**Homework 5**
BIO534

Problems

1. (Gotelli 5.1) You are studying competition between red and black desert scorpions. For the red scorpion, $K_1 = 100$, $\alpha = 2$ and for the black scorpion, $K_2 = 150$ and $\beta = 3$.

   Suppose the initial population sizes are 25 red scorpions and 50 lack scorpions. Graph the state space and Zero Net Growth Isoclines (ZNGI) for each species, and plot these initial population sizes. Use the graphical model to predict the short-term dynamics of each population and the final outcome of interspecific competition.

2. (Gotelli 5.2 ) 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 competition?

3. (Gotelli 6.1) 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?

4. (Gotelli 6.2) Suppose the 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?

5. Explain the "Paradox of Enrichment". Use text and graphics as needed.

6. Contrast the three ways we have discussed combining control functions.

7. Briefly describe the main rational presented by Oreskes et al. 1994 in their claim that models cannot be validated. Why does this not invalidate modeling in general?

8. What are two reasons you think the Fussman et al. 2000 paper was accepted for publication in Science magazine – one of the top rated jouranls. s