



1

Learning goals

Define population and community ecology

Discuss how populations change through time

Compare K- and r-selection

Discuss human population growth

Identify the types of interactions between species in communities and their results

2

Definition

- **Ecology:** The study of the interaction between organisms and their environments
 - Individuals
 - Populations
 - Communities
 - Ecosystems

Organisms: In a forest, each pine tree is an organism.

Populations: Together, all the pine trees make up a population.

Communities: All the plant and animal species comprise a community.

Ecosystems: This coastal ecosystem in the southwestern United States includes living organisms and the environment in which they live.

The Biosphere: Encompasses all the ecosystems on Earth.


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Population ecology


- **Population ecology** is concerned with the interactions between individuals within the same species that live in the same area
 - Species distribution
 - Population size
 - Population growth
 - Reproduction
 - Intra-specific competition




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Uniform






Random





Clumped



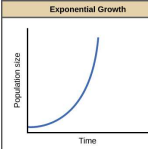
Species distribution

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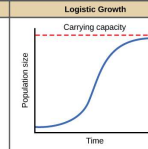
Population growth

- Population growth is naturally **exponential**
- Growth rate (r)
 - the change in the number of individuals in a population over some unit of time
 - The number of individuals in a population (N)
- Populations can't grow forever:
 - Food can be reduced due to competition
 - Accessibility to habitats/breeding patterns can decrease
 - Parasite and disease incidence can increase
 - Predation risk can increase
 - We call these **density-dependent factors**

Exponential Growth

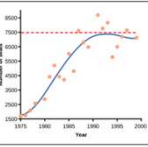

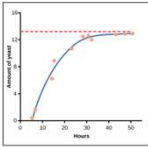
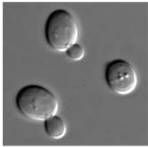


Logistic Growth



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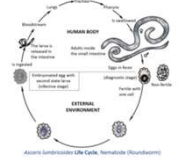
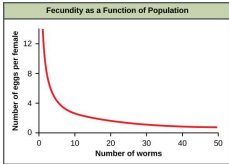
Carrying capacity (K)



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Density-dependent factors

Ascaris reproduction within their host is negatively affected by the number of individuals within the host.



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Density-independent factors

- Density-independent factors impact population growth independent of the number of individuals in the population
- Forest fires
- Epidemics
- Extreme weather



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K vs r-selected species

Characteristics of K-selected and r-selected species

Characteristics of K-selected species	Characteristics of r-selected species
Mature late	Mature early
Greater longevity	Lower longevity
Increased parental care	Decreased parental care
Increased competition	Decreased competition
Fewer offspring	More offspring
Larger offspring	Smaller offspring



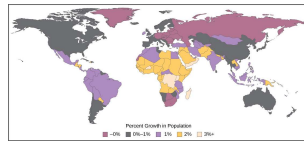
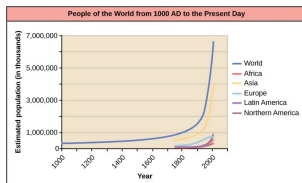
(K-selected species)



(r-selected species)

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The human population



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Community ecology



Community ecology:
The study of how
ecological interactions
shape the structure of
communities

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Niche



Figure 15-20
When's Life? A Guide to Biology, Third Edition
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Competition

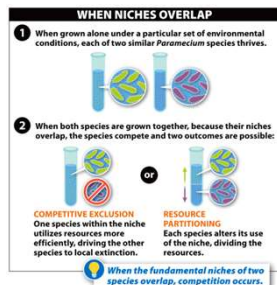


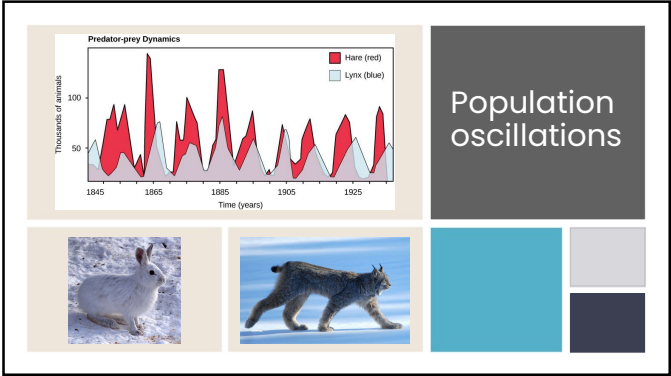
Figure 15-22
When's Life? A Guide to Biology, Third Edition
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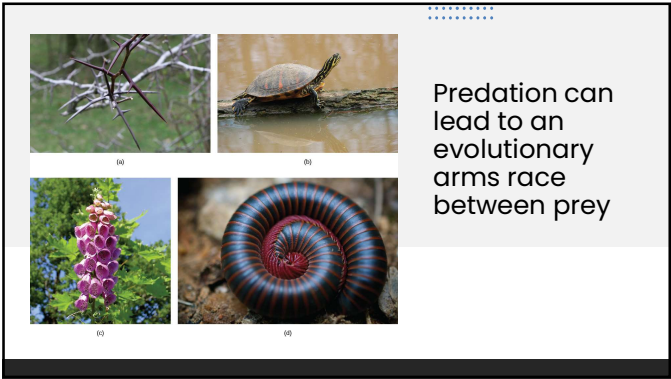
Interactions

- Major types of interactions:
 - Predation (+ -)
 - Parasitism (+ -)
 - Mutualism (+ +)
 - Commensalism (+ 0)

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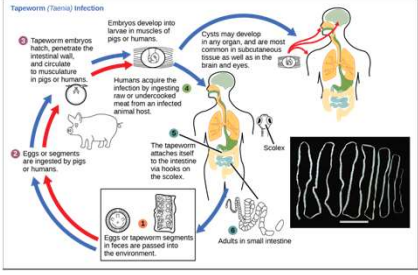
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Tapeworm (Taenia) Infection

1. Tapeworm embryos hatch, penetrate the intestinal wall, and circulate to muscle tissue in pigs or humans.

2. Eggs or segments are ingested by pigs or humans.

Embryos develop into larvae in muscles of pigs or humans.

Cysts may develop in any organ and are most common in subcutaneous tissue as well as in the brain and eyes.

Humans acquire the infection by ingesting raw or undercooked meat from an infected animal host.



The tapeworm attaches itself to the intestine via hooks on the scolex.

Adults in small intestine

Eggs or tapeworm segments in feces are passed into the environment.

Parasitism


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Mutualism

- Mutualisms are common in nature
- Termites have a mutualistic relationship with bacteria in their guts
- Lichen is a symbiotic pairing of fungi and algae

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Commensalism

One species benefits, the other is unaffected.

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