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TWO NEW DRAGONFLIES FROM OKLAHOMA

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DESCRIPTIONS of two new species of Odonata from Oklahoma and Georgia are given in this paper. The types are deposited in the Museum of Zoology at the University of Michigan.

Gomphus oklahomensis, n. sp.

A slender greenish species, striped with brown, the abdomen dark brown and yellow with the clubbed segments narrow.

MALE.—Labium, pale greyish, tinged with brown in the middle; anteclypeus, whitish; labrum, postclypeus, and frons, greenish yellow, except narrow posterior border of horizontal surface of frons which is dark brown; vertex dark brown with a greenish yellow spot behind each lateral ocellus, the interocellar region darker, nearly black; occiput, greenish yellow; rear of the head, yellow, orbits, dark brown above; antennae nearly black with a white apical ring on first and third segments. Face covered with black pile.

Prothorax, light reddish brown, the anterior margin whitish; median lobe with a geminate pale spot medially, its lateral angles broadly greenish yellow, and with a small anterior pale spot, sometimes obscure, on each side between the median and lateral spots; hind lobe caudally margined with greenish yellow.

low; propleura with lower hind angle yellow. The pale areas are black pubescent.

Synthorax greenish yellow with light reddish brown markings as follows: Median dorsal stripe free from the other stripes, 1.5 mm. wide, parallel sided, narrowed just before the antecular sinus and diverging at the collar; antehumeral stripe as wide as the pale dorsal stripe, pointed above and narrowly separated from the dark humeral except at the suture above the mesinfraepisternum, the humeral being the narrower below; first lateral stripe complete, vaguely connected with the humeral below; second lateral stripe complete, divided below, and separate from the first although both are somewhat diffuse. Legs light reddish brown, the coxae and trochanters pale; first four femora paler beneath, posterior femora with a superior pale streak on basal half; tibiae, first segment of anterior four tarsi, and first two segments of posterior tarsi white externally (white of the tarsi brownish or obscured in some specimens). Wings hyaline or with a slight flavescent tinge, costa edged with yellow, veins brown, stigma yellow.

Abdomen dark brown with yellow markings as follows: Middorsal stripe on terga 1-7 inclusive, narrowed to a point, except on 1 and 2, at the apex of each segment, and with minute constrictions at the supplementary transverse carinae; 8 with a basal triangle and narrow line; 9 with a middorsal stripe wider than the triangle on the preceding segment; 10 with a small diamond-shaped spot; wide lateral margins of 1-3, with no dark marking behind the auricle, but with subapical infuscation on 3; basal quadrangular spots on sides 4-7 not noticeably decreasing in size on the more posterior segments, usually connected with the lower margin, and with indefinite lighter markings on the sides of these segments; bright lateral stripe on 8-9, and spot on lower margin of 10. Anal appendages dark brown, accessory genitalia light reddish brown (see Pl. I).

FEMALE.—Similar to the male, all the femora with a pale streak above on the basal half of the first two pairs and on the basal three-fourths of the posterior pair. A greenish yellow

stripe is present just posterior to the quadrangular spot on the sides of abdominal segments 4-7, and extends to the end of each segment; the markings under the longitudinal stripe thus formed are light reddish brown strongly contrasting with the dark brown of the dorsum. Each hind femur has a double row of less numerous, much longer and stronger spines. The hind margin of the occiput is uniformly convex. The vulvar lamina is completely divided into two short lobes, the lateral margin of each half being slightly concave.

Length: male, 46-47 mm., female, 47; abdomen, male and female, 34; hind wing, male, 26, female, 27-28; superior appendages, male, 1.5.

TYPES.—Holotype male and allotype female taken in copulation, Fourche Maline Creek, 8 miles north of Wilburton, Oklahoma, April 28, 1934, A. E. Pritchard, collector. Paratypes: 24 males, 2 females same data as holotype (8 of these males collected by C. A. Sooter); 3 males, 3 females, Wilburton, May 12, 1934, (A. E. P.); 3 females, Wilburton, June 9, 1934, (A. E. P.); 1 male, Wilburton, June 10, 1934, (A. E. P.); 1 male, Wilburton, April 25, 1931, (A. E. P.); 1 male, Idabel, Oklahoma, April 28, 1934, collected by C. A. Sooter. Many specimens in alcohol, others papered.

This species is similar to *graslinellus* Walsh, but may be distinguished by its smaller size, paler legs with external white markings, and characteristic genitalia. The labium is pale in both sexes of *oklahomensis*, as compared with *graslinellus* males which have the labium black with pale margins; most of the setae on the basal half of the mandibles are golden, there are a few black ones intermixed; these setae are black in *graslinellus*. The legs even in old specimens are light reddish brown (reddish brown in dried specimens)—the legs of *graslinellus* are black; the external pale stripe on the tibia reaches practically to the tarsus—each tibia of *graslinellus* has an apical black ring; the first segments of the tarsi are white externally—the tarsi of *graslinellus* are always black. The pile on the thorax is rather dense; that of *graslinellus* is sparse especially on the sides. The lower margin of the side of

abdominal segment 8 has 4-9 black denticles posteriorly; *graslinellus* has the whole lower edge beset with 18-24 of these denticles. The male abdominal appendages resemble *G. cavillaris* Needham more than they do *graslinellus* and have the ventral lobe at the tip of the superior appendages, rather than rounded as in *graslinellus*, biangulate with the anterior angle produced; the second hamule is more slender and the vesicle of the penis is less robust. The hind margin of the occiput of the female is evenly convex; that of *graslinellus* has a median projection. The lateral margin of each half of the vulvar lamina is slightly concave, while in *graslinellus* this margin is slightly convex. These differences are noted from Oklahoma specimens of both species, but the more important of these differential characters are likewise to be found in descriptions of *graslinellus*.

The late Mr. E. B. Williamson wrote concerning the 1931 male whose abdominal appendages were somewhat damaged:

Seems to be most closely related to *graslinellus* and *militaris*, but I am unable to identify it as either of these species and I believe it represents an undescribed species of which more material is necessary for description.

Dr. Philip P. Calvert, after comparing several specimens with material of *graslinellus* from northern Illinois (near the type locality), wrote me of certain differences from that species and called the one in question "near *graslinellus*." A series maintains the constancy of these and other characters which I believe are of specific value.

Fourche Maline Creek, at the type locality, is a small stream in the sandstone hills north of Wilburton. In a wooded area where the creek is widened out, the wary males of *Gomphus oklahomensis* were found squatting on the ground in sunny spots along the banks, making only short journeys, and these mostly when disturbed. Two copulating pairs which were flushed from the low vegetation higher on the banks were easily captured. Exuviae were found several inches high on trees standing in the water, or along the banks close to the water. The male taken at Wilburton in April, 1931, was

found in the rain clinging to the tip of a dead stick in the middle of the stream.

The Idabel male was found on the bank above a small muddy lake in which the species doubtlessly breeds.

Mr. C. A. Sooter, who was fortunate in observing an ovipositing female writes in his notes:

Alone she hovered about two feet above the water close to the bank, descending to dip the water with her abdomen and arising quickly to the same position. Six or seven dips were thus made several seconds apart before the "nosey" *Tetragoneuria* chased her a few feet upstream where she met with similar results. After a third trial she flew away, perhaps to hunt a more secluded retreat.

G. oklahomensis was most abundant at the end of April at which time it was associated with *Tetragoneuria cynosura simulans*, *Didymops transversa*, and *Enallagma divagans*. By the first part of June, *Gomphus oklahomensis* was almost completely replaced by *graslinellus*. Several ragged females, immediately recognized in the field, were found along the stream on the ninth, an old male on the tenth, and further search thereafter revealed no more. *Enallagma divagans* was then replaced by *E. exsulans*; the other spring dragonflies were likewise gone.

The following description of the naiad of *Gomphus oklahomensis* is drawn from several muddy exuviae.

NYMPH.—General color, brown; the wing pads, blackish. Head fringed with long hairs on antennae and ventral margin of eyes; produced behind, the lateral angles obtusely angulate. Third antennal segment twice as long as first two combined, fourth rudimentary. Labium with mentum one-third longer than broad; median lobe slightly convex and thickly beset with scale like setae; lateral lobes curved with the fixed end hook produced strongly inward, the mesal margin curved and shallowly notched to form 7-8 truncate teeth; hinge barely reaching hind margin of prosternum. Inner wing pads reaching just beyond base of fourth abdominal segment, the outer reaching to the middle of that segment; hind femora

reaching tip or just beyond outer wing pads. Abdominal dorsal hooks present on 4-9, highest on 6 and 7, and reduced to an apical spine on 9; lateral spines on 6-9 increasing in size posteriorly, that on 9 not quite reaching to middle of 10. Abdomen widest at segment 5; 7 and 8 subequal in length, 9 two-thirds that of 7 and 8 combined, 10 one-half that of 9, appendages two-thirds that of 10.

Length, 24.5-26 mm.; length of abdomen, 15-17; greatest width of abdomen, 6; hind femur, 5.5; hind wing, 5.5.

Celithemis verna, n. sp.

A yellow and black species with only basal wing markings, the thorax and abdomen, especially in the male, becoming completely blackened with age.

MALE.—Labrum, brown; face, yellowish; the dorsal surface of the frons shining blue-black with a downward prolongation in the middle and on each side at the eye; frontal vesicle entirely shining blue-black; occiput, brown. Vertex, frons except narrow lower border, median spot on anteclypeus, and labrum all shining metallic blue-black in old specimens; the yellow of the face somewhat darkened.

Thorax, yellow, striped with brown; median brown stripe wide, the lateral margins concave, widened above to join the dark humeral stripe on each side and abruptly constricted at the crest immediately behind this connection; side with an irregular oblique brown stripe running from the lower end of the dark humeral stripe across the metastigma where it is considerably widened, to the upper end of a dark stripe on the second lateral suture; venter, pale yellow. Legs, black; the coxae, pale yellowish.

Except for basal markings, wings hyaline or tinged with flavescence on the apical half in old specimens. Basal brown markings reduced, showing very little variation. Front wing with extreme base of second series of antenodals brown, the first antenodal of this series often infuscated. Hind wing with two apparent brown areas: that formed by the basal cell between Sc and R + M, although a clear spot is present in the

outer half of this cell, its outer limiting crossvein, and the lower corner of the cell above; and the area posterior to the base of the cubitus, receding from just beyond the anal crossing to the posterior cells and veins close to the membrane. Yellow tinge accompanying brown markings usually slight and unnoticeable. Veins, brown, those in brown area, yellow; stigma, brownish yellow.

Abdomen with segments 1 and 2 black on dorsum and sides above; segment 3 bright yellow, a black spot on each side at the hind margin, connected dorsally on the margin and each extending forward nearly to or to the median transverse carina, sometimes widened below to form another spot; venter 1-3 yellow; segment 4 black except yellow area on the dorsum and sides anterior to the median transverse carina, the pale area being extended in a small longitudinal triangle or notch on each side of the dorsal ridge just posterior to the transverse carina; 5-10 and appendages completely black, or sometimes paler ventrally.

FEMALE.—Similar to the male, the frons not darkened as extensively, a variable yellow spot usually present on the dorsum of abdominal segment 3, and the venter of segments 4-10 appears paler. The one old female I have, although quite blackened, has not completely lost her color pattern as in the males which exhibit this character.

Length: male, 33-35 mm., female, 30; abdomen, male, 21-23, female, 20; hind wing, male, 25-26, female, 23-25.

TYPES.—Holotype male, near Quinton, Oklahoma, June 10, 1934, (A. E. Pritchard). Allotype female, Antlers, Oklahoma, May 12, 1934, (A. E. P.). Paratypes, 7 males, 15 females, same data as allotype, 1 female, Antlers, Oklahoma, April 28, 1934, (A. E. P.); 1 male, 1 female, Antlers, Oklahoma, June 24, 1932, (A. E. P.); 1 female, Antlers, Oklahoma, May 15, 1932, (A. E. P.); 1 male, Leesburg, Georgia, August 6, 1923, (F. M. Root); 1 male, Sparks, Cook County, Georgia, June 11, 1923, "at light" (F. W. Walker). A few specimens in alcohol, others papered.

In *verna* the M_{spl} is well developed, separated from M_4 by one row of cells and from Cu_1 by two rows of cells. This character, the heavily marked thorax, and the black abdominal segments 5-10 readily separate *verna* from *amanda* and *martha*. With the latter species *verna* shares the characteristic of complete blackening with age. The shining blue-black frontal vesicle and the entire absence of dorsal triangles on abdominal segments 4-7, effectively separate *verna* from *ornata* and *bertha*. Especially in the male sex, *bertha* turns quite red with age; *ornata* males¹ turn dark reddish brown, but the color pattern remains discernible.

C. verna is most closely related to *ornata* from which species I believe it has been derived. The dark coloration of the dorsum of the thorax and especially of the abdomen is more developed than in that species, but the venter is of a much paler character; the face is differently patterned; and the coloration at the base of the wings is minimized.

In the 59 front wings studied, 39 have the triangle followed by 3 (or 4) cells, followed by 3, and 20 have the triangle followed by 3 (or 2) cells, followed by 2 cells for 1-3 rows, then 3. This high degree of variability found in the post-triangular cells and rows renders the use of these characters, as Mr. Williamson (1922) employed them, of little value for the purpose of a key. There are 80 per cent of the wings which have 2 rows of cells between R_s and R_{spl} which is a condition not usually found in this genus. The extent of this double row is very variable. Only 2 specimens (females) have all of the wings with these substended cells in one row.

The single old male taken at Quinton was found by a rather large open lake whose edges and bays were overgrown with cat-tails. *Celithemis elisa* and *fasciata* were present in large numbers facing the wind from the tips of high reeds with the abdomen down and their wings seemingly poised to hold their balance. Several day's search revealed only the one specimen of *verna*, found in company with these two species

¹ E. B. Williamson, "Notes on *Celithemis* with Descriptions of two New Species," *Occ. Papers Mus. Zool., Univ. Mich.*, 108, 1922: 7.

and sharing their habits. This was in the first part of June; *C. eponina* was making its debut, and *C. verna* its last appearance of the season.

The unique home of *Celithemis verna* at Antlers is a small clear lake close to the Kiamichi River, a veritable dragonfly paradise concealed by a dense growth of vegetation and trees, only the center of which is free from prolific masses of water lilies. *C. verna* here enjoys company with many species which have not been found elsewhere in the state. *Enallagma dubium*, *Teleallagma daeckii*, *Nehalennia integricollis*, *Ischnura kellicotti*, *Lestes vigilax*, *L. inaequalis*, and *Ladona deplanata*, along with many other eastern and especially southeastern species, are spring and early summer residents of the lake.

The sequence or succession during the season at the Antlers Lake is also interesting. By late summer the Oklahoma sun has shown its effects, and in early September, 1933, the lake was a scene of desolation, common species heretofore absent such as *Enallagma civile*, *Libellula luctuosa*, and *Tramea onusta* having taken possession.

I had very little success here in finding *verna* in the daytime. At daybreak, however, on May 12, 1934, numbers were found emerging among the water lilies. During the day, several teneral specimens which were flushed from the vegetation bordering the lake fluttered to the tree tops. The pair of blackened individuals taken at Antlers in June were found in tandem flying close to the water, engaged in oviposition. Led by the male, the female dipped her abdomen in the water among the water lilies at frequent intervals.

I am indebted to Dr. Nathan Banks for specimens of *C. ornata* and *martha*, to Dr. C. Francis Byers for the loan of specimens of *ornata* and *bertha* for study, to Mrs. Leonora K. Gloyd for the specimens from Georgia, and to Dr. Philip P. Calvert for kind advice concerning this species.

The following description of the nymph of *Celithemis verna* is drawn up from numerous exuviae.

NYPH.—Light brown without definite color pattern, but legs indistinctly annulate with darker rings. Posterior angles

of eyes strongly produced laterally and sharply acuminate; rear of head and its angles gently convex. Mental setae 11-12, decreasing in size mesally; lateral setae, 8; mesal margin of lateral palpi shallowly crenulate, each crenulation with a set of 2 to 3 short spines. Middorsal hooks present on abdominal segments 4-7, high and but little curved on 4, strong and posteriorly directed on 7. Lateral spine on 8 one-half as long as 9; lateral spine on 9 reaching just beyond tip of appendages.

Length: 15-17 mm.; length of abdomen, 10-11; greatest width of abdomen, 5-6; hind femur, 6-6.5.

PLATE I

FIGS. 1, 2, 3, and 4.—Dorsal and lateral views of abdominal appendages, lateral view of accessory genitalia of second abdominal segment of male, and vulvar lamina of female, *Gomphus grasinellus*, Wilburton, Oklahoma, June 9, 1934.

FIGS. 5, 6, 7, and 8.—Same of *Gomphus oklahomensis*, holotype and allotype.



