Additions to the Indiana List of Dragonflies with a Few Notes.

By E. B. Williamson.

ADDITIONS.

1. *Calopteryx aequabilis* Say. Whiting, Lake County, June 9, 1900, along a ditch which drains into Calumet River, one male; and Wolf Lake, Lake County, July 21, 1900, two males. Clarence C. Bassett.

2. *Lestes eurinus* Say. Elkhart, June 8, 1900, one female. R. J. Weith.

3. *Enallagma calverti* Morse. Lake Maxinkuckee, May 27, 1900, two males, one female. Howard North.

4. *Nasiaeschna* (*Aeschna*) *pentacantha* Rambur. Banks of St. Joe River, Elkhart, June 10, 1900, two females. R. J. Weith.

5. *Aeschna multicolor* Hagen. City limits, Elkhart, September 5 and October 12, 1899, three females, one identified by Dr. Calvert. R. J. Weith.

6. *Sympetrum albifrons* Charpentier. Bluffton, Indiana, September 9, 1900. E. B. Williamson.

7. *Libellula exusta* Say. Woods near Simonton Lake, May 15 and 20, 1900. R. J. Weith.

The State list now numbers 91 species of Odonates. Four of the above additions are due to Mr. Weith, who has also added several species, known from other points in the State, to his local list. Collections are being made at Lake Maxinkuckee, Winona Lake, Evansville, and perhaps at other points, so further additions to the list may be expected, and our knowledge of seasonal and geographical range within the State is certain to be augmented. Descriptions of two of the species mentioned above are unfortunately not found in "The Dragonflies of Indiana." They are given in the notes which follow.

NOTES AND CORRECTIONS.

1. *Enallagma calverti* Morse is of the color type of *En. doubledayi* Selys. The male may be recognized by having the superior abdominal appendages much shorter than the inferiors, in profile appearing like a short cylinder with a rounded apex which is usually distinctly notched below the middle. Mr. Morse's original description of the male of this species follows: "Abd. 23–25mm., hind wing 17–19.5mm. 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." Nevada, Wyoming and other western States, and Massachusetts. This is an interesting addition to the list of *Enallagmas* known to occur in Indiana, bringing the number to thirteen, and leaving two regional species, *doubledayi* and *aspersum*, yet to be discovered.

2. *Ischnura kellicotti* Williamson sometimes has the blue ante-humeral stripe of the thorax interrupted as it is normally in *Nehallennia posita* and rarely in *Ischnura verticalis* and *Enallagma germinatum*. Individuals were taken which had the stripe continuous on one side and interrupted on the other. The species was very abundant at Shriner, Round and Cedar Lakes, July and August, 1900, found only about the white water-lily beds. Orange females were numerous.

3. Dr. Calvert has recently called attention to the fact that *Gomphus externus* as identified by Kellicott and as described in "The Dragonflies of Indiana," is in reality *Gomphus crassus*. What is said of *Gomphus externus* on pages 289 and 290 of "The Dragonflies of Indiana," excepting geographical range, belongs to *Gomphus crassus*. *Gomphus crassus* is known from Kentucky, Ohio, Indiana and Illinois. *Gomphus externus* has been taken in Illinois and westward in Nebraska, New Mexico and Texas. It must be dropped from the Indiana list, though it may be found in the State in the future. It may be separated from *fraternus* and *crassus* by the following points: In *externus* the two lateral thoracic stripes are complete, not shortened or interrupted. *Externus* has the dorsum of 9 and 10 with a yellow band as usual in *crassus*. The appendages of the male of *externus*, as figured in the "Monographie des Gomphines," plate XXI, fig. 2, as seen in profile, somewhat resemble fig. 20, plate VI, "Dragonflies of Indiana," excepting

that they are more acute and the lower edge is less angular. The vulvar lamina in *externus*, as in *fraternus*, is not constricted at the middle as it is in *crassus*. In *externus* the lamina is bifid for almost half its length; in *fraternus* it is bifid for scarcely more than a fourth of its length. *Fraternus* and *externus* are about the same in size.

On page 285, "Dragonflies of Indiana," the references should be to plate VI, and not plate VII, as there printed. Line 17 from the bottom, same page, for *Abdomen about 40 in length.* EXTERNUS, read *Abdomen about 38 in length.* FRATERNUS.

4. In "Occasional Memoirs of the Chicago Entomological Society," Vol. I, No. 1, March, 1900, pp. 17 and 18, Mr. James Tough has described and figured the appendages of the male of a very interesting species of *Gomphus* under the name of *Gomphus cornutus*. The author's description is quoted.

"Length, ♂, 55–57mm.; abdomen, 40–42mm.; hind wing, 32–33mm.

"Yellowish green, with black and brown markings. Face and occiput yellowish green, eyes posteriorly black above, yellowish below, occiput distinctly convex, notched in center and fringed with black hairs, vertex and antennae black. Prothorax black, with a geminate spot in center and a patch on each side, yellowish. Thorax yellowish green, except a narrow band, indistinct or absent anteriorly, on each side of mid-dorsal carina, also except humeral and antihumeral bands, and margins of first and second lateral sutures, all of which are brown. Legs black, front femora yellowish green below. Wings hyaline with viens black, pterostigma yellowish, and costa yellowish green. Abdomen of uniform thickness, black, a dorsal stripe or spot on segments 1–8, small and basal on 8, and a small quadrangular spot on 10, yellowish; dorsum of 9 entirely black.

"Superior appendages dull yellowish; seen from above, internal branches produced inward and backward until they meet, acute and spinose at tip; external branches short, rather broad, and tipped with a blunt spine. Inferior appendage, seen from above, slightly longer than superiors, spreading, the distance from tip to tip of outer extremities being more than twice the width of the tenth abdominal segment at base. From side view the internal branches of superiors are seen to bear a conical tooth about midway between base and apex; the inferior curving upward gradually and each branch bearing a curved spine at tip.

"Described from two male specimens, taken at Glen Ellyn, Du Page County, Illinois, one June 14, 1897, the other May 30, 1898."

Mr. Tough writes me that he thinks he has since taken the female of this species. The occiput is high, rounded, and in front is a triangular pyramid, its base bounded by the line between the vertex and occiput, and by lines drawn

from the extremities of this line to the middle point of the posterior edge of the occiput. This species will very probably be found to inhabit Indiana.

5. *Gomphus pallidus* Rambur. St. Joe River, June 8, 1900, one female. R. J. Weith.

6. *Gomphus spicatus* Hagen. Elkhart, May 20, 1900. R. J. Weith. In plate VI, "Dragonflies of Indiana," figs. 18 and 19 will *not* serve to distinguish the males of *Gomphus spicatus* and *G. descriptus*. Seen from above the superior appendages of *spicatus* have a distinct median external tooth; *descriptus* has the appendages angulated beyond the middle, but there is no tooth.

7. *Gomphus sp.* Page 294, "Dragonflies of Indiana," is a new species soon to be described by Mr. Hine.

8. With a knowledge of the nymph of *Tachopteryx thoreyi* another arrangement of the genera of the Gomphinae than that employed in the "Dragonflies of Indiana" becomes desirable. The arrangement of genera of the Gomphinae as worked out by Selys in his "Synopsis des Gomphines" and culminating with his final "Note sur la classification" in the fourth addition to the Synopsis, may be employed here for the genera taken in Indiana. The genera would then stand in this order: *Ophiogomphus, Dromogomphus, Gomphus, Progomphus, Hagenius, Tachopteryx, Cordulegaster.*

9. The genus *Nasiaeschna* has recently been established by Selys (Termèszetrajzi füzetek, XXIII, 1900, p. 93) for the species *Aeschna pentacantha* Rambur. In the key to genera in "The Dragonflies of Indiana" *pentacantha* will run out to the genus *Epiaeschna*. The genus *Nasiaeschna* is distinguished from *Epiaeschna* by the supplementary sector between the subnodal and median sectors being separated from the subnodal by one row of cells (two rows in *Epiaeschna*), by having the face excavated, by the absence of a dorsal spine on abdominal segment 10 in the male, and by the superior appendages of the male being shorter and less dilated.

10. *Aeschna multicolor* Hagen. Calvert (Odonata of Baja California, p. 509) has the following paragraph relating to the range of this species. "*Distribution.* Mexico (Cordova, Baja California), California, Texas, Dakota, Colorado, Yellowstone, British Columbia (Victoria)." In Bull. Geol. Surv. Terr. 1875, p. 591, Hagen says of it, "A decidedly western species." To find it in Indiana is a surprise. The following description is found in the Syn. Neur. N. A., 1861, p. 121. "Fuscous, spotted with blue, head blue (♂) or luteous (♀), front with a T spot, each side terminated with yellow, and a band before the eyes, black; thorax fuscous, dorsum each side with a stripe (interrupted or absent in the female), sides, each side with two oblique ones blue (♂) or yellow (♀); feet black, femora

rufous above, the apex black, anterior femora beneath, luteous; abdomen moderate, slender, cylindrical, narrow behind the inflated base; fuscous, spotted with blue (♂) or yellow (♀), segments 3–10 with two large, apical spots, segments 3–8 with two triangular spots upon the middle, and a basal, divided spot each side, segment 2 with a medial interrupted fascia, and a broad apical one, blue or yellow; superior appendages of the male black, long, foliaceous, narrow, the base narrower, inwardly carinated, straight, curved inwardly before the apex, an elevated triangular lamina above, and a longer tooth placed more inferiorly; the apical tip acute, curved downwards; the inferior appendage, pale fuscous, one-half shorter, elongately triangular; appendages of the female moderate, fuscous, foliaceous, broader; wings hyaline, those of the female towards the apex, subflavescent, pterostigma short, fuscous, or luteous (♀); membranule fuscous, the base white; 16–17 antecubitals; 8–9 postcubitals. Length 65–67 mm. Alar expanse 90–100 mm. Pterostigma 3–3½ mm." Calvert (Odonata of Baja California, p. 503) describes the superior appendage as having the apex distinctly forked when viewed in profile. "Front wings with discoidal triangle 4–6-celled, internal triangle 2-celled, rarely free, 3–4 other median cross-veins, 1–2 supratriangulars, first and sixth or seventh antecubitals thicker. Hind wings with discoidal triangle 4–5-celled, internal triangle 2-celled, 2–3 other median cross-veins, 1–2 supratriangulars, first and fifth or sixth antecubitals thicker. Male: anal triangle 3-celled; 10 with a small, median, basal, dorsal tooth and a smaller one on each side. Abdomen ♂ 47–51, ♀ 49. Hind wing ♂ 43–47, ♀ 45–47." (Calvert, Odonata of Baja California, p. 508).

11. *Didymops transversa* Say. Simonton Lake, May 15 and 20, 1900; and St. Joe River, Elkhart, May 29, 1900. R. J. Weith.

12. *Epicordulia princeps* Hagen. St. Joe River, Elkhart, July 7, 1900. R. J. Weith.

13. Males of *Sympetrum rubicundulum* and *Sympetrum obtrusum* exhibit but little difference in coloration. *Rubicundulum* has the face light brown, yellowish, darker above; *obtrusum* has the face white. The general body color of females of the two species is distinctive. *Obtrusum* and *rubicundulum* seem specifically distinct for the following reasons: both sexes offer differences in color and structure; they occur together, often in the same isolated swamp; and there seem to be no intermediate forms. On September 9, 1900, *obtrusum*, *rubicundulum* and *albifrons* were associated together in a small swamp surrounded by woodland in Wells County, near Bluffton. At a glance both sexes of *albifrons* may be recognized by the face, white below, shading above into a clear china blue, the frontal vesicle being of the same color.

14. The genus *Diplacodes* is distinguished from related genera: by the triangle of the fore wings long and narrow, free (usually) and followed by two rows of post-triangular cells (three or four rows in related genera); and by the last antenodal not continuous. *Diplacodes minusculum* could *not* be traced out by the key to genera, "Dragonflies of Indiana," p. 250. The hind lobe of the prothorax in this species is narrower than the middle lobe, sides straight, but with the hind margin emarginate, giving it a bilobed character. The supratriangular space is free and there are eight antecubitals in the front wings. In the arrangement of the genera in the "Dragonflies of Indiana" *Diplacodes* may be placed between *Pachydiplax* and *Nannothemis*. Old males of *Diplacodes minusculum*, like old males of *Nannothemis bella*, are entirely pruinose.

Eskers and Esker Lakes.

By Charles R. Dryer.

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(Abstract.)

(1) The sand, gravel and till ridges around High Lake, Noble County, Indiana, with their associated lakes and kettleholes, are described and their structure and origin discussed. The till ridge is thought to be a frontal moraine, the others to be the result of subglacial drainage and the sliding or dumping of drift material into crevasses. These forms are so connected in space and related in structure as to render genetic classification difficult. The system as a whole constitutes an esker-kame-moraine.

(2) The esker system of Turkey Creek, Noble County, Indiana, is described. These sand ridges traverse the valley floor and nearly inclose the basin of Gordy's Lake. High and Gordy's lakes seem to constitute a distinct species for which the name *esker lakes* is proposed.

The paper is accompanied by two maps.