

## BIO 45 -- Exam 2 – **Answer Key\_ - 11/14/02**

### INSTRUCTIONS:

1. Put your name on this page only - **Transfer the exam number to each page** of the exam.
2. **Read each question very carefully.** You need to figure out **exactly** what each one asks. Give us **concise, short answers**. **Do not write on the back of the page** unless you have had to change your answer. Writing legibly will often help more than adding sentences. We will take off points for errors even if the correct answer is given.
3. When examples are asked for, give preference to well documented ones. **Do not use hypothetical or anecdotal information (unless it is asked for)**. Citing species names and names of those who did the experiments will reduce ambiguity in your answers.
4. **Do not use the same example more than once on the exam.**
5. **If you feel a question is ambiguous - ask for clarification!** Some questions are meant to be confusing unless you have a solid grasp of the material. Do not hesitate to ask - some ambiguities are not intended and will be corrected during the exam.

6. Terms:

**Explain** = Show that you **understand** what is going on - don't just list facts.

**Cite or Identify** = Who did the work on what species and some details relevant to the question. If you can't remember names, give enough detail for us to identify the study you mean.

**List** = You do not have to go into detail. Make sure the items in your list are really distinct.

**Briefly** = a few well-chosen words or phrases will suffice.

1. This is the final grading key. The grade distribution is posted on the web site. The mean was 35 out of 50 pts and the range was 12-49.
2. Again, points were lost due to your not being able to use the vocabulary and concepts correctly in reading and answering questions. Note the words emphasized with bold and underlined text on the exam and in the answer key below.
3. I will be happy to talk about your exam and to go over it in detail. I ask that you first study the answer key and your exam to see if you can spot some of the reasons you lost points in general as well as in specific cases. If you felt you really understood the material going into the exam (it made sense to you) and did poorly, chances are that you haven't fully come to grips with the difference between something making sense to you and your being able to use it in general and specific ways. We can work on that.
4. If you did poorly on the exam -- especially less than 25 points you need to figure out what went wrong in your approach to the exam. I would like to talk with you about it -- often an adjustment can be made in studying or thinking that will clear up the problem. You haven't ruined your grade yet, but you do need to have a solid grasp of the concepts and terminology since they will be on the next exam as well. Do this before the second exam!!!

### 5. RE-GRADE REQUESTS:

- A. Carefully go through the answer key with your exam.
- B. Write me a short note about the problem and leave it and the exam in the envelope on my door in Walter Hall (room 208).
- C. Do that before 3 PM Friday 22 November
- D. I will go over the entire exam as well as the specific questions you request.

1. (8 pts) Exploring concepts about how selection can be due to the actions of conspecifics:

A. (3 pts) Here is a pay-off matrix for interactions between “walk” and “run” tactics in a game. This is all you need to know to be able to tell me under what condition RUN is the ESS. Describe the condition by using the letters A, B, C and D.

	WALK	RUN
WALK	A	B
RUN	C	D

**$C > A$  and  $D > B$  or  $(A+B)/2 < (C+D)/2$**

B. (5 pts) When  $C > V$ , **explain why Doves can invade but not replace a population of Hawks**. No pay-off matrix or numbers are needed. Just state the answer in words that show **you understand the dynamics that allow this** to happen.

**Since D vs H has higher payoff for D than H vs H does for H, dove can invade. As they increase in number Hawks have fewer H vs H contests and more H vs D contests that raises their average payoff relative to doves. Dove continue to increase until the average payoff for Doves = that for Hawks – stable equilibrium.**  
**2 pts for why doves invade 3 pts for freq. dependence and equilibrium reasons**  
**I wanted an answer that shows you understand the frequency dependence involved – why Dove does well at first but begins to do less well as it gets more common in the population – Hawks have more contests with doves which raises their average payoff.**

2. (8 pts) What is the major take-home message in two of the following papers?

1. Robinette & Ha on factors influencing vigilance by northwestern crows
2. Brooks & Kemp on male age and good genes theory
3. Weins on the loss of sexually selected traits
4. Vincent et. al. on Pipefishes and Seahorses

Your answer had to make it clear you read and understood the main point(s) of the paper.

1. Vigilance does not decrease with group size – mainly because of increased need to watch out for scroungers or for opportunities to scrounge.
2. AIM does not always apply, there are a number of weaknesses of the old age = good genes hypothesis. One example of such a weakness really helped.
3. Loss of Sex. selected traits may be greater than gain because... You needed to give one of the reasons (otherwise you are just repeating the title)
4. A change in PI does not necessarily mean role reversal. Shift in emphasis from PI to OSR. Just mentioning that Role reversal correlates with polygamy but not monogamy was not enough – that was the pattern that the paper tried to explain not the take-home message.

3. (8 pts) Gonzo studied a tropical fish in which males vary in how red their dorsal fins are. He divided an aquarium into three parts with clear glass partitions (see figure). He recorded how much time each of several females spent in front of each of several pairs of males. He found that females always spent more time in front of the reddest male in a pair.

M 1	FEMALE
M 2	

A. What are **the** two alternative ways to interpret these results?

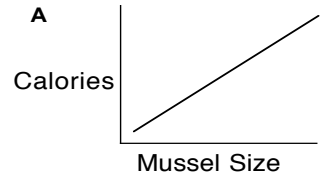
**1. female choice for redder male**  
**2. male-male interaction causes female reaction**  
**A possible approach would be that females base choice on redness or that a correlated character is involved (red correlated with some other basis of choice). If you could identify a single simple change to distinguish these you got credit. But, that still does not rule out male-male interaction. Read the question carefully – nowhere does it say females choose.**

B. What single, simple change to Gonzo’s experiment could you make that would eliminate one of the alternatives?

**He could make the partition between males opaque to remove male-male interaction**

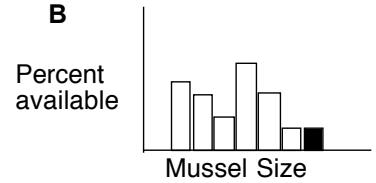
4. (10 pts) You read a paper on oystercatcher foraging and thought about how the study might differ for a population of stabbers. Answer the following questions about a set of data on **stabbers** foraging on mussels: **No Parasites in Mussels**

A. (4 pts) **Figure A** is a graph of calories versus mussel size. In order to turn it into a graph of profitability versus mussel size what would you have to do?



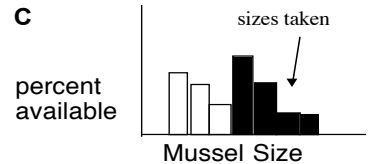
**Divide calories by handling time for each mussel size**

B. (4 pts) The profitability graph turns out to look just like Figure A but with a slightly lower slope. Now, **fill in the bar(s) in figure B** for the mussel size(s) they **should** take if they are to maximize energy gain per hour spent foraging --- all else being equal.



**Only the largest size class – all else equal that has the highest E/h and will maximize E/T. Many confused % available with density – the figure just shows that the largest size class makes up a small % of those there.**

C. (4 pts) **Figure C** shows the sizes of mussels they **actually** ate. The birds are foraging optimally, all assumptions of the model are correct, the currency **accurately reflects** fitness gain and loss, and utility function to be maximized is correct. How can you explain these results? Think before you write!



**The density of the optimal prey size was not high enough, birds had to include next most profitable prey types into diet. Note the difference between percent available (frequency) and density.**

5. (6 pts) Let's explore your understanding of some basic concepts:

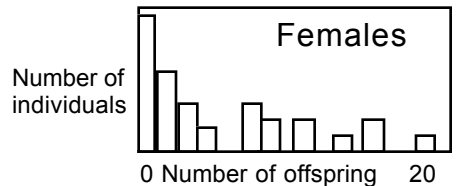
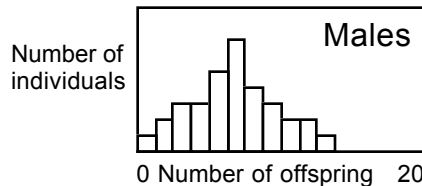
A. In order to navigate, what "tools" does an animal need?

**Basically, you need a "map" and a "compass." "Map" to locate where you are and where home is and "compass" to orient while traveling home.**

C. What does sensory exploitation have to do with runaway selection?

**It is one way to get a "choice gene" to high enough frequency in a population to allow the runaway process to take off.** Partial credit = 1 pt for explanations of Sensory exploitation and runaway selection

6. (8 pts) Tell me about sexual selection in this species:



**You had to note that sexual selection was acting on females and explain why, based on the graphs. There is high variation in female reproductive success relative to males and thus you would expect males to be limiting female success. That should lead to female-female competition and male choice. Sexual dimorphism might also be expected as well as something that makes males a limiting factor for female reproduction. If you said that PI was reversed you attracted the attention of the grader who not only took off points but now suggests you really pay attention to the Vincent et. al. Paper we are discussion this week!**

7. (2 pts) What is **THE** difference between males and females?

**Their gametes - Males produce sperm, females produce eggs**