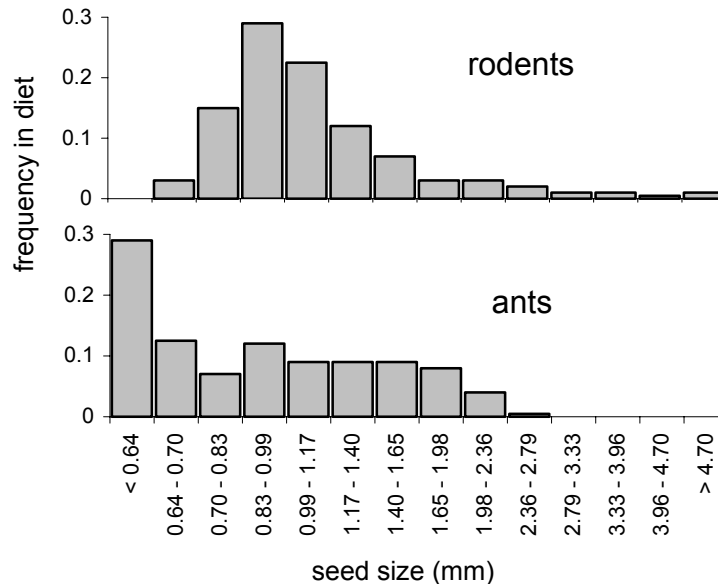


Ecology – Study Problems for Final Exam

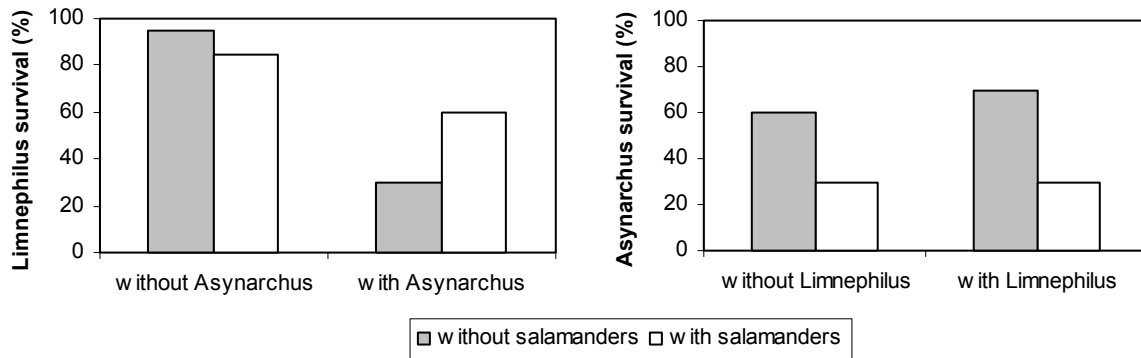
The final exam will be on Tuesday, May 4 at 12:30 p.m. Approximately 33% of the points possible on this exam will be based on problems selected from those below.

1. Many species of seed eating ants and rodents are found in desert habitats of Arizona. Both species prey on seeds. The prey (seed) size distributions for these animals are shown below.



- Give at least two alternative hypotheses to explain the difference in the sizes of seeds consumed by ants and rodents. Explain each of these hypotheses.
 - Design an experiment to test the two hypotheses that you have stated in (a). For full credit, include appropriate experimental manipulations and controls; explain what kind of data you would collect, and describe and justify the time period and spatial layout for your experiment. Show two sets of possible results: one that would support your first hypothesis and one that would support your other hypothesis (be sure to note which is which).
2. Two species of “bedstraw” plants in the genus *Galium* have been observed growing on soils of different pH. *Galium saxatile* is found on acidic soils, while *Galium sylvestre* is found on basic soils.
- Describe an experiment that could be used to determine the fundamental and realized niches (with respect to soil pH) of each species of *Galium*. Include enough detail that another ecologist could perform this experiment.
 - Draw two graphs, representing two possible outcomes of your experiment. In the first graph, show a result that would indicate that the observed distribution of the two *Galium* species is determined SOLELY by the abiotic requirements of each species. In the second graph, show a result that would indicate that the observed distribution of the two species is NOT determined solely by the abiotic environment.
3. Thoroughly explain how environmental complexity can promote the coexistence of competitors. Consider both the biotic and the abiotic environment in your explanation. Does this invalidate the competitive exclusion principle? Why or why not?

4. Salamander larvae are predators of caddisfly larvae. Wissinger and colleagues studied the effects of salamanders on the survival of two co-occurring species of caddisfly, *Asynarchus* and *Limnephilus*. *Asynarchus* larvae are aggressive predators that eat *Limnephilus*. Results of the study are shown in the graphs below.



- Draw a food web that includes these three species (salamander larvae, *Asynarchus* larvae, and *Limnephilus* larvae).
- Which caddisfly species do salamanders prefer to eat? How can you tell?
- If salamanders were removed from this ecosystem, what would be the overall effect on *Asynarchus* larvae? How do Wissinger et al.'s data help you determine this?
- If salamanders were removed from this ecosystem, what would be the overall effect on *Limnephilus* larvae? How do Wissinger et al.'s data help you determine this?

5. Jane Lubchenko studied the effects of a snail, *Littorina*, on an algal community. She found that when the snails were common, a red alga, *Chondrus*, was the most abundant species the community. When snails were removed, the green algae, *Enteromorpha*, became most abundant within the community.

- What species of algae does *Littorina* prefer to eat?
- How would the results have differed if *Littorina* preferred the other species?
- Which species of algae is competitively superior?
- How would the results have differed if the other species was competitively superior?
- Lubchenko also found that algal species richness was highest when *Littorina* was at an intermediate density. Explain this result.

6. According to the intermediate disturbance hypothesis, both low and high levels of disturbance can reduce species diversity. Explain possible mechanisms producing this relationship. Include trade-offs between competitive and dispersal abilities in your discussion.

7. You have been assigned to a group of scientists to figure out how to prevent the spread of a newly discovered pathogen. You are the only ecologist in the group. List three ecological questions that you would want to ask to help understand how to prevent the spread of this pathogen. Explain why each question is ecological, and explain why each question is important to preventing the spread of this disease.