Egret Wades into water to grab small fish.

Flamingo Feeds on tiny organisms on the muddy bottom.

Oystercatcher Uses its narrow beak to pry open shellfish.

Skimmer Nabs small fish on the surface of the water.

Shorebird Competition

Figure 3 Draw a line from each bird to the location where it feeds.

Competition and Predation

In every type of ecosystem, a range of **interactions** takes place among organisms every day. Two major types of interactions among organisms are competition and predation.

Competition

More than one species of organism can live in the same habitat and obtain the same food. For example, in a desert ecosystem, a flycatcher and an elf owl both live on the saguaro cactus and eat insects. However, these two species do not occupy exactly the same niche. The flycatcher is active during the day, while the owl is active mostly at night.

When two species share a niche, one of their populations might be affected. The reason for this is **competition**. The struggle between organisms to survive as they use the same limited resources is called competition. For example, different species of birds in a park compete for the same bugs and worms to eat. If one population of birds is more successful, it will increase while the other population decreases.

In any ecosystem, there are limited amounts of food, water, and shelter. Organisms that share the same habitat often have adaptations that enable them to reduce competition. Observe the shorebirds in **Figure 3** and discover how their niches vary in the shoreline habitat.

Academic Vocabulary

How have you heard the term *interactions* used in another subject and what does the word mean in that context?

HANDS-ON LAB

Investigate Model competition between organisms.

Predation A tiger shark bursts through the water and grabs a sea snake swimming on the surface. An interaction in which one organism kills another for food or nutrients is called **predation**. In this interaction, one organism is the predator and the other is the prey. The tiger shark, for example, is the predator and the sea snake is the prey. These interactions happen throughout nature. Predator and prey interactions may reduce the number of organisms or eliminate the populations.

Adaptations All species have ways of supporting their survival in their environment. Some predators have adaptations, such as sharp teeth and claws, well-developed senses, and the ability to run fast, which help them to catch and kill their prey. Prey organisms may have protective coverings, warning coloration, or the ability to camouflage themselves to help them avoid being killed. Study the predator-prey interaction in **Figure 4.**

Model It

Predator and Prey Adaptations

Figure 4 In a rainforest ecosystem, a gecko finds out that the flexible snake can hold onto tree bark with its muscles and scales as it hunts.

Develop Models Consider a grassland ecosystem of tall, tan savanna grasses. Draw either a predator or a prey organism that might live there. Label the adaptations that will allow your organism to be successful.

Population Size Predation affects population size. Changes in population size occur when new members arrive or when members leave. Population size increases if more members enter than leave, and declines if more members leave than arrive. Too many predators in a area can decrease the prey population, leading to less food availability and possible predator population decline. In general, predator and prey populations rise and fall together in predictable patterns.

READING CHECK **Summarize** What effect do competition and predation have on population size?

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Math Toolbox

Predator-Prey Interactions

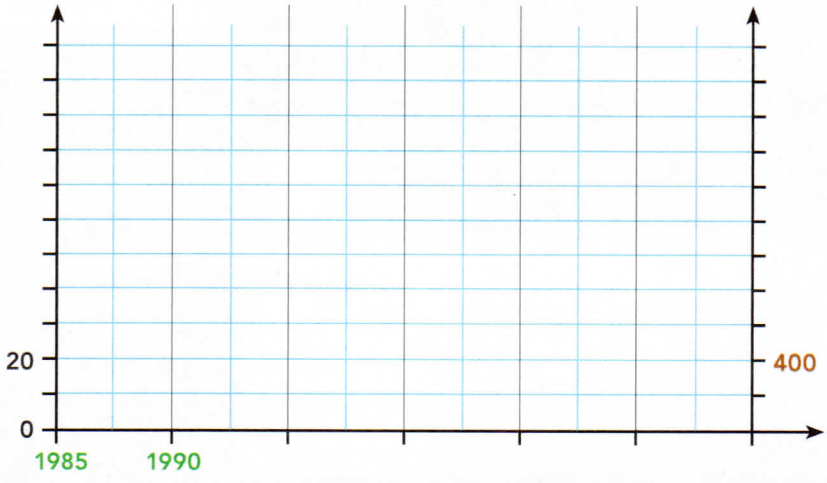
Moose and Wolf

Populations on Isle Royale

On Isle Royale, an island in Lake Superior, the populations of wolves (the predator) and moose (the prey) rise and fall in cycles.

Year	Wolves	Moose
1985	22	976
1990	15	1,315
1995	16	2,117
2000	29	2,007
2005	30	540
2010	19	510
2015	2	1,300

1. **Construct Graphs** Create a double line graph of the data above. Fill in the x-axis and both y-axes. Use a different color line for each animal and provide a key.



2. **Analyze and Interpret Data** Describe the relationship shown by your graph and suggest factors that impact it.

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INTERACTIVITY

Classify symbiotic relationships.

VIDEO

Explore the three types of symbiotic relationships.

Literacy Connection

Determine Central Ideas As you read, determine the central idea of the text. Note how this idea is developed through examples. Underline examples that you think most clearly explain the central idea.

Symbiotic Relationships

Symbiosis is a third type of interaction among organisms. **Symbiosis** (sim bee OH sis) is any relationship in which two species live closely together. There are three types of symbiotic relationships: commensalism, mutualism, and parasitism.

Commensalism Birds build nests in trees to make a place to live. The tree is unharmed. This relationship is an example of **commensalism**. Commensalism (kuh MEN suh liz um) is a relationship in which one species benefits and the other species is neither helped nor harmed.

Mutualism In some interactions, two species may depend on one another. In Africa, oxpecker birds and zebras display this relationship. The oxpecker bird rides on the zebra's back, eating bugs that crawl on the animal. The bird gets a meal and the zebra has harmful pests removed. This relationship is an example of **mutualism** (MYOO choo uh liz um), which is a relationship in which both species benefit.

Commensalism is not very common in nature because two species are usually either helped or harmed a little by any interaction. Scientists may disagree on whether a particular relationship truly demonstrates commensalism.

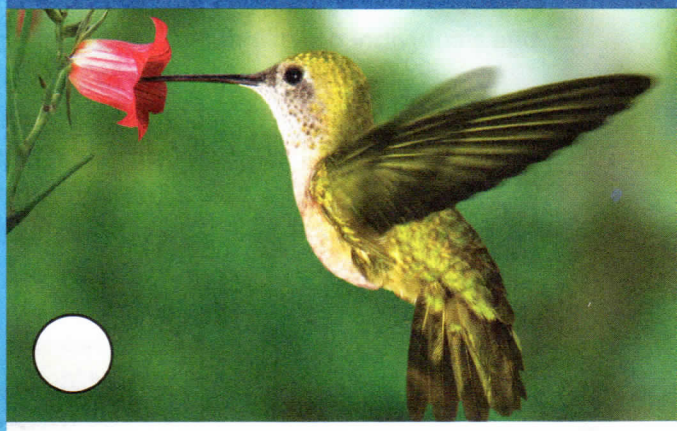
For example, clownfish live among the poisonous and stinging tentacles of sea anemones to avoid being eaten by larger fish. Some scientists think that the relationship between clownfish and sea anemones is commensalism, while others think the sea anemones also benefit from this relationship, making it an example of mutualism. Identifying examples of commensalism can be difficult. See examples of some of these relationships in **Figure 5**.

Mutualism and Commensalism

Figure 5 Some relationships more clearly show benefits to one or both species than others.

1. **Synthesize Information** Read each image caption. Label each photo "M" for mutualism or "C" for commensalism in the circle provided.
2. **Use Evidence** Beneath each image, use evidence to justify how you classified the relationship.

Hummingbirds feed on nectar deep within a flower. While sipping, the flower's pollen rubs off on the hummingbird. The bird can carry it to another flower.



Evidence

The banded mongoose feeds on ticks and other tiny animals that nestle in the warthog's fur and feed off of the warthog.

Evidence

Barnacles feed by filtering tiny organisms from the water. They grow on objects below the surface, such as piers and rocks, and attach themselves to whales.

Evidence

Remora attach themselves to the underside of a manta ray with a suction-cup-like structure. Mantas are messy eaters and remora feed on the food scraps.

Evidence

INTERACTIVITY

Interpret models of relationships in different ecosystems.

Parasitism

If you've ever seen a dog continually scratching itself, then it may have fleas. This interaction is an example of **parasitism** (PAHR uh sit iz um). Parasitism is a relationship that involves one organism living with, on, or inside another organism and harming it.

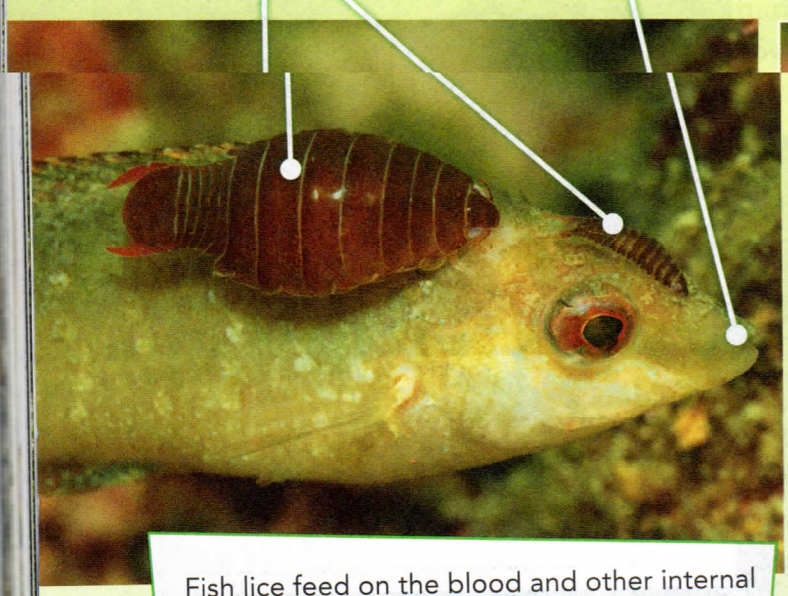
The organism that benefits is called a parasite. The host is the organism that the parasite lives in or on. The parasite is generally smaller than its host. The fleas, for example, are parasites that harm the dog by biting it to feed on its blood for nourishment. Pets can suffer from severe health problems as a result of these bites. Study the examples of parasitism in **Figure 6**.

Parasitic Relationships

Figure 6 Unlike a predator, a parasite does not usually kill the organism it feeds on. If the host dies, the parasite could lose its source of food or shelter.

READING CHECK **Integrate with Visuals** In each picture, label the host and the parasite shown.

Construct Explanations How does parasitism differ from other symbiotic relationships?



Fish lice feed on the blood and other internal fluids of the fish. Eventually the fish may quit eating and lose color from the stress caused by the lice.

A braconid wasp lays its eggs under the skin of the tomato hornworm. After the larvae emerge, they form cocoons on the hornworm. As the larvae develop inside the cocoons, they feed on the insides of the hornworm.