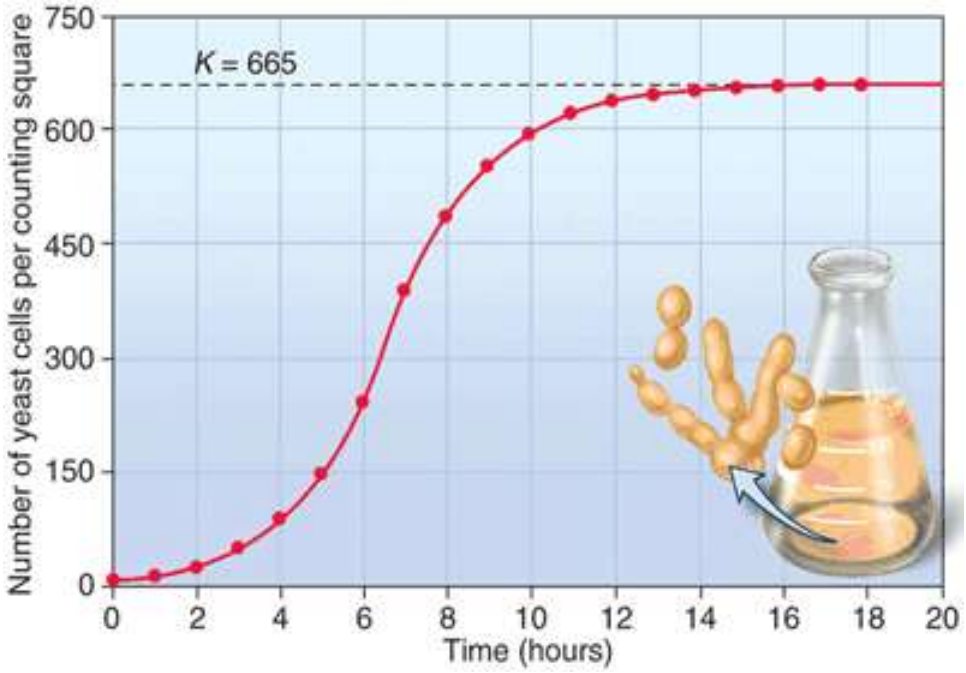
- ***Population Ecology***

QOD



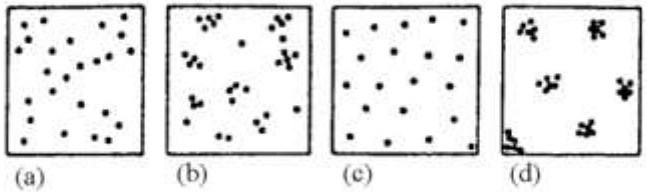
- Given the logistic growth curve shown to the left, calculate the rate of growth between hours 6 and 8
- Next calculate the rate of growth between hours 12 and 16
- Explain the differences in these figures

Population

- A group of the same species living in the same area at the same time.

Population characteristics

- **Density** **•counts**
  •sample size estimate
  •indirect indicators •mark-recapture
- **Dispersion** **(patchy)**
  •clumped
  •uniform
  •random



Density is individuals per unit of area

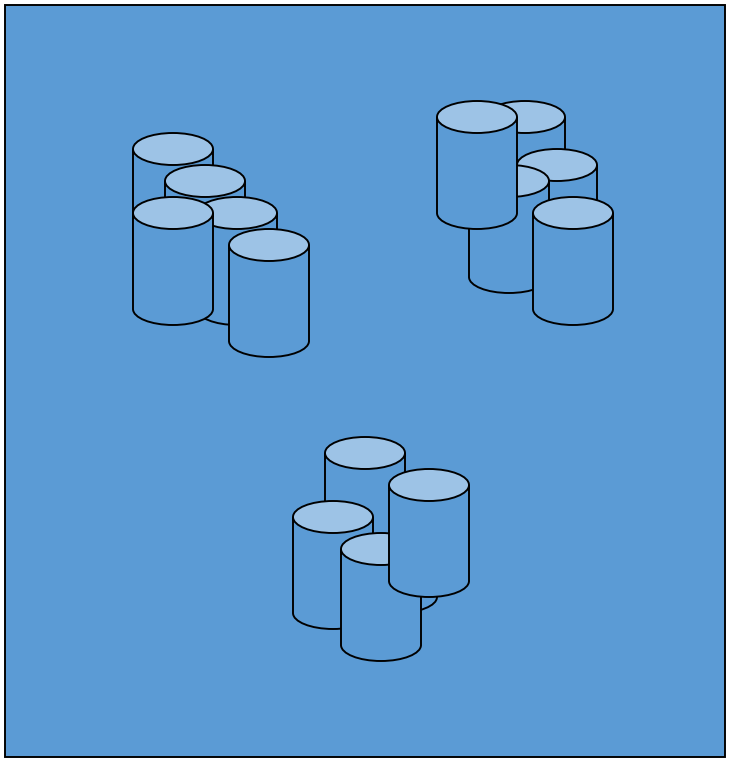
- Individuals may be counted individually
- Indirect measures such as nests or droppings may be counted
- The mark-recapture method is most common

$$N = \frac{\text{(number marked) x (total re-caught)}}{\text{number of marked recaptures}}$$

Dispersion describes spacing of organisms, there are three types:

- Clumped
- Uniform
- random

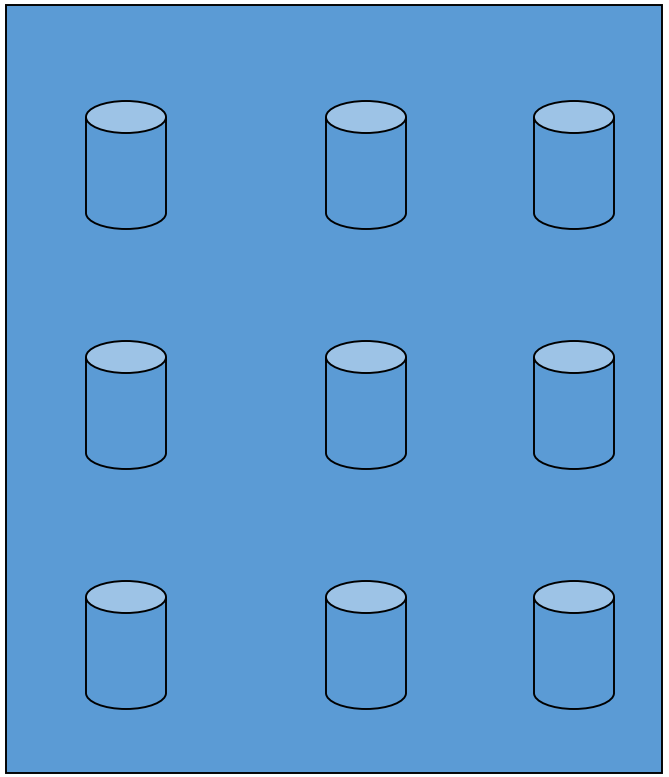
Clumped



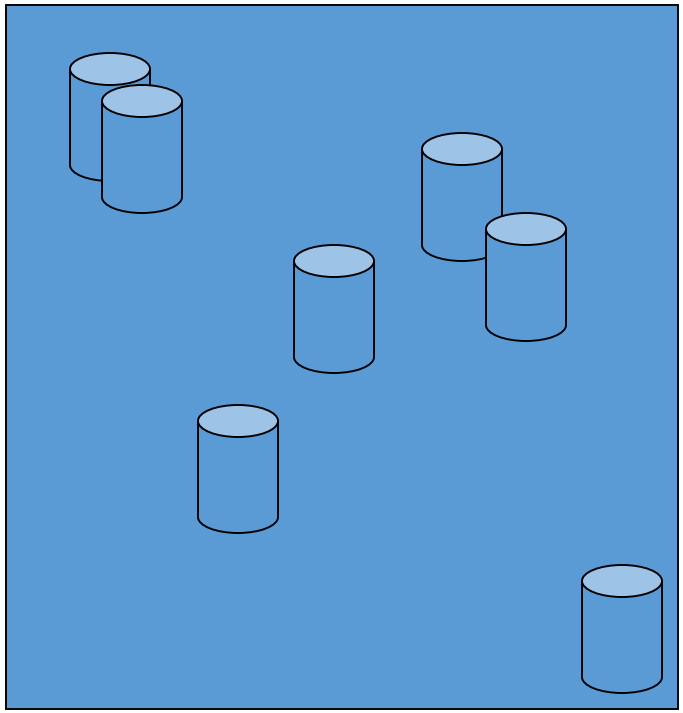
- Individuals collect in patches
- Patches may be around resources
- May result from mating or social behavior
- Helps defend against predators

Uniform

- Even spacing of organisms
- May result from competition for limited resources
- May result from territorial behavior pattern



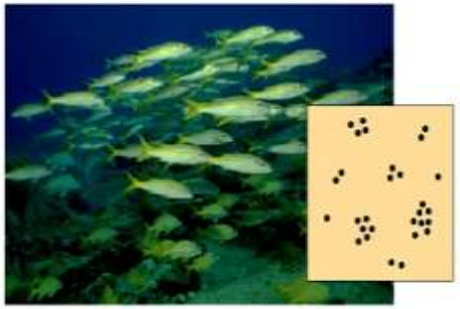
Random



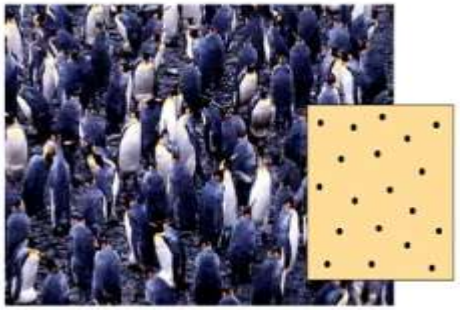
- Unpredictable spacing
- Rare in Nature
- No strong attraction or repulsion among organisms

Population characteristics

- **Density -** **of individuals per unit of area**
  - **counts**
  - **sample size estimate**
  - **indirect indicators**
  - **mark-recapture**
- **Dispersion** **- pattern of spacing**
  - **random~ unpredictable, patternless spacing (a)**
  - **clumped~ patchy aggregation (b)**
  - **uniform~ even spacing (c)**



(a) Clumped

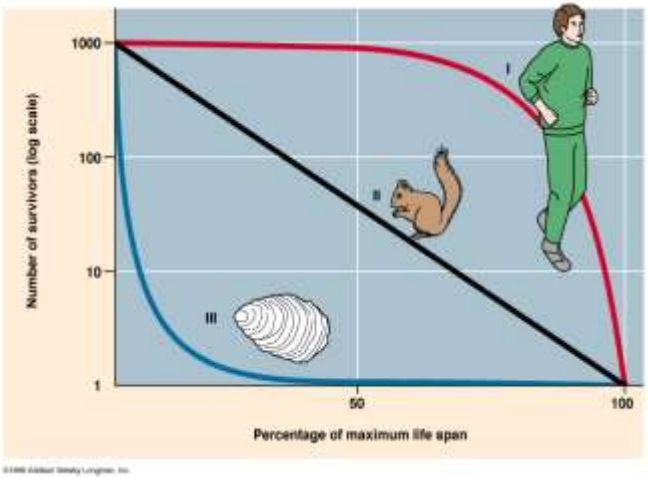


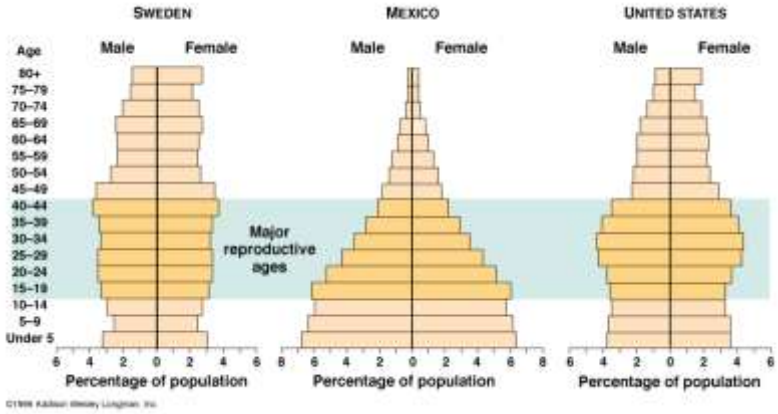
(b) Uniform

(c) Random

Demography

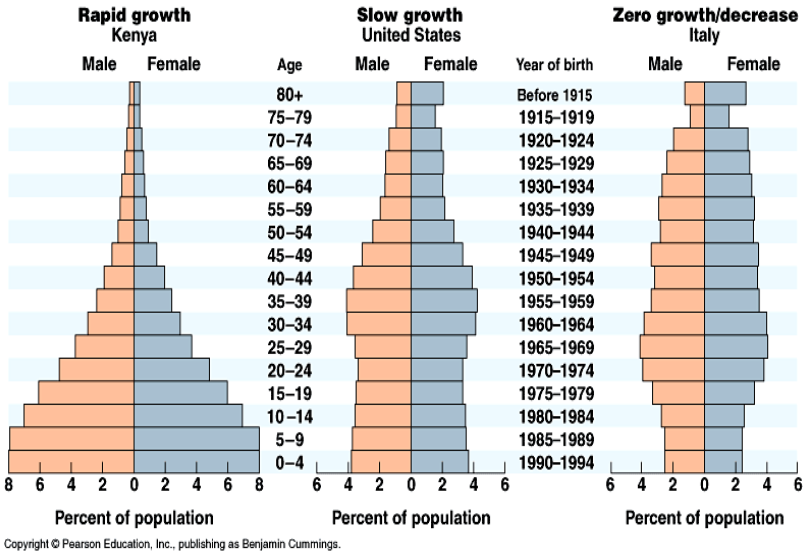
- **Birthrate (natality, fecundity)**
- **Death rate (mortality)**
- **Age structure**
- **Survivorship curve**

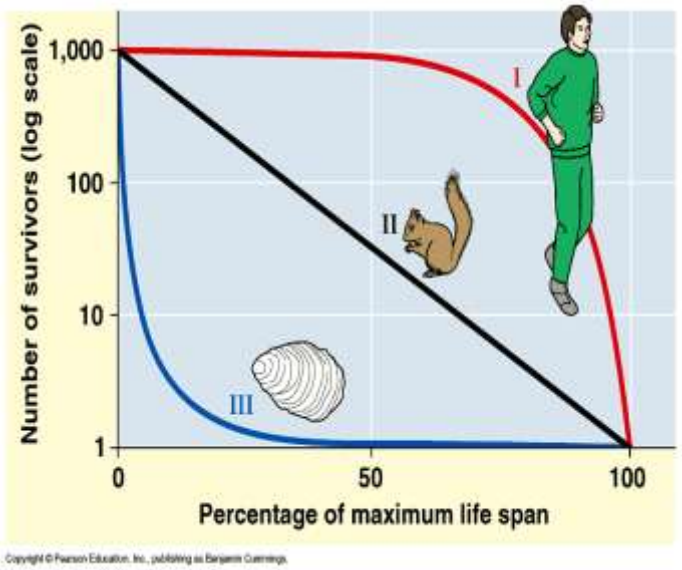




Demography: factors that affect growth & decline of populations

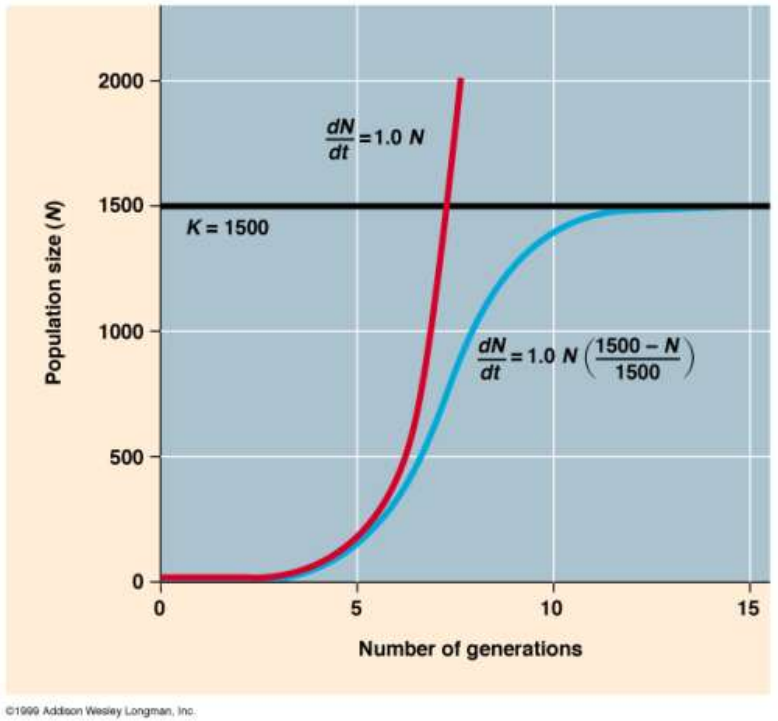
- **Birthrate (natality, fecundity)~ # of offspring produced**
- **Death rate (mortality)**
- **Age structure~ relative number of individuals of each age**
- **Survivorship curve~ plot of numbers still alive at each age**





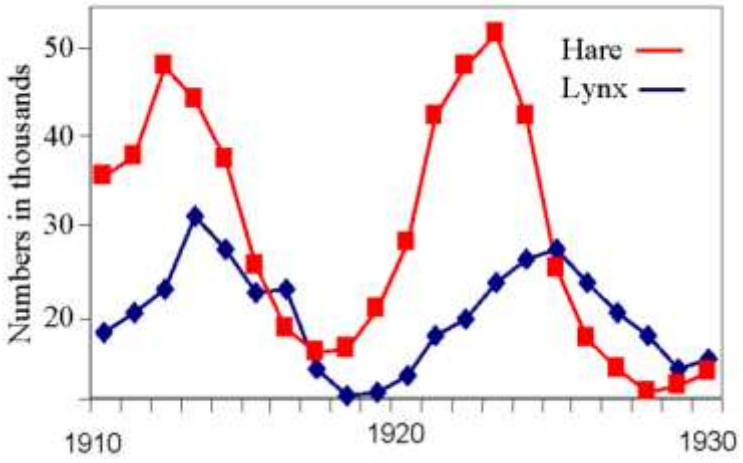
Population Growth Models

- **Exponential model**
  - **ZPG**
- **Logistic model**
  - **carrying capacity**



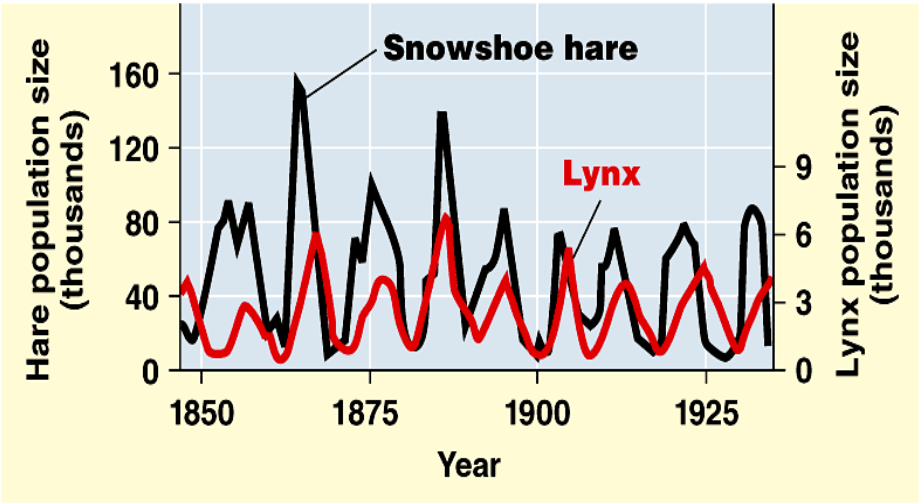
Population limiting factors

- **Density-dependent factors**
  - **competition**
  - **predation**
  - **stress/crowding**
  - **waste accumulation**
- **Density-independent factors**
  - **weather/climate**
  - **periodic disturbances**



Population limiting factors

- **Density-dependent factors**
  - ❑competition
  - ❑predation
  - ❑stress/crowding
  - ❑waste accumulation
- **Density-independent factors**
  - ❑weather/climate
  - ❑periodic disturbances



Population life history strategies

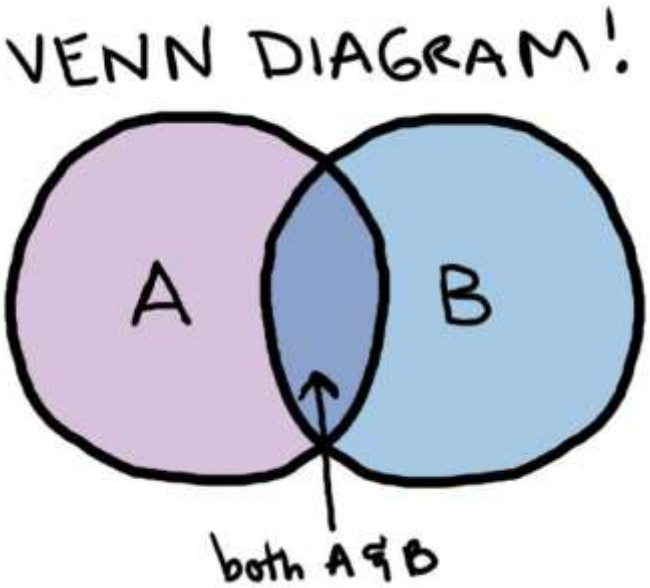
- r-selected
  - Short maturation & lifespan
  - Many (small) offspring; usually 1 (early) reproduction; no parental care
  - High death rate
- K-selected
  - Long maturation & lifespan
  - Few (large) offspring; usually several (late) reproductions; extensive parental care
  - Low death rate

Population life history "strategies"

- r-selected (opportunistic)
  - Short maturation & lifespan
  - Many (small) offspring; usually 1 (early) reproduction; no parental care
  - High death rate
- K-selected (equilibrial)
  - Long maturation & lifespan
  - Few (large) offspring; usually several (late) reproductions; extensive parental care
  - Low death rate

And Now its Your Turn

- In the time remaining, please prepare a Venn Diagram for r and k selected population strategies.
- You should include examples, definitions and pictures
- Minimum content: 5:3:5



From Your Lab Manual

RATE AND GROWTH	
Rate dY/dt **Population Growth** dN/dt=B-D **Exponential Growth** $\frac{dN}{dt} = r_{max}N$ **Logistic Growth** $\frac{dN}{dt} = r_{max}N\left(\frac{K-N}{K}\right)$	dY= amount of change t = time B = birth rate D = death rate N = population size K = carrying capacity r_{max} = maximum per capita growth rate of population

QOD

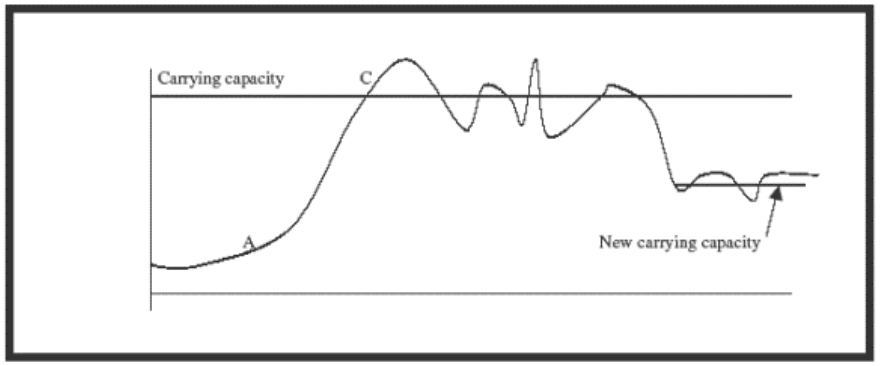


Figure 18.3 Carrying capacity.

- What factors prevent perpetual logarithmic population growth?

Population Growth Models

- **Exponential model (blue)**
  - idealized population in an unlimited environment (J-curve);
- r-selected species (r=per capita growth rate)
- **Logistic model (red)**
- •carrying capacity (*K*): maximum population size that a particular environment can support (S-curve); K-selected species