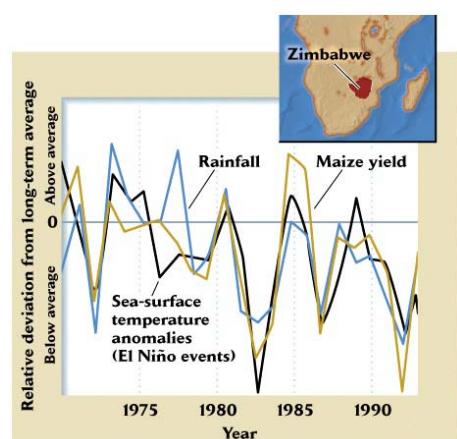


Ecology 203, Exam I. September 26, 2005. Print name: _____

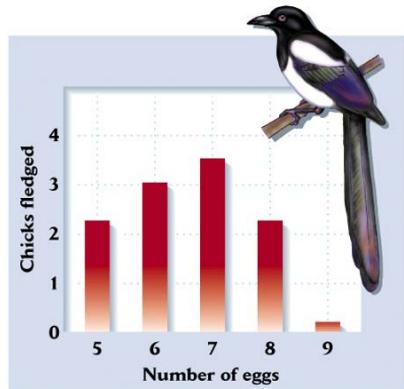
Rules: **Read carefully, work accurately and efficiently.** There are no questions that were submitted by students. “[FG:page #]” is a question based on information from the field guide, “[TB:page]” the textbook, and “[L]” the lectures. I hope this helps you track down information when you get the exam back. Total = _____

Multiple guess. (5 pts each, 70 pts total)

1. Forest stratification is (FG: 9-10):
 - a. the vertical layering in a forest, from the herbaceous understory plant layer up to tree canopies.
 - b. the process of slowly losing forests due to cutting down trees.
 - c. the structural differences observed in forests at different latitudes.
 - d. all of the above.
 - e. none of the above.
2. Species richness refers to the (FG: 25-26, L)
 - a. number of species in an area.
 - b. the number of unique species in an area.
 - c. the abundance of rare species relative to weedy species.
 - d. all of the above.
 - e. none of the above.
3. Your field guide identifies a number of interesting and common species found in this region. The field guide suggests that one reason to identify species is (FG: 50-58):
 - a. that we can't know anything about biological systems until we know the names of organisms.
 - b. that to save a species you need to have a name for it so it can be put on a threatened or endangered species list.
 - c. that if we can identify species we often can then say something about the habitats in which they are found.
 - d. all of the above.
 - e. none of the above.
4. Lake turnover is a process where (TB: 82; L)
 - a. changes in temperature result in decreases in species diversity.
 - b. changes in temperature result in a mixing of cold and warm water.
 - c. glacier periods come and go, resulting in the appearance and disappearance of lake ecosystems.
 - d. changes in temperature result in water becoming uniform in temperature and, therefore, able to mix.
 - e. all of the above.
5. El Niño events are very important climatically (TB: 83-86), as can be seen in the graph to the right (TB: Fig. 4.16). These events are caused by
 - a. changes in sea surface temperature near Peru.
 - b. changes in sea surface temperature near Madagascar.
 - c. changes in CO₂ concentration in the atmosphere.
 - d. changes in bird migration patterns.
 - e. high latitude melting of glaciers.
6. Fitness is (L)
 - a. the strength of an individual.
 - b. the number of offspring an individual has.



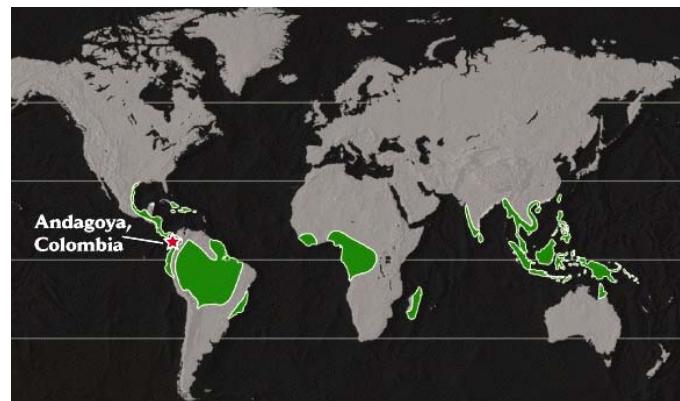
- c. the number of offspring an individual has relative to the average number of offspring that individuals in the same species have.
- d. the probability that successful organisms will leave more offspring than other members of the same species.
- e. all of the above.
7. Adaptation, in an evolutionary sense, refers to (TB: 184; L)
- the ability of an organism to adjust physiologically to an environment.
 - the phenotypic plasticity of a trait.
 - behavioral changes an animal makes to external (outside) stimuli.
 - all of the above.
 - none of the above.
8. Organisms are able to survive extreme environmental conditions by having evolved the ability to (TB: 189)
- migrate.
 - store resources accumulated during favorable conditions.
 - becoming dormant during those times.
 - all of the above.
 - none of the above.
9. The graph on the right suggests (TB: 201; L)
- birds grow fastest if they lay seven eggs.
 - birds rarely lay nine eggs.
 - birds, in general, usually lay seven eggs.
 - laying more eggs is better than laying fewer eggs.
 - none of the above.
10. If you conduct a reciprocal transplant experiment using a species of plant and discover that those from habitat A are twice as tall when grown in habitat B and are of equal height of those in habitat B and that individuals in habitat B are half as tall as those in habitat B when grown in habitat A, this is strong evidence that the trait is (TB: 204-205; L)
- genetically determined.
 - environmentally determined.
 - there is a genetic by environmental interaction determining plant height.
 - the trait is fixed.
 - there is not enough information to determine this.
11. Lamont Cole presented an explanation for why semelparous and iteroparous reproductive strategies might coexist (termed “Coles’ Paradox”). The explanation, presented mathematically, suggests that the two strategies are equivalent if (L)
- perennials die with a 50% probability each year.
 - annuals produce one more offspring per year.
 - perennials produce one more offspring per year.
 - annuals actually live for two years (like wild carrot, which is actually a “biennial”).
 - none of the above, all iteroparous organisms are now extinct!
12. Hamilton and Zuk proposed the parasite-mediated sexual selection hypothesis. This hypothesis suggests that (TB: 233-4; L)
- males with higher parasite loads are able to outcompete other males because of their acquired strength (“what doesn’t kill you makes you stronger”).
 - females choose mates with higher parasite loads.
 - females evaluate male genotypes based on the male’s ability to fend off parasites and maintain their general healthy condition.



- d. all of the above.
e. none of the above.
13. Science and religion differ because (L)
- conclusions in science are provisional (they might change at any time).
 - science is based on evidence while religion is based on belief.
 - knowledge in science is testable and falsifiable while it is not in religion.
 - all of the above.
 - none of the above.
14. You test the null hypothesis that humpbacked whales in the Atlantic and Pacific Oceans are not different in mass. You weigh a sample of 20 in each ocean and conduct a t-test on mass between these two groups. Your statistical program provides you with a p-value = 0.05. Which of the following best describes your correct conclusion?
- Whales in these two oceans have statistically similar masses.
 - Whales in these two oceans have statistically different masses.
 - You need to collect more data to prove a difference exists.
 - All of the above.
 - None of the above: explain: _____

Short answers. (Answer two of the following three questions, 10 pts each, 20 pts total)

1. Provide a Walter climate diagram for the biome depicted in this map. Label the axes clearly. Include the name of the biome. (TB: 106; L)



Darker areas represent the biome (not the oceans)

2. Provide a graph that relates fitness for a species of bird with a large number of individuals having different sized beaks (beak depth). Assume that the birds are subjected to balancing selection. Provide words and arrows pointing to what individual(s) might be favored or selected against under balancing selection. Label the graph completely (no bad graphs!). (TB: 184; L)
3. Fill in the chart below with the proper name for each of the four types of social interaction. Provide an example for two of the types of interactions. Do not use humans. (TB: 241; L)

Positive (+)		
Fitness increment of recipient		
Negative (-)		
	Negative (-) Positive (+)	Fitness increment of donor

Mandatory Short Answer (two questions, 15 pts total)

1. You sequence 100 individuals in a population for alleles at a single locus and discover the following numbers of individuals for each genotype: A1A1 = 10, A1A2 = 40, and A2A2 = 50, for a total of 100 individuals. What is p (the frequency of the A1 allele)? What is the Hardy-Weinberg stable frequencies for each genotype? Show your work below. (TB: 315 [not assigned], L, Living Graphs website) **(10 pts)**

Hardy-Weinberg Genotype Frequencies
A1A1 A1A2 A2A2

p = _____

Do your results suggest that the population is evolving? Why do you say this?

2. What are the four easily observed characteristics of natural selection? [L] (**5 pts**) (note that missing one of these results in the loss of 2 points)

1. _____
2. _____
3. _____
4. _____

Extra Credit (5 pts, 10 pts total)

1. I talked a few times about my friends who have been working on the Galapagos finches for decades. There was a news item on them in the Sept 16, 2005 issue of the journal *Science*. Here they are. What are their names? (TB: 278 [not assigned!], L)



Love's reward. It's said that love and work don't mix. But don't tell that to population biologists [REDACTED]. This month, the married couple from Princeton University in New Jersey won an \$800,000 International Balzan Foundation prize for their 30-year study of the finches on the Galápagos Islands.

Married since 1962, the couple has avoided conflicts by carving out specialties within their field. "She is the expert on behavior and bird song, while I focus on measuring phenotypes," says [REDACTED]. And what will they do with the money? "I have no idea," says [REDACTED], "but we're on cloud nine."

The Swiss-based foundation has also honored Russell Hemley and David Mao, mineralogists at the Carnegie Institution of Washington, D.C.; Lothar Ledderose, an art historian at Ruprechts Karls University in Heidelberg, Germany; and Peter Hall, a social historian at University College London, U.K.

2. In the "What's New" section of the class we discovered that a zoo animal in Alaska had a special exercise machine built. For credit, what was the machine and for what animal was it built?