

**REJECTION RESPONSES BY FEMALE *DROSOPHILA*
MELANOGASTER: THEIR ONTOGENY, CAUSALITY AND
EFFECTS UPON THE BEHAVIOUR OF THE
COURTING MALE**

by

KEVIN CONNOLLY and ROBERT COOK ¹⁾

(Department of Psychology, University of Sheffield, England)

(With 14 Figures)

(Rec. 20-XII-1971)

The literature on courtship and mating behaviour within the genus *Drosophila* contains a number of references to particular patterns of movement made by both virgin and fertilised females in response to the courting male. These responses appear to be attempts to minimise courtship and prevent copulation. They have been variously labelled rejection responses or repelling actions. The original description of courtship behaviour in *Drosophila melanogaster* made by STURTEVANT (1915) contains a reference to repelling behaviour on the part of the female: "Occasionally a female seems to frighten off a male by spreading her wings and moving quickly towards him".

In his extensive review of mating behaviour in the genus *Drosophila* SPIETH (1952) lists a number of female repelling movements including: fluttering of the wings, depressing the tip of the abdomen, elevating the tip of the abdomen, decamping, kicking and extrusion. Extrusion, which consists in pushing the vaginal plates posteriorly so that they project from the tip of the abdomen as a tube like structure, was first described in *Drosophila subobscura* and *Drosophila melanogaster* by RENDEL (1945) who found it to be a typical reaction of the fertilised female to a courting male. MAYNARD SMITH (1956) has provided data substantiating RENDEL's observation for *Drosophila subobscura*. Although extensive SPIETH's (*op. cit.*) review does not contain any information on the relative effectiveness of the various responses or on the circumstances in which they are emitted by the female.

BASTOCK & MANNING (1955) studied the effects of extrusion on the

1) The authors would like to thank Dr U. WEIDMANN for making the German summary of the paper. Whilst this work was carried out ROBERT COOK was in receipt of a research studentship from the Science Research Council.

courting *melanogaster* male using a time sampling method. Their results indicate a strong tendency for the males' courtship to cease following extrusion by the female, though it is interesting to note that this was not invariably the case, extrusion being sometimes followed by attempted copulation. Their conclusion, that extrusion is an effective rejection response, was supported by a further finding that given both a virgin and a fertilised female at the same time the male will direct significantly more of his courtship towards the virgin.

The chief repelling movements made by virgin females are flicking, kicking and twisting. BASTOCK & MANNING (*op. cit.*) also observed extrusion by virgin females though they do not indicate whether this inhibits courtship in the same manner as extrusion by fertilised females. Flicking has also been observed, particularly by BASTOCK & MANNING (in *melanogaster*) who reported that it had an inhibitory effect on the males' behaviour, particularly when it stemmed from another male rather than a female. They present convincing, though not conclusive, evidence that males exposed to flicking by other males are subsequently less ready to court than are males which have had no such experience. On the other hand MAYR & DOBZHANSKY (1945) working with *Drosophila persimilis* and *Drosophila pseudoobscura* found that unreceptive wingless females were just as capable of avoiding males as winged females. Thus for these species flicking may not be such an important response. EWING & BENNET-CLARK (1968) describe a repetitive buzz made by unreceptive females of the *melanogaster* species. This buzz may be the auditory consequence of the wing flicking movements. Also kicking and twisting may not be sufficiently potent signals to immediately halt courtship, though as for flicking, they may have a cumulative inhibitory effect.

BROWN (1964) in his analysis of the courtship behaviour of *Drosophila pseudoobscura* presents some quantitative data in relation to rejection responses. Decamping by the female occurred most often in response to 'high level' courtship by the male, particularly attempts at mounting and vibration. These BROWN called 'contact' behaviours—when the male touched or came close to the female. Curling was found to be a contact response confined to 1 day females. Fending (a response described by SEXTON & STALKER, 1961; CONNOLLY, 1968) was shown by one and three day old females. No detectable effect on the sequence of courtship was observed by BROWN following any of these three kinds of response.

In *pseudoobscura* BROWN distinguished between extrusion which is shown by fertilised females and a similar (and often difficult to distinguish) response shown by virgin females which he called 'spreading of the