Lecture 1 and 2: History and Methods of Behavioral Ecology

1. What is behavioral ecology? (define). Why might a particular behavior depend on the ecology of an organism?

2. In Darwin's 1872 The Expression of Emotions in Man and Animals, what types of behavior was Darwin concerned with? What were Darwin's scientific goals in studying these behaviors? What were the four 'causes' of behavior that he identified? Give a concrete example of a behavior that fits into one of these categories.

4. Describe what an ethogram consists of and why ethograms can be useful for the study of behavior.

5. List the four questions about a behavior that Niko Tinbergen stated that all behavioral ecologists should ask. Give a short description of what he meant by each question. Explain why you think it is important to ask all of these questions about a behavior.

6. What are some proximate questions that could be asked about a particular behavior? What are some ultimate questions? Give examples of other sub-disciplines of biology and how they relate to answering proximate and ultimate questions in behavior.

7. What is the purpose of science? Describe two ways in which science works. Is science fallible?

8. You observe a bird bouncing up and down in a complicated behavior while on a nature walk. You would like to understand why it is doing that behavior. Describe some general things (at least four) that you should do when formulating hypotheses and determining what is going on with the behavior. For example, should your hypothesis be falsifiable?

9. Who were the three founders of the modern field of ethology/behavioral ecology? Give examples of proximate and ultimate questions as relating to the work that they did.

10. Describe how Tinbergen investigated the behavior of beewolves. What were some of the things that he did well in terms of being a skeptical thinker while testing his hypothesis?

11. What is the evidence that supports a hypothesis that black-headed gulls have been selected to remove eggshells from their nests?

12. How do bees communicate information about the distance and direction of a food source? Describe the basics of the experiments that determined how they communicate.

13. What are some questions that Konrad Lorenz investigated?
14. What is the comparative method? How did the comparative method as applied to weaver birds reveal insight into behavioral evolution?

**Lecture 3 Natural selection on behavior.**

1. What are the three essential components that Darwin described are needed for natural selection to occur? How do we think about these components in terms of modern genetics? How does natural selection affect the phenotypes of organisms in their environment? How does it affect genetic variation? Describe how natural selection affected cricket populations in Kauai.

2. Does natural selection act on genotypes or phenotypes? Is it a random process? Does it act for the good of the species?

3. What is the pattern in feeding behavior of garter snakes? What is the evidence that this is not a learned behavior and thus might be genetic? Describe an experiment that would explicitly test whether the feeding behavior is genetic.

4. What is heritability, and why is it important to investigate when studying natural selection? What type of genetic variation is acted upon by natural selection? Which type of heritability measures this type of genetic variation?

5. If a trait has a broad sense heritability of .75, how much of the phenotypic variation is explained by environmental factors? How much to genetic factors?

6. What are two different ways of measuring heritability? What do each of the methods compare in order to determine heritability?

7. A friend of yours read an article that says that identical twins reared together have IQ’s that are 90% similar. The friend argues that this means that IQ must be nearly all genetically determined, and therefore improving the school system is a waste of money. What would be your argument in response? Describe some of the evidence that suggests your friend is wrong? Describe the multiple factors that can affect IQ.

8. Describe a laboratory experiment that could be used to study whether a behavioral trait can undergo natural selection in nature.

9. You bet someone that you can predict next year’s average calling behavior in crickets on Hawaii. You assume that these crickets only live 1 year and die right after laying eggs. You observed that the average rate of calling done by crickets in the spring was 50 times a minute. However, some parasitic flies landed on the island and killed some of the crickets, preferentially killing ones that called a lot. By the fall (right before they laid their eggs) the remaining crickets were only chirping an average of 20 times a minute.
The heritability of cricket calling is .40. What is your prediction of the average calling behavior next year?

12. Describe Carol Lynch's artificial selection experiment on mice. What are two reasons why the selected lines might not have continued to diverge?

Lecture 4 Types of natural selection, Genes and behavior

1. Draw graphs illustrating each of directional selection, stabilizing selection, and disruptive selection. What are the different results these forms of selection have on the phenotypes in the population? What are examples of each of these types of selection?

2. What is frequency dependent selection? Give an example and discuss why it is frequency dependent.

3. Discuss how garter snakes are an example of correlational selection for a behavior and a morphological trait.

4. Do genes alone determine behaviors? What are some other factors to consider?

5. Give an example of how variation in a single gene can influence behavior. What maintains variation in that gene?

6. Give an example of how multiple genes may shape behavior.

7. What is the evidence that migratory behavior is genetically determined? Is it likely that selection is currently affecting this behavior?