

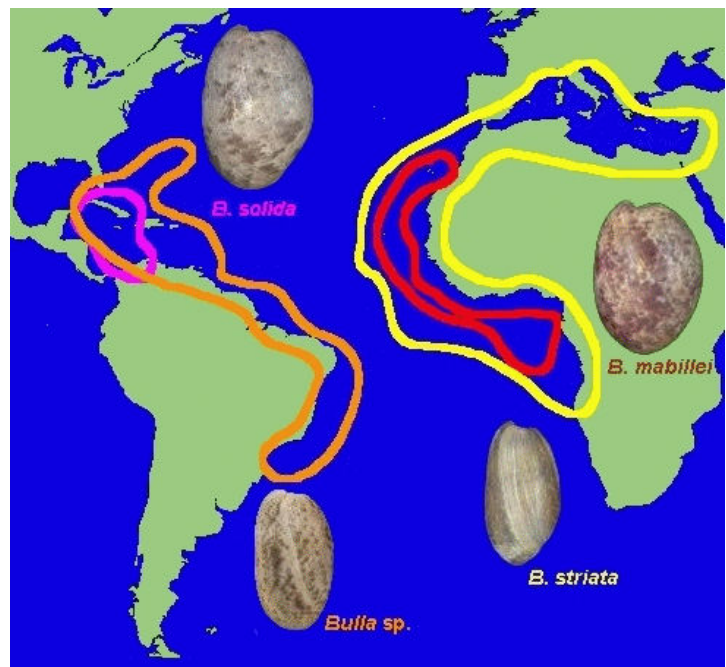
**NAME:** \_\_\_\_\_  
**BIO 112: Organisms, Evolution, and Ecosystems**  
Dr. Chris Paradise

**TIME Started:** \_\_\_\_\_  
**Review #3**  
Fall 2007

**Instructions:** This review is worth 150 points (~15% of your course grade) and will be due on Monday, 12/17/07, no later than 5:00 p.m., no exceptions. **You may not consult** any references or any person while working on this review. Your signature under the Honor Code signifies that the work is yours alone and is **pledged** under the Honor Code. When you break the seal on the envelope you will have **three hours to complete the review**. You may type your answers, but use an equivalent amount of space provided underneath the question. For each question, limit your answers to the space below the question. Any part of your answer outside of the space provided **will not be graded**.

1. Answer the following questions regarding population biology (15 pts).
  - a. Describe one ecological mechanism that may lead to a population with a clumped distribution.
  
  
  
  
  
  
  
  
  
  
  - b. How does the age structure of a population affect its future growth?
  
  
  
  
  
  
  
  
  
  
  - c. Explain why the logistic population growth model is more realistic than the exponential population growth model.
  
2. Answer the following questions regarding community ecology (15 pts.).
  - a. Briefly, what explains the relationship between latitude and primary productivity?
  
  
  
  
  
  
  
  
  
  
  - b. What is one mechanism by which one species excludes another species from a resource?
  
  
  
  
  
  
  
  
  
  
  - c. Describe one specific example of how change occurs in a community.
  
3. Answer the following questions regarding the **nitrogen cycle** (15 pts).
  - a. Describe, **in one sentence**, one impact in the atmosphere as a result of the disruption by human activities on the nitrogen cycle.
  
  
  
  
  
  
  
  
  
  
  - b. **List** one major reservoir of nitrogen, the major form of nitrogen in that reservoir, and the processes involved in moving nitrogen to and from that reservoir.
  - c. Describe, **in one sentence**, one way in which recent human-caused changes in the nitrogen cycle are related to recent changes in the carbon cycle.

4. Consider the distribution map of four species of bubble shells (Bullidae; on the next page), which are a small, worldwide family of gastropods with predominantly tropical distribution. Answer the following questions regarding species distributions and phylogenetic relationships (15 pts.).
- If you knew nothing about the actual phylogenetic relationships between these four species, what would you predict about their phylogenetic relationships if you only had access to the distribution data?
  - The two species with smaller ranges have more specialized abiotic requirements. What would you predict about these species in the face of global climate change?
  - If *B. solida* and *B. mabiliei* turned out to be sister species (most closely related to each other than they are to any other species), then to explain the current distributions of these two species, would you predict a vicariant or a dispersal event, and why?



5. Succession and disturbance are two concepts that illustrate the dynamic nature of ecosystems. Consider the natural disturbance of drought in a temperate grassland that has been exposed to nutrient additions from nearby agricultural fields. Discuss, **in one sentence each**, how the following concepts or statements relate to these communities exposed to severe drought (15 pts.).
- Adaptation
  - Competition
  - Response to drought compared to temperate deciduous forest

- d. Soil fertility
6. Consider each of the following concepts we discussed in this course and relate each, **in one sentence**, to the article “Fishing down aquatic food webs” (15 points).
- a. Natural selection
  - b. Trophic levels
  - c. Keystone species
  - d. Secondary productivity
  - e. Maximum sustainable yield
7. Suppose that biodiversity in a particular ecosystem declines due to human encroachment. Consider how ecosystem functions may change, and answer the following questions (15 pts.).
- a. What is the general conclusion regarding complementarity of functions performed by different species in an ecosystem?
  - b. Briefly describe one ecosystem function that has value to humans.
  - c. What is one other ecological factor we should consider as species are lost from an ecosystem (one that does not relate to humans)?
8. Lake Victoria, in Africa, is a large, deep, isolated lake with many microhabitats that, until recently, contained hundreds of species of cichlid fishes found nowhere else (i.e., they’re endemic). They are threatened by the recent introduction of a top predator, the Nile perch, which consumes many different species of predatory and herbivorous cichlids. Many Lake Victoria cichlids have reduced population sizes or have gone extinct since the introduction. **Use specific concepts from Biology 112**, to answer the following questions (15 pts.).
- a. **List** two reasons why there were so many endemic species in Lake Victoria to begin with?
  - b. Should the Nile perch be considered a keystone predator? Why or why not?

