1.6 The Interactions of Living Things in Ecosystems

You have learned that the number of plants or animals in a population can be limited by factors in the non-living environment, such as sunlight and water. You have also learned that plants and animals interact with other living things. These interactions can place limits on population growth as well.

Competition

When you run a race or play a baseball game, you are competing. You are hoping to be more successful than your competitors. Other animals and plants also compete, often for life or death. Competition in ecosystems occurs when an organism tries to get what it needs to survive, but other organisms need and try to get the same things (**Figure 1**). For example, plants that grow close together all try to get water, sunlight, and nutrients from the same small area. They may all be small and thin, until some die and make more water, sunlight, and nutrients available for the remaining plants (**Figure 2**).

Figure 1
Which animals are competing for the salmon in this carving by Fred Davis (Haida)?

Figure 2
Which plants are winning this competition?

A competition can leave you feeling tired and weak. Plants and animals are also weakened by competition. It is easier for a disease to affect a weakened organism.

The competition for the resources in an ecosystem limits the sizes of populations. For example, grizzly bears compete with other grizzly bears for food and places to live. Each grizzly bear requires a very large area for gathering food. Even the huge Khutzeymateen Valley can only support about 50 grizzly bears.

Predator–Prey Interactions

An animal that hunts another living thing for food is called a **predator.** The organism that is being hunted is called the **prey.** A lynx (the predator) eating a snowshoe hare (the prey) is an example of a predator–prey relationship (**Figure 3**).

Figure 3
A lynx (the predator) is chasing a snowshoe hare (its prey).

A population of predators cannot increase unless there is enough prey. At the same time, the predators tend to keep the population of prey from increasing. As a result, there is usually a balance between predators and prey in an ecosystem. This balance is more like a teeter-totter than a level beam, with more prey or more predators at different times.

Case Study: The Search for an Explanation

The population of snowshoe hares in the Yukon Territory and other parts of northern Canada rises and falls in a cycle that is about 10 years long. Some Aboriginal peoples have known about this cycle for thousands of years. The hare were a major food source for the Aboriginal peoples. When the population of hares was at its lowest, they often went hungry.

Fur traders for the Hudson Bay Company also noticed this cycle. They bought the pelts of both the hare and one of its predators, the lynx. In 1925, a scientist graphed the Hudson Bay Company data (**Figure 4**). The graph showed that the lynx population also cycles in a pattern. The lynx pattern follows the hare pattern by about a year.

LEARNING TIP

Look at each axis of the graph and the legend. What do they tell you about what the graph shows? Check your understanding by explaining the graph to someone else.

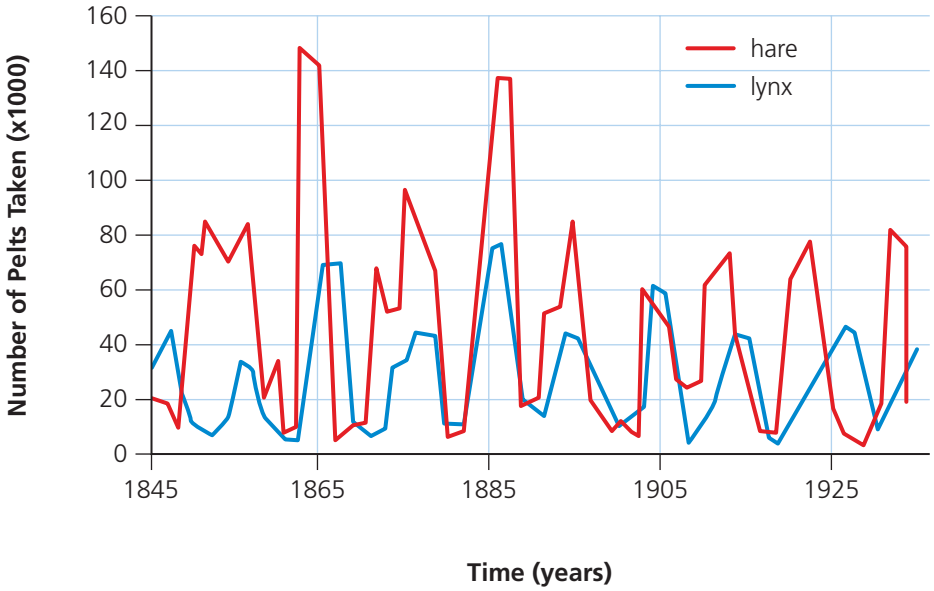

Figure 4

The size of the hare (prey) population is the main factor that controls the size of the lynx (predator) population.

At first, scientists thought that they had found a simple cause-and-effect relationship. If there were many snowshoe hares, then the lynx population would increase. When there were more lynx killing and eating hares, the hare population would decrease. As the hare population decreased, there was less food for the lynx and their population would also decrease. With fewer lynx killing hares, the hare population would increase again, and so on.

Scientists still think that the size of the hare population is the main factor that controls the lynx population. Although lynx eat other animals, such as grouse, they depend mainly on hares for food.

Scientists no longer think, however, that the lynx population is the main factor that controls the hare population. Snowshoe hare populations cycle even in areas where there are no lynx. This may be due to the fact that hares have several other predators, including wolves, owls, and humans.

Some scientists thought that perhaps the hares run out of food when their numbers are high. To find out, they fenced areas of plants to keep the hares out. To their surprise, they found little difference between the number of plants in the fenced areas and the number of plants in the unfenced areas where the hares were feeding. When scientists looked at the plants, however, they found that the plants nibbled by hares had produced substances that made them less tasty. The hares were not running out of food. The food was there, but the hares could not eat it. The scientists had discovered another cycle. As the number of hares increases, the number of plants that produce the unappetizing substances also increases. This decreases the number of hares, which, in turn, decreases the number of plants that produce the unappetizing substances.

Today, scientists are still testing hypotheses to explain the hare population cycle. They still cannot fully explain the causes of the cycle. This is because all living things in an ecosystem are interconnected.

LEARNING TIP

If you find this explanation difficult, read more slowly at the beginning until you feel you understand the content.

CHECK YOUR UNDERSTANDING

1. How can competition affect the success of a plant or animal population?
2. Why do gardeners sometimes thin out rows of vegetable plants while the plants are still small?
3. Aboriginal peoples did not blame the lynx when the hare population declined. What might these Aboriginal peoples have known that the Hudson Bay Company fur traders did not?
4. Explain why a pet cat might have more effect than a wild predator on a population of birds.