BIOLOGY

4.2 Niches and Community Interactions

The Niche

- A niche is the range of ________________________________ in which a species lives and the way the species obtains what it needs to survive and reproduce.

Tolerance

- Every species has its own range of tolerance, the ability to ______________________________ and ______________________________ under a range of environmental circumstances.

- When an environmental condition, such as temperature, extends in either direction beyond an organism’s optimum range, the organism experiences ______________________________.

- The organism must expend more energy to maintain ______________________________, and so has less energy left for ______________________________ and ______________________________.

- Organisms have an ______________________________ for every environmental factor. Beyond those limits, the organism cannot survive.

- A species’ tolerance for environmental conditions, then, helps determine its ______________________________—the general place where an organism lives.

Defining the Niche
• An organism’s **niche** describes not only the environment where it lives, ____________

______________________________with biotic and abiotic factors in the environment.

• In other words, an organism’s niche includes not only the physical and biological aspects of its environment, but also the way in which the organism ____________ to survive and reproduce.

**Resources and the Niche**

• The term **resource** can refer to any _______________, such as water, nutrients, light, food, or space.

• For plants, resources can include _______________.

• For animals, resources can include _______________.

**Physical Aspects of the Niche**

• Part of an organism’s niche involves the _______________ it requires for survival.

  o Example: Most amphibians, for example, lose and absorb water through their skin, so they must live in moist places. If an area is too hot and dry, or too cold for too long, most amphibians cannot survive.

**Biological Aspects of the Niche**

• Biological aspects of an organism’s niche involve the _______________, such as when and how it reproduces, the food it eats, and the way in which it obtains that food.

  o Birds on Christmas Island in the Indian Ocean, for example, all live in the same habitat but they prey on fish of different sizes and feed in different places. Thus, each species occupies a distinct niche.

**Competition**

How does competition shape communities?

• By causing species to divide resources, competition helps determine the _______________ of species in a community and the _______________ each species occupies.

• How one organism ________________ is an important part of defining its niche.
• Competition occurs when organisms attempt _____________________________________________

__________________________________________ in
the same place at the same time.

  o In a forest, for example, plant roots compete for resources such as water and nutrients in the soil.

  o Animals compete for resources such as food, mates, and places to live and raise their young.

• Competition can occur both between members of the same species, known as ____________

  competition, and between members of different species, known as ________________

  competition.

The Competitive Exclusion Principle

• ________________ competition between different species almost always produces a winner and a loser—and the losing species dies out.

  o In the experiment shown in the graph, two species of paramecia (P. aurelia and P. caudatum) were first grown in separate cultures (dashed lines). In separate cultures, but under the same conditions, both populations grew.

  o However, when both species were grown together in the same culture (solid line), one species outcompeted the other, and the less competitive species did not survive.

• The ____________________________________________ states that no two species can occupy exactly the same niche in exactly the same habitat at exactly the same time.

  o If two species attempt to occupy the same niche, one species will be better at competing for limited resources and will eventually exclude the other species.

  o As a result of competitive exclusion, natural communities rarely have niches that overlap significantly.
Dividing Resources

- Instead of _________________________ for similar resources, species usually ________________ them.
  - For example, the three species of North American warblers all live in the same trees and feed on insects.
  - But one species feeds on high branches; another feeds on low branches, and another feeds in the middle.
  - The resources utilized by these species are similar yet different. Therefore, each species has its own niche and competition is minimized.
  - This division of resources was likely brought about by past competition among the birds.

- By causing species to divide resources, competition helps determine the _________________ and ____________________ of species in a community and the _______________ each species occupies.

Predation, Herbivory, and Keystone Species

How do predation and herbivory shape communities?

- Predators can affect the size of ___________________________________________ in a community and determine the places prey can ________________________________.

- Herbivores can affect both the _________ and __________________________ of plant populations in a community and determine the places that ___________________________.

Predator-Prey Relationships
• An interaction in which one animal (the predator) captures and feeds on another animal (the prey) is called ____________________.

• Predators can affect the __________ of prey populations in a community and determine the places prey can ____________________________.
  
  o Birds of prey, for example, can play an important role in regulating the population sizes of mice, voles, and other small mammals.

This graph shows an idealized computer model of changes in predator and prey populations over time.

Herbivore-Plant Relationships

• An interaction in which one animal (the herbivore) feeds on producers (such as plants) is called ____________________.

• Herbivores can affect both the ______________ and _________________________ of plant populations in a community and determine the places that certain plants can survive and grow.
  
  o For example, very dense populations of white-tailed deer are eliminating their favorite food plants from many places across the United States.

Keystone Species

• Sometimes changes in the population of a single species, often called a _________________ species, can cause dramatic changes in the structure of a community.
  
  o In the cold waters off the Pacific coast of North America, for example, sea otters devour large quantities of sea urchins.

  o Urchins are herbivores whose favorite food is kelp, giant algae that grow in undersea “forests.”

  o A century ago, sea otters were nearly eliminated by hunting. Unexpectedly, the kelp forest nearly vanished.
Without otters as predators, the sea urchin population skyrocketed, and armies of urchins devoured kelp down to bare rock.

Without kelp to provide habitat, many other animals, including seabirds, disappeared.

Otters were a keystone species in this community.

After otters were protected as an endangered species, their population began to recover.

As otters returned, the urchin populations dropped, and kelp forests began to thrive again.

Recently, however, the otter population has been falling again, and no one knows why.

**Symbioses**

What are the three primary ways that organisms depend on each other?

• Biologists recognize three main classes of symbiotic relationships in nature:
  1. ___________________
  2. ___________________
  3. ___________________

• Any relationship in which two species live closely together is called ___________________, which means “_____________________________________________."

**Mutualism**

**EXAMPLES**

• The sea anemone’s sting has two functions: to capture prey and to protect the anemone from predators. Even so, certain fish manage to snack on anemone tentacles.

• The clownfish, however, is immune to anemone stings. When threatened by a predator, clownfish seek shelter by snuggling deep into an anemone’s tentacles.

• If an anemone-eating species tries to attack the anemone, the clownfish dart out and chase away the predators.

• This kind of relationship between species in which _____________________________ is known as **mutualism**.

**Parasitism**
EXAMPLES:

- Tapeworms live in the intestines of mammals, where they absorb large amounts of their hosts’ food.

- Fleas, ticks, lice, and the leech shown, live on the bodies of mammals and feed on their blood and skin.

- These are examples of **parasitism**, relationships in which one organism ____________________________ ___________________________ another organism and ___________________________.

- The parasite obtains all or part of its nutritional needs from the host organism.

- Generally, parasites weaken but do not kill their host, which is usually larger than the parasite.

**Commensalism**

EXAMPLES:

- Barnacles often attach themselves to a whale’s skin. They perform no known service to the whale, nor do they harm it. Yet the barnacles benefit from the constant movement of water—that is full of food particles—past the swimming whale.

- This is an example of **commensalism**, a relationship in which one organism ___________________________ and the other is neither ___________________________.