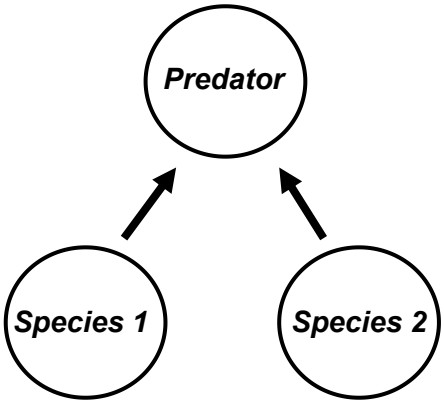
Introduction to Theoretical Ecology Assignment 9

Apparent Competition and P* Rule

In addition to exploitative competition, species can also compete indirectly via a common predator, known as “apparent competition”:



In this assignment, we are going to build a model of such interactions among two focal prey species (N_1 and N_2) and a predator (P) and simulate their population dynamics.

1. Assume that N_1 and N_2 grow exponentially with intrinsic growth rates r_1 and r_2 and are consumed by predator in a linear fashion at the rates a_1 and a_2. The conversion efficiencies for the two prey items to predator are e_1 and e_2, and the mortality rate of predator is m. Write out your model and simulate the system. Try out different combinations of parameter values and discuss if the two focal prey species can coexist. (Hint: There is a P* rule, just like the R* rule for exploitative competition.) (5 pts)

2. Now consider N_1 and N_2 grow logistically with carrying capacities K_1 and K_2. Again, write out your model, simulate the system, and discuss if the two prey species can coexist. What is the difference between this and the previous model? Can you explain why? (5 pts)