Take home exam one. 85 points.

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Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**You are expected to abide by the NCSU Honor code**.

Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Please sign simply by typing in your name here. **Unsigned exams will not be graded.**

Please read each question carefully. The allotted space indicates the length expected in your answer **and I do not plan to read beyond this space**.

1. Why would any definition of natural selection need to consider reproduction as well as survival? 10 points.

2. You are studying color and its possible role as an adaptation for camouflage in a widespread species of snake that lives on the forest floor.

Snakes come in two colors, mottled brown and tan. After some observation you feel that more tan snakes are found in woodlands where trees are more scattered, there is little leaf litter in the fall and spring. Tan mushroom growth covers most of the space between trees, except for a few months in the year in the dead of winter when snakes are dormant. Brown mottled snakes seem to be found in forests where trees are closely spaced and there is a lot of leaf litter.

**Your hypothesis is that the color of the snakes is a camouflage adaptation with tan snakes less noticeable among the mushrooms, and brown mottled snakes difficult to see among the leaf little.**

a. How would you use artificial selection experiments to test your hypothesis? (Think Conover!) You have several small rooms available that will allow you to recreate forest populations in terms of substrate minus trees of course. While the university will not allow you to import snake predators to keep for a few years, you can substitute human observers and volunteers. 20 pts.

b. What other parameters would you check to make sure you were monitoring the “whole” phenotype that natural selection was impacting? 10 pts.

**Two exceptions to your general observations come from two small populations near each other but in isolated** **woodland very far from those previously studied. Both of these populations contain a high proportion of tan snakes although located in heavily forested areas with a lot of leaf litter.**

c. How would you determine if gene flow, founder effects or time lags plus founder effects were more important in determining frequencies in these two small populations? Include definitions for these terms in your answer. 20 pts.

3. Discuss the importance of considering alternative hypotheses, when it comes to Zebra stripes. Which hypothesis do you feel is supported by the evidence.

15 points

4. Historic or phylogenetic constraints on adaptation are assumed to be the most prevalent barriers to perfection in adaptation.

Define what is meant by an historic constraint. **If you feel you need to use an example, use that of the vertebrate eye or the location of the vas deferens in male mammals.** . **Do not use lack of parthenogenetic frogs or cheetah limb arrangements, they are poor ones.**  There are plenty of parthenogenetic species of vertebrates and the cheetah example is worded poorly. 10 pts.