1

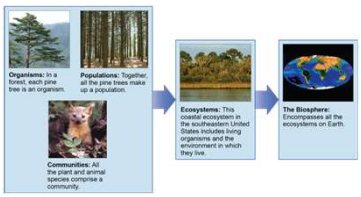
Learning goals

- 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



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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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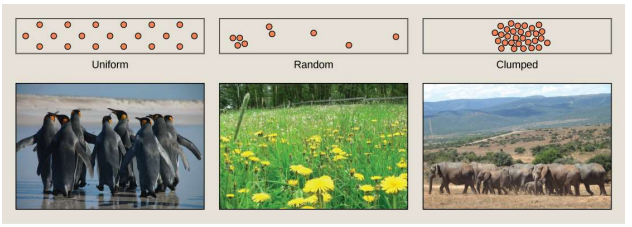
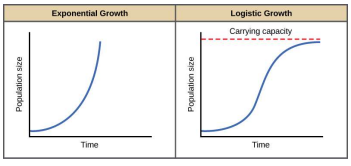


Species distribution

5

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**



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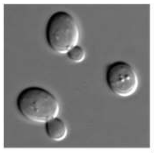
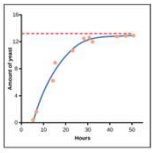
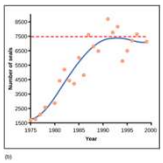
Carrying capacity (K)







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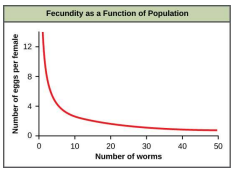
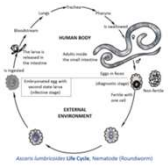
Density-dependent factors

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

9

K vs r-selected species

Characteristics of *K*-selected and *r*-selected species

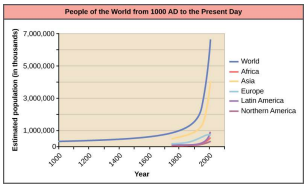
Characteristics of *K*-selected species	Characteristics of *r*-selected species
Mature late	Mature early
Greater longevity	Lower longevity
Increased parental care	Decreased parental care
Increased competition	Decreased competition
Fewer offspring	More offspring
Larger offspring	Smaller offspring

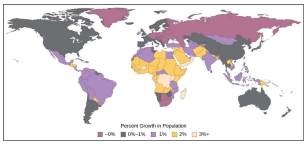
(a) *K*-selected species

(b) *r*-selected species

10

The human population





11

Community ecology

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

12

Niche

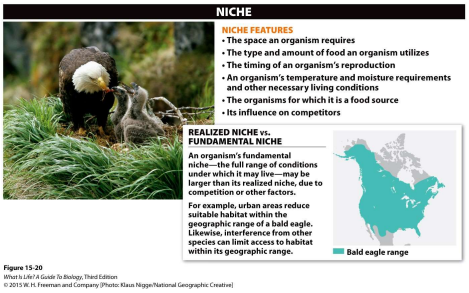


Figure 15-20
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13

Competition

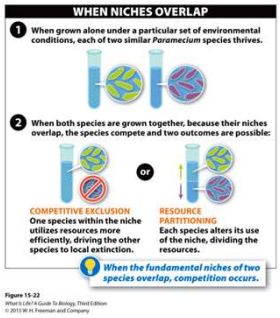

Figure 15-22
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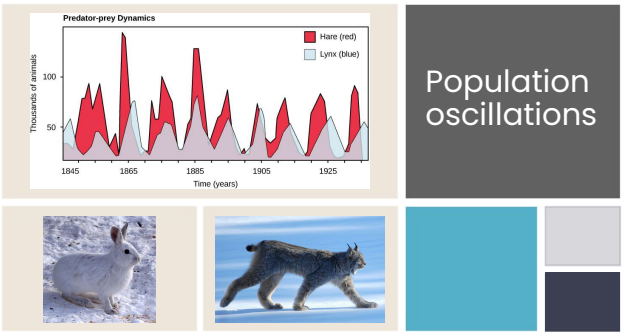
14

Interactions

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

15



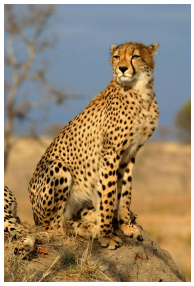
Population oscillations

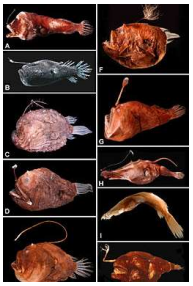
16

Predation can lead to an evolutionary arms race between prey

17

...and the predator





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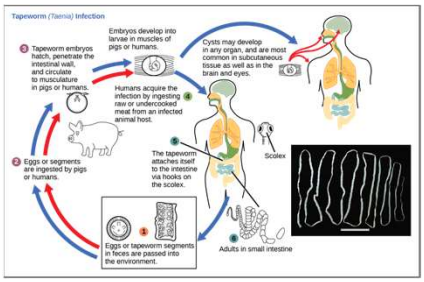

Parasitism

19

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

20

Commensalism

One species benefits, the other is unaffected.

21