Lecture 6 Outline

Population Growth and Population Dynamics

Limits on Growth

Natural populations cannot grow without limit

Populations stabilize or decrease after a period of increase

The maximum sustainable population size for a given species in a given location is the **carrying capacity** (*K*)of that location

Logistic Growth

Population growth limited by carrying capacity

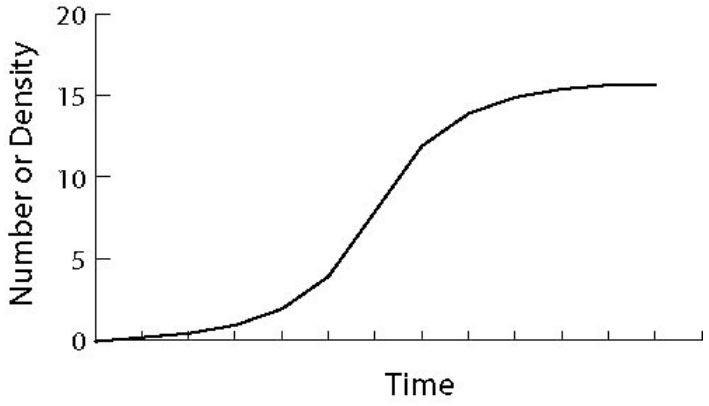
$$\frac{dN}{dt} = r_{MAX}\left[\frac{K-N}{K}\right]N$$

$$r = r_{MAX}\left[\frac{K-N}{K}\right]$$

when N is very small, K-N is almost equal to K and r is almost 1.0*(r_{MAX})

when N is nearly equal to K, K-N is almost zero and r is almost 0.0*(r_{MAX})

Logistic Growth



Logistic Model Assumptions:

Each new individual immediately reduces carrying capacity

Every individual is equivalent

Continuous births and deaths

Carrying capacity is constant

Intrinsic rate of increase is constant

Assumptions are not met in reality yet many populations have constant populations over time (like a population at carrying capacity)

Smooth approach to K may be rare in nature

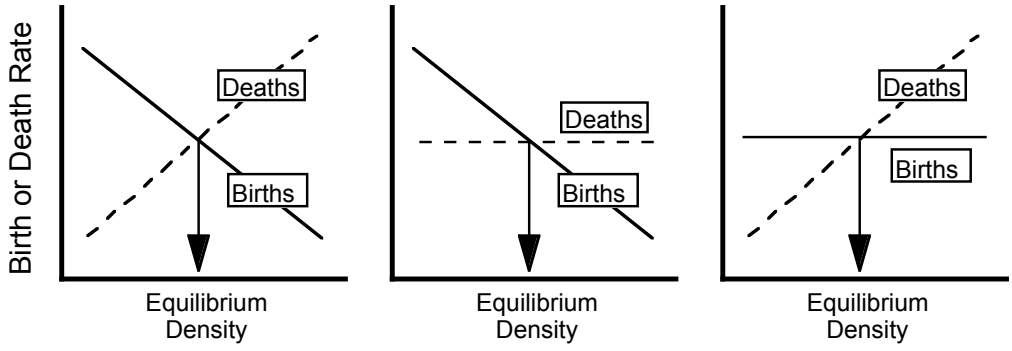
What causes populations to be stable (constant density over time)?

Density Dependence and Independence

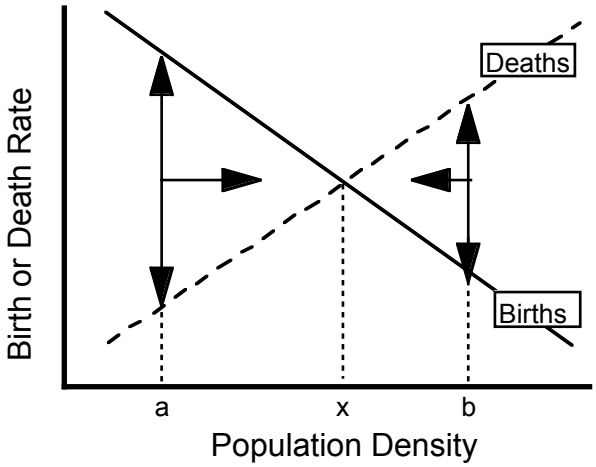
Density dependent birth rates decrease as density increases

Density dependent death rates increase as density increases

Density independent rates do not respond to population density



If either birth rates or death rate or both are density dependent, a population equilibrium will be reached



Population Equilibrium

birth rates = death rates and population growth stops

What factors keep population growth in check?

Darwin's Hostile Forces of Nature (the causes for natural selection)

Climate and Weather

Predators

Parasites and Diseases

Resources Shortages

Ecological Limiting Factors