BIO 45 - DISCUSSION #7 - TAILS OF THE PEACOCK – 29-31 OCT. 2002

I. PURPOSE:

Ever since Darwin, people have used the peacock's elaborate train ("tail") as an example of the product of sexual selection by female choice. Now, finally, Marion Petrie and her colleagues at The Open University have actually tried to test the validity of Darwin's tale of the peacock's train.. We will read the first paper from their study and see a video about their study. Your can compare the "book" with the "film". As usual we will not be satisfied with looking at what <u>has</u> been done. We will explore what <u>should</u> be done in the future as well.

This section brings together a lot of the ideas in the lectures on sexual selection. The video gets across the problem that Darwin was faced with when trying to fit flamboyant male secondary sexual characters into his theory of natural selection. Photos of a peacock's train are impressive, but the full sense of the power of sexual selection requires seeing the show he puts on with his train.

II. READINGS:

1. Petrie, Marion, Tim Halliday & Carolyn Sanders. 1991. Peahens prefer peacocks with elaborate trains. Anim. Behav. 41:323-331.handedout in class -- **do not wait until last minute**!!

III. ASSIGNMENT:

Read the paper as you did the Oystercatcher paper. Ask questions while you read it. Look for strengths and weaknesses. Be ready to tell your section what you liked the most about the paper (study). Be prepared to tell the section what experiment you would most like to be involved in using peacocks as the study animal. See if you can explain why females would choose males with more eyes on their train. What does she get from the male when she mates with him? What does it cost her to choose one male over another? Try to make some sense out of this choice. What could the train tell her about the male or his genes? How might mating with a particular male affect a female's offspring?

IV. EXPLAINING THE TABLES:

A lot of the statistics in this paper involve regression analysis. For example, "What measured traits correlate best with mating success?" or better yet, "How much of the variation among males in mating success is explained by variation in display rate or train length, etc.?". Table 1 examines the results of plotting a number of possible causal factors against number of mates. You are given the mean value for each independent variable (X axis of a graph) and its effect on the dependent variable (number of mates -- Y axis). Figure 3 is an example of such a regression plot from Table 1. The "r" in table 1 is a measure of how well the data fit the regression line. The closer the number is to 1.0 (or -1.0) the better the fit and the stronger the relationship. An "r" of 0.0 means there is no effect of X on Y. As you can see only 'No. of eye spots' is significant ($P < 0.05$).

The multiple regression in Table 1 is a little more complicated. Suppose variation in display rate was affected by train length -- males with longer trains displayed slower. Now suppose a strong relationship between train length and number of mates was found -- slower males had more mates. What would be the relationship between train length and number of mates? It would be that males with longer trains had more mates. But which relationship is the true cause of number of mates? Is it train length, which just happens to affect display rate? Or, is it display rate? You see the fact that train length and display rate are correlated (in my hypothetical example) makes it hard to interpret the causal relationships between display rate and train length and number of mates. Ideally then, one wants to be sure that each independent variable tested in Table 1 is independent of (correlation = 0) of all of the others. Otherwise we cannot really tell if the significant effect of eye spot number is acting by itself. The way that Petrie et. al. test this independence is to use multiple regression. That allows them to test the effect of A on B while holding the effect C constant. They do this for each variable (A = eye spot number and B = number of mates) in turn. That regression (A vs. B) is significant no matter which other factor is held constant. Thus the is no interaction among these independent variables -- no hidden causality.

Table 2 is identical, in statistical analysis, to the first part of Table 1. Now that we know that eye spot number was the only variable in Table 1 that had a significant effect on number of mates, we want to know if there is any other trait (of those measured) that is significantly related to eye spot number. This is done to be sure that eye spots and not some character correlated to eye spots are what females are using as their clue. Suppose bigger birds have more eye-spots. Then if females preferred bigger birds it could look as if they preferred more eye-spots. We might only look at eye-spots and conclude that females like eye-spots when in fact they liked bigger males. Table 2 tells us that only one variable (train length) is related to eye-spot number. The longer the train the more eye-spots (a positive "r" that is significant, $P < 0.05$).