Study Guide for Midterm #2

COMMUNITY INTERACTIONS

Competition

Terms

What are interference and exploitative (= resource) competition? Intraspecific vs. interspecific competition? What is the competitive exclusion principle? What does it mean to describe a niche as an "n-dimensional hypervolume"? What are fundamental and realized niches? Why might they differ for a given organism?

Predicting the potential outcomes of interspecific competition

What predictions do Lotka-Volterra models make for the outcome of interspecific competition? How do the Lotka-Volterra graphs illustrate these predictions? What factors might allow species to coexist even if they compete? Why might the outcome of interspecific competition depend on environmental conditions?

What are the strengths and/or weaknesses of the different kinds of evidence that different species compete? What is character displacement? How does this relate to the 'ghost of competition past'? How does character displacement relate to the competitive exclusion principle?

Exploitation

Terms

Predation, Parasitism, Parasitoids, Herbivory, Hyperparasitoids

Can predation regulate the population size of the prey? Why do predator-prey cycles arise? What factors influence the degree of fluctuations in predator-prey cycles? In experiments and in the real world, what conditions are necessary to get persistence of both predator and prey in the long term? Under what conditions can predation lead to increased species diversity in a community?

What is the difference between predator functional response and numerical response? What are two mechanisms responsible for the leveling off of rates of predation as prey populations increase in the Types II and III functional responses? Why do rates of predation initially increase slowly as prey populations increase in the Type III functional response?

How do numerical and functional responses of predators relate to predator satiation? What consequences might this have for dynamics of prey reproduction? Given these consequences, how might predation act as a selection force on prey life histories? How might predation act as a selective force on prey coloration?

Mutualism

Terms: symbiosis, mutualism, obligate, facultative, specialists, generalists.

Are mutualisms ecologically significant? Why or why not? What are the general types of 'currency' in mutualisms? What are some examples of the different types of mutualisms? For the different mutualisms described in your text, what are the benefits gained by each of the respective partners? To what extent are the relationships between the organisms in these examples involved obligate vs. facultative? Which are specialists and which are generalists? Why are mutualisms prone to the evolution of 'cheater' strategies, such as parasitism?

Dispersal and Spatial Dynamics

In what ways are the dynamics of metapopulations different from those of single populations?

What is a 'classic metapopulation'? How does this differ from a 'core-satellite metapopulation'? What are 'source' and 'sink' populations? How does this relate to the rescue effect? What two factors have the greatest influence on the probability that a given suitable habitat patch will be occupied? Why? What are non-equilibrium metapopulations, and why are they called that? What is the 'spiral of extinction' in metapopulations? What causes it?

COMMUNITY STRUCTURE

Species abundance and diversity

Terms:

Richness, Evenness, Species dominance/abundance, Shannon-Weiner index, Simpson's Index, alpha diversity, beta diversity, log-normal distribution, open vs. closed communities, rarefaction analysis

What are the reasons to expect that communities are closed vs. open? How has gradient analysis helped address this debate? Why is it a challenge to determine the number of species in a community? How can rarefaction analysis help with this problem? What can we infer from the typical log-normal distribution of communities?

Food Webs and Trophic Cascades

What is a food web? What is a food chain? What is a trophic level? What is connectance? What is the relationship between connectance and species richness, as typically observed? What does this relationship indicate? What do we mean by interaction strength in food webs? What is the difference between top-down and bottom-up control? What is a trophic cascade? What is a keystone species? How do you differentiate between a keystone species and a dominant species? Are top predators always keystone species? How can human exploitation of single species or introduction of single species affect entire food webs?

Factors Regulating Diversity and Community Structure

What is the typical pattern with regard to species richness and latitude? What are the possible explanations for this relationship, and what evidence supports those explanations? What different interactions among species can affect species richness in communities?

What is the species-area relationship? What factors explain this general relationship? What factors determine the specific relationship between habitat area and species richness for a given type of habitat and group of organisms?

In the Equilibrium Model of Island Biogeography (EMIB), how do island size and distance affect species richness individually? Why? How do they interact? Given islands of differing sizes and distances from source populations, which would have the highest and which the lowest species richness according to EMIB? What are some limitations/assumptions of EMIB that affect its applicability?

Succession

What is succession? What is the difference between primary and secondary succession? What types of disturbance are associated with each?

What are the predictions of the intermediate disturbance hypothesis? What is the rationale for these predictions?

What are the typical characteristics of pioneer and climax species? Do these traits tend to vary independently or together? How do these relate to r- and K-selected life history strategies? Are there general patterns of how species richness changes through succession? Why or why not?

What are the mechanisms of succession? Do they operate independently of each other? Do they counteract each other or are they synergistic? What are some examples of how they operate? How do these mechanisms relate to concepts of competition discussed earlier in the quarter?

How do environmental variables (e.g., light availability, soil carbon and nitrogen pools) change during primary vs. secondary succession? What brings about these changes?