

Interactions in Ecosystems

The ways in which flamingos interact with other organisms and their environment are only a small part of the ecology of a tropical lagoon ecosystem. To understand what individuals, populations, and communities need to survive, ecologists study the interactions among and between species and their environment.

Habitat and Niche

Flamingos live in tropical and subtropical regions of the world. They prefer environments that have alkaline lakes or saltwater lagoons and large mud flats. These environmental features are examples of a flamingo's habitat. A **habitat** includes all of the biotic and abiotic factors in the environment where an organism lives. For a flamingo, these factors include things such as the shrimp and other small invertebrates that it eats, the water salinity, and the air temperature.



Model Draw a model of your habitat. Think of all the places that you regularly visit and the people you interact with, and include those in your model.

Many species live in the same habitat, but each species occupies a different ecological niche. An **ecological niche** contains all the physical, chemical, and biological factors that a species needs to survive and reproduce.

The factors that make up a species' niche include the following:

Food sources The type of food a species eats, how a species competes with others for food, and where it fits in the food web are all part of a species' niche.

Abiotic conditions A niche includes the range of conditions such as air temperature and amount of water that a species can tolerate.

Behavior The time of day a species is active and where and when it feeds and reproduces also are factors in the niche of a species.

An ecosystem is a collection of habitats. The organisms that occupy these habitats have separate niches, but the niches have certain abiotic and biotic factors in common. Think of a habitat as *where* a species lives and a niche as *how* the species lives within its habitat.

Relationships in Ecosystems

Each organism in an ecosystem interacts with other organisms as it goes about its daily activities. The flamingos and other animals prey on the lagoon's plankton, invertebrate, and fish populations for food, and they in turn are food for larger carnivores. Plants compete with one another for space, water, and nutrients. Still other organisms form interspecies relationships to provide or gain shelter, get protection, or find food. These interspecies interactions often benefit only one of the organisms in the relationship, but sometimes both organisms benefit.

FIGURE 2: Flamingos live and feed in large groups.



Explain How is a niche different from a habitat?

FIGURE 3: The frog is the predator in this relationship.



Predation and Competition

Predation is the process by which one organism, the predator, captures and feeds upon another organism, the prey. The frog in Figure 3 is the predator, and the insect is its prey. However, if a snake slithered by, the frog might become its prey. Predation is not limited to carnivores—herbivores that seek out and eat parts of living plants are considered predators, too. The relationship between predator and prey is important for energy transfer in food chains.



Analyze Are humans predators in their ecosystem? Explain your answer.

Competition occurs when two organisms compete for the same limited resource, be it food, shelter, water, space, or any other biotic or abiotic factor that both organisms need to survive. Whenever two organisms need the same resource in a habitat, they must compete for it. Competition can occur between members of different species or between members of the same species, such as the blue jays that are fighting over a peanut in Figure 4.



Collaborate With a partner, think of at least two reasons why an organism might compete with another organism of the same species for a limited resource. Explain why two organisms would compete for these limited resources rather than share them.

Competition for limited resources in an ecosystem can be like a game of musical chairs—not enough chairs are available for everyone and each chair seats only one person. When the music stops, one person will be competitively blocked from the chairs by the remaining players.

FIGURE 4: Two blue jays compete for a food source.



Stability and Change

FIGURE 5: These songbirds eat insects commonly found in spruce, pine, and fir trees.



In ecology, the principle of competitive exclusion states that when two species compete for the same resources, one species will be better able to get the resources in the niche. The unsuccessful species will be pushed into another niche or become extinct. The result is that both species end up in distinctive niches so they do not compete for the same limited resource.



Analyze Use the diagram in Figure 5 to answer the following questions.

1. What does this diagram show, and how does it relate to the competitive exclusion principle?
2. Suppose the tip of the spruce tree was broken off during a wind storm. How might the birds be affected by the loss of the uppermost niche in the tree?

Symbiosis

Symbiosis is a close ecological relationship between two or more organisms of different species that live in direct contact with one another. There are three major types of symbiosis: mutualism, commensalism, and parasitism.

FIGURE 6: Symbiotic relationships



Mutualism

Mutualism occurs when both species benefit from the relationship. Pollination, in which an insect pollinates a plant, is a common example of mutualism. Other examples of mutualism include species providing food or shelter, aiding in reproduction, or providing protection for one another. A shrimp cleaning the mouth of a fish, shown at left, is an example of mutualism.



Commensalism

Commensalism is a relationship between two organisms in which one organism receives an ecological benefit from the other, while the other neither benefits nor is harmed. A commensal relationship between two species might involve one organism providing transportation or a home for the other without harm or benefit to itself. As shown at left, an egret eating the insects stirred up by a cow as it moves and feeds on grass is an example of commensalism. The cow neither benefits nor is harmed by the actions of the egret.



Parasitism

Parasitism is a relationship in which one of the organisms benefits while the other one is harmed. Unlike a predator, which kills and eats its prey, a parasite benefits by keeping its host alive for days or even years. The needs of the parasite are met by the victim of the parasite, called the host. The host's health often suffers due to blood or nutrient loss. Galls made by insects on the leaves of plants are an example of parasitism, as shown here.



Gather Evidence

What do the shrimp and the fish each gain from this ecological relationship? Why doesn't the fish eat the shrimp?



Explain How might symbiosis help the stability of an ecosystem? How might it hurt ecosystem stability?