Worksheet 4: Evolutionary Ecology I

1. What is natural selection? (pg 71)

2. Natural selection requires two conditions. Describe these two conditions and explain how together they lead to the process of natural selection. (pg 71)

3. What is evolutionary fitness? How can it be measured? (pg 71)

4. The following is a common definition of an adaptation: An anatomical, physiological, or behavioral trait that increases the ability of an organism to cope with its environment.

   a. Using a favorite organism of yours, give an example of a characteristic (i.e., trait) that varies among individuals (e.g., hair color, speed) and that likely affects the ability of individuals to cope with their environment. (pgs 71-72)

   b. For the trait you chose above, describe a quantitative measurement you could take on each individual of your organism that would quantify how well it copes in its environment. (pgs 72-73)

5. Do individuals or populations evolve through the process of natural selection? Explain your answer. (pgs 71-72, and throughout chapter)

6. What is the difference between a gene and an allele? (pgs 72)
7. Individuals in populations vary in their genotypes and in their phenotypes. What is the relationship between genotype and phenotype? Is it ever possible for individuals with the same genotype (clones) to have different phenotypes? Explain your answer. (pgs 72-73)

8. Peter and Rosemary Grant are scientists who have studied the evolutionary ecology of Darwin’s finches on the Galapagos Islands for many years. Read pages 73-77 in your text and answer the following questions based on this information.

a. How did the La Niña weather pattern affect the proportion of small versus large beaked birds in the population of medium ground finches on the Galapagos Islands?

b. Why did finches with large beaks have greater fitness than those with small beaks?

c. What type of selection (directional, stabilizing, or disruptive) was evidenced in this population of ground finches? What evidence can you cite to support your answer?

9. Three general types of selection occur in populations. Using a frequency distribution to represent the variation of a trait within a population, illustrate the three types of selection and explain how they occur. (pg 75-77)

10. In figure 5.11 in your text (pg 76), black-bellied seedcrackers show a bimodal distribution of bill size. Explain how such a bimodal distribution could have arisen in this species.

11. Explain how mutation can introduce genetic variation into a population. (pg 77)