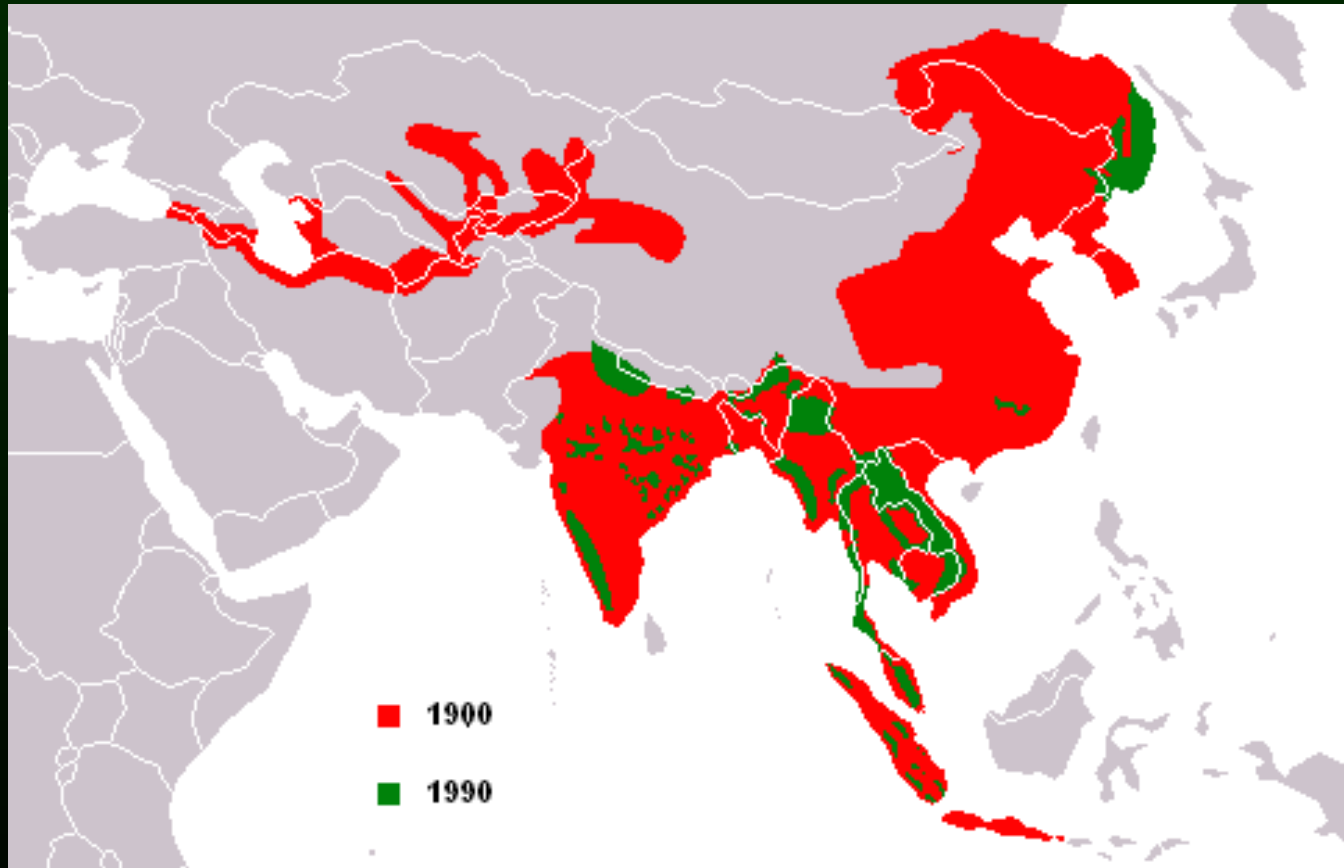


# Population Distribution and Abundance

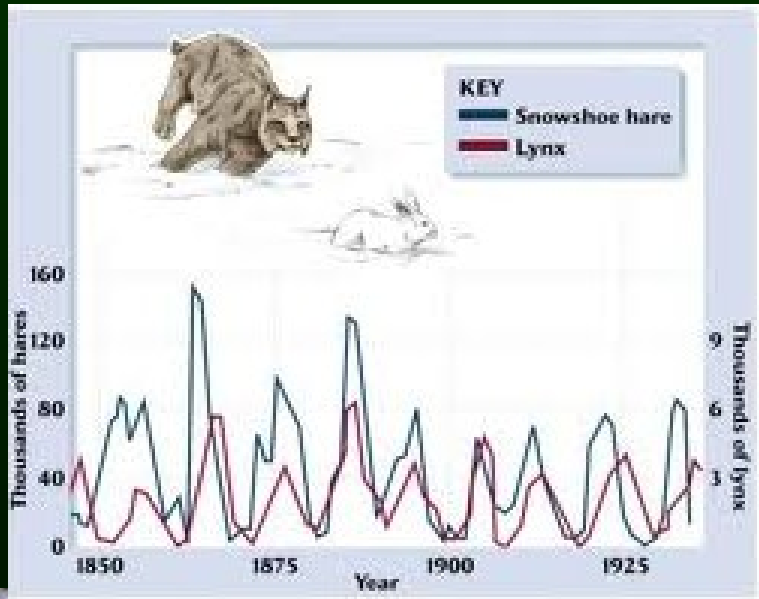
## Chapter 9



**Tiger distribution**

# What is a population?

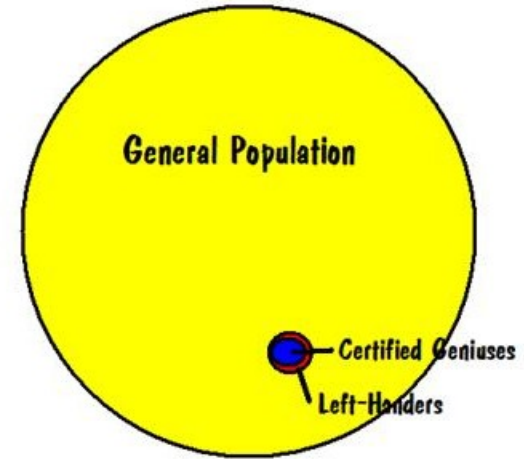
A group of individuals of a single species inhabiting a specific area.



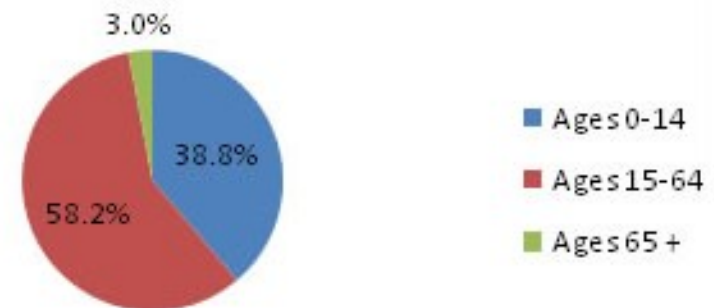
# How can populations be characterized?

- ❖ Abundance
- ❖ Density
- ❖ Distribution
- ❖ Age distributions
- ❖ Growth rates
- ❖ Birth and death rates
- ❖ Immigration & emigration rates

Relative Population Distribution of Left-Handers and Certified Geniuses Compared to the General Population



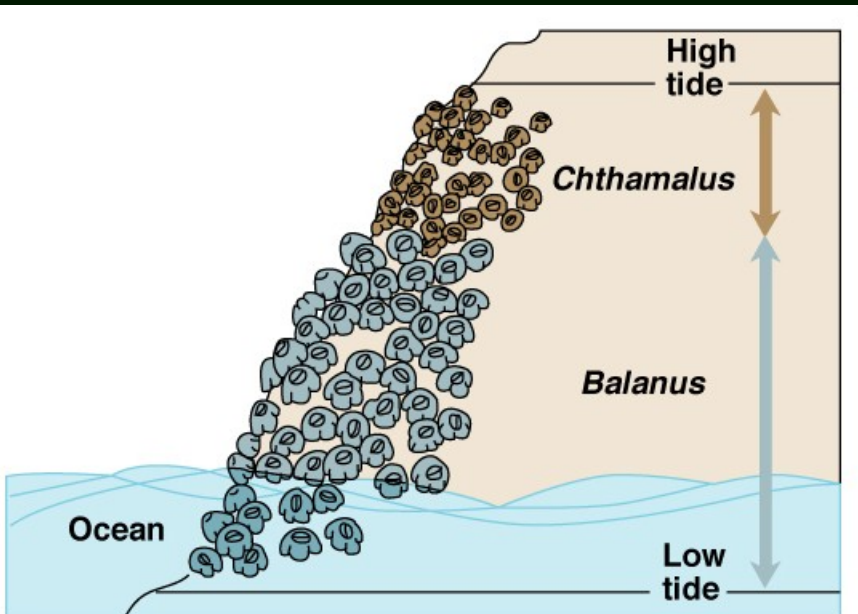
Age Structure



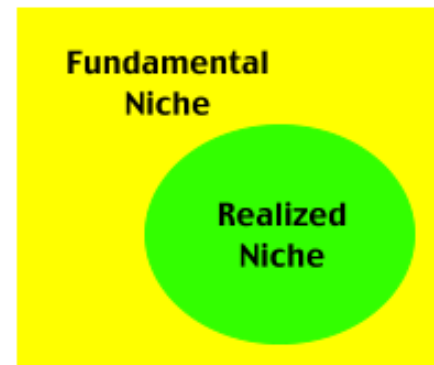
# What influences where populations are found?

- **Niche**: Summarizes environmental factors that influence growth, survival, and reproduction of a species.

**Fundamental = physical conditions only**  
**Realized = includes biotic interactions**



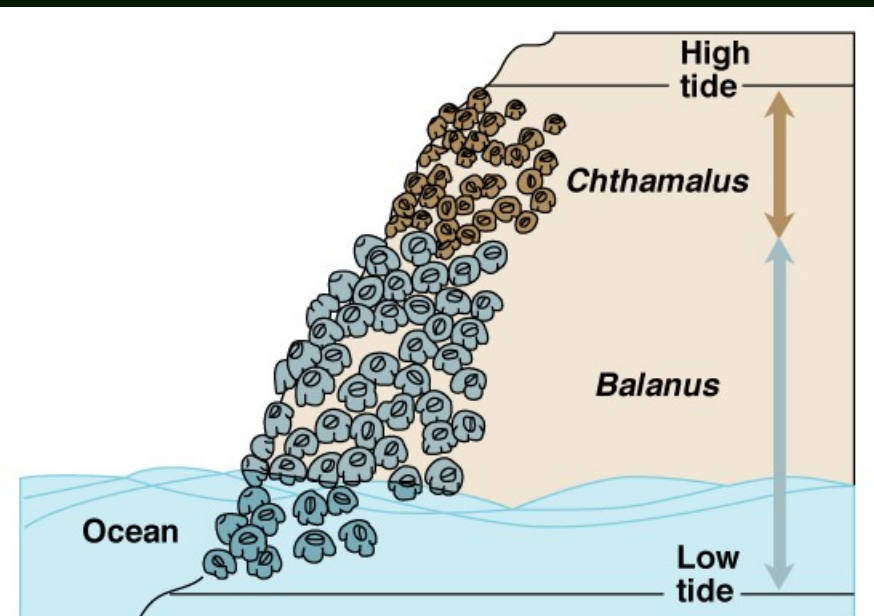
Moisture



Temperature

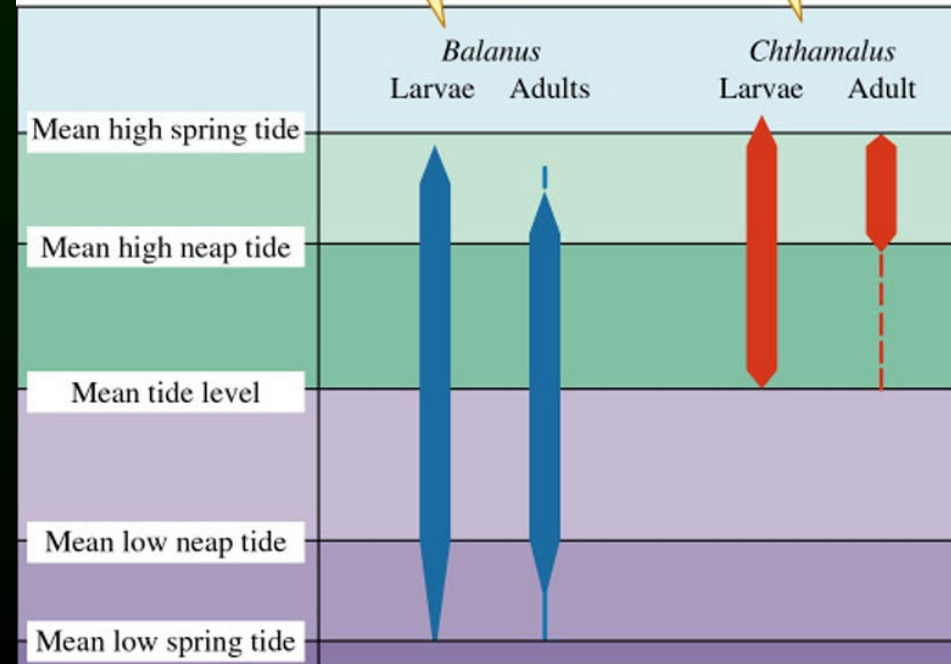
# Distributions of Barnacles Along an Intertidal Gradient

What is the fundamental niche of *Chthamalus*?  
What is the realized niche of *Chthamalus*?  
What affects the population distribution of *Chthamalus*?



*Balanus balanoides* larvae settle throughout intertidal zone but survive to adults mainly in middle to lower intertidal zones.

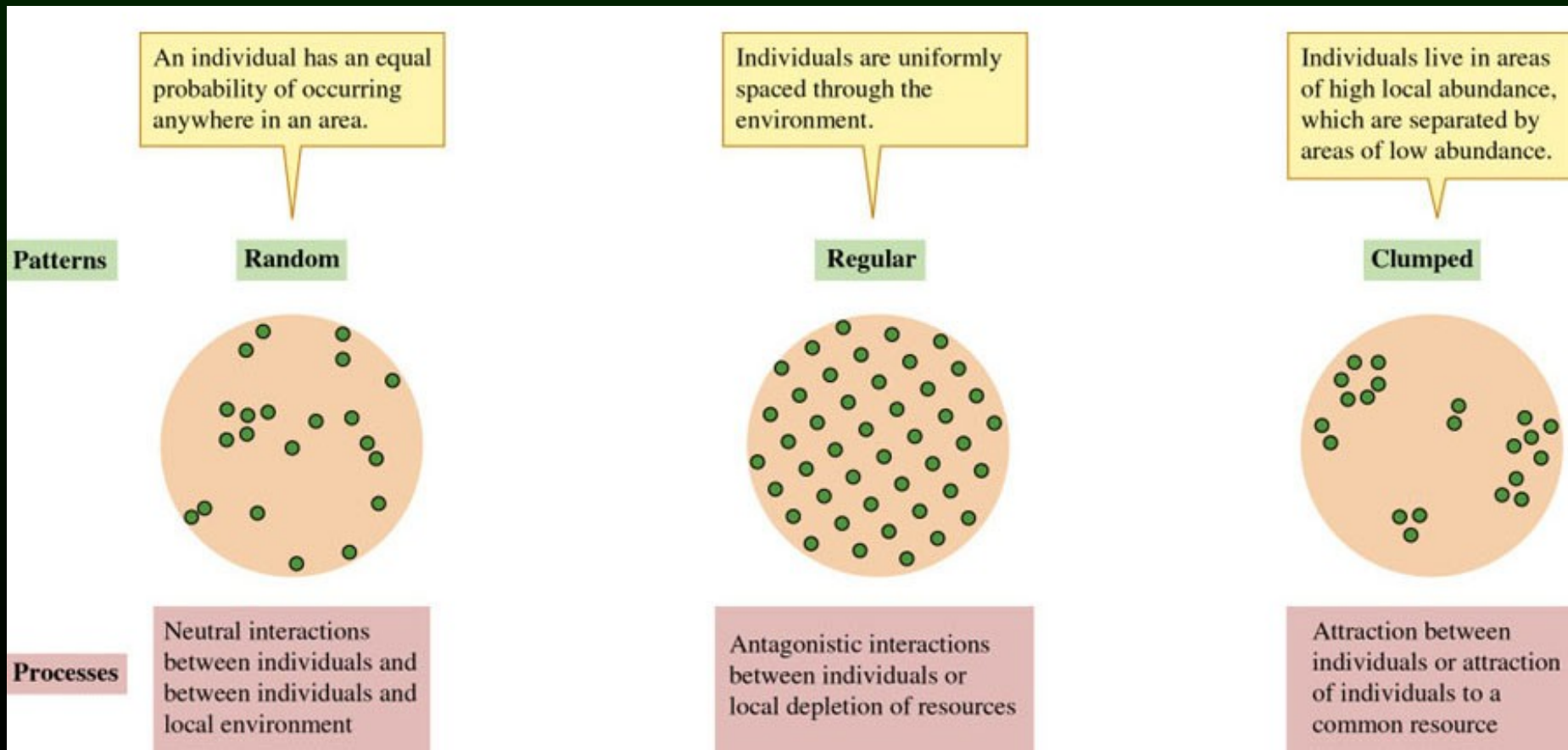
*Chthamalus stellatus* larvae settle in middle and upper intertidal zones but survive to adults mainly in upper intertidal zone.





# Small-scale Population Distribution Patterns

- **Random**: Equal chance of being anywhere.
- **Regular**: Uniformly spaced.
- **Clumped**: Unequal chance of being anywhere.



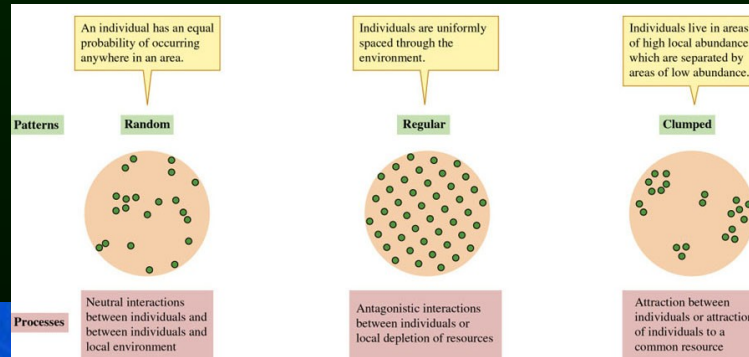
# Random Distribution

Equal chance of being anywhere

- Very rare in nature for **true** (completely by chance) randomness: Plankton, plants, fungi



**Least common in nature!**





# Regular Distribution

Uniformly spaced

• Also somewhat uncommon in nature

**Patterns**

- Random**: An individual has an equal probability of occurring anywhere in an area.
- Regular**: Individuals are uniformly spaced through the environment.
- Clumped**: Individuals live in areas of high local abundance, which are separated by areas of low abundance.

**Processes**

- Random**: Neutral interactions between individuals and between individuals and local environment.
- Regular**: Antagonistic interactions between individuals or local depletion of resources.
- Clumped**: Attraction between individuals or attraction of individuals to a common resource.

Mark Dimmitt 1969

Creosote – found in California deserts!

*Silvia leucophylla* (sage) releases a chemical which inhibits other plants

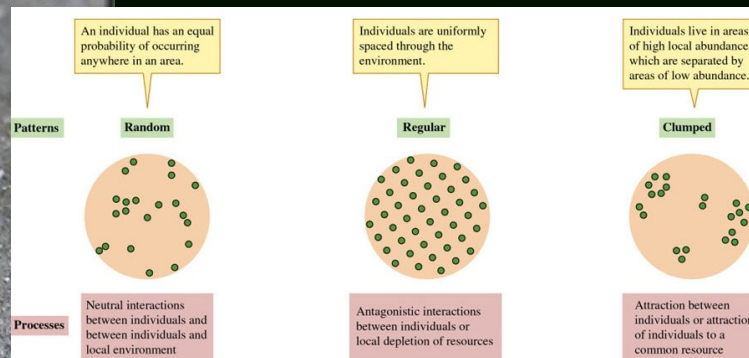
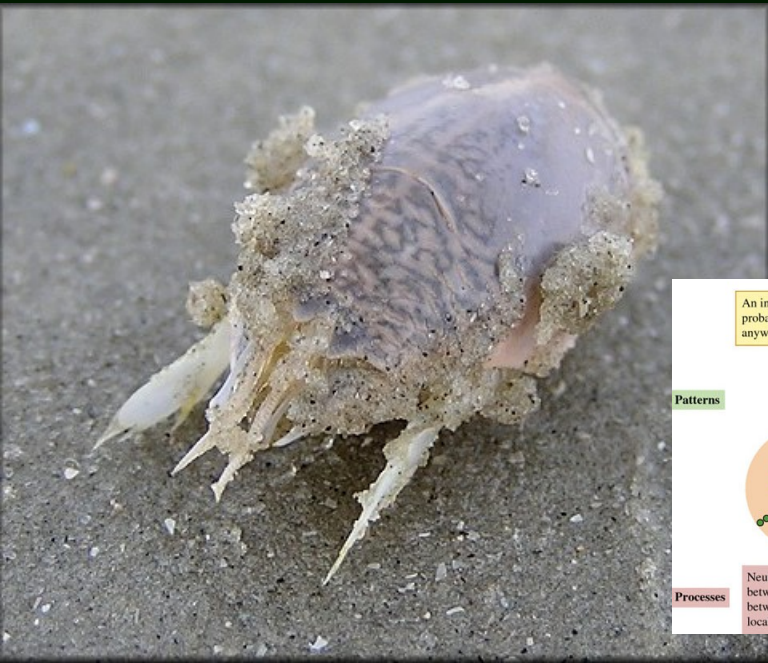




# Clumped Distribution

## Unequal chance of being anywhere

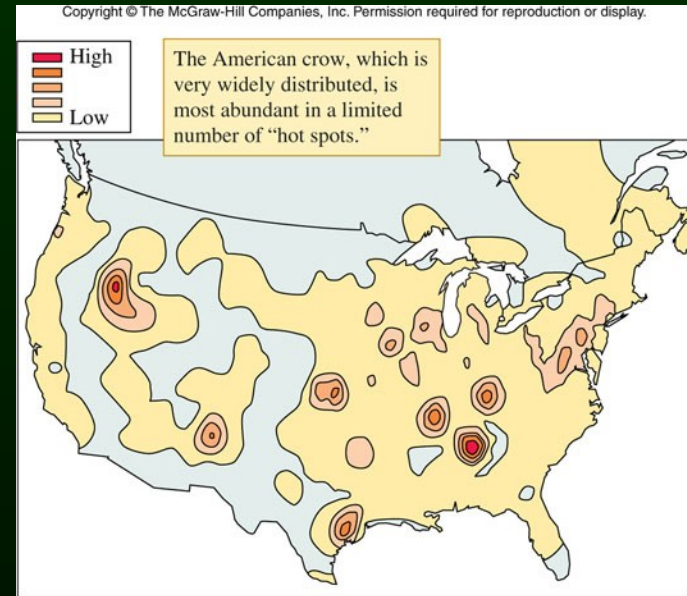
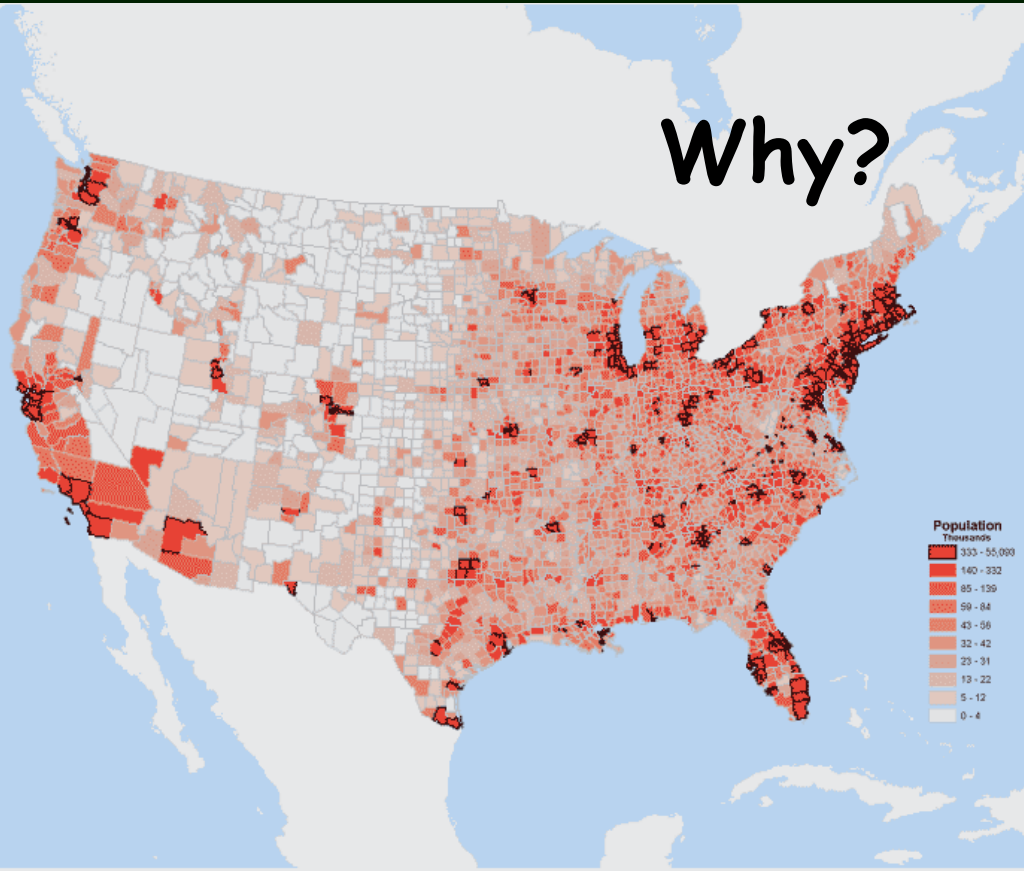
- Most common distribution found in nature
- Attraction between individuals or common resource



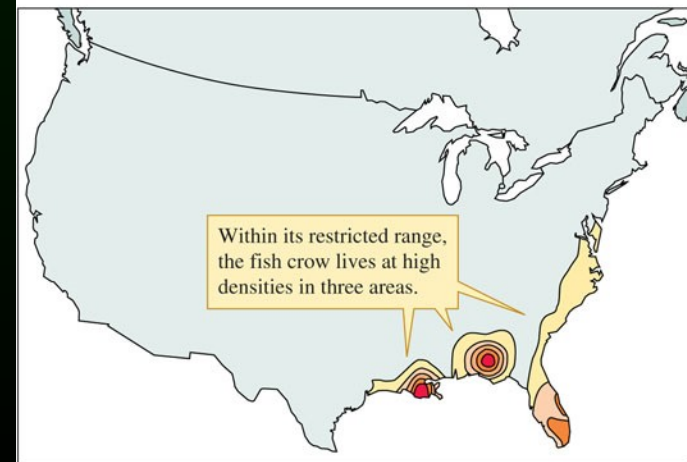
# Large-scale Population Distribution Patterns

On large scales, individuals within a population are clumped.

Why?



(a)



(b)

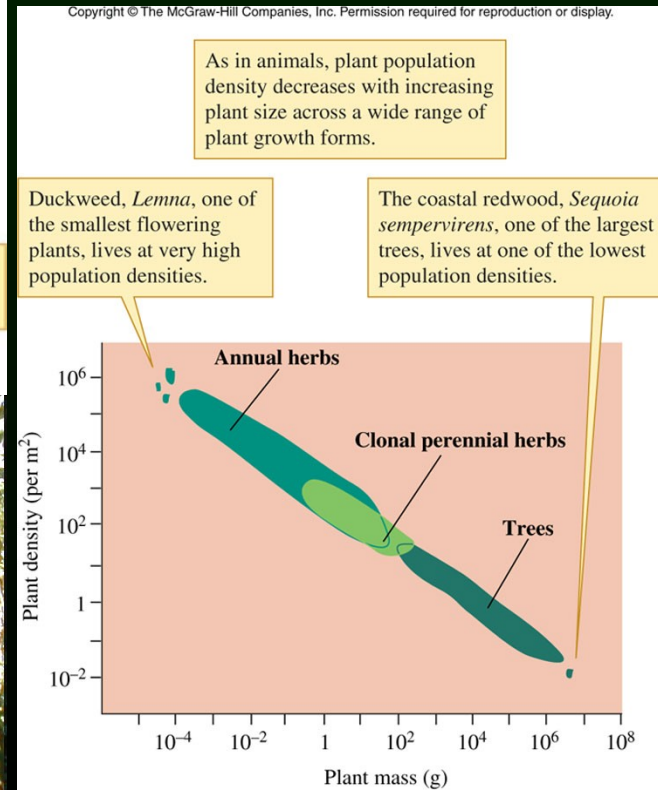
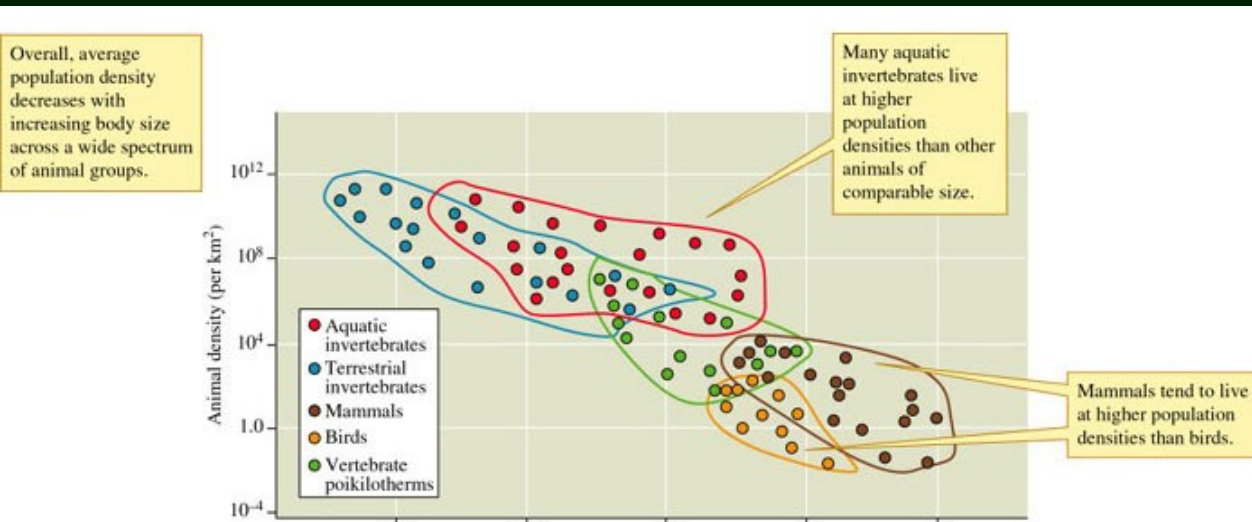


# Organism Size and Population Density

- In general, population density declines with increasing organism size – both for plants and animals

❖ Some variance between groups

## Why the variance?





# What makes an organism rare?

- Based on (3) factors:
  - Geographic Range of Species
  - Habitat Tolerance
  - Local Population Size

## Rarity I

Has one of the 3 factors:  
Tiger

















## Rarity II

Has two of the 3 factors:  
Fish Crow

## Rarity III

Has all 3 factors:  
California Condor

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Most common	Species	
Extensive geographic range Broad habitat tolerance Large local population	 House sparrow <i>Passer domesticus</i>	 Dandelion
Restricted geographic range Broad habitat tolerance Large local population	 Galápagos medium ground finch	 Monterey pine
Extensive geographic range Narrow habitat tolerance Large local population	 California grey whale	 Fremont cottonwood
Extensive geographic range Broad habitat tolerance Small local population	 Tiger	 Grass fern <i>Asplenium septentrionale</i>
Restricted geographic range Narrow habitat tolerance Large local population	 Fish crow	 Haleakala silversword
Restricted geographic range Broad habitat tolerance Small local population	 Tasmanian devil	 Welwitschia
Extensive geographic range Narrow habitat tolerance Small local population	 Northern spotted owl	 Pacific yew
Restricted geographic range Narrow habitat tolerance Small local population	 Mountain gorilla	 <i>Pritchardia monroe</i> No photo available
Rarest		

Species such as these show no aspects of rarity; they are among the most common in the biosphere.

Each of these species show one aspect of rarity, which gives them some vulnerability to extinction.

With two aspects of rarity, these three groups of species are even more vulnerable to extinction.

Species such as these are the rarest in the biosphere and are the most vulnerable to extinction.

Text on white highlights aspects of rarity.