

MALE DOMINANCE AND COURTSHIP SUCCESS IN CRICKETS

Synopsis: This 3-week long lab exercise will examine the relationship between male dominance and courtship success in domestic crickets. During the first week of the lab, you will gain familiarity with cricket behavior, including aggressive interactions among males and courtship interactions between males and females, and will design a short experiment aimed at determining if males that win aggressive encounters have greater access to females. During the second week of the lab, you will conduct the experiment that you designed and collect the associated data. During the final week of the lab, you will use the time in class to analyze these data and to begin preparing a written report that describes your results. You may work in teams of 5-6 people (ca. 4 groups per lab section, although everyone is expected to write their own report describing the outcome of your experiment. Crickets will also be available during the final week of the lab in case you want to repeat any part of your experiment or acquire additional data.

TO PREPARE FOR LAB, YOU SHOULD READ THE MATERIAL FOR EACH WEEK BEFORE COMING TO CLASS. THERE IS QUITE A BIT TO DO

DURING EACH LAB AND YOU WILL BEST BE ABLE TO MAKE USE OF THE TIME IF YOU ARE READY TO GO WHEN YOU WALK IN THE DOOR!

Week 1. Getting started.

The purpose of today's lab is to become familiar with crickets, including both handling the animals and observing their behavior. Due to the limited number of mini-aquariums available for observing crickets, you will need to work in groups of 5-6 students during all three weeks of the lab.

To complete the lab, you will need to be able to distinguish male from female crickets. This is easy - just look for the huge ovipositor on the female!

To be able to follow specific individuals, you will need to mark the crickets that you observe. Several colors of paint are available on the side counter in the lab room for this purpose. Place a small dot (or dots) of paint on the thorax of the cricket to give it an individually distinct mark. To do this, it may be easiest to use a toothpick to simply dab paint on the cricket while it is in its half of the mini-aquarium. Be sure not to get the paint on the wings, since the animals use these during the behavioral displays that you will be observing!

The standard procedure for characterizing interactions between individuals is to develop an **ethogram**, which is a diagrammatic catalog of the behaviors exhibited during the interaction. An example of an ethogram for crickets is shown on the following page. Your ethogram doesn't need to be this complex, but it should include the major behaviors that you observe during aggressive or courtship encounters. By connecting these behaviors with arrows, you can indicate the typical sequence of individual actions exhibited by the animals. In addition to gaining a general feeling for the behavioral patterns that occur during aggression and courtship, **you will need to decide what behaviors (1) indicate**

the “winner” of aggressive encounters and (2) can be used to measure access to females.

From: Alexander, R. D. 1961. Aggressiveness, territoriality, and sexual behavior in field crickets (Orthoptera: Gryllidae). *Behaviour* 17:130-223.

To develop your ethogram, we suggest that you complete the following set of observations:

Step 1. Stage encounters between 5 pairs of males. For each encounter, simply remove the cardboard divider in one of the mini-aquariums and observe the behavior of the two males that it contains for 5 minutes; use a different mini-aquarium for each encounter. The first time that you do this, you won't know what behaviors the males will exhibit, so you should employ a form of all-occurrence sampling in which you provide a written narrative of all actions observed. As you become more familiar with male-male interactions, you can shift to the type of all-occurrence sampling that we used at the Aquatic Park, in which you simply tick off each time that an important behavior is observed. At 5 minutes per encounter, this part of the lab should take about 45 minutes to complete.

Step 2. Stage encounters between 5 male-female pairs. For this part of the study, simply place a male and a female in an empty mini-aquarium and record what happens.

Step 3. In the time remaining for the lab, you should work in your groups to outline the experimental procedures that you will use next week to document male dominance and access to females. Some suggestions for next week are given on the following page; these are intended to help guide you toward a feasible experiment, but you are not restricted to performing these activities if you think that modifications to the protocol will improve your experiment. You can also use any extra time at the end of the first lab to stage more of the encounters described above if you are not yet confident about identifying the components of these interactions.

Week 2. The experiment.

This is the heart of the multi-week lab exercise. Your goal for this lab period is to execute a simple experiment aimed at determining if dominance during aggressive interactions is associated with greater access to females. Although some suggested procedures are given below, you should feel free to modify this outline as seems best, keeping in mind the type of equipment available and the time constraint imposed by the lab period (about 2 hours to collect your data).

For any design, you should complete 6-10 repetitions of your experiment so that you have enough data to begin to look for general patterns regarding male behavior and access to females.

Possible general protocol: Stage an encounter between a pair of males, watch their interactions for a specified time period to determine who is dominant, then introduce a female and determine which male has greater access to the female.

Some tips: Be sure to determine what behavioral data you will collect before you begin the experiment. For example, you should determine what your criteria for dominance are, as well as what criteria you will use to measure access to females. Although some surprises may emerge during the course of the trials, it's best to have a clear idea of what you need to record before you start putting crickets together.

Week 3. Data analysis.

During the final week of the lab, your group will use the lab period to analyze and begin interpreting the data that you collected during week 2. Crickets and all of the equipment used during the lab will be available in case you want to add a few trials or go back and repeat part of your experiment.

The lab report.

The final aspect of the project is the preparation of a lab report, which will be due in lab during the week of 26 April. This report is worth 50 points, so it is a relatively important part of the final course grade. The report should be written in standard scientific format (introduction, methods, results, discussion, tables and figures, references). Examples of reports will be available during the third lab period and you will be provided with a paper that provides tips on writing good scientific papers. The point breakdown that will be used to grade your report is provided on the next page.

Grading scheme for lab reports (50 points total)

Introduction (8 points total)

Contains basic statement of research problem, including clear statement of hypothesis to be tested (4 pts)

Provides enough background to place research question in the larger context of reproductive competition and intrasexual selection (4 pts)

Methods (15 points total)

Procedures used to collect data are clearly explained in sufficient detail that your experiment could be repeated by someone reading your report (8 pts)

Methods are appropriate to the question being addressed (4 pts)

Procedures used to analyze data are clearly explained (3 pts)

Results (15 points total)

Major results are summarized in text, with more detailed information provided in tables and figures (8 pts)

Tables and figures are clear, easy to read, and convey primary findings that they are supposed to present (5 pts) (Statistical analyses are not required, but if you would like to employ them talk to one of us for some tips)

No interpretation or discussion of findings included (2 pts)

Discussion (8 points total)

Primary results are interpreted within the context of the hypothesis being tested and a conclusion is reached regarding whether the hypothesis is supported (4 pts)

At least three relevant published papers are cited to support your interpretation of the data (2 pts)

Major sources of error or significant confounding variables are identified and their possible effects evaluated (2 pts)

Other (4 points total)

Writing is clear, correct, and easy to read (2 pts)

Paper follows appropriate format for a scientific report (2 pts)