♀, 26-27. Hind fem., 7. Pter., 3.5, yellowish-brown, margined with black. Wings very slightly flavescent at base. Face yellowish-green. Vertex black, posteriorly brown and green. Occiput yellowish-green; back of head immediately behind eyes black above, on sides greenish-yellow, paler below. Occipital horns slender, brown. Thorax

yellowish-green, marked with brown as follows: a narrow mid-dorsal band, widest in the middle, narrowed at each end, in front barely wider than the mid-carina which may be partly pale, continuous behind with the brown of the ante-alary sinus; a very narrow humeral stripe, widest above, where it is partly divided by a pale streak on the suture; and an equally narrow ante-humeral stripe separated from the humeral by a green band of equal width which is continuous above with the green of the dorsum, thus separating the ante-humeral stripe from the sinus. Legs with the basal $\frac{3}{4}$ of femora green (sometimes fuscous above), otherwise black. Abdomen dark brown marked with yellow as follows: ♂, dorsum of 1 and 2; basal half to two-thirds of 3-8 with a triangular spot, produced apically; 9 with a quadrate or orbicular spot on basal third, with an apical tail; 10 with a lanceolate spot, its apex reaching the hind margin; ventral portions of sides of 8 and 9 and indications on the same portions of preceding segments. ♀ similar, more suffused. 10 one-half as long as 9 in both sexes. Vulvar lamina $\frac{2}{3}$ as long as 9, bifid for a little more than its apical half, the branches slightly divergent at first, then convergent, the tips contiguous, their apices rounded or with a minute tooth, the basal inner half of each branch somewhat thickened. Superior appendages of ♂ as long as 10 and $\frac{1}{2}$ of 9. Seen from above the basal half is $\frac{2}{3}$ as broad as long, the distal half smoothly tapering, with straight sides, acute, sharp; the inner margin of the basal half is deeply concave, the outer margin slightly so. Seen from the side the sup. app. is a little upturned at the tip, acute, almost acuminate; the dorsal margin strongly sinuate, being slightly concave at the basal fourth, strongly convex at the half, and distinctly concave on the distal third. Its lower margin is deeply excavate at the basal fourth, strongly convex and denticulated on the remaining portion; the distal $\frac{2}{3}$ of the outer ventral face of the

appendage is convex in both longitudinal and transverse section and thickly beset with black denticles; the narrowed basal part is a little stouter than the corresponding part of the inf. app. Inferior appendage $\frac{3}{4}$ as long as sup. app., the lower margin of the branch straight, slightly ascending, the upper margin concave on the basal $\frac{2}{3}$, straight and descending on the apical third, forming a tooth-like process at the two-thirds point and an acute apex.

2 ♂, 3 ♀, northeastern U. S. (probably Wellesley, Mass., but if not, then Ohio, Ind., or Ill.); one ♀ received from S. F. Denton, the remainder from S. W. Denton.

Tetragoneuria indistincta, sp. nov.

Very similar to *T. cynosura* Say, but somewhat larger and differing from it as follows: a black T spot on front above; pubescence of thorax deep brown, instead of somewhat hoary; wings slightly fumose and a little (2 mm.) longer, the basal part of median space and basal antecubital cell of each series fuscous; pterostigma slightly longer; abdomen longer (2 mm.), more slender, especially toward apex, ninth segment nearly as long as the width of its posterior margin, 10 also distinctly longer proportionally than in *cynosura*; superior appendages 2.7 mm. long, fusiform-cylindric, a little slenderer at base, their apices rounded (of *cynosura* 1.8 mm. long, and the apices sharply pointed).

Abdomen 29 mm.; hind wing, 31. 1 ♀, Winchendon, Mass., July 2.

This species has probably been confused with *T. cynosura* Say. In fact, much confusion has existed and perhaps still exists concerning the forms known as *cynosura*, *semiaquea*, and others closely allied to them. I regret to say that even the specimens in the Hagen collection arranged under these names are sadly mixed, the same

species occurring under two or three names, and two or three species occurring under one name. The species referred to here as *cynosura* is the one abundant in Massachusetts in June, and presents two forms, as follows: (1) that known as *cynosura*, having the fuscous marking of the hind wings restricted to the immediate base (♀), or basal and anal parts (♂) of wings; and (2) what has been called *semiaquea*, having the fuscous extending from the anal angle nearly to the nodus, with a slight nodal spot which is sometimes connected to the base; specimens with markings intermediate in character are not uncommon, varying from a mere fuscous bordering of the venules of the anal area up to the form described here. These two forms are doubtless one species, no structural differences being perceptible.

There is another species found in the southern States, having the fuscous of a more reddish hue, and even wider in extent, which presents differences in the abdominal appendages. This is perhaps the true *semiaquea*.

Erythromma conditum Hag.

A series of 3 ♂, 2 ♀, specimens of this species collected by Mr. S. W. Denton, probably at Wellesley, Mass., presents an interesting case of variation in venation. It is the more worthy of attention for the reason that the variation affects a character upon which analytical keys are often based.

In one female the lower sector of the triangle arises distinctly *before* the basal postcostal nervule, in the fore wings about twice as far as in the hind wings; in the other female it arises *at* the postcostal nervule on all wings. In two males the sector arises

just before it on the front wings and at it on the hind wings; in the other male at or almost imperceptibly before on one hind wing, very slightly before on the other, and distinctly before on the front wings.

Enallagma traviatum Selys vs. *E. aspersum* Hag.

Banks (Can. Ent., Mar. 1894) considers *traviatum* as "hardly more than a variety of *aspersum*." From this opinion I must dissent, regarding it entitled to full specific rank, a number of males collected last summer showing marked differences when compared with *aspersum*. These differences, in addition to the characters indicated in the original description of *traviatum* (Syn. d. Agr.), are as follows: 1st, side view, *traviatum*: Superior abdominal appendage with the upper branch slender, nearly equal throughout, slightly decurved, the apex equally rounded, not especially decurved. Inferior appendage projecting one-third its length beyond the lower branch of the sup. app., the upper margin nearly straight, the lower margin deeply excavated, the excavation dividing the app. into a broad base and a slender tip, the base being about four times as broad and one-half as long as the tip, which is slender, equal, straight, and directed nearly straight backward. Side view, *aspersum*: Sup. app. with upper branch rather stout, its apex noticeably decurved. Inf. app. projecting about as far as the lower branch of the sup. app., its upper margin concave, lower margin strongly convex. 2nd, top view, *traviatum*: Sup. app. as long as 10; its upper branch slender, one-fourth to one-third as wide at base as long, cylindrical, nearly straight, the equally rounded tip very slightly incurved. Top view, *aspersum*: Sup. app. shorter than the side of 10; the upper branch rather broad, its width at base nearly or quite one-half its length, tapering, the tip slightly expanded inwardly, forming an inner apical tooth; inner apical margin truncate, oblique; outer apical angle rounded.



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