Discrimination in Male Bean Beetle Mounting Behavior

Student Handout

Objectives

- Consider various factors that could influence male mounting behavior
- Design and perform a set of experiments to test whether male mounting behavior is random with respect to sex

Introduction

Bean beetles, *Callosobruchus maculatus*, spend their short adult life span (1- 2 weeks) mating, with females laying (ovipositing) single fertilized eggs on the surface of various bean species (Talukder & Howse, 1994). Following oviposition, a beetle larva will burrow into the bean and ingest the endosperm portion of the seed before emerging as an adult. The later stages of this process can be readily observed through the appearance of a window where the beetle is pupating. Upon emergence, adults of this species do not require any food or water to survive.

Mating behavior in this species is devoid of courtship and is characterized by a male climbing on a female (mounting) and attempting the transfer of a spermatophore. Mating is also characterized by traumatic insemination of the female due to the male's spiny genitalia (Crudgington and Siva-Jothy, 2000). Indeed, the female response to male mounting in some cases is to attempt to dismount a male during copulation before a spermatophore is deposited (Eady, 1994), presumably to prevent damage to her reproductive tract (Crudgington and Siva-Jothy, 2000).

Observation of a bean beetle (*Callosobruchus maculatus*) colony reveals that males, easily identifiable by a lack of white stripe on the caudal end of the abdomen (Figure 1), are regularly seen mounting multiple individuals within the colony, regardless of sex. This interesting animal behavior raises the question of whether or not the mounting is random. More specifically, is male – male mounting an example of intrasexual selection (i.e., competition between males that ultimately leads to greater access to females by one of the males)?

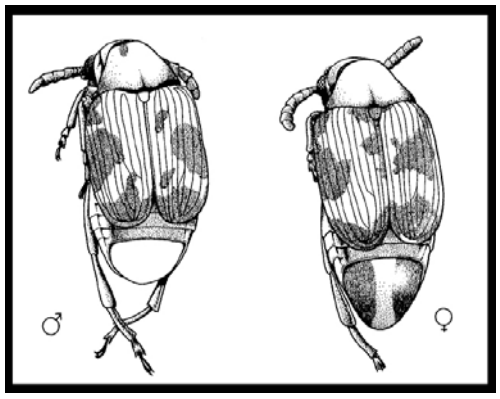

Figure 1: Dorsal view of *Callosobruchus maculatus* **(**From Brown and Downhower, 1988).

Materials/Methods

In class, you will be provided with live cultures of bean beetles that have been raised on black eyed peas (*Vigna unguiculata*). Each culture will contain a dense colony of beetles.

Experimental Design

You will observe the colonies for occurrences of male mounting behavior for 10 minutes. The groups will then come up with a hypothesis and experimental design to test the significance of this behavior. Then you will perform a collectively decided upon experiment and as a class, we will perform statistical analyses of the data from the experiment.

Each group will then formulate a hypothesis and design an experiment to test possible factors that could influence male mounting behavior. Designs will be presented in a future class meeting and a common experimental design will be selected to test. When designing experiments, you should consider the following:

- List possible advantages and disadvantages for male-male mounting behavior.
- List possible experiences or culture conditions that could influence mounting behavior.
- Describe an experiment to further test whether male-male mounting behavior is random.
- List the variables you would manipulate in your experiment.
- List the variables you would keep constant.
- Predict outcomes for your experiment.

Literature cited

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