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TWO NEW SPECIES OF *STYLURUS* (ODONATA-  
GOMPHINAE)

BY E. B. WILLIAMSON

IN late September and early October, 1931, Mr. W. H. Ditzler, his wife Ivy, their daughter Laura, and myself, made a three weeks' collecting trip which took us from Indiana as far to the southeast as Keysville, Georgia. The results of this trip far exceeded our expectations; the greatest surprise was the discovery of two new species of *Stylurus*. Mrs. Ditzler and her daughter by their coöperation made this trip possible, and in the field they were active and successful collectors. It is appropriate, therefore, that these new species which, without their help would not have been discovered, should be named for them.

The genus *Stylurus* was proposed by Needham<sup>1</sup> in 1897, and five known eastern species were described in some detail by Williamson<sup>2</sup> in 1901. In 1917 Kennedy<sup>3</sup> cleared up the

<sup>1</sup> Needham, James G. "Preliminary Studies of North American Gomphinae." *Canad. Entom.*, 1897, 29: 164-168, 181-186.

<sup>2</sup> Williamson, E. B. "The Subgenus *Stylurus* Needham: Selys' Groups VI and VII of the Genus *Gomphus* (Odonata), and on the post-anal cells in the latter." *Trans. Am. Ent. Soc.*, 1907, 27: 205-217.

<sup>3</sup> Kennedy, C. H. "Notes on the Life History and Ecology of the Dragonflies (Odonata) of Central California and Nevada." *Proc. U. S. Nat. Mus.*, 1917, 52: 583-635.

western species. In the meantime the shifting of the species into different genera (or subgenera as they were now known) had begun; this reached its climax in 1929 in *A Handbook of the Dragonflies of North America*,<sup>4</sup> where the species were distributed through three subgenera, though Walker,<sup>5</sup> in 1928, had correctly placed all the species. Walker, however, on nymphal characters alone, came to the conclusion "that it seems unnatural to attempt" the separation of *Stylurus* and *Gomphurus*. The accumulation of adult material in *Stylurus*, with the exception of western material collected by Kennedy, has been slow, but with more intensive study the distinctness of *Stylurus* has gradually emerged, at least in my own mind, though its definition has progressed by a process of reduction.

*Stylurus* has features which indicate a group of at least generic rank, even under a broad interpretation of that term. Not only has the group good morphological characters but it has developed within itself two morphologically distinct subgroups, through both of which run two color types; each morphological subgroup has attained continental distribution. Speciation has been extensive with well-marked specific geographical habitats within the continental area, and with seasonal distributions differing from those of their nearest allies. An ancient and well-defined group is clearly indicated. I believe my specific determinations of 1901 are correct, and it is upon that basis that the following two new species are treated. Drs. Calvert and Byers have examined specimens of both and regard them as new.

Through the kindness of Professor Needham I have examined the types of *Gomphus abditus* Butler, and I believe it is a synonym of *amicola*. Determination of its identity was necessary in the preparation of this paper, since *amicola*

<sup>4</sup> Needham, James G., and Heywood, Hortense Butler. *A Handbook of the Dragonflies of North America* (Springfield, Illinois: Charles C. Thomas, 1929), i-viii, 1-378.

<sup>5</sup> Walker, E. M. "The Nymphs of the Stylurus Group of the Genus Gomphus with notes on the distribution of this group in Canada (Odonata)." *Canad. Entom.*, 1928, 60: 79-88.

is the closest ally of the two new species. The following brief key based on adult (not teneral) specimens will serve for the easy recognition of the species of the subgroup.

## STYLURUS

Male.—First hamule slender, rod-like, simple, not unguiculated; second hamule laminate, apex acute; abdominal appendages widely divaricate; the superiors beyond the middle bevelled on the outer edge to the apex, the bevelled portion with a narrow, crenulate, externo-ventral ridge. Female.—Vulvar lamina in length not exceeding one-fifth the length of the sternum of segment 9, roughly triangular with the apex bifid, or very short, transversely linear.

1. Second hamule directed ventrad or more or less cephalad, the anterior margin uniformly curved to the apex which is directed cephalad. Vulvar lamina in length less than one-seventh the length of the sternum of segment 9 . . . . . NOTATUS GROUP
- 1'. Second hamule directed ventrad or slightly caudad; the apical anterior margin swollen before the apex and then broadly excavated to form a shallow fork or hook with the apex directed cephalad. Vulvar lamina longer than one-seventh the length of the sternum of segment 9 . . . . . INTRICATUS GROUP 2
2. Largely black, segments 3–7 annulate with pale . . . . . *scudderi*
- 2'. Abdomen not distinctly annulate . . . . . 3
3. Black or nearly black species, sharply patterned with yellow or green . . . . . 4
- 3'. Brown and yellow species, abdominal segments 3–6 at least obscurely patterned . . . . . 5
4. Mesothoracic half collar widest at the midline and connected with the pale of the middorsal carina. Ventral margin of tergum of segment 9 sharply patterned black . . . . . *ammicola*
- 4'. Mesothoracic half collar narrowly divided at the midline. Ventral margin of tergum of segment 9 never darker than brownish yellow and not sharply patterned . . . . . *laurae*
5. Mesipisternum predominately yellow . . . . . *intricatus*
- 5'. Mesipisternum predominately dark brown . . . . . *ivae*

*Stylurus laurae*, new species

Male.—Labrum and genae bluish or greenish yellow; inferior margin of labrum dark brown, a dark, small, rounded median spot usually present, generally indistinct, and rarely wanting. Anteclypeus brown. Postclypeus dull greenish

	♂	Average	♀	Average
Abdomen, including appendages . . . . .	42-45 mm.	43.9 mm.	46-47 mm.	46.4 mm.
Abdominal segment 7 .		5.6 mm.		5.6 mm.
segment 8 .		4.2 mm.		4.0 mm.
segment 9 .		3.6 mm.		3.8 mm.
Hind wing . . . . .	36-38.5 mm.	36.9 mm.	40-42 mm.	41.0 mm.
Antenodals front wing .	13-17	14.6	15-17	16.2
hind wing .	9-11	10.05	10-12	11.1
Postnodals front wing .	8-12	10.15	11-14	12.4
hind wing .	9-11	10.05	10-14	11.8
Number of open cells posterior to A in the postanal row ( <i>a</i> ) and in the row basal to <i>a</i> ( <i>b</i> ) in the number of wings indicated				
a 1, b 1 ..	0		4	
a 1, b 2 ..	2		0	
a 2, b 1 ..	1		5	
a 2, b 2 ..	16		1	
a 2, b 3 ..	1		0	
Anal triangle 3-celled .	18			
2-celled .	2			
Stigma front wing ...	4.2-5.0 mm.	4.5 mm.	4.8-5.2 mm.	5.0 mm.
hind wing ....	4.6-5.2 mm.	4.9 mm.	5.2-6.0 mm.	5.5 mm.
Length of third femur along dorsal surface.		7.0 mm.		7.4 mm.
(Above data based on 10 ♂ 5 ♀)				

yellow, more or less brown, especially in the median area, the depressions, and along the fronto-clypeal suture; in the darkest instances only the lateral expansions are pale. Frons dull light green, brown along the fronto-clypeal suture and the vertex; in the darkest instances the anterior surface of the frons almost to the dorsal angle is brown, and above, in the midline, the brown almost reaches the dorsal angle as the apex of a long low triangle. Vertex brown, the laterocellary ridge with a rudimentary spine, sometimes scarcely discernible, between the lateral ocellus and the eye; no spine on postocellary ridge. Occiput greenish or yellowish more or less en-

circled with brown which, in the darkest instances, may cover the entire occiput; hind margin nearly straight. Rear of head, lower half pale, more or less yellowish; upper half brown, darkest above.

Prothorax brown, anterior margin yellow or yellowish, posterior lobe nearly or quite black, middle lobe marked more or less yellowish or greenish on the postero-lateral area.

Mesepisternum very dark brown, almost black; marked dorsally with bluish green; synthorax laterally and posteriorly passing into yellower tints until the metepimeron is usually distinctly more yellowish. Middorsal carina entirely dark, the pale mesothoracic half collar narrowly divided in the midline. Dorsal mesepisternal pale stripes divaricate, not reaching the antealar carina above, and separated below from the mesothoracic half collar by a distance equal to the width of the dorsal stripe or, from that extreme, by a mere line. All these pale markings vivid pale bluish green which may become pale yellowish, or greenish, or almost white in dried specimens. A narrow curved pale antehumeral stripe, beginning above as a rounded spot, passing below into a narrower stripe, complete, or divided just below the spot by a distance reaching a maximum of about three times the diameter of the superior spot. This stripe duller than the dorsal stripes. A dark humeral stripe about 1 mm. wide, followed by a slightly wider pale stripe on the mesepimeron, each approximately parallel sided. The brown stripe posterior to the pale stripe may be more or less wanting as described below. Above on the metepisternum is a dark brown spot about 1 mm. long and usually semicircular in shape, joined above with the brown of the lateroalar carina, and with its straight edge reaching the mesepimeron. Below it, there is usually a brown stripe which may cover the first lateral suture and join the semicircular spot, but usually the stripe is divided briefly from the spot, and in rare instances the stripe is entirely wanting; when present it is most persistent at its inferior end. Brown stripe on the second lateral suture scarcely .5 mm. wide, joined above with the lateroalar carina and extending below to about the

level of the metastigma. The metepisternum, enclosed between the first and second lateral stripes, varies greatly in color, both in living and preserved specimens. The yellow color is often lightly tinged with plumbeous, and, in the most extreme instances, this plumbeous becomes almost as dark as the adjacent lateral stripes, though the pattern is still discernible.

Costa and venation black; stigma light brown. Coxae and trochanters pale plumbeous, more or less yellowish tinged. Femora beneath plumbeous to almost black, the first usually most distinctly patterned, and the second often about as distinctly, and both usually apically black; first and second, black above; third with more or less black at the apex, more so dorsally than ventrally; on the dorsum a twin line of varying distinctness is produced basally from the apical black towards or to the trochanter. Rarely, the third femur is almost entirely black, with restricted pale on the dorsum at the base on either side of the twin-line which becomes fused into a black bar reaching the trochanter. Tibiae and tarsi black; the first tibia with a short, ventral, apical, median low keel. Trochanter and femur spinulose beneath, the heavier spines on the trochanter (and more rarely on the base of the femur) interspersed with spicules. Both spines and spicules black. Femoral spines most numerous on second and third femora, and on the basal half of all the femora. On the apical part of each femur the spines pass into two rows, one on the antero-, the other on the postero-ventral edge, the longest spines developed on the apical end of the latter edge. A single row of widely spaced spines not reaching the apex on the dorsum of the third femur and a few scattered spines on the dorsa of all the femora. The trochanters and femora are very sparsely and inconspicuously hairy; hairs pale and of varying lengths.

Abdomen long and slender, 7 apically and 8 and 9 broadly dilated, but these characters less strongly marked than in *ammicola*. Segments 1 and 2, black above; 1 with an apical

transverse quadrangular plumbeous spot, about half the length and extending nearly the width of the segment; 2 with a median longitudinal yellow or yellowish bar from base to apex; laterally the two segments have a broad inferior yellowish bar from base of abdomen to apex of 2, occupying a little more than half the height. Segments 3-7, black, each marked yellow or yellowish as follows: a small triangular dorsal basal spot (sometimes more bluish than yellowish) in no instance as long as the segment is wide, each spot produced posteriorly in a hair line which approaches the apex to varying degrees; at the base below midheight is a small nearly round spot, comparable in size to the dorsal spot directly above it, except that it is larger on 3 where it is produced posteriorly as a triangular spot, reaching the inferior margin at about one-third the length of the segment, and on 7 the lateral basal spot is joined posteriorly by a large, lateral yellow spot usually obscured by brown, which rises from near the ventro-basal angle of 7 to full midheight and almost reaches the apex of the segment; this spot is the homologue of the two spots following it on 8 and 9; usually this large spot on 7 encloses at its postero-inferior angle a small rounded bright yellow spot. Segments 8 and 9 above rich reddish brown, generally darkest in the midline, darker on 8, each with a median basal spot much like those on the anterior segments but less produced posteriorly, especially on 9. Segment 8 above may be largely black, especially at base, in which case the pale middorsal basal spot may be as well defined as on 7 but not produced as far caudad. On 8 and 9, each side with a large more or less semicircular yellow or obscured spot, as long as the segment and as wide at midlength as the dorsal brown; these large yellow areas may vary from clear yellow through various mottlings in lovely shades of orange-brown to limited areas of almost black; the extreme lower margin of 8 varies from light to dark brown, but the same margin of 9 is clear or very slightly obscured. Segment 10 brown above, sides yellowish. Abdomen beneath dull brown or plumbeous to near the apex of 7 from which point it is yellowish, clearest on 9 and 10.

First hamule about .85 mm. long, slender, almost straight and cylindrical, apex rounded. Second hamule directed slightly caudad, about 1.8 mm. long, laminate, in profile extending about .4-.6 mm. below the level of the rounded vesicle-like first joint of the penis; the margins nearly parallel to about three-fourths its length where it is slightly wider, from which point the anterior margin turns obliquely backward to meet the posterior margin in the acute, cephalad-directed apex.

Appendages brown, more or less tinged plumbeous or dull yellowish. Superiors divaricate, enclosing about  $90^\circ$ ; in profile each appendage is about 1.8 mm. long, dorsal edge low convex, height at base about .67 mm.; lower edge concave at base, then directed toward the apex; the apical third slightly convex with a crenulated ventro-external margin. Branches of the inferior appendage enclosing  $90+^\circ$ , the median posterior margin smoothly rounded; in profile, about 1.5 mm. in length, dorsal edge almost straight to the abrupt upturned and notched apex; inferior edge low convex, slightly angled before midlength, more convex in the dorsad directed apex; the lamina supra-analis yellow, roughly and variably triangular, its apex nearly reaching the posterior border of the appendage; in dorsal view there is a short elliptic, deep, smooth excavation just before the abruptly contracted apex.

Female.—Similar to the male; duller, especially the abdomen which suffers more from post-mortem changes. Spine on laterocellary ridge about .2 mm. high, base broader, orange-brown, as is the ridge adjacent to it. In one specimen there is a low, rounded similarly colored tubercle on the posterior end of the postocellary ridge at the same point where a spine occurs in *scudderi* and *spiniceps*. Occiput slightly narrowed in the midline, low convex on either side.

The prothorax in the brightest marked specimens has, in addition to the large yellowish or greenish pale area at each extremity of the middle lobe, a light brown spot placed mediad and adjacent to it, and mediad to this is a rounded pale spot which, with its fellow of the opposite side, makes a median



geminate spot; on either side of the posterior lobe is an extensive pale area obscurely encircled with brown; in the median line on the posterior border is a small rounded pale spot. In living males it is not improbable similarly patterned individuals occur, but due to age or to post-mortem changes more obscurely marked prothoraces are commoner.

Legs colored like those of the paler colored males, especially conspicuous on the third femur which has about the basal three-fourths pale, the twin-line from the apical black inconspicuous or wanting; first tibial keel lacking. Armature of legs similar to that of the male but the spines of the apical half of the third femur are conspicuously longer in the female.

Abdomen more robust, the apical segments less dilated than in the male; color pattern generally obscured; middorsal stripes wider; the inferior lateral bar on 1 and 2 of the male reaches to within a mere line of the apex of 3; posterior to the transverse carina on 4-6, there is a lateral pale spot or area near the lower margin of each segment which reaches from the transverse carina nearly to the apex. Appendages thorn-like, about 1.4 mm. long, pale at base to a variable extent, apex black. Vulvar lamina triangular, apex bifid, about .65 mm. long and about 1.40 mm. wide at base; apical incision about .30 mm. long, included angle acute; distance between the triangular acute apices about .27 mm.

Material.—Muscahituk River (Wabash River System), Jackson County, Indiana, where Indiana State Road 31 crosses it, September 1, 1929, Norman Shufelt, 1 ♂. Baggs Creek (Chestatee-Chattahoochee-Apalachicola River Systems), White County, Georgia, about 1 mile above its mouth, September 25, 1931, 2 ♂. North Saluda River (Saluda-Congaree-Santee River Systems), Greenville County, South Carolina, on either side of the bridge on U. S. Road 25, October 5 and 6, 1931, 53 ♂, 5 ♀. Richmond, Virginia, presumably in James River drainage, from automobile radiator, August 2, 1931, C. F. Byers, 1 ♀. Total 56 ♂, 6 ♀. Type ♂, October 5, and allotype ♀, October 6, 1931, North Saluda River; others, paratypes.

Because of the striking general resemblance of *laurae* to *S. notatus*, it is necessary to rely on the opinion of earlier authors as to the identity of Rambur's type and the species now known as *notatus*.

The single male taken in Indiana, where *amnicola* rather than *laurae* might be expected, may be a stray from across the mountains to the southeast. It has broken wings (possibly caused at time of capture) and, after Mr. Shufelt caught it, the three of us in our party, spent 2 or 3 hours diligently looking for more. The Muscakituk at this point is 10-30 feet wide and *Dromogomphus spoliatus* and *Macromia taeniolata* were flying there at the time *laurae* was captured. The locations where *laurae* was taken in Georgia and South Carolina were not suitable habitats, so far as my experience goes, for either of the two species apparently at home on the Muscakituk.

Baggs Creek flows in rock, sand, and mud. It is 10-15 feet wide where we collected, and is swift and shallow with frequent low rapids. Taller bankside vegetation is rather sparse and confined to a narrow strip along the stream. The two males were taken on a short stretch where small trees and bushes afforded some shade. Possibly half a dozen were seen but they were nervous and wary, resting only briefly on rocks in the stream or on tree or bush leaves overhanging the water. *Boyeria vinosa* was abundant and Ditzler took a single male of *Stylurus scudderi*.

The North Saluda River, where we took a remarkable series of *laurae*, is a beautiful stream, 20-30 feet wide, flowing largely in broken rocks and sand with some gravel and mud. The water is generally shallow, a foot or two deep and with few deep holes. For five or six miles, we found no obstructions or unwadeable pools that compelled us to leave the stream bed. There are occasional shoals over undisturbed or large broken masses of crystalline rock. Altogether we found it one of the most workable and lovely streams we have ever collected. It is generally well shaded, but its width permits ample sunlight to reach the stream, which flows, in sun and

shade, with much overhanging vegetation. This bordering vegetation is narrow, but usually sufficient to give the collector in the stream bed an impression of adjacent forest, concealing from him the fact that in this locality the stream is closely approached by open fields, usually planted to corn. Close to the water's edge are frequent long stretches of alders. Trees noted were birch, sycamore, maple, box elder, yellow poplar, water-beech and sweet gum. Among the trees and often in distinct colonies of their own near the water were viburnum, cane (usually 8-10 and rarely 15-20 feet high), briars, honeysuckle, strawberry-bush (*Euonymys*), flowering dogwood, and several species not known to me. Tying it all together were the rampant stems of clematis, wild grape, and green brier.

Most of our collecting was downstream from the bridge on U. S. Road 25, a distance of 5 or 6 miles. Our camp was on the left bank of the river about a hundred yards below a wooden bridge, 4 miles by the speedometer from the U. S. Road.

Odonate life, excepting *Boyeria vinosa*, was not abundant on the North Saluda at this season. In two days we saw a single individual of each sex of *Somatochlora tenebrosa*; and a single *Enallagma*, a female of *weewa*, was taken. There were no argias; *Calopteryx maculata* was very rare and *Hetaerina titia* was scarcely more abundant. Of other *Styluri*, associated with *laurae* on the North Saluda, we took one male and one female of *S. plagiatus*, one male of *S. scudderi*, and two females of *S. spiniceps*. On the other hand we captured 98 boyerias, taking only those individuals which forced their attention upon us.

On the North Saluda River *S. laurae* almost invariably rested on leaves, 1-10 feet above the water. Two alighted on logs projecting from the water, but remained there only a few seconds. On leaves they were not wary (generally true of gomphines) and were easily approached and captured. In fact, I caught the first 15 individuals I saw. They could be expected at almost any sunny spot along the stream but

seemed to prefer the heads of ripples, resting on leaves well out over the water. From such a perch they sailed down the ripple and back, but they spent more time at rest than on the wing. We found them on the river generally from about 10:00 A. M. to 4:00 P. M. The temperature was slightly lower than usual at the time we were collecting, and this probably explained the brief period that *laurae* was active on the river. We did not observe any pairs or any females ovipositing.

About 5 or 6 miles above the bridge on U. S. Road 25, the North Saluda becomes a rocky mountain stream, coming out into the valley in an almost sheer descent of about 25 feet over water-smoothed crystalline rock. Laurels and rhododendrons, rare or wanting along the river below the bridge, were abundant here, and hemlock, not seen at all below, was common. We collected about an hour on October 6, taking 3 males of *laurae* and 1 male of *scudderi*. The high waterfall separated fairly definitely the habitats of these two species.

#### *Stylurus ivae*, new species

Male.—Entire face pale yellow or greenish yellow; the anteclypeus slightly, or not at all, obscured darker. Frons very narrowly brown along the vertex, narrowest anterior to the median ocellus. Vertex brown; postocellary plate largely greenish yellow; laterocellary spine rudimentary; no spine on postocellary ridge. Occiput nearly straight, brighter yellow than the postocellary plate. Rear of head pale yellow, a narrow strip along the eye, above the angle of the eye, slightly darker and brownish.

Prothorax largely pale yellow; anterior lobe bright yellow at the extremities, brown at the base in the middle area; middle lobe with the extremities bright yellow, brown in the area on either side adjoining the posterior lobe, a broadly joined, yellow geminate spot in the midline; hind lobe brown, a yellowish median spot its entire length.

Synthorax rich brown and bright yellow; mesepisternum dark, dorsal pale stripes widely divaricate, above barely separated from the antealar carina, below separated by about half

	♂	Average	♀	Average
Abdomen including ap- pendages .....	42-44 mm.	42.9 mm.	46.0 mm.	46.0 mm.
Abdominal segment 7 .....		5.3 mm.		5.5 mm.
“ segment 8 .....		4.0 mm.		4.4 mm.
“ segment 9 .....		3.0 mm.		3.5 mm.
Hind wing .....	35-36 mm.	35.2 mm.	41-41.5 mm.	41.2 mm.
Antenodals front wing ...	12-14	12.9	13-14.0	13.2
“ hind wing .....	9-10	9.9	10	10.0
Postnodals front wing ...	9-10	9.4	9-11.0	10.0
“ hind wing .....	8-11	9.2	10-12.0	11.2
Number of open cells posterior to A in the postanal row ( <i>a</i> ) and in the row basal to <i>a</i> ( <i>b</i> ) in the number of wings indicated.				
a 2, b 1	0		2	
a 2, b 2	10		2	
Anal triangle 3-celled .....	10			
Stigma front wing .....	4.0-4.8 mm.	4.4 mm.	5.0-5.2 mm.	5.1 mm.
“ hind wing .....	4.4-5.6 mm.	4.9 mm.	5.6 mm.	5.6 mm.
Length of third femur along dorsal surface.		6.7 mm.		7.2 mm.
(Above data based on 5 ♂ 2 ♀).				

their width from the pale mesothoracic half collar, which is narrowly divided in the midline; a superior large rounded, or roughly triangular, isolated spot, just posterior to the dorsal stripe and barely separated from the antealar carina. Antehumeral pale stripe of related species wanting, but a very narrow pale humeral stripe present. A dark posthumeral stripe about .5 mm. wide, variably widely separated from the lateroalar carina above, and terminated below at the upper level of the mesinfraepisternum or, at the other extreme, carried posteriorly below and behind to join almost the narrower dark stripe on the first lateral suture. Brown on first lateral suture still more variable; at the maximum it is a spot above meeting the lateroalar carina, separated from the stripe below

by a distance about equal to the length of the spot itself, the lower extremity of the stripe attaining the level reached by the posthumeral stripe; at the minimum the brown is represented only by a short narrow bar opposite the metastigma, about two or three times the length of the long axis of the metastigma. Brown stripe on second lateral suture varying from a narrow line on the lower two-thirds of the suture to a mere short streak at about the level of the metastigma.

Costa yellow, passing into obscure brown at the base, and black over the central area of the stigma; venation brown behind the costa passing into black in the apical and posterior parts of the wing; stigma dull light brown, surrounded by black veins.

Coxa, trochanters, and femora yellow; anterodorsal face of femora with a brown stripe, darkest and widest at the apex, paler and diminishing in area proximad, relatively most extensive on the first femur where it may reach the base, and least extensive on the third where it may not extend beyond the apical third. Tibiae and tarsi black, in sharp contrast with the yellow femora. Armature of the legs, including first tibial keel, as in *laurae* except that the spicules are pale and colored like the hairs.

Abdomen slightly more robust than in *laurae*; dilatation of apical segments about the same. Segments 1 and 2 yellow; on either side a row of four brown spots, one on 1 and three on 3, forming a broken line which is widely separated from its fellow of the opposite side near the base of the abdomen, and closely approaches it at the apex of 2. Segments 3-6 not sharply patterned, largely faded brown marked with dull light yellow as follows: 3 with about the basal third pale, tapering posteriorly on the dorsum in a long acute triangle which just fails to reach the apex; 4-6 similarly patterned, progressively darker posteriorly on the dorsum, the basal pale on each segment reduced to an ill-defined basal ring about 1 mm. wide. Segments 7-10 largely bright yellow slightly obscured on 7 and to a lesser extent elsewhere, and patterned with light orange brown on the dorsum especially of segments 8 and 9;

7 ringed basally like 4-6, this pale ring connected more or less distinctly with an indefinitely patterned pale dorsal area, which is as variably bounded on either side with pale brown to about midheight of the segment, the lower half more clearly yellow; in one male the color pattern of 7 in *laurae* is clearly indicated; 8 dark above, a basal median spot, different in size and shape in every individual examined; on each side the pale area about equals the middorsal darker area. Dark color on dorsum of 9 about equal in width or a little narrower than on 8, and variously patterned paler at the base in the midline. Segment 10 usually slightly and narrowly darker on the sides at the apex. Abdomen beneath brown, narrow dark apical rings on 3-6; 7 slightly obscured yellow, 8-10 and eleventh sternite bright yellow.

First hamule about .85 mm. long, slightly flattened laterally, the anterior edge with a low angle, apex rounded. Second hamule directed slightly caudad, about 1.3 mm. long, laminate, in profile extending about .4 mm. below the level of the rounded first joint of the penis; the margins nearly parallel for about two thirds its length, at which point the anterior margin turns backward in a smooth curve to meet the posterior margin in the acute, cephalad-directed apex.

Appendages paler, more yellowish than in *laurae*; in profile almost identical, the crenulate apical border of the superior appendage slightly longer, the apex of the inferior less abruptly upturned and not notched. The inferior appendage is similar to that of *laurae* but the median posterior margin is wider and straighter, and the apex is less abruptly contracted; the lamina supra-analis is more rounded or oblong and farther removed from the margin.

Female.—Similar to the male, abdomen paler, colors less contrasting, 7-9 not strikingly different from adjacent basal segments as they are in the male. Laterocellary ridge and spine yellow, the spine about .3 mm. high. Occiput nearly straight, a small, shallow, obtuse, median notch. Legs colored as in the male; armature as in the female of *laurae*; first tibial keel of male lacking as in *laurae*.

Abdomen more robust, apical segments less dilated than in the male; color pattern of 3-6 little if any more obscure than in the male; 1 colored above as in the male; 2 yellow, a brown stripe on either side above, the middorsal yellow about half as wide as the brown on either side; 3-10 brown above; 3-7 with a continuous middorsal narrow pale stripe, which is diffuse on 8. Side of 3 with lower two-thirds yellow; 4-6 each with a large lateral pale area obscurely divided into a smaller anterior and larger posterior area. Segments 7-10 obscure, pattern more or less concealed, but where discernible essentially that of the same segments of the male. Appendages thorn-like, about 1.6 mm. long; more or less pale at base, apex black. Vulvar lamina triangular, apex bifid, about .76 mm. long and about 1.52 mm. wide at base; depth of incision about .34 mm., distance between the apices about .38 mm.

Material.—Lee County, Georgia (Flint-Apalachicola River Systems); brushy pasture, Smith's plantation, September 3, 1923, Dr. F. M. Root, 2 ♂ (recorded as *Gomphus* sp. in *Ent. News*, Nov., 1924, 35: 319-320 by Dr. Root who kindly gave me the specimens). Brier Creek (Savannah River System), Burke County, Georgia, near Keysville, September 28 and October 2, 1931, 3 ♂. Brushy Creek (Brier Creek-Savannah River Systems), Burke County, Georgia, about 4-5 miles southwest of Keysville, September 30, 1931, 2 ♀. Total 5 ♂, 2 ♀. Type ♂, October 2, Brier Creek, and allotype ♀, September 30, 1931, Brushy Creek; others, paratypes.

Brier Creek at Keysville is about 30-60 feet wide, with the depth rarely less than 2 or 3 feet, and with many much deeper long pools in which were frequent holes 8-10 feet deep. It meanders through a swamp forest (or its remnants) in a bed of sand and leaf muck, full of logs and tree tops. The water is slightly stained, cold, and flows rather rapidly, possibly about 3 miles an hour. At points the water is swifter, but over the stretches we explored there were no ripples. At the date we were there the water level was very low. Had it been even a foot higher we should have found collecting difficult. As it was a thorough exploration was impossible as only lim-



ited areas at long intervals were wadeable. Working these small shallow areas the collector, following an inadvertent step into unexpectedly deep water, often found himself paddling wildly to get his feet on the ground. The water and air were so cold that the half drowned collector was soon chilled to the bone. Had Brier Creek been as workable as the North Saluda, I believe our catch of *ivae* might have equalled that of *laurae*. On each stream, when we collected there, the temperature was low for the season; this is a great handicap in *Stylurus* collecting.

The forest through which Brier Creek flows is largely black gum, sweet gum, holly, maple, oak, willow, and sourwood, among which grow some palms and cane, with patches of blackberry briars, and tangled webs of green brier and poison ivy. At the water's edge are some alders, long stretches of lizard's-tail, most of it ripened and dead at this season, and occasional patches of a coarse grass and a coarse sedge.

Possibly altogether a dozen *ivae* were seen. They rested usually on tree leaves, always in sun, and were not wild or nervous. Coming out of the forest they appeared on the stream, a bright dash of brilliant yellow as conspicuous and lovely as a goldfinch. Associated with *ivae* on Brier Creek were *Calopteryx dimidiata*, *Hetaerina titia*, *Argia moesta* and *tibialis*, *Hagenius brevistylus*, *Dromogomphus armatus*, *Stylurus plagiatus* (the most adaptable of all Styluri), *Boyeria vinosa*, and *Somatochlora linearis*. A few cottonmouth moccasins on the river bank and some alligators in the stream complete the picture.

Brushy Creek, 12-20 feet wide where we collected above Butler's Mill Pond, is in general a smaller Briar Creek. Because it is more easily waded it would probably offer better collecting than the larger stream:

## PLATE I

## STYLURUS

Figures 8 and 9 drawn by J. W. Leonard; other figures by E. B. Williamson. Figures 4-12 all the same magnification.

Figures 1-3, thoracic color patterns. 1. *S. laurae*, ♂, North Saluda River, October 6, 1931; 2. *S. ivae*, ♂, Brier Creek, September 28, 1931; 3. *S. amnicola*, ♂, Ohio, collected by Chas. Dury. See descriptions of *laurae* and *ivae* for variations in thoracic patterns.

Figures 4 and 5, vulvar lamina in ventral view. 4. *S. ivae*, Brushy Creek, September 30, 1931; 5. *S. laurae*, North Saluda River, October 5, 1931.

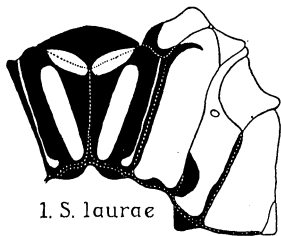
Figures 6 and 7, inferior abdominal appendage in ventral view. 6. *S. laurae*, North Saluda River, October 6, 1931; 7. *S. ivae*, Brier Creek, September 28, 1931. (Identification of parts labelled in figures confirmed by Dr. Calvert.)

Figures 8 and 9, penis of *S. laurae*, North Saluda River, October 5, 1931; 8, lateral view; 9, ventral view of segments 3 and 4.

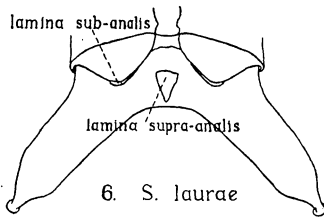
Figures 10-12, left genital hamules in antero-lateral view. 10. *S. amnicola*, Ohio, collected by Chas. Dury; 11. *S. laurae*, North Saluda River, October 6, 1931; 12. *S. ivae*, Brier Creek, September 28, 1931.

Figure 13, occiput of *S. laurae*, ♀, North Saluda River, October 5, 1931.

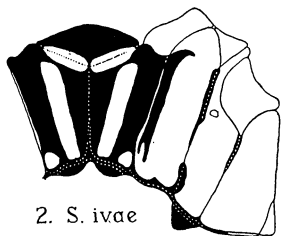
NEW SPECIES OF STYLURUS (ODONATAGOMPHINAE) PLATE I



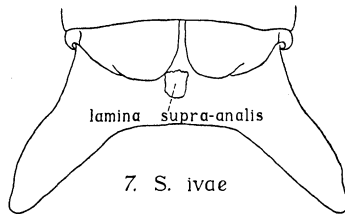
1. *S. laurae*



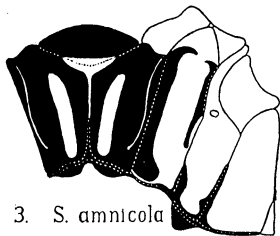
6. *S. laurae*



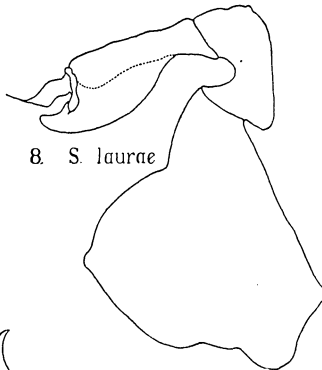
2. *S. ivae*



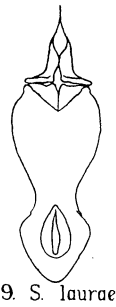
7. *S. ivae*



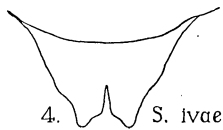
3. *S. amnicola*



8. *S. laurae*



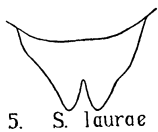
9. *S. laurae*



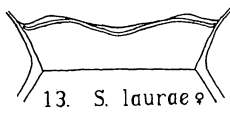
4. *S. ivae*



10. *S. amnicola*



5. *S. laurae*



13. *S. laurae* ♀



11. *S. laurae*



12. *S. ivae*

