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| BIO 45 -- Exam 1 -- Ways of Studying Behavior -- 4 October 2000 |
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INSTRUCTIONS:**FINAL ANSWER KEY**

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 36 out of 50 pts.
2. Many 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 my mailbox in Walter Hall.
- C. Do that before 3 PM Friday 20 October
- D. I will go over the entire exam to see if points can be added or taken off.

1. (10 pts) What do we mean? **Briefly** answer both questions

A. "Adaptation are always adaptive traits, but adaptive traits may not be adaptations." **Explain**

Adaptive traits enhance survival and reproductive success but they do not always have a genetic basis. If they do not they cannot be adaptations.

0 pts – restating but not answering the question

3 pts - increases fitness

5 pts – increases fitness, but does not have to have genetic basis (or be heritable)

note: If you got this right and question 4B wrong then you do not fully understand the meanings of adaptation and adaptive – make sure you do.

B. What do we mean by "a genetic basis" for a behavior

See lecture #6 handout where this was defined

We mean the basis for differences among variants of the same trait is genetic, the different types will breed true. Just saying genes code for the behavior only got partial credit

3 pts – defined it has heritable 5 pts – included differences breed true or are heritable

2. (12 pts) Lists of things: remember, lists do not require detailed explanations or examples

A. List three reasons why an adaptation may not be perfect:

Any combination of:

1. needed genetic variation does not occur
2. environment changes too fast or too often
3. there are phylogenetic and phenotypic constraints
4. There are physiological and behavioral trade-offs
5. Selection only favors better of existing variants

evolution lacks foresight, individual versus species, hitchhiking genes, are not relevant
many combined phylogenetic constraints and physiological trade-offs

B. The environment plays **three key roles** in the production and evolution of animal behavior. What are they? Just a sentence each

1. Environment as the stimulus that releases behavior or facilitates learning
2. Environment during development
3. Environment as selection

descriptions of environments were not relevant

many answers contained two versions of the same answer – credit only for one

3. (8 pts) Genes, environment and behavior:

A. Cite an example from Alcock that **contradicts** this statement: "If a behavior is totally inflexible in adults and is exactly the same the first time it occurs as the last time, then it is clearly genetically determined."

Had to happen in juvenile period and affect adult behavior. A developmental process that caused the behavior to fix and stay that way. Contradicts the statement means it provides evidence for environmentally determined fixed adult traits.

Examples include the cannibalistic salamanders, imprinting if it relates to adult behavior, song tutoring examples and Galah contact (but not alarm) calls. Also: effects of siblings in womb, oystercatcher feeding types (3 pts, not in Alcock), zebra finch male and female affected by hormone in critical period,

B. Cite an example from Alcock that **supports** this statement: "Most people would consider the developmental environment of a behavioral trait to be that within an egg or womb. However, the developmental environment can be external to either parents or the developing offspring."

A documented example of a developmental influence that is outside of the individual or its parents body and beyond the direct influence of its parents. Lab experiments are not relevant (Rhesus monkey study, imprinting and so on.) Imprinting does not work – e.g., geese in nature only see mom at critical period. Examples include several of those for part A but not if you used the example in part A: social modification of bird song, cannibalistic salamanders, bee division of labor, twin studies, spiny mouse..

4. (10 pts) Show your understanding of some basic concepts in behavioral ecology. One or two well-phrased sentences without unneeded details will answer each question.

A. Suppose there is no variation in the population for a behavioral trait (and its associated morphology). Suppose you cannot create variation (i.e., like cutting and gluing tails to change their lengths). You can still **directly** test an adaptation hypothesis for this trait? **Using an example, briefly explain how.**

You can vary the environment and see how the reproductive success varies in the different environments, or how environmental context affects expression of trait (e.g., Pope's study). One environment is the one you think the trait was selected for, the other isn't. Environment = selection or context in which the trait is hypothesized to function.

Several examples in Alcock and the Pope paper is a very nice one. Many used the fish that supposedly hide in vegetation to avoid predators. That was a hypothetical example I used in lecture. In the future be sure that when asked for an example use only well documented ones from Alcock, the readings or lecture. The fish ponds one only got credit if you specifically stated that you would compare survival in ponds with predators and with and without grass.

A number of you compared species – that is an indirect test

B. "... **the authors** subsequently declare that knowledge of the underlying genetic, developmental and historical bases of a behavior is not required to conclude that it is adaptive." [S. Cameron. 1997. Trends Ecol & Evol. 409-410]. **Are the authors right? Why?**

Yes, they were. Cameron is confusing adaptation and adaptive trait. We can legitimately study how selection affects that trait, no matter what its origin or genetic basis. [guess who one of the authors was!] If you got this wrong and 1A correct then you really don't have the difference between adaptation and adaptive trait clear yet. Make sure you do!!

C. Explain how the horns of female antelope **could** be used to illustrate both adaptation and incidental effect?

Female horns as an adaptation:

We could see them as designed for defense against predators and thus selected for in that context and heritable. If you only suggested an adaptive function you lost 1 point.

Female horns as an incidental effect:

They could be hitchhiking traits, or developmental constraints – like nipples in males. You had to say how the trait gets expressed in females despite any cost to them. Otherwise you simply repeat the question by saying it was an incidental effect.

5. (10 pts) There are a number of hypotheses for infanticide in langurs and other animals. Alcock notes that one should make a set of **predictions for the alternative hypotheses that when tested could distinguish between them**. I have started a table for doing that, you finish it
 (The cannibalism hypothesis is that males must replenish energy after the expense of take-over)

| Predictions | Alternative Hypotheses | |
|---|------------------------|------------------------|
| | Sexual Competition | Cannibalism Hypothesis |
| Infanticide only occurs after take-overs | +++ | +++ |
| Remove the group male, new male still commits infanticide | + or +++ | --- |
| (4 pts) for example: Feed the new male a lot and no infanticide If there are no cubs in the group, nobody is eaten Group males does not kill cubs after failed take over attempt on his group | --- +++ +++ | +++ --- --- |

+++ = Strong support for hypothesis

--- = Hypothesis not supported

+ = Weak support for hypothesis

The object was to make a prediction or describe the result of a manipulation that would **distinguish between** the two hypotheses. If your prediction or hypothesis did not distinguish you lost a point (in addition to any errors in +++ or ---).

Note that saying females were more receptive to males after infanticide is wrong for two reasons. First, that is a female action not a male one. Second, it happens to support both hypotheses – females who lose kids will replace them.