A NEW MARKING TECHNIQUE FOR STUDYING
THE MATING BEHAVIOR OF ODONATA

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ABSTRACT

A new marking technique useful for studying mating behavior and isolating and releasing mechanisms of Odonates was developed and tested. Fluorescent pigments mixed with vaseline are applied so that some of the paste is transferred during mating. Application is to the male caudal appendages or their points of contact on the female. An ultraviolet light is then used to check field collected individuals for transferred pigment.

Previous studies of breeding behavior and related isolating and releasing mechanisms in Odonata have required direct observation of mating adults (Jacobs 1955). Since many dragonflies do not copulate at a time or place convenient for observation, the reproductive behavior of such species remains unstudied. A mark, release, and recapture technique which expedites the study of breeding behavior without observation of mating is detailed below.

METHODS AND MATERIALS

Day-Glo® (Day-Glo Color Corp., Cleveland, Ohio) powdered fluorescent pigments are mixed with approximately equal volumes of vaseline. The vaseline keeps the pigment in place and remains soft and sticky, and hence transferable. This paste is applied so that some pigment is transferred during tandem linkage, a normal and necessary step prior to copulation in Odonata.

The best sites of application are the caudal appendages of the male or their points of contact on the female. The paste is applied to the dorsum of the prothorax in female Zygoptera (damselflies) and the occiput and rear of the head in female Anisoptera (dragonflies). In the Aeshnidae (Anisoptera) some paste should also be applied to the front and sides of the prothorax in females because the upper surfaces of the male's superior caudal appendages articulate with this area (Walker 1912).

The paste can be applied with any small pointed tool. Pine needles or leaf petioles work quite well and are disposable. Very small quantities of fluorescent pigment can easily be seen under ultraviolet light. Therefore, hands, net, and pigment containers must be inspected repeatedly for stray pigment. After a day or so to allow for pigment transfer, adults are collected and checked for fluorescence with an ultraviolet light.

The method was tested on the damselfly Calopteryx maculata (Beauvois) at a small stream near Gainesville, Florida. On 17-18 May 1973, 66 females were marked with fluorescent paste and released. As many adults as possible were collected and checked on 20 May 1973.

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RESULTS AND DISCUSSION

From the 158 males collected, 90 instances of tandem linkage were recorded. This is a minimum estimate of the number of matings during the test period. The value of the technique is not just in determining the number of matings, but in comparison of the tandem linkage frequencies of individuals that have been subjected to different treatments.

According to Corbet (1963) most dragonflies use visual cues for pair formation involving male recognition of the female. In the majority of Odonata recognition is immediately followed by the male attempting tandem linkage. In using this method to determine which female character, or characters, the male uses, the suspect characters of one group of females are altered. These females are marked with one color fluorescent paste, control and normal groups with different colors. If altered females have a significantly lower frequency of tandem linkage than control females then it is assumed the altered characters were used for recognition by the male, and act as stimuli for releasers of tandem linkage. In some Odonates such as Calopteryx maculata (Johnson 1962) and Perithemis tenera (Jacobs 1955) recognition of the female is followed by an elaborate courtship behavior. The stimuli used for tandem linkage is likely to be different than that used for recognition in these species.

In the trial conducted on C. maculata, 110 untreated females were collected and checked for fluorescent pigments. Five were found with traces of pigment on their prothorax. These females represent a double transfer from an experimental female, to a normal male, to a normal, untreated female. Considering the very small quantities of paste on these nonexperimental females, the possibility of any additional transfers to unmarked males is highly unlikely. The chances of this multiple transfer can be minimized by limiting the amount of paste originally applied and limiting the length of the experiment. However, to insure validity, both sexes should always be monitored for pigments.

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LITERATURE CITED


