probably *hymenaea*, gave the collectors several wild chases. Both *Celethemis fasciata* and *Libellula semifasciata* are almost certain to be taken sooner or later.

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h. A New Diagnostic Character for the Species of the Genus Argia.

Clarence Hamilton Kennedy.

The following paper was undertaken at the suggestion of Mr. E. B. Williamson, to whom the writer is also indebted for other suggestions and for much of the material examined.

The paper is the result of an attempt to find some character, if possible structural, by which the females of the five species of Argia found in Indiana could be separated.

The characters generally used in the classification of Odonata are the venation of the wings, the shape of the prothorax, the shape of the abdominal appendages, and the color pattern. A distinction upon the basis of venation has not been attempted. The color pattern is notoriously inadequate, and after careful comparison I find that the structure of the prothorax and abdominal appendages is equally so.

After a close study of the thorax a structure was discovered rarely, if ever, used in classification, which in the case of the five Indiana species is sufficiently different to separate the females readily. This is the peculiar shield-shaped structure on the anterior end of the mesepisternum. I can find no mention of this very peculiar structure except in Selys' "Synopsis des Agrionines." Here, just as I was finishing this paper, I found the following, in which Selys recognizes the diagnostic value of this character in the case of the females of the genus Argia: "De grandes difficultés se présentent pour donner les diagnoses des quarante-six espèces (Argia) Américaines, dont plusieurs sont très voisines les unes des autres. Les appendices anals des mâles et *les lames du devant du thorax* des femelles fournissent, il est vrai, pour la plupart, des caractères positifs; mais ils eussent rendu les diagnoses très-longues, et ces organes ne pouvant etre bien vus qu' avec un certain grossissement, j'ai cherché dans les diagnoses de ce Synopsis, à me passer de ces caractères, qui seront réservés pour une monographie spéciale."*

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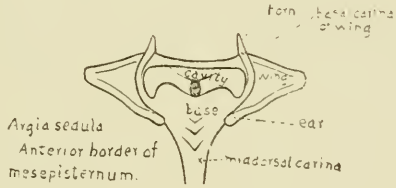
* De Selys-Longchamps, Synopsis des Agrionines, Bulletins de l'Academie royale de Belgique, 2me série, tome XX, No. 8, p. (9).

As far as I know the "*monographie speciale*" was never published.

Calvert, too, in a paper which has just appeared on the genus *Argia*, recognizes this structure.*

This structure occurs, as far as I have examined, in all the native genera of the Zygoptera, but it is lacking entirely in the Anisoptera or possibly is replaced there by the low transverse carina across the extreme anterior end of the mesepisternum. It is found on the same general plan in the different genera, consisting of a heart-shaped enlargement of the mid-dorsal carina, on either side of which is a triangular wing with its apex running down to the mesinfraepisternum.



In the genus Argia a more or less oblong depression (cavity—see figure above), bounded on either end by the high basal carina of either wing (see figure above) occurs in front of the heart-shaped end of the mid-dorsal carina. The basal carina of each wing ends in front in a horn, and behind, in the case of the females of four of the five species, in an ear-like lobe (the ear—see figure above). In the male no elaborate expansion into an ear occurs. The most striking differences in this structure are those of the size and shape of the ears. As these ears are absent in the males, for them the structure loses most of its diagnostic value. However, for interest in comparison, figures of this structure as it occurs in the males of the five species are shown in the plate (see Plate 11, Figs. 1, 3, 5, 7 and 9). By reference to them it will be seen at once that, in the male, this structure is of a more generalized type than in the female. The structure as found in the male is nearer the general type found in related genera.

The above would seem to indicate that this structure is a sexual organ functioning in the female and merely passively present in the male. One would at once jump at the conclusion that it is the organ by which the male holds the female during the act of copulation. The cavity would

* Calvert, Bull. Mus. Comp. Zool. Nov. 1902.

seem especially fitted for the insertion of the abdominal appendages of the male. But from direct observation it is known that the male holds the female by the prothorax, probably by the encircling groove at its anterior end. Moreover, because this structure is covered by the posterior lobe of the prothorax, it would be impossible for the male to reach it. See Plate II, Fig. 2.

Nevertheless this structure must in some way be involved in the act of copulation. It is interesting to note that in the Anisoptera where the male holds the female by the head instead of by the thorax this peculiar structure is not developed at all.

But whatever its function, or whether it has a function or not, its form is sufficiently different in the females of the different species of Argia, and sufficiently constant among those of any given species to warrant its use in classification. How far this structure is good in showing relationships, it is difficult to say. According to it *putrida* would fall in a very distinct group by itself. *Apicalis* would fall by itself. *Violacea*, *sedula*, and *tibialis* would fall in a group by themselves, in which *violacea* and *sedula* would be much more closely related than either to *tibialis*.

A key to females may be constructed as follows:

A. The ears entirely absent. The whole structure wide laterally and narrow from front to back.....*apicalis*.

AA. The *posterior edge* of each wing produced into a broad rectangular lobe. The median longitudinal fossa of the base broad and shallow .....*putrida*.

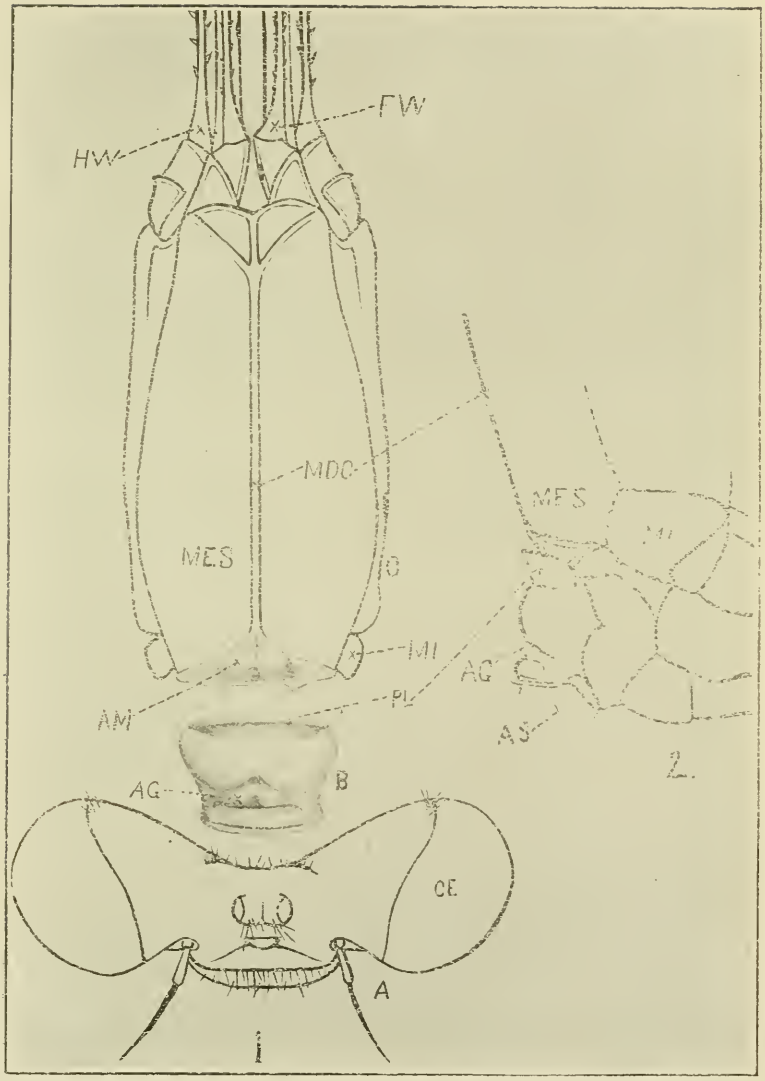
AAA. The *posterior angle* of each wing produced into an ear. The median fossa relatively deep.

B. The apex of each ear pointing forwards and upwards. The entire structure relatively deep from front to back. *tibialis*.

BB. The apex of each ear pointing upwards and backwards.

C. The cavity very narrow. The ears broad and flat. *violacea*.

CC. The cavity of usual width. The posterior edge of each ear turned up.....*sedula*.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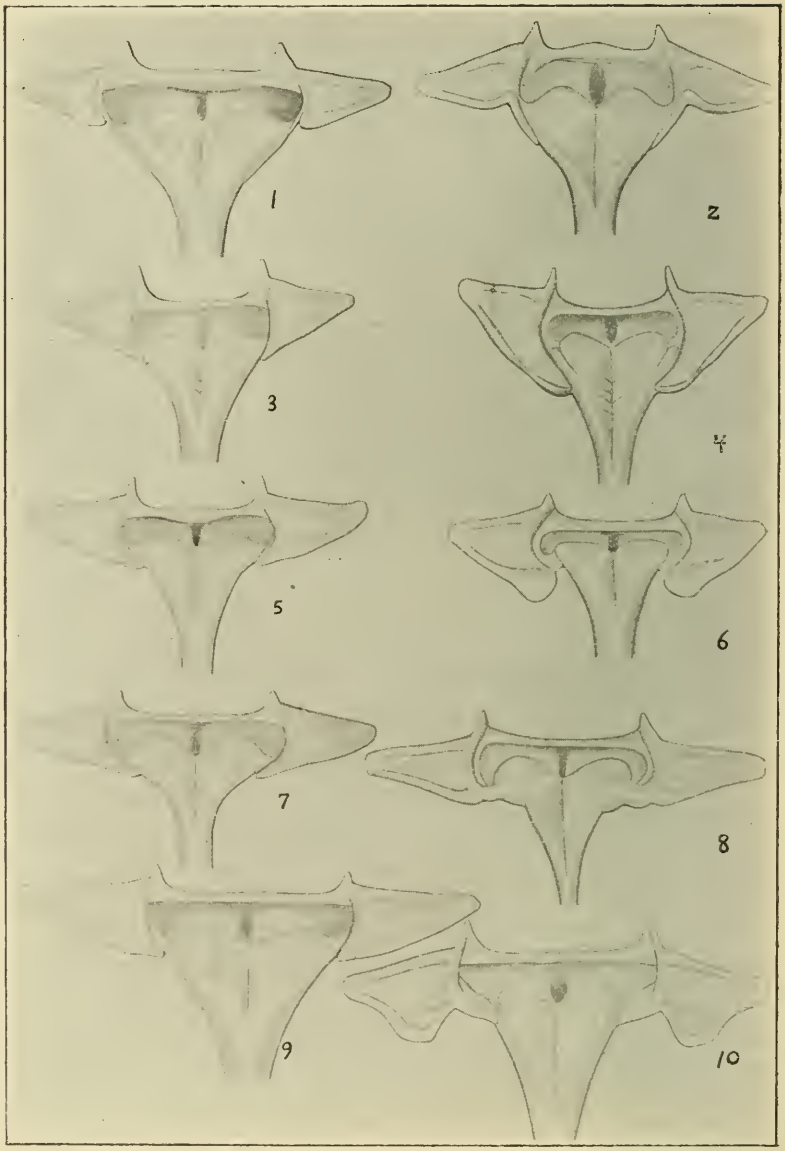
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EXPLANATION OF THE PLATES.

Plate I.

The drawings were made with a camera lucida, using a Bausch and Lomb $^1/_6$ objective with the lower lens removed and a 2-inch eyepiece.

Fig. 1. *Argia apicalis* (Say). Bluffton, Ind., August 18, 1900, E. B. Williamson. Dorsal view of head, prothorax, and mesothorax of ♂, disjointed.

A—Head. *CE*, compound eye.

B—Prothorax. *PL*, posterior lobe. *AG*, anterior groove.

C—Mesothorax, the metathorax showing underneath. *AM*, anterior end of mesepisternum. *MDC*, middorsal carina. *MES*, mesepisternum. *MI*, mesinfraepisternum. *HW*, hindwing. *FW*, forewing.

Fig. 2. *Argia apicalis* (Say). Bluffton, Ind., August 18, 1900, E. B. Williamson. Lateral view of prothorax, and mesothorax.

AS—Articulating surface for head. Other lettering as for Fig. 1.

Plate II.

The drawings were made with a camera lucida, using a Bausch and Lomb ⅙ objective and 2-inch eyepiece.

1. *Argia tibialis* (Rambur). Bluffton, Ind., June 17, 1901, E B. Williamson. Anterior end of mesepisternum of ♂.

2. *Argia tibialis* (Rambur). Bluffton, Ind., June 17, 1901, E. B. Williamson. Anterior end of mesepisternum of ♀.

3. *Argia sedula* (Hagen). Fort Wayne, Ind., July 18, 1901, E. B. Williamson. Anterior end of mesepisternum of ♂.

4. *Argia sedula* (Hagen). Fort Wayne, Ind., July 18, 1901, E. B. Williamson. Anterior end of mesepisternum of ♀.

5. *Argia violacea* (Hagen). Tippecanoe River, Ind., July 2, 1901, E. B. Williamson. Anterior end of mesepisternum of ♂.

6. *Argia violacea* (Hagen). Pittsburg, Pa., June 15, 1899, E. B. Williamson. Anterior end of mesepisternum of ♀.

7. *Argia apicalis* (Say). Bluffton, Ind., June 2, 1901, E. B. Williamson. Anterior end of mesepisternum of ♂.

8. *Argia apicalis* (Say). Bluffton, Ind., June 2, 1901, E. B. Williamson. Anterior end of mesepisternum of ♀.

9. *Argia putrida* (Hagen). Bluffton, Ind., June 17, 1901, E. B. Williamson. Anterior end of mesepisternum of ♂.

10. *Argia putrida* (Hagen). Fort Wayne, Ind., July 18, 1901, E. B. Williamson. Anterior end of mesepisternum of ♀.