BIOL 303, Ecology

Study guide for Exam 2, Spring 2009

1. What is a home range? An ecological territory? A behavioral territory?
2. What are the three basic patterns of spatial distribution, for resources and for the organisms that use them? What spatial and temporal patterns of resource distribution favor territoriality? What spatial and temporal patterns of resource distribution favor shared use of space?
3. What was the logic of Orians & Horn's study relating spatiotemporal patterns of resource distribution to the nesting patterns of red-winged and tricolored BB?
4. What did Waser's experiment with white-tailed mongooses reveal about the effect of resource renewal rates on grouping in species that depend on spatially uniform resources?
5. Explain Macdonald's Resource Dispersion Hypothesis. Under this hypothesis, what predicts group size? Home range size? What is the distinction between a 'social group' and a 'spatial group'?
6. Explain Brown's model of economic defensibility of territories, using graphs.
7. How have field studies tested economic defensibility models?
8. Understand what is measured by each of the major variables in a demographic 'life table'. There will be some questions that require you to complete parts of a table: you should be prepared to calculate numeric values for l_x, s_x, $l_x m_x$, R_0 & gross reproductive rate for a table with nice round numbers (so no calculator is needed). For variables that are more complex to calculate, I expect you to understand their definitions and their use, but will not ask you calculate numeric values (generation time, intrinsic rate of increase, reproductive value, residual reproductive value, life expectancy).
9. What is reproductive value? Residual reproductive value? How can a plot of residual reproductive value vs current reproductive effort (fecundity) be used to examine reproductive strategies (iteroparity vs semelparity).
10. Explain the simple graphical model of offspring quality vs offspring quantity.
11. How are R_0, r and λ related? What is the exponential growth model for each of these growth rates?
12. Use the equation for discrete exponential population growth to calculate a population's doubling time.
13. How did the data sets for rotifers, sparrows and white-tailed deer reveal density-dependent changes in survival and/or reproduction?
14. Explain the Pearl-Verhulst model of density dependent population growth. Figures 5.7 and 5.8 in your book are important here.
15. From the Populus module on the Pearl-Verhulst model, and from the overheads in class, use a plot of per-capita realized population growth, $\frac{dN}{dt}$/N, versus population size to show why this is a model of *linear* density dependence.
16. Explain the consequences for population dynamics of time lags in density dependence, as seen in the Populus lab you did. What does 'chaotic' population growth look like? What caused it? What is the distinction between chaotic and random?
17. What is the ecological definition of competition? What are the distinctions between interference competition and exploitative competition?
18. Explain Gause's experiments on interspecific competition in *Paramecium*. What is competitive coexistence with density compensation? Competitive exclusion?

19. Explain the Lotka-Volterra model of population growth with intraspecific and interspecific competition. What is a competition coefficient? What is a zero isocline? How do you get a zero-isocline from the Lotka-Volterra model, and what is the underlying logic? How can phase-plane plots of zero isoclines be used to predict the outcome of interspecific competition? Figures 8.7, 8.8 and 8.9 in your book are useful here.
20. Why is it believed that African wild dogs are limited mainly by interspecific competition with lions and spotted hyenas?

There will be questions that include figures from the overheads in class, asking you to interpret them. As examples, this will include things like:

- Interpreting a graph of Brown's model of economic defensibility of territories
- Using a plot of residual reproductive value vs. m_x to make predictions about reproductive strategies (semelparity vs. iteroparity)
- identifying the result that is established by a data set
- explaining output from Populus about exponential population growth (continuous, discrete, time lagged) and density dependent population growth