

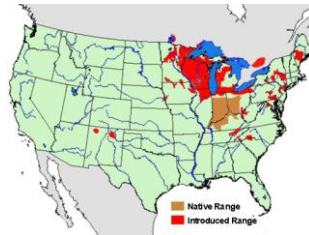
Chapter 5: Populations

Section 5.1: How Populations Grow



Quadrat Sampling

Describing Populations



Geographic distribution of rusty crayfish. Adapted from USGS Rusty Crayfish Fact Sheet (2007).

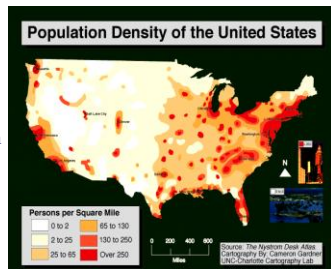
- How do ecologists study populations?
- 1. Geographic Range: The area inhabited by a population.
 - Can vary greatly – e.g. bacteria on pumpkin or cod in the Atlantic.

Describing Populations

2. Density and Distribution: The number of individuals per unit area.

□ **Density**: Can differ in between individuals living in the same environment.

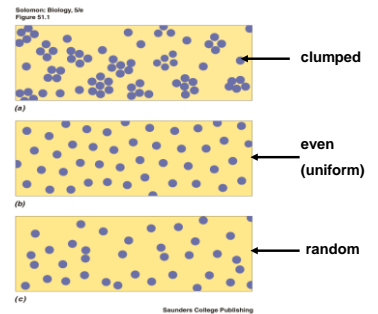
□ **Formula**: $D_p = \frac{N}{S}$

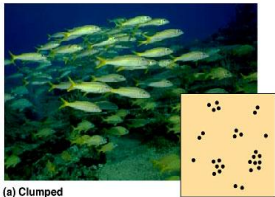


Pop. Density (D_p) = number of individuals (N) / unit of space (S)

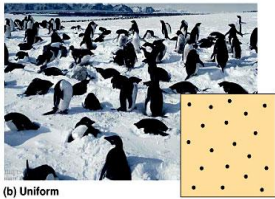
Describing Populations

- **Distribution**: How individuals in a population are spaced out. Can be:
- Clumped
 - Uniform
 - Random





(a) Clumped



(b) Uniform

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(c) Random



Describing Populations

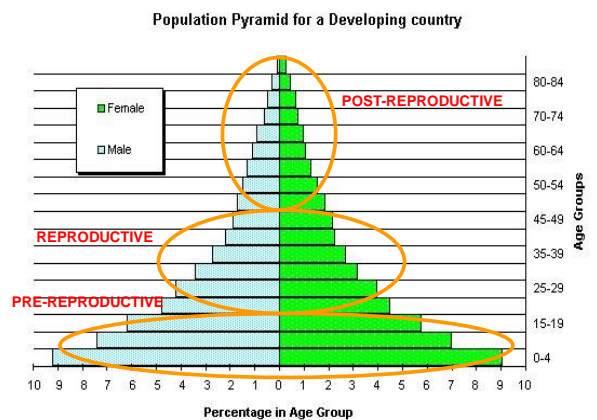
3. Growth Rate

- Determines whether the size of the population increases, decrease, or stays the same.
- Asian beetle population.

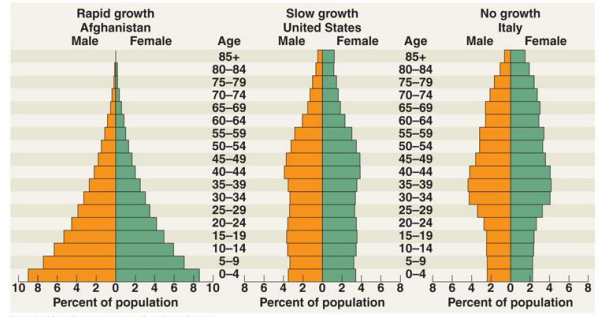
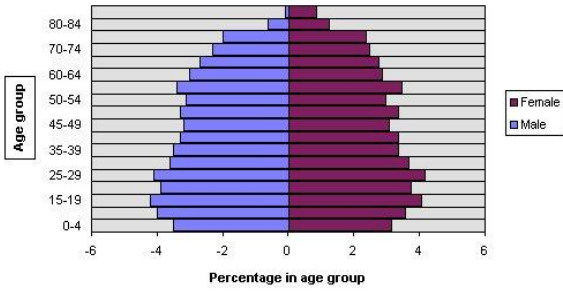
Describing Populations

4. Age Structure

- The number of males and females of each age a population contains.
- Important because only the females can reproduce and the age differs depending on the animal.



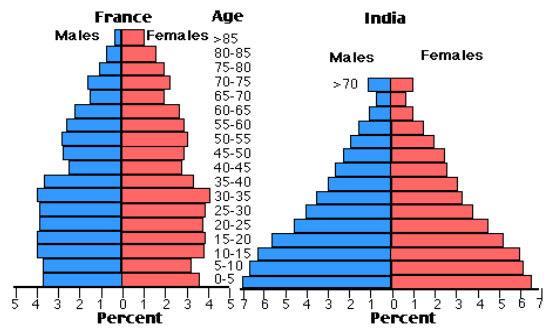
Population Pyramid for a Developed country



Population Growth

- What factors affect population growth?
 - Birthrate (natality) and Death rate (mortality).
 - Population **grows** when BR is higher than DR.
 - Population **decreases** when DR is higher than BR.
 - Population stays **same** if BR and DR are the same.

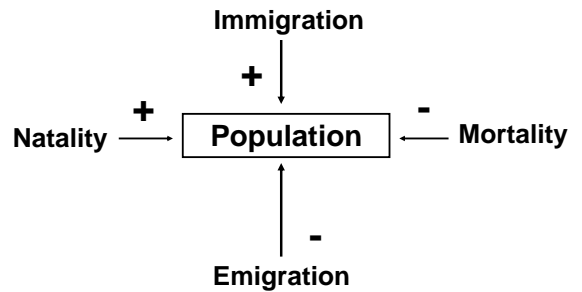
You Decide!



Population Growth

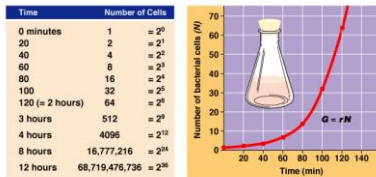
- Immigration and Emigration
 - **Immigration:** Movement of individuals into a population. (population will grow)
 - **Emigration:** Movement of individuals out of a population. (population will decrease)

Factors that Affect Future Population Growth



Exponential Growth

- What happens during exponential growth?
 - Under ideal conditions with unlimited resources, a population will grow exponentially.



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Exponential Growth

- Organisms that Reproduce Rapidly
- R-Strategists
 - Short life span
 - Small body size
 - Reproduce quickly
 - Have many young
 - Little parental care
 - E.g.: cockroaches, weeds, bacteria



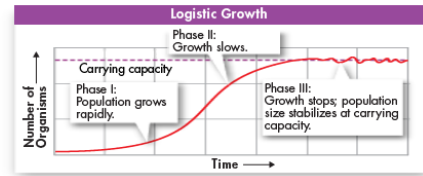
Exponential Growth

- Organisms that Reproduce Slowly
- K Strategists
 - Long life span
 - Large body size
 - Reproduce slowly
 - Have few young
 - Provides parental care
 - E.g.: humans, elephants



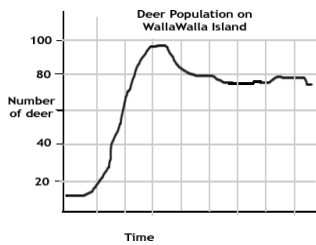
Logistic Growth

- Populations don't grow exponentially for long.
- Phases of Growth:
 - Exponential growth
 - Growth slows down
 - Growth stops



Logistic Growth

- **Carrying Capacity:** The maximum number of individuals of a particular species that a particular environment can support.



Carrying Capacity

