EXAM NO. _____

BIO 45 – **Exam #3** -- 11 December 2000

NAME ____**FINAL ANSWER KEY**_____

This is a summary of the way in which we graded the exams. All exams near borderlines have been checked. Unless you feel we have taken off 6-10 points more that we should have, there is no use in having me check the grading.

Third Hour exam

Question 1	_____	of 8
Question 2	_____	of 8
Question 3	_____	of 8
Question 4	_____	of 9
Question 5	_____	of 5
Question 6	_____	of 12
Total Points:	_____	of **50**

INSTRUCTIONS:

1. Put your name on this page only - **Transfer the exam number to the other pages.**
2. **Take the first 20-30 min. to read through the exam and organize your thoughts.** Use the exam book we gave you for notes and draft answers. **Make sure that all your answers are on the exam** and that they are clear, concise, legible, and reveal your understanding of behavioral ecology.
3. **Do not write too much**. We will take off points for errors even if the correct answer is given. **Do not write on the back of the page** unless you had to change your answer.
4. **Read each question very carefully.** You need to figure out **exactly** what each one asks. **If you feel a question is ambiguous - ask for clarification!**
5. 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.
6. **Do not** use the same examples more than once on the exam
7. When asked for lists or alternatives **make sure that each is clearly distinct**.
8. Definitions:
   "**Explain**" means show us that you understand what is going on - don't just list facts. **"Explain" also means** that you tell why as well as give a reason.
   List = just identify, do not embellish unless it is needed to clearly identify things or differences.
   Identify = Who did the work, on what species and some details relevant to the question. If you can't remember names, give enough detail to identify the study.
   Briefly = a few well-chosen words or phrases will suffice.
9. If you read the instructions above, write your exam number here _____

1. (8 pts) correcting mistakes.

A. **Rewrite the following so that it is correct**: "The inclusive fitness of a male in a coalition of lions is the number of kids he fathers, plus the number of kids produced by other coalition males times his average relationship to the other males."

The inclusive fitness of a male in a coalition of lions is the number of kids he fathers, plus

The number of kids he fathers, minus any that were do to the help of others, plus the number of kids produced by other coalition males that his help was responsible for, times his average relatedness to the other males.

Note: it is r to other males not to their kids that counts.

B. "Because one male can fertilize all of a female's gametes, females do not benefit from mating with multiple males." **Explain why this is wrong**.

I wanted one clear benefit to multiple mating by females. This is intended to be very easy. E.g., assurance of fertilization, help from more than one male (dunnocks), access to multiple resources, nuptial gifts, protection, genetic diversity of young, and so on. No example needed.

2. (8 pts) "Alternative possibilities..." -- For each of the following observations or situations, provide **two different but probable explanations**. Try to make these **mutually exclusive** alternative explanations and make sure they are based on material from the course.

A. Freda has found a population of jackals where young, unmated, but sexually mature males help raise pups by bringing food to the pups and the pups mother.

1.

1. the helpers are related and gain via inclusive fitness
2. the helpers are not related and gain experience for their own future reproduction
3. Courting the female for later reproduction by demonstrating parental skills
4. kidnapping – raising unrelated offspring so they believe they are yours and will help in future

Note: 1 and #2 could not both be helping relatives – otherwise you lost a point
If you just said C=0 that was not enough you had to explain why the would help

2.

B. A molecular geneticist has studied a new bird species - the tannenbaum distlefink. She found -- in a sample of 10 chicks per nest for over a hundred nests -- that the relatedness of the chicks in each nest ranged from 0.00 to 0.50 with a mean of 0.25. She now asks you to tell her what kind of mating system the tannenbaum distlefink might have. Suggest two possibilities based on your understanding of mating systems (examples would help).

1.

The idea was to suggest a mating system that would produce 0 to .5 relatedness with an average of .25. In other words, half-sibs (two dads or two moms maximum)
• like polyandrous species (dunnocks, jacanas) plus Egg dumping
• like monogamous species with egg dumping and EPCs (variety of birds)
• like polygynous species with egg dumping and/or EPCs
• Polygynandry (eg. Dunnocks)
• crèche system like ostriches
*****Note that to get 0 relatedness the kids can't share a parent (thus egg dumping by unrelated bird – except in polygynandry where there will be kids with totally different parents)**
Cowbirds do not work - they do not have nests.

2.

3. (8 pts) Explaining how:

A. How can you distinguish between helping and altruism using Hamilton's rule?

Altruism means geneotypic altruism (you should know that) You can say it in words or simply write: if rb-c>0 = helping but if rb-c<0 = altruism

B. Ignatz studied a monogamous species in which individuals reproduce only once in their lifetime. It has a brood of 5 offspring and both parents care for the kids (bringing them food to eat). Ignatz says, "Clearly there is no parent-offspring conflict in this species because there are no future offspring to be produced by the parents." **Explain why he is right or wrong:**

Ignatz is _____ because

Wrong because each offspring wants it all and the parents would be more likely to divide among them. Even if parents prefer one really healthy chick vs several mediocre ones, not all the chicks "agree" – still a conflict. You had to express both the parent and offspring view clearly to get full credit.

4. (9 pts) Good things come in threes --

A) What are three distinct things that can alter the operational sex ratio?

1.

Any three mutually exclusive things (factors): differential mortality, reproductive synchrony, different rates of reproduction or parental investment, reproductive suppression, etc.
If you used parental investment, you had to make sure it was not also the cause of another one (e.g., rates of reproduction and PI are hard to separate). So are differential mortality and distorted population sex ratio.
Note: answers like "sexual selection" or female choice are not correct unless you said specifically how they would change the OSR. (OSR causes the selection!).

2.

3.

B) Describe three different social **dynamics** for the single male - multi-female ("harem") **social** structure. Just enough information to clearly distinguish them. Examples will help.

1.

• Gelada type - females bonded, permanent group, male guards
• Hamadryas type - male-female bonds (also gorilla)
• Horse, plains zebra, red deer (in rut), gorilla type - female associations looser, females come and go
• Grevys Zebra type – looks like harem but females not bonded to either females or male (also elephant seals)

Note that social structure does not mean mating system (e.g. dunnocks do not work here)
Note that elephants are not single male - multi-female groups, nor are lions

2.

3.

C) List **Alcock's** three hypotheses for monogamy?

1.

See pp. 484-490 in Alcock – I wanted his hypotheses, not just list of conditions or benefits

• mate-assistance monogamy (or ecological necessity but not both)
• mate-guarding monogamy (or certainty of paternity but not both)
• female-enforced monogamy

2.

3.

5. (5 pts) Carberry studied a eusocial wasp where workers have the choice of helping to raise brothers or helping to raise nephews (sons of reproductive sisters). Queens in this species only mate once. The workers help will add as many brothers as they will nephews. Workers are unable to reproduce at all (even sons). Under these conditions, **explain** what the workers should do.

Pretty simple if you remember two things:
1. **wasps (hymenoptera) are haplodiploid**
2. **The worker is helping to raise so the "r" you need is the "r" to either the queen (who makes the brothers) or the sister (who makes the nephews).**

Helping mom gives an r = 1/2 and helping sister gives one of 3/4, so they should help sisters to raise nephews

The rest of the question gives you b and c for Hamilton's rule so all that matters is the relatedness – they help sisters raise nephews

Note: many people used the fact that Brothers are 1/4 related and nephews are 3/8 related. That is true, but the r in Hamilton's rule is relatedness to the one helped (mom to produce more brothers or sisters to produce more nephews.) and you lost 1 point

6. (12 pts) What happened as a result of the following perspective shift in behavioral ecology? "**What happened**" means what was gained, what was revealed, what was cleared up and/or what is different as a result of the shift.

Write a **concise statement** that shows me you **understand the significance, for behavioral ecology, of the following perspective shift**.

"Concise" means use just **two ideas and examples** for the perspective shift. Do not add extraneous information – just two clear, supported points.

Short term costs and benefits TO long term costs and benefits

I wanted two distinct and clear things that happened (ideas) and an example of each of them. Ideas = 3 pts each, examples = 3 pts each

• if you made two points (ideas) but they were basically the same thing you got 3 + 1 pts for the ideas (same for examples that were not distinct).
• Many of you made one point (e.g., helps us understand) and gave two examples of that. If the examples were distinct enough (e.g., not about the same kind of phenomenon) you got 9 pts
• One idea plus two examples that were really about the same kind of thing = 7 points
• otherwise you lost points here and there for errors and vagueness.

Note: since you had time and feedback on preparing for this question, I was expecting a well reasoned and supported statement – I did not give anyone the benefit of the doubt for vague answers.