

Chapter 19 Populations

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Chapter 19 Section 1 Understanding Populations

Objectives

- **Describe** the main properties that scientists measure when they study populations.
- **Compare** the three general patterns of population dispersion.
- **Identify** the measurements used to describe changing populations.
- **Compare** the three general types of survivorship curves.



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Chapter 19 Section 1 Understanding Populations

Properties of Populations

- A **population** is a group of organisms that belong to the same species and live in a particular place at the same time.
- Populations can be measured in terms of size, density, dispersion, growth rate, age structure, and survivorship.



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Chapter 19 Section 1 Understanding Populations

Properties of Populations, *continued*

- **Population Size**
 - A population's size is the number of individuals that the population contains.



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Properties of Populations, *continued*

- **Population Density**
 - Density is a measure of how crowded the population is.



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Properties of Populations, *continued*

- **Dispersion**
 - **Dispersion** describes the distribution of individuals within the population and may be random, uniform, or clumped.



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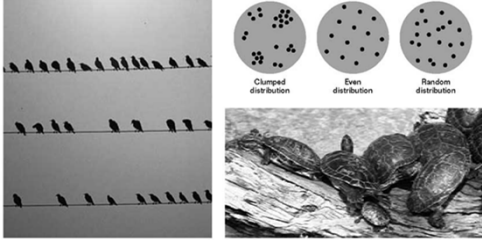
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Section 1 Understanding Populations

Three Patterns of Population Dispersion



This panel, top right, shows the three patterns of dispersion possible in populations. Turtles seeking the warmest basking sites form a clumped distribution. Bottom right, Starlings arrange themselves evenly along telephone lines, left.

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Section 1 Understanding Populations

Population Dynamics

- Age Structure
 - A population's **age structure** indicates the percentage of individuals at each age.

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Section 1 Understanding Populations

Population Dynamics, *continued*

- Patterns of Mortality
 - Populations show three patterns of mortality or **survivorship curves**:
 - Type I (low mortality until late in life)
 - Type II (constant mortality throughout life)
 - Type III (high mortality early in life followed by low mortality for the remaining life span).

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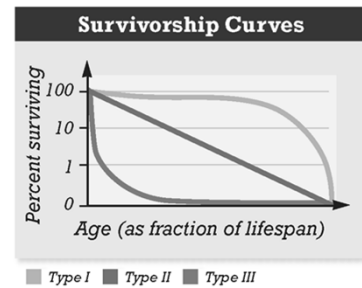
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Section 1 Understanding Populations

Survivorship Curves



■ Type I ■ Type II ■ Type III

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Section 2 Measuring Populations

Objectives

- **Identify** the four processes that determine population growth.
- **Compare** the exponential model and the logistic model of population growth.
- **Differentiate** between density-dependent and density-independent regulation of populations.
- **Explain** why small populations are more vulnerable to extinction.

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Section 2 Measuring Populations

Population Growth Rate

- Demographers, scientists who study population dynamics, define the **growth rate** of a population as the amount by which a population's size changes in a given time.

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Section 2 Measuring Populations

Population Growth Rate, *continued*

- Population Size
 - Birth rate - death rate = growth rate



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The Exponential Model

- The exponential model describes perpetual growth at a steady rate in a population.
- The model assumes constant birth and death rates and no immigration or emigration.



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The Logistic Model

- In the **logistic model**, birth rates fall and death rates climb as the population grows.
- When the **carrying capacity** is reached, the number of individuals the environment can support is reached and population growth becomes stable.



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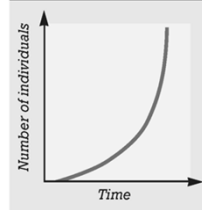
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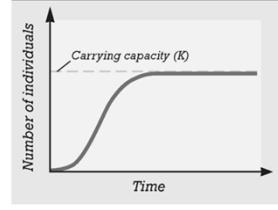
Section 2 Measuring Populations

Two Population Growth Models

The Exponential Model



Logistic Population Growth



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Section 2 Measuring Populations

Population Regulation

- Population-limiting factors, such as competition, are **density-dependent** because the effect on each individual depends on the number of other individuals present in the same area.



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Section 2 Measuring Populations

Population Regulation, *continued*

- Population-limiting factors, such as bad weather and fires, are **density-independent** because the effect on each individual does not depend on the number of other individuals present in the same area.



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Section 2 Measuring Populations

Population Regulation, *continued*

- **Population Fluctuations**
 - All populations fluctuate in size.



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Population Regulation, *continued*

- **Perils of Small Populations**
 - Small populations have low genetic diversity and are subject to inbreeding, so they are less likely to adapt to environmental changes.



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Section 3 Human Population Growth

Objectives

- **Explain** how the development of agriculture changed the pattern of human population growth.
- **Describe** changes in human population size in the past 10,000 years.
- **Compare** observed patterns of population growth in developed and developing countries.



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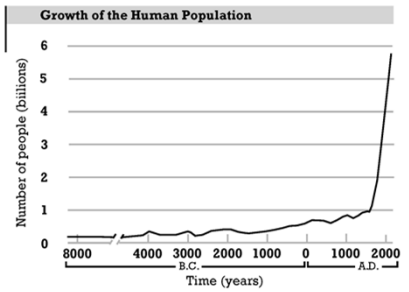
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Section 3 Human Population Growth

Human Population Growth

In the past, the human population grew very slowly. Technology has increased the average life span and decreased infant mortality to the point where the human population can now double in just 45 years.



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