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## GYNANDROMORPHISM IN THE ODONATA

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In the Odonata, gynandromorphism has been rarely observed or mentioned in the literature. In 1929, Ris reported that only three cases were known to him. Two were in the Calopterygidae, and one in the Libellulidae. Since then gynandromorphic specimens have been recorded for one species of Aeshnidae and five more for the Libellulidae. For the latter family, I can add another record which is the first for the subfamily Corduliinae and the second for North America.

A list of the species and specimens in which gynandromorphism has been noted and the nature and extent of the modification of sexual characteristics may be summarized as follows:

*Calopteryx splendens* (Harrison). According to Ris (1929:100) the specimen figured, briefly described and determined by Westwood (1874:189 & Pl. 35, Fig. 12) as *C. virgo*, is a chiefly feminine *C. splendens* having a mosaic type of anomaly of the wings. The specimen was taken in France and is in the McLachlan Collection. This may be the same specimen exhibited by McLachlan at the November 6, 1865 meeting of the Entomological Society of London (1866:125) as "a partially andromorphous female of the dragon-fly *Calepteryx splendens*" taken in France by M. Fallou. Both accounts give the left front wing as of the color of the male and only blotches or dashes of color on the right front wing.

*Calopteryx virgo* (Linné). A predominately female specimen, collected by Dr. Ris in Switzerland has been described in detail and figured by him (1929:97-100). The departure from female characteristics is most conspicuous in the coloration of the wings. The left front wing is like that of the male, the right hind wing is largely so, and both lack the pterostigma characteristic of females. The color pattern of head and prothorax is mostly like that of the male, but on the pterothorax the pattern is in keeping with the corresponding colored wings, described as a mosaic arrangement of the characters of both sexes.

*Rhyothemis phyllis snelleni* Selys. Ris (1919:1222 and 1929:101-102, Fig. 3) described a specimen from North Celebes, collected in 1913 by Dr. L. Martin, that was typically female except for the superior appendages which were many times longer and much more robust than normal, and in length exceeded those of a male but were unlike them in shape.

*Aeshna juncea* (Linné). Harrison (1939:286) reported a specimen of this species taken in Scotland as a gynandrous example but did not describe it.

*Plathemis lydia* (Drury). Klots (1943:142) described and figured a predominately male specimen, collected in 1934 in Westchester Co., New York. The right front wing had the color pattern of a female, and abdominal segment 2 lacked a right hamule.

*Crocothemis servilia* (Drury). Yakota & Asahina (1953:167-169, Figs. 1-5) described a specimen, collected in 1952 in Japan, having the red coloration of a normal male on the right side and the brownish color of a female on the left. Structures characteristic of the male are normal on the right side but underdeveloped or rudimentary on the left. The left superior abdominal appendage is like that of a female, but the inferior appendage is fully developed and symmetrical.

*Orthetrum brachiale* (Beauvois). Pinhey (1958:116) recorded a specimen collected by Dr. P. Corbet in Northern Tanganyika, August 26, 1956 that is primarily a female. Markings, coloration, and abdominal segments 3-7 and 9-10 are typically female. Abdominal segment 2 has a well-developed left posterior lobe similar to that of the male, and on segment 8 the foliations are narrow on the right side and on the left only developed on the distal half of the segment.

*Deielia phaon* Selys. Eda (1960:264-266, Figs. 1-3) collected a heterocromatic female on June 10, 1960 in Tokyo, Japan. The left side of the thorax and left legs have the color of a male. The abdomen, aside from vestigial and imperfectly formed accessory genitalia on segments 2-3, is similar to a normal female and contained mature eggs.

*Lyriothemis pachygastra* Selys. I have not seen the article by Yamamoto (1968) in which he records a gynandromorphic specimen of this species.

*Somatochlora filosa* (Hagen). On August 25, 1932, in Liberty Co., Florida, a member of the Williamson-Ditzler Expedition collected a female with indications of male characteristics as follows: On abdominal segment 2, lateral lobes are present but not as large as in a normal male, and on the sternal plate there is a curved paired process suggestive of vestigial hamules; segment 3 has a narrowing or constriction of the segment intermediate between that of the normal male and female; the superior appendages are also intermediate in shape and slightly shorter than normal; and the wings lack any tinge of color. The legs have no tibial keels but the femora are as long as those in the male; the ovipositor has a greater upward curve than in a normal female; the distal margin of segment 10 dorsally is like that of a female; and the epiproct has no suggestion of any prolongation to form an inferior appendage.

Of the eight specimens for which data was available for this paper, six are predominately female, one is about half and half, and one is predominately male. There seems to be no consistent pattern or uniformity in degree of gynandromorphism.

In the genus *Calopteryx*, sex of an individual is usually easily determined by the coloration of the wings and the presence or absence of pterostigmas. If a specimen has one or two wings colored like those of one sex and the others like the opposite sex, it is regarded as a gynandromorph. This raises a question of why a specimen with all four wings like the male and a body of a female is not regarded as a gynandromorph. In the same paragraph of McLachlan's description of the andromorphous *C. splendens* (1866:125) is the following: "De Selys Longchamps mentioned the capture, in Prussia, by Dr. Hagen, of the female *C. splendens* the wings of which were entirely coloured as in the male." An example of the same type is described by Shiffer (1969:138-141) for two females of *Perithemis tenera* (Say) with amber wings characteristic of males. Are these merely homeochromatic females? Or, if body color and pattern is like that of a male in an otherwise normal female, as frequently occurs in several species of *Ischnura* and perhaps less often in some other zygopteran genera, is this a form of gynandromorphism?

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