

Discrimination in Male Bean Beetle Mounting Behavior

Instructor Notes

In this activity, students observe a specific social behavior in male *Callosobruchus maculatus*. This lab exercise allows students to consider the reasons for this behavior as well as how environmental, developmental, or social environments could affect it. Student groups perform an introductory experiment to test the frequency of mounting attempts made by males, either toward females or other males. The class then performs statistical tests to determine if there is a significant difference between male-male versus male-female mounting behavior. As a class, we discuss possible factors that could influence male mounting, and students are asked to (go home and) design an experiment to test these possibilities. In a follow-up class, students present their experimental designs and (as a class) we select one to perform. Since the follow up experiment occurs during a subsequent class meeting, preexisting colonies of various types will be required (see “Equipment and supplies”).

Experimental designs may involve tracking male mounts by marking one or more males in a colony. We found that males can be easily marked with a spot of white paint on the dorsal surface without the need to chill them.

Experimental Design

In the first laboratory class, students observe dense cultures of bean beetles and observe any bean beetle demonstrating mounting behavior, regardless of sex. Students then design an experiment to test the statistical significance of this behavior and determine whether male mounting behavior is random. The class then discusses what factors might influence the randomness, or lack of randomness, of male-male mounting. After student group and class discussions, students independently formulate hypotheses and design experiments to explain male mounting behavior. In a second class, after students briefly present their designs, a single experiment is chosen to further investigate male mounting behavior.

Questions you might expect students to ask:

- Does the ratio of males to females influence male mounting behavior?
- Does the reproductive experience of the male influence male mounting behavior?
- Does the reproductive experience of the female being mounted influence male mounting behavior?
- Does the reproductive experience of the male being mounted influence male mounting behavior?
- Is a mounted male affected, behaviorally or physiologically, by being mounted?
- Do culture conditions (bean type, bean density, temperature, etc.) influence male mounting behavior?

Data Collection

Variables related to mating experience can be controlled by isolating and culturing specific eggs/beetles. Different culture conditions can be controlled through the development and maintenance of multiple colonies under varying conditions.

A single class, usually 6 -8 groups of 3 or 4 students, should provide enough replicates to be sufficient. Data can be collected in simple table form, with tallies or checks, to record each observed mounting. Time frames could also be added to track the amount of time spent mounting, spent in the mounting position, or incrementally over a given time frame. Data collection can be collected the same day the experiment is done or later, as dictated by the experiment.

Data Analysis

For a typical experiment, students will record the number of times a male mounts a female versus a male. The data will be pooled and analyzed using binomial tests to compare frequency of mounts.

Additional analysis may be needed depending on the follow up experiment.

Equipment and supplies

For a class of 24 students working in groups of 4:

- 6 bean beetle cultures (150mm plates with monolayer of black eyed peas), with dense colonies of beetles
- White, non-toxic acrylic paint
- 6 handheld magnifying glasses