Chapter 6
Population and Community Ecology

Nature exists at several levels of complexity

[Diagram showing the hierarchy from individual to biosphere]
Factors that Regulate Population Abundance and Distribution

- Population size - the total number of individuals within a defined area at a given time.
- Population density - the number of individuals per unit area at a given time.
- Population distribution - how individuals are distributed with respect to one another.
- Population sex ratio - the ratio of males to females
- Population age structure - how many individuals fit into particular age categories.
Factors that Influence Population Size

• Density-dependent factors- the size of the population will influence an individual’s probability of survival.

• Density-independent factors- the size of the population has no effect on the individual’s probability of survival.

Exponential Growth Model

• Growth rate- the number of offspring an individual can produce in a given time period, minus the deaths of the individual or offspring during the same period.

• Intrinsic growth rate- under ideal conditions, with unlimited resources, the maximum potential for growth.
Exponential Growth Model

- J-shaped curve - when graphed the exponential growth model looks like this.

![Exponential Growth Model Graph](image)

Logistic Growth Model

- Logistic growth - when a population whose growth is initially exponential, but slows as the population approaches the carrying capacity.
- S-shaped curve - when graphed the logistic growth model produces an “S”.

![Logistic Growth Model Graph](image)
Variations of the Logistic Model

• If food becomes scarce, the population will experience an overshoot by becoming larger than the spring carrying capacity and will result in a die-off, or population crash.

Reproductive Strategies

• K-selected species - the population of a species that grows slowly until it reaches the carrying capacity. Ex. elephants, whales, and humans.

• R-selected species - the population of a species that grows quickly and is often followed by overshoots and die-offs. Ex. mosquitoes and dandelions
### TABLE 6.1 Traits of K-selected and r-selected species

<table>
<thead>
<tr>
<th>Trait</th>
<th>K-selected species</th>
<th>r-selected species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life span</td>
<td>Long</td>
<td>Short</td>
</tr>
<tr>
<td>Time to reproductive maturity</td>
<td>Long</td>
<td>Short</td>
</tr>
<tr>
<td>Number of reproductive events</td>
<td>Few</td>
<td>Many</td>
</tr>
<tr>
<td>Number of offspring</td>
<td>Few</td>
<td>Many</td>
</tr>
<tr>
<td>Size of offspring</td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Parental care</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>Population growth rate</td>
<td>Slow</td>
<td>Fast</td>
</tr>
<tr>
<td>Population regulation</td>
<td>Density dependent</td>
<td>Density independent</td>
</tr>
<tr>
<td>Population dynamics</td>
<td>Stable, near carrying capacity</td>
<td>Highly variable</td>
</tr>
</tbody>
</table>

Table 6.1

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### Survivorship Curves

![Survivorship Curves](image)

*Figure 6.12
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Metapopulations

- Metapopulations - a group of spatially distinct populations that are connected by occasional movements of individuals between them.

Competition

- Competition - the struggle of individuals to obtain a limiting resource.
Predation

- Predation - the use of one species as a resource by another species.
- True predators - kill their prey.
- Herbivores - consume plants as prey.
- Parasites - live on or in the organism they consume.
- Parasitoids - lay eggs inside other organisms.
Mutualism

- Mutualism - A type of interspecific interaction where both species benefit.

Commensalism

- Commensalism - a type of relationship in which one species benefits but the other is neither harmed nor helped.
Keystone Species

- Keystone species - a species that plays a role in its community that is far more important than its relative abundance might suggest.

Primary Succession

- Primary succession - occurs on surfaces that are initially devoid of soil.
Secondary Succession

- Secondary succession occurs in areas that have been disturbed but have not lost their soil.

Aquatic Succession
Factors that determine species richness:

- Latitude
- Time
- Habitat size

Theory of Island Biogeography

- Theory of island biogeography - the theory that explains that both habitat size and distance determine species richness.