

BIOL 410 Tutorial 6

Metapopulation

Q1

You are studying competition between red and black desert scorpions. For the red scorpion, $K_1 = 100$ and $\alpha = 2$. For the black scorpion, $K_2 = 150$ and $\beta = 3$.

Suppose the initial population size are 25 red scorpions and 50 black scorpions. Graph the state space and isoclines for each species, and plot these initial population sizes. Predict the short-term dynamics of each population and the final outcome of interspecific competition.

Q2

Suppose that , for two competing species, $\alpha = 1.5$, $\beta = 0.5$, and $K_2 = 100$. What is the minimum carrying capacity for species 1 that is necessary for coexistence? How large is the carrying capacity needed for species 1 to win in competition?

Q3

Diagram the state space for two competing species in which there is a stable equilibrium. Show how intraguild predation could shift this to exclusion by the predatory species.

Q4

Suppose that spider and fly populations are governed by Lotka-Volterra dynamics, with the following coefficients: $r = 0.1$, $q = 0.5$, $\alpha = \beta = 0.001$. If the initial population sizes are 200 spiders and 600 flies, what are the short-term population dynamics predicted by the model?

Q5

Suppose that hawk and dove populations cycle with a peak every 10 years, and $r = 0.5$. If q is doubled in size, what happens to the period of the cycle?