

Chapter 8 Notes

Section 1

Objectives

- **Describe** the three main properties of a population.
- **Describe** exponential population growth.
- **Describe** how the reproductive behavior of individuals can affect the growth rate of their population.
- **Explain** how population sizes in nature are regulated.

What Is a Population?

- A **population** is a group of organisms of the same _____ that live in a specific geographical area and _____.
- A population is a _____ group because organisms usually breed with members of their own population.
- The word *population* refers to the group in general and also to the size of the population, or the _____ it contains.

Properties of Populations

- _____ is the number of individuals of the same species in that live in a given unit of area.
- _____ is the pattern of distribution of organisms in a population. A population's dispersion may be even, clumped, or random.
- Size, density, dispersion, and other properties can be used to describe populations and to _____ within them.

How Does a Population Grow?

- A population _____ individuals with each new offspring or birth and _____ them with each death.
- The resulting population change over time can be represented by the equation below.
 - $\text{Change in population} = \text{Births} - \text{Deaths}$
- _____ is an expression of the increase in the size of an organism or population over a given period of time. It is the birth rate minus the death rate.
- Overtime, the growth rates of populations _____ because birth rates and death rates increase or decrease.
- For this reason, growth rates can be _____, negative, or _____.
- For the growth rate to be _____, the average number of births must equal the average number of deaths.
- A population would remain the same size if each pair of adults produced exactly _____ offspring, and each of those offspring survived to reproduce.
- If the adults in a population are not replaced by new births, the growth rate will be _____ and the population will _____.

How Fast Can a Population Grow?

- Populations usually stay about the same size from year to year because various factors _____ many individuals before they can _____.
- These factors control the _____ of populations.
- In the long run, the factors also determine how the population _____.

Reproductive Potential

- A species' _____ potential is the _____ rate at which its populations can grow. This rate is limited by _____ potential.
- **Reproductive potential** is the _____ number of offspring that a given organism can produce.
- Some species have _____ reproductive potentials than others. Darwin calculated that it could take 750 years for a pair of _____ to produce 19 million descendants. While _____ could produce that in a few days or weeks.
- Reproductive potential increases when individuals produce _____ at a time, reproduce more often, and reproduce _____ in life.
- Reproducing earlier in life has the _____ effect on reproductive potential.
- Reproducing early shortens the _____ time, or the average time it takes a member of the population to reach the age when it reproduces.
- Small organisms, such as bacteria and _____, have short generation times and can reproduce when they are only a few hours or a few days old.
- As a result, their populations can grow _____.
- In contrast, large organisms, such as elephants and _____, become sexually mature after a number of years and therefore have a much _____ reproductive potential than insects.

Exponential Growth

- **Exponential growth** is logarithmic growth or growth in which numbers increase by a certain _____ in each successive time period.
- Exponential growth occurs in nature only when populations have plenty of _____ and _____, and have no _____ or _____.
- For example, population explosions occur when bacteria or molds grow on a _____.
- In exponential growth, a _____ number of individuals are added to the population in each succeeding time period.

What Limits Population Growth?

- Because natural conditions are neither _____ nor _____, populations cannot grow forever.
- Eventually, _____ are used up or the _____ changes, and deaths increase or births decrease.
- Under the forces of _____ selection in a given environment, only _____ members of any population will survive and reproduce. Thus, the properties of a population may _____ over time.

Carrying Capacity

- **Carrying capacity** is the largest population that an environment can _____ at any given time.
- A population may increase _____ this number but it cannot _____ at this increased size.
- Because ecosystems change, carrying capacity is difficult to _____ or calculate exactly. However, it may be _____ by looking at average population sizes or by observing a population _____ after a certain size has been exceeded.

Resource Limits

- A species reaches its carrying capacity when it consumes a particular _____ at the same _____ at which the ecosystem _____ the resource.

- That natural resource is then called a _____ *resource*.
- The supply of the most severely limited resources determines the carrying capacity of an environment for a particular species at a particular time.

Competition Within a Population

- The members of a population use the _____ resources in the same ways, so they will eventually compete with _____ as the population approaches its carrying capacity.
- Instead of competing for a limiting resource, members of a species may compete _____ for _____ dominance or for a _____.
- Competition within a population is part of the _____ of natural selection.
- A territory is an area _____ by one or more individuals against other individuals.
- The territory is of value not only for the _____ but for the shelter, food, or _____ sites it contains.
- Many organisms expend a large amount of _____ and _____ competing with members of the same species for mates, food, or homes for their families.

Two Types of Population Regulation

- Population size can be limited in ways that may or may not depend on the _____ of the population.
- Causes of death in a population may be density dependent or density _____.

Population Regulation

- When a cause of death in a population is density dependent, deaths occur more quickly in a _____ population than in a _____ population.
- This type of regulation happens when individuals of a population are densely packed together.
- Limited resources, predation and _____ result in higher rates of _____ in dense populations than in sparse populations.
- When a cause of death is density independent, a certain proportion of a population may die regardless of the population's density.
- This type of regulation affects _____ populations in a general or uniform way.
- Severe weather and _____ are often density independent causes of death.

Section 2

Objectives

- **Explain** the difference between niche and habitat.
- **Give** examples of parts of a niche.
- **Describe** the five major types of interactions between species.
- **Explain** the difference between parasitism and predation.
- **Explain** how symbiotic relationships may evolve.

An Organism's Niche

- A **niche** is the unique _____ occupied by a species, both in terms of its physical use of its habitat and its _____ within an ecological community.
- A niche is different from a _____. An organism's habitat is a location. However, a niche is an organism's _____ of its habitat.
- A niche can also be thought of as the functional role, or _____ of a particular species in an ecosystem.

Ways in Which Species Interact

- Interactions between species are categorized at the level where one population interacts with another.
- The five major types of species interactions are:

- _____
- Predation
- Parasitism
- Mutualism
- Commensalism

Ways in Which Species Interact

- These categories are based on whether each species causes _____ or _____ to the other species in a given relationships in terms of total effects over time.
- Other types of interactions are possible.
- Many interactions between species are _____, some interactions do not fit in a category clearly, and other types seem possible but are rarely found. Therefore, many interactions are neither _____ nor well studied.

Competition

- **Competition** is the relationship between two species (or individuals) in which both species (or individuals) attempt to use the same limited _____ such that both are _____ affected by the relationship.
- Members of the _____ species must compete with each other because they require the same resources and because they occupy the same _____. When members of different species compete, we say that their niches _____, which means that each species uses some of the same resources in a habitat.

Indirect Competition

- Species can compete even if they never come into direct contact with each other.
- For example, suppose that one insect _____ on a certain plant during they day and that another species feeds on the same plant during the night. Because they use the same _____, the two species are indirect competitors.
- Humans rarely interact with the _____ that eat our food crops, but those insects are still competing with us for food.

Adaptations to Competition

- When two species with similar niches are placed together in the same ecosystem, we might expect one species to be more _____ than the other.
- But in the course of evolution, adaptations that _____ competition will also be advantageous for species whose niches overlap.
- One way competition can be reduced between species is by dividing up the niche in _____ or space.
- Niche restriction is when each species uses _____ of the niche than they are capable of using. It is observed in _____ species that use the same resources within a habitat.
- For example, *Chthamalus stellatus*, a _____ species, is found only in the upper level of the intertidal zone when another barnacle species is present. When the other species is removed, *C. stellatus* can be found at deeper levels.
- The _____ niche used by a species may be smaller than the _____ niche.

Predation

- **Predation** is an interaction between two species in which one species, the predator, _____ on the other species, the prey.
- In complex food webs, a _____ may also be the prey of another species.
- Most organisms have evolved some _____ to avoid or defend against predators.

Predators

- Some predators eat only _____ types of prey. In this kind of close relationship, the sizes of each population tend to increase and decrease in _____.

Parasitism

- An organism that lives _____ or _____ another organism and feeds on the other organism is a *parasite*. Examples include ticks, fleas, _____, heartworms, and bloodsucking leeches.
- The organism the parasite takes its nourishment from is known as the _____.
- **Parasitism** is a relationship between two species, the parasite, _____ from the other species, the host, and usually _____ the host.
- The differences between a parasite and a predator are that a parasite spends some of its life in or on the host, and that the parasites do not usually _____ their hosts.
- In fact, the parasite has an evolutionary _____ if it allows its host to live longer.
- However, the host is often _____ or exposed to _____ by the parasite.

Mutualism

- Many species depend on another species for survival. In some cases, neither organism can survive _____.
- **Mutualism** is a relationship between two species in which both species _____.
- Certain species of bacteria in your _____ form a mutualistic relationship with you. These bacteria help break down food that you cannot _____. In return, you give the bacteria a warm, food-rich habitat.

Commensalism

- **Commensalism** is a relationship between two organisms in which one organism _____ and the other in _____.
- An example is the relationship between sharks and a type of fish called _____. They attach themselves to sharks and feed on scraps of food left over from the shark's meals.
- Even seemingly harmless activity, however, might have an effect on another species.

Symbiosis and Coevolution

- **Symbiosis** is a relationship in which two different organisms live in close association with each other.
- Symbiosis is most often used to describe a relationship in which _____ species benefits.
- Overtime, species in close relationships may _____. These species may evolve adaptations that reduce the harm or improve the benefit of the relationship.