

ABIO320: Ecology

Problem Set F

1. Consider a metapopulation with the “internal colonization” dynamics of deme initiation (colonization) and local extinction. Let p_t represent the fraction of patches occupied at time t ; $0 < p_t \leq 1$. We have:

$$\frac{dp_t}{dt} = c p_t (1 - p_t) - e p_t$$

Let the colonization rate parameter $c = 0.1$, and let the extinction rate parameter $e = 0.02$. Find the immigration-extinction equilibrium p^* . What is the colonization rate when $p = p^*$?

2. Again consider the metapopulation model:

$$\frac{dp_t}{dt} = c p_t (1 - p_t) - e p_t$$

At dynamic equilibrium, $p^* = 0.6$. Then, what is the ratio of the colonization rate parameter c to the extinction rate parameter e ?

3. Circle the letter preceding your answer. An island community is termed disharmonic if:

- a) different species have the same extinction rate
- b) immigration rates depend on island size
- c) extinction rates depend on island size
- d) turnover rate decreases with distance from the mainland
- e) none of the preceding.

4. Circle the letter preceding your answer. Islands found at a fixed distance from the mainland differ in size. The equilibrium model of island biogeography predicts that as island size increases:

- a) species number and turnover rate should increase
 - b) species number should increase, and turnover rate should decrease
 - c) species number and turnover rate should decrease
 - d) species number should decrease, and turnover rate should increase.
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3. Describe successional trends in species diversity, niche width, and primary net productivity.

4. Describe the niche preemption model and the lognormal model for species abundances. List each model's biological assumptions. Explain how the two models' importance plots differ.

5. Compare communities 1 and 2 below by using the following samples to estimate species richness and species diversity.

Community 1:							
Species	A	B	C	D	E	F	G
Count	12	17	36	14	53	20	8

Community 2:								
Species	A	B	C	D	E	F	G	H
Count	14	35	6	44	15	12	41	50