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MALE RESPONSE TO FEMALES IN THE MARSH CRANE FLY, *TIPULA PALUDOSA* MG. (DIPTERA: TIPULIDAE)

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ABSTRACT

Laboratory and field experiments suggest that male *T. paludosa* receive a specific mating stimulus only in close proximity of a female. The anterior part of the female rather than the isolated abdomen is the source of the sex pheromone. Attempts to extract the material were unsuccessful.

INTRODUCTION

The biology and control of *Tipula paludosa* Mg. and its occurrence in North America have been reviewed by Wilkinson and MacCarthy (1967). In the field mating takes place immediately following the female's emergence which peaks about 11:00 p.m. and the eggs are mostly laid before morning (Coulson, 1962). Thus control by adult extermination is ineffective. The following preliminary experiments were intended to define the role of sex pheromone with a view to control by means of a metarchon (Wright, 1964).

METHODS AND RESULTS

Larvae collected in June and July 1969 were held in soil seeded with lawn grass. The pupae were sexed

and held separately in 30 x 30 x 30 cm cages in separate rooms under natural illumination but with supplementary light during the day from fluorescent lamps. An intact female pupa placed in a cage with ten unmated males was ignored until the first stage of emergence. Then mating attempts began and the males helped to dislodge the pupal integument. The pheromone was effective over a very short distance only as shown by the following experiments.

On five occasions, at different stages of the diel cycle of illumination, 1 to 3 unmated females (1-2 days old) were placed in a cylindrical cell (5 cm x 5 cm) with bronze mesh at each end. The cells were introduced into cages containing males and were ignored by them until the females were released when mating took place immediately.

A cylinder containing three females placed upwind of ten males in a wind tunnel (Kellogg and

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Wright, 1962) in an air stream of 25 cm-sec, elicited no male response. A female held by forceps, and brought progressively closer to an unmated male, produced a mating response only when the distance was reduced to about 1 cm.

The source of the pheromone was examined as follows: single males were confined overnight in 1-liter glass jars in darkness at 25 degrees C and 70 per cent R.H. and experiments were made in the morning by the light of a red photographic safelight. Using forceps, an isolated abdomen, the remaining head and thorax held by the wings, and an intact female were brought to within 1 cm of each male at 5 minute intervals. The results shown below, suggest that the source of the pheromone is in the forepart of the body.

Attempts were made to extract the active material from 10 unmated females with ether, alcohol, benzene or water containing a wetting agent. The extracts applied to 2 cm squares of filter paper or to female models failed to elicit mating response. Extracts from paper towels on which 20 females had been held for a week were likewise inactive.

Field experiments were made during August and September when wild *T. paludosa* adults were abundant. Traps made from half-gallon milk cartons, three baited with five males and three baited with five females were set three meters apart in a row in randomized order. In three days the traps baited with males caught seven males and one female while those baited with females caught six males. A second experiment used traps consisting of four 30 x 30 cm adhesive-coated vanes set at right angles and joined at the centre where a bronze mesh cell contained five males or five females. The total catch during a four-day exposure was 1,311 adult *T. paludosa* but the

ratio of 1 female to 4.6 males was the same in the traps baited with males as with females.

DISCUSSION

These experiments suggest that although a volatile emanation released by the female acts as a mating stimulant it is effective over a very short range and offers little hope of serving as an attractant to lure males into traps or onto a poisoned surface. However, in the absence or masking of this emanation it is probable that mating would not take place. Any substance which would pre-adapt the males by some kind of masking or fatiguing might be a useful means of control. Methods of achieving such interfering substances are under active development and have been reviewed by Wright (1970).

Mating attempts by virgin male *T. paludosa* caged for 30 sec. near intact females or their constituent parts, at 5-min intervals, on 2 days, were as follows:

Number of males	Mating attempts		
	Abdomen	Head and thorax	Intact female
4	0	4	4
6	0	4	6

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