***Introduction to Theoretical Ecology Assignment 6***

Graphical Analysis of Lotka-Volterra Competition Model

The Lotka-Volterra competition model can be written in terms of the carrying capacities of the two competing species *N1* and *N*2:

, where *r1* and *r2* are the intrinsic population growth rates; *K1* and *K2* are the carrying capacities; *α* is the effect of *N1* on the population growth of *N*2; *β* is the effect of *N2* on the population growth of *N*1.

1. Find the equilibrium population sizes of the two species.

***Solution:***

1. Use graphical analysis to determine the stability of the system for all possible scenarios.

***Solution:***

Scenario 1: *N1* wins

*K1/α*

*K2*

*N2*

*N1 Isocline*

*N2 Isocline*

*K2/β*

*K1*

*N1*

Scenario 2: *N2* wins

*K2*

*N2*

*N2 Isocline*

*K1/α*

*N1 Isocline*

*K2/β*

*K1*

*N1*

Scenario 3: Stable coexistence

*K1/α*

*N1 Isocline*

*N2*

*K2*

*N2 Isocline*

*K2/β*

*K1*

*N1*

Scenario 4: Unstable coexistence (saddle)

*K2*

*N2 Isocline*

*N2*

*K1/α*

*N1 Isocline*

*K2/β*

*K1*

*N1*