Relationships in Ecosystems

Reflect

If you were hiking on a mountain, you might not notice these rocks covered with lichens as you pass by. The tiny organisms that live on these rocks are an amazing model of interdependency. A lichen is composed of two organisms: a fungus and a photosynthetic alga or bacterium. These two organisms cooperate with each other to survive. The fungus provides the alga or bacterium with a structure to live in as well as important materials from the surrounding environment.

The alga or bacterium provide the fungus with food. These organisms cooperate to exploit (or obtain) the resources in their shared environment, allowing them to survive in harsh environments that have very few nutrients. Relationships between organisms within an ecosystem help maintain balance in the community. These relationships can take many forms. What are some of the different types of relationships between organisms in an ecosystem? How do these relationships affect each organism?

Symbiotic Relationships

When two different species of organisms live in close contact, this relationship is called *symbiosis*. The term *symbiosis* comes from the Greek language and means “living together.” In lichens, a fungus and an alga or bacterium coexist in the same physical space and share materials. In some forms, symbiosis is beneficial to both organisms, as seen in lichens on the tree pictured to the left. Other forms of symbiosis only benefit one partner. For example, off the California coast, you can spot gray whales with white barnacles attached to their skin. Barnacles do not harm the whales, but they like to eat the same tiny plankton that whales like. Another type of symbiosis actually benefits only one organism while harming another. An example of this is mistletoe growing in a tree as it takes water and nutrients away from the host plant.

Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. *Mutually beneficial interactions*, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these *competitive*, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms both living and nonliving with their environments are shared.

Mutually Beneficial Interactions: A Win-Win Situation

Both organisms participating in a mutualistic relationship benefit from the partnership. An example is the relationship between hummingbirds and the flowers they feed on (pictured right). The hummingbird benefits from consuming the flower's nectar. The flower benefits when the hummingbird spreads the flower's pollen to other members of its species. Many scientists believe that mutually beneficial relationships evolved from organisms that originally had parasitic relationships. Parasites harm, weaken, or sometimes kill their hosts, which helps neither the hosts nor the parasites in the end. In a mutualistic relationship, also known as a mutually beneficial interaction, both organisms benefit from each other.

Hummingbirds have a mutualistic relationship with flowers. The bird drinks the nectar and distributes pollen to other flowers as it flies.

Everyday Life: Symbiotic Relationships and Human Survival

The human body is a host to a wide variety of bacteria species. Colonies of bacteria live throughout the human body, including on the skin, in nasal passages, and along the digestive tract. The human intestines are home to about 500 different species of bacteria. If not for mutualistic bacteria, humans would not be able to digest certain foods or keep their immune systems running efficiently. Bacteria help the human digestive tract break down food molecules by providing enzymes that humans do not produce. Humans are able to digest and absorb nutrients that would not otherwise be available to them. Bacteria also contribute vitamins and anti-inflammatory compounds that aid digestion and enhance human nutrition.

Lactobacillus

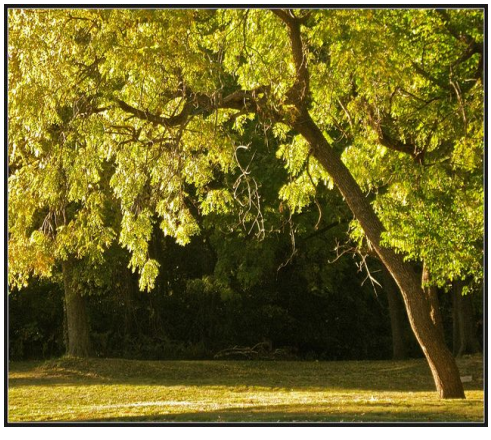
Researchers have identified approximately 10,000 species of bacteria that live inside the human body. If one species is killed off when a person takes antibiotics to fight a disease, another species takes over those functions. Microbes also help regulate human metabolism and contribute to weight control. The genus *Lactobacillus* has been shown to reduce inflammation and help prevent cancer or infection caused by other types of bacteria, such as salmonella.

Predation

Have you ever seen a hawk swoop down out of the sky and capture a small animal? Have you seen a spider trap a fly in its web? These are examples of *predation*, a behavior in which one species kills another species for food. The aggressor is the *predator*; the victim is the *prey*.

Predation serves to control the sizes of populations. Without predation, the population of prey animals could grow too large. Similarly, the amount of prey available controls the size of the predator population. There are only as many predators as the prey population can support. In predation, the predator's goal is to kill the prey organism.

Competition occurs when more than one organism is trying to obtain the same resource. Organisms occupy a niche, or role, in their environment. For example, a snail might consume algae and live in small, cool ponds. This is its niche. If another species of snail also consumed algae and lived in small, cool ponds, then these two species of snails would compete for food and space. Competition can lead to the elimination of one species. This fight for resources becomes particularly fierce in dense populations. If a large number of organisms live in a small space, resources will become limited more quickly. These rams are fighting for dominance, which will result in superior mates, territory, food, and water sources for the winner.



When different species compete for the same resources, they are engaged in *interspecific competition* (*inter-* means "between"). Animals such as hyenas and vultures compete for the same food. Interspecific competition also occurs in plants. In forests, for example, trees that grow tall quickly are able to outcompete others for sunlight. As they grow larger, they crowd out other plant species competing for the same nutrients, water, sunlight, and even space. The black walnut tree actually inhibits the growth of neighboring plants by secreting a chemical, or poison, called juglone.

Organisms may have to fight for resources within their own species. This is called *intraspecific competition* (*intra-* means "within"). Grasshoppers competing with each other for grass and other vegetation are one example. Once the food source is depleted, the population declines. Animals also compete for mates and territory in the quest for survival.

Look Out!

Predation and competition are not the same. When animals compete, they are fighting for a limited array of resources. When they exhibit predation, one animal becomes a resource for another. Resource availability, or lack thereof, can affect interactions between organisms (ex: organisms in a resource-limited environment may have a competitive relationship, whereas those same organisms may not be in competition in a resource-rich environment).

Try Now

Write a *C* next to any scenario that demonstrates a competitive interaction, an *M* next to any scenario that demonstrates a mutually beneficial interaction, and a *P* next to any scenario that demonstrates a predatory interaction.

_____ Cheetahs and lions hunt the same prey in the savanna.

_____ Polar bears hunt seals through the ice in the North Atlantic.

_____ Spiders spin webs to catch flies to consume later.

_____ Clown fish live inside sea anemones; the clown fish fight off predators of the anemones, and the anemones sting predators of the clown fish with their tentacles.

_____ Male bighorn sheep ram their horns together when attracting the same mate.