Population Dynamics



Recall: Define Populations.

Populations is a group of organisms, <u>all</u> of the <u>same</u> species, that live in a <u>specific</u> area.



Characteristics of Populations

- Every organism you can think of is a member of a population.
- A <u>healthy</u> population will grow and die at a relatively <u>steady</u> rate unless it...
 - Runs out of food, water, or space
 - Attacked by disease or predator

How researchers study populations *trends*?

 Introducing organisms in a <u>controlled</u> environment and watching how they <u>interact</u>.



 Controlled environment is when all the <u>abiotic</u> factors can be <u>fixed</u> (controlled).



 Abiotic factors are the <u>nonliving</u> parts of an organism's environment.

Examples:







How fast do populations grow?

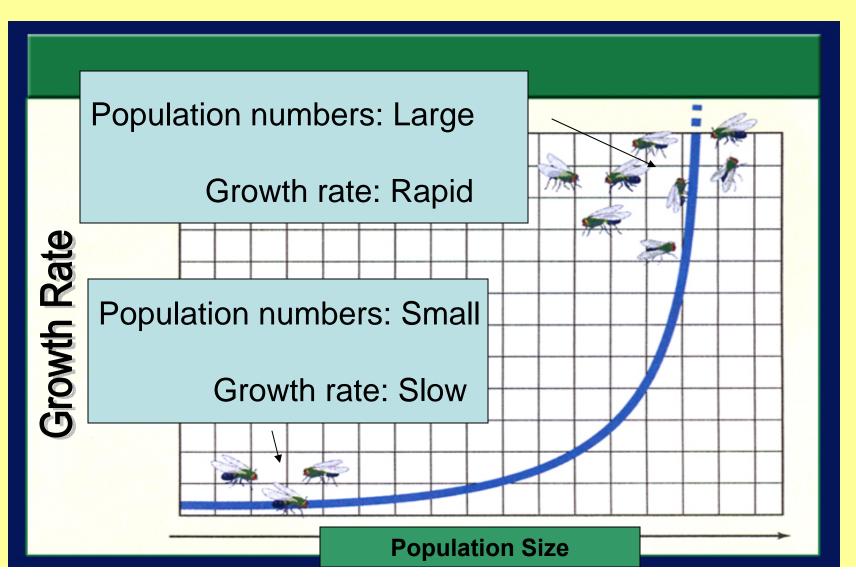
 Populations of organisms do not show a <u>linear</u> growth.

 Rather, the grow resembles a J-shaped curve.

Define Exponential Growth?

· Exponential growth means that as the population gets larger, it also grows at a faster rate.

Exponential Growth of Houseflies



Can a population of organisms grow indefinitely?

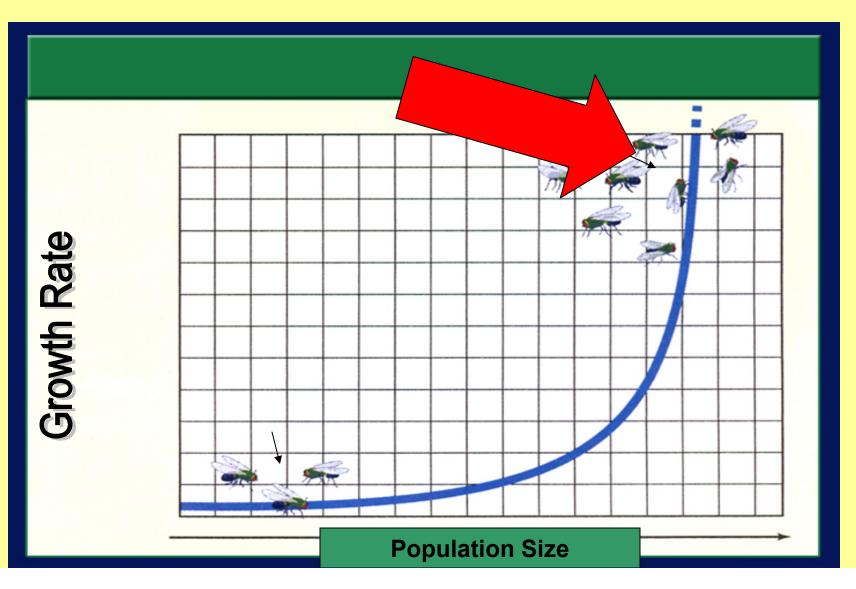
Answer:



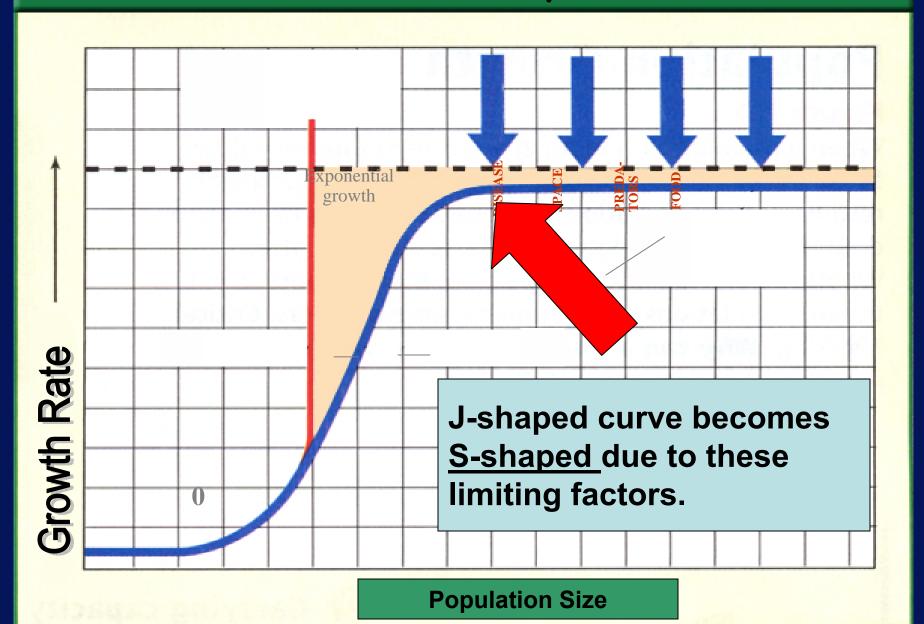
Why?

<u>Limiting</u> factors such as food, disease, predators, or lack of space will cause population growth to <u>slow</u>.

Exponential Growth of Houseflies



Characteristics of Population Growth



Define Carrying Capacity?

• Carrying capacity is the number of organisms of one species that an environment can support indefinitely.

Carrying Capacity

In other words, it's the <u>line</u> on the graph that represents the <u>number</u> of species it can <u>support</u> among resources available <u>without</u> excessive competition.



When available resources become limited, growth rates fluctuate.

<u>Death</u> rates are higher than birth Rates.

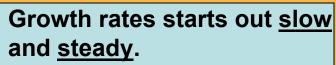
Growth rate becomes rapid.

Birth rates are <u>higher</u> than <u>death</u> rates.









Birth rates are low.



Why don't' populations reach carrying capacity and remain stable?

 In nature, animals and plant populations <u>change</u> in size.

 Researchers study an organism's reproductive pattern.

Also known as its <u>life-history</u> pattern.

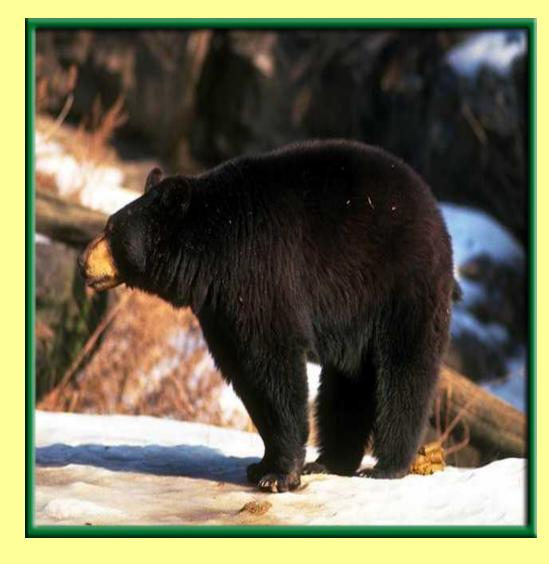
Rapid Life-History Patterns

Rapid lifehistory organisms have a small body size, mature rapidly, reproduce quicker, and have a shorter life span.



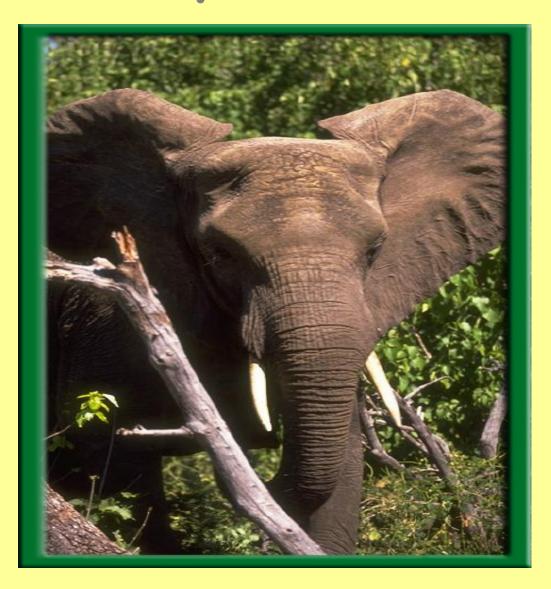
Slow Life-History Patterns

 Slow life-history organisms reproduce and mature slowly, and are longlived. They maintain population sizes at or near carrying capacity.



Slow Life-History Patterns

 Large species that live in more stable environments usually have slow lifehistory patterns.



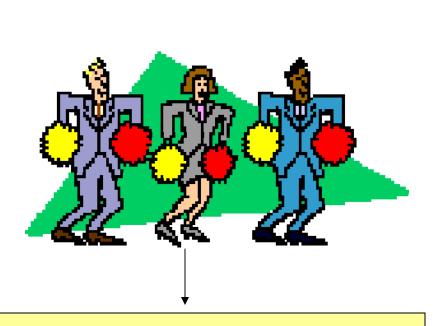




Define Density-Dependent Factors.

 Density-dependent factors include <u>disease</u>, <u>competition</u>, <u>predators</u>, <u>parasites</u>, and <u>food</u>.

Characteristics of density-dependent factors.





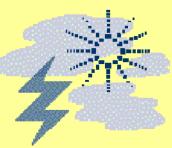
When population numbers are <u>small</u>; spread of disease is <u>slow</u>.

When population numbers are <u>large</u> and <u>close</u> together; spread of disease more <u>rapid</u>.

Define Density-Independent Factors.

 Density independent factors can affect populations, <u>regardless</u> of their size.

Examples include:







- Name the most type of population affected.
 - Populations of <u>small</u> organisms.



Organism Interactions Limit Population Size

Population sizes are <u>limited</u>
 <u>not</u> only by <u>abiotic</u> factors,
 but also are <u>controlled</u> by
 various <u>interactions</u> among
 organisms that <u>share</u> a
 community.

Predation affects population size

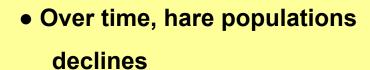
 When a predator consumes prey on a large enough scale, it can have a drastic effect on the size of the prey population.



Snowshoe Hare versus Lynx Populations







With less lynx predators
 hare population increases



More food for lynx and populations increase

Therefore, less food for lynx and population decreases.





The effects of *crowding* and *stress*.

 As populations increase in size in environments that cannot support numbers, individual animals can exhibit a variety of stress symptoms.

The effects of crowding and stress.

 Symptoms of stress include <u>aggression</u>, <u>lower parental care</u>, <u>decreased fertility</u>, and <u>lower resistance to disease</u>.

 All these symptoms can have a <u>negative</u> effect on a population.

 They can become <u>limiting</u> factors for growth and keep populations <u>below</u> carrying capacity.