Environmental Science 362-302 Name_____

EXAMINATION #2

[Note: You are given several choices for questions to answer. If you answer more than the required number, I will only grade as many as you were supposed to answer -- any additional answers will not be graded.]

Part I: Identification. Briefly define 5 of 6 (4 points each for a total of 20 points)

1.1 Zooxanthellae

1.2 S-Strategist

1.3 Michaelis-Maenten Curve

1.4 Appearancy Hypothesis

1.5 Muellerian Mimic

1.6 Convection

Part II. Short Answers. Answer 8 of 10 (6 points each for a total of 48 points). Be sure to label axes for any graphs, and parts of any diagram.

2.1 Diagram the distribution of carboxylase enzymes in the leaves of (a) C3, (b) C4, and (c) CAM plants

2.2 Diagram the conditions under which competitive exclusion will occur in Lotka-Volterra competition models.

2.3 Illustrate hypothetical population pyramid diagrams for (a) the southern U.S. two decades after the Civil War, (b) the population of Ft. Lauderdale during March, and (c) a population which has reached replacement reproduction but which is still growing.

2.4 What environmental conditions will select for semelparity? Why?

2.5 List three strategies which plants have evolved to encourage seed dispersal via animal vectors. In each case, tell me what the animal is getting out of this arrangement.

2.6 List three ways in which plants living in alpine tundra can achieve relative temperature stability. Tell me which components of the basic energy flux model each is modifying.

2.7 List 6 life history factors that distinguish r and K strategists, and provide how they differ between these two groups.

2.8 Show me a ZNGI for a hypothetical species (a) before and (b) after an allelopathic competitor arrives on the scene.

2.9 List and describe (through words or pictures) the three main assumptions which limit the predictive ability of classical Lotka-Volterra predator-prey models.

2.10 Lots and lots of fingerling bass are dumped into an (a) nutrient rich and (b) nutrient poor lake. Diagram the relationship between average individual mass and density for these two lakes over time, assuming no more individuals are stocked into the lake.

Part III. Problems.

3.1 You observe a cohort of 550 fish for several years. You find that average number of individuals alive during the first year 333, during the second is 82, during the third is 36, during the fourth is 14, and during the fifth is 2. Determine lx, qx, and ex for this population. (9 pts)

3.2 You also studied the reproduction within this population. You observed that the average number of female offspring produced per female during the first year was 0.34, in the second year 1.42, in the third year 1.88, in the fourth year 2.02, and 2.33 for all females living past their fourth year. If you assume that there are no differences in the survivorship between males and females, tell me the average generation time and doubling time for this population. (8 points)

Part IV. Short Essay. Answer 1 of 2 (15 points).

4.1 Two very rare species are suddenly forced to live together due to habitat destruction. Unfortunately, one of the species is able to cause competitive exclusion of the other. Suggest (using words and drawings) a general plan to allow coexistence of these two species in (a) Lotka-Volterra and (b) Resource Ratio models. Then, make specific, real-world recommendations about how you would try to accomplish these goals.

4.2 Of the many factors of global change facing the planet right now, perhaps one of the more profound is the enrichment of the atmosphere in CO2, which may cause substantial global warming. Any such change in climate will cause the ranges of species to shift. Some species may have their entire range shifted, as they will be completely unable to survive in the areas they now occupy. Design (and justify) a research plan which will help identify such species.