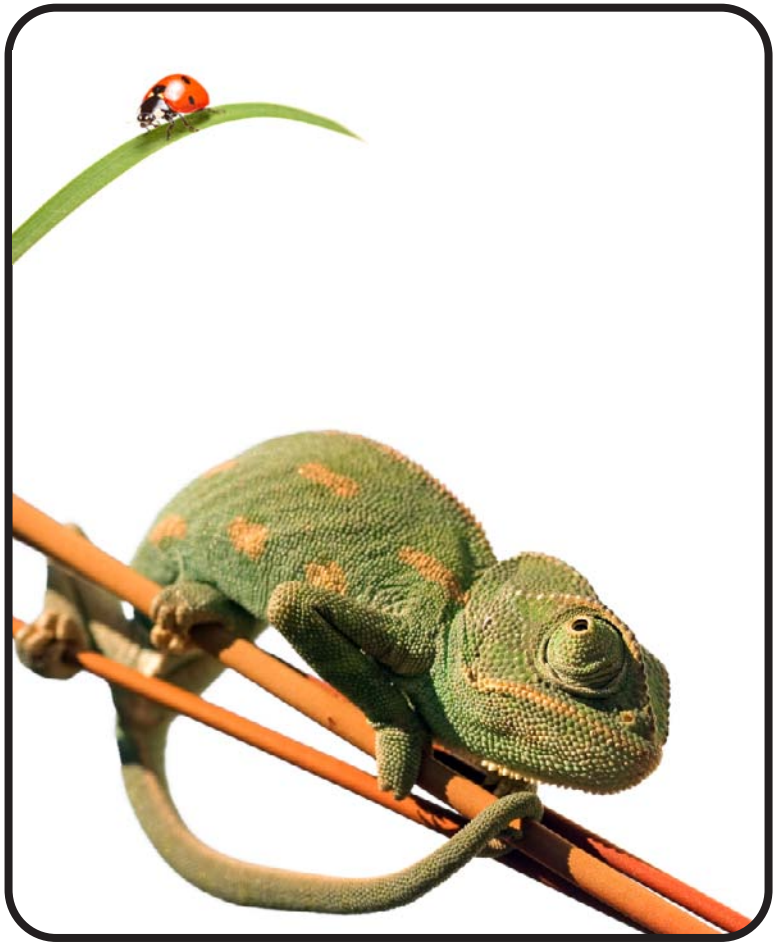
FOOD CHAINS and FOOD WEBS

A Science A–Z Life Series

Word Count: 1,938

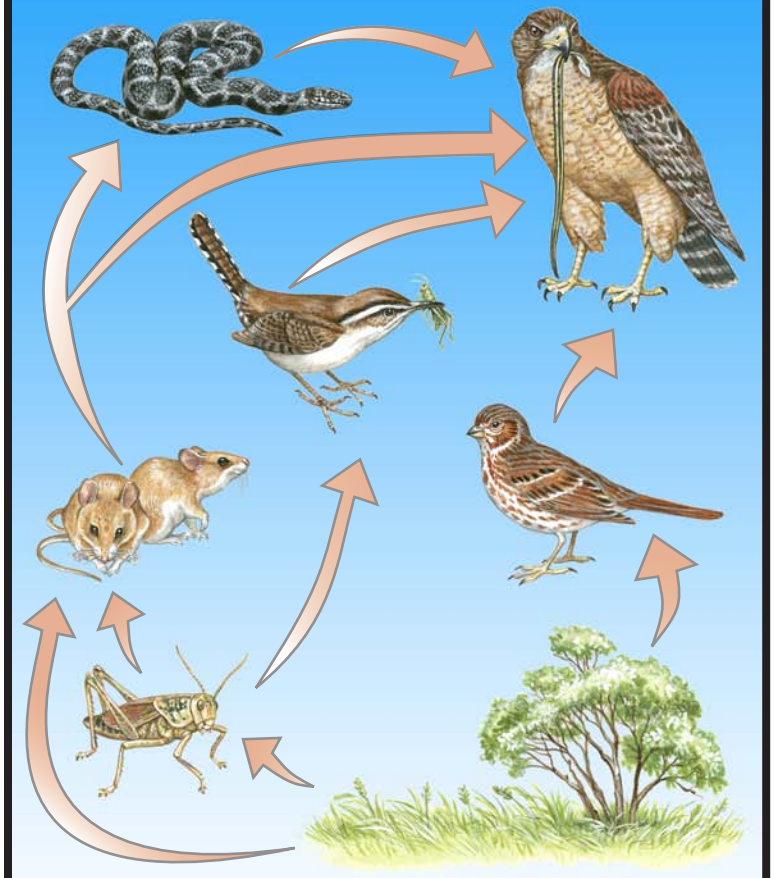


Science a-z

Visit www.sciencea-z.com

Science a-z

FOOD CHAINS and FOOD WEBS



Written by Kira Freed

www.sciencea-z.com

Food Chains and Food Webs

Written by Kira Freed

www.sciencea-z.com

KEY ELEMENTS USED IN THIS BOOK
The Big Idea: Every living thing is part of a food chain as well as a more complex food web. There are various ways to categorize organisms within an ecosystem, including producers, consumers, and decomposers; predators and prey; and herbivores, carnivores, and omnivores. Whatever happens to one species can affect many others. Entire ecosystems can even be threatened due to changes. Humans are also part of food webs all around the world. Therefore, it is in our best interest to make a positive impact by protecting ecosystems and by reducing behaviors that can disrupt natural food chains.
Key words: adaptation, carnivore, change, competition, consumer, decomposer, diet, ecosystem, energy, energy pyramid, food chain, food web, global warming, herbivore, invasive species, link, omnivore, organism, photosynthesis, population, predator, prey, primary consumer, producer, scavenger, secondary consumer, species, survival, survive, tertiary consumer, top predator **Key comprehension skills:** Interpret graphs, charts, and diagrams *Other suitable comprehension skills:* Cause and effect; compare and contrast; classify information; main idea and details; identify facts; elements of a genre **Key reading strategy:** Summarize *Other suitable reading strategies:* Ask and answer questions; connect to prior knowledge; visualize; using a table of contents and headings; using a glossary and bold terms

Photo Credits:
Back cover (top):© iStockphoto.com/Ljupco; back cover (bottom): © iStockphoto.com/Evgeniy Ayupov; title page: © Eric Isselée/Dreamstime.com; page 3: © Helen Filatova/Dreamstime.com; pages 4 (left), 22 (top): © Rob Marmion/Dreamstime.com; page 4 (center): © Leonid Nyshko/Dreamstime.com; page 4 (right): © Nastiakru/Dreamstime.com; page 6 (top): © iStockphoto.com/Studio Araminta; page 7 (top): © iStockphoto.com/Sheriar Irani; page 7 (center left): © iStockphoto.com/Karen Nicolaon; page 7 (center right): © Bernard Maurin/Dreamstime.com; page 7 (bottom left): © iStockphoto.com/Seb Fremont; pages 7 (bottom right), 11, 14 (all art except turtle), 17 (top, center bottom, bottom): © Jupiterimages Corporation; page 8 (top): © iStockphoto.com/Cathy Keifer; page 8 (bottom), page 17 (center top): © iCLIPART.com; page 10 (top left): © iStockphoto.com/Nico Smit; page 10 (top right): © iStockphoto.com/tw photos; page 10 (bottom left): © iStockphoto.com/Zanthra; page 10 (bottom right): © iStockphoto.com/Irving N. Saperstein; page 14 (turtle): © iStockphoto.com/Andrew Roche; page 18: © Martin Harvey/Getty Images; page 20 (top left): © iStockphoto.com/Julien Grondin; page 20 (top right): © iStockphoto.com/Peter Pattavina; page 20 (bottom): courtesy of Brent Esmil/USFWS; page 21 (top): courtesy of Steve Hillebrand/USFWS; page 21 (bottom): courtesy of Donald Croll, UCSC/USGS; page 22 (bottom): © Robyn Mackenzie/Dreamstime.com

Illustration Credits:
Front cover, pages 5, 6 (bottom), 9, 12, 13, 15, 19: Cende Hill/© Learning A–Z

Mushrooms decompose a tree stump.

Table of Contents

Ana eats breakfast to get the energy she will need for the school day.

Introduction

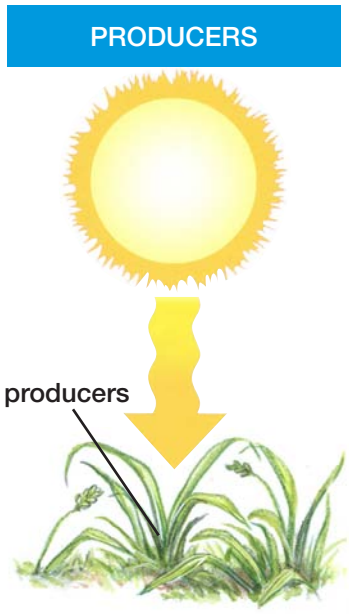
Ana sits down at the table for a breakfast of oatmeal, yogurt, and orange juice before going to school. The food she takes in will provide energy for learning, gym, and her other morning activities. Where did the energy in her food come from?

This book explores how living things get the energy they need to survive. You will learn how one living thing depends on another and that all living things depend on energy from the Sun. You will also learn what happens when a food source is taken away.

Producers and Consumers

Living things are either **producers** or **consumers**. Producers produce, or make, their own food. Green plants are the main producers. They produce food by using energy from the Sun to combine water, nutrients from the soil, and a gas in the air. This process is **photosynthesis**. Without the Sun's energy and the producers that use it for photosynthesis, most living things on Earth would not survive.

Consumers cannot make their own food. Instead, they depend on producers for food. For example, grass is a producer. When a cow eats grass, the cow is a consumer. Consumers eat, or consume, producers or other consumers. The cow that munched on the grass was growing and also making milk. When you drink a glass of milk or eat a hamburger, you are a consumer, too.

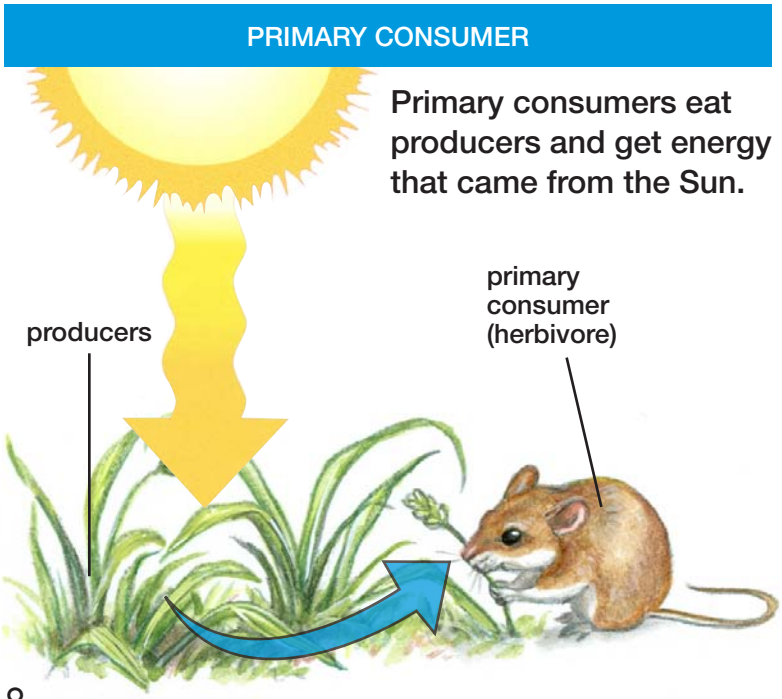


Producers and consumers depend on each other in many ways. Let's learn about their relationships.

Food Chains

Food chains show how one living thing depends on another living thing for food and how energy flows from producers to consumers. Since producers make food, they are the first link in a food chain.

A food chain has only one link for producers but many links for consumers. *Primary consumers* are living things that eat plants. They are the next link in a food chain. Grasshoppers and elephants are both primary consumers, or **herbivores**. They only eat producers (plants).



Herbivores often have special body parts that help them get and use the energy stored in certain plant parts. For example, parrots have tough beaks that can crack open the hard outer cases of tropical fruits and nuts. Elephants have special teeth to grind bark. Even with special body parts, many herbivores must spend a long time eating to obtain enough energy to stay alive.

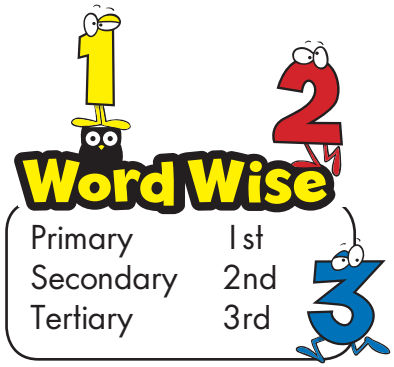
All these animals are herbivores.

To review, the first link in a food chain is the producers, or plants. The second link is primary consumers, or herbivores. The third link is *secondary consumers*—animals that eat the herbivores. These animals are **carnivores**, or meat eaters.

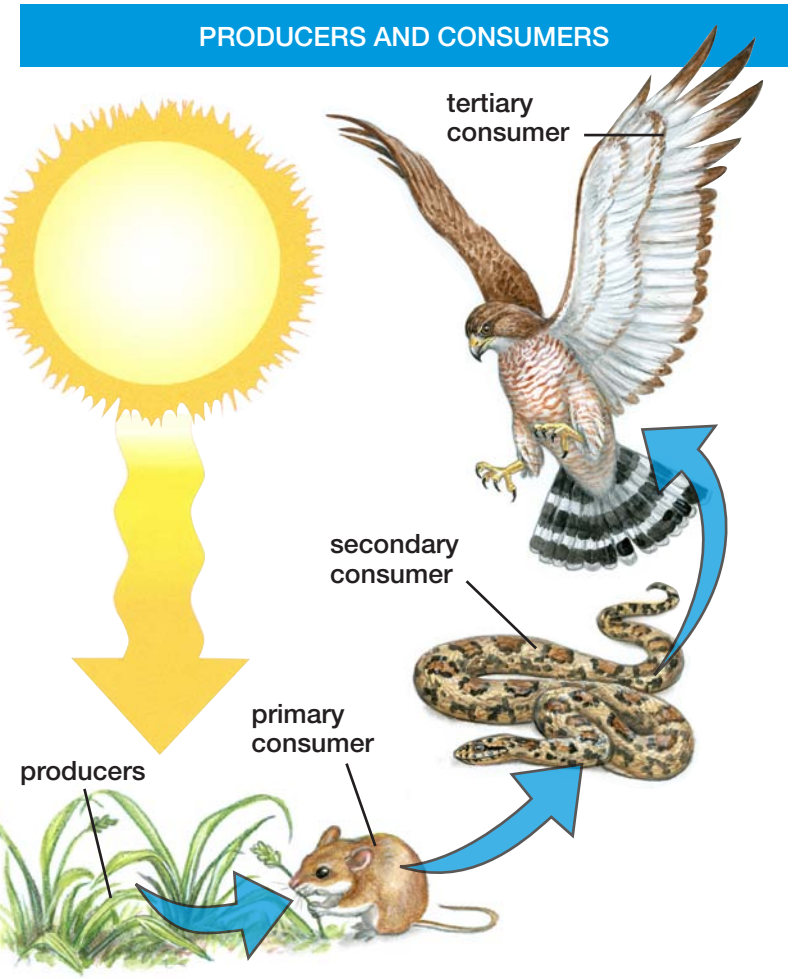
When people think of carnivores, they often think of animals such as tigers and wolves. But other animals, such as insect-eating spiders, anteaters, and some bats, are also carnivores. So are penguins, bald eagles, and other fish eaters.


A spider eats a grasshopper.

Can you guess the next link in a food chain? After primary consumers (which eat plants) and secondary consumers (which eat herbivores), many food chains have *tertiary consumers*—carnivores that eat other carnivores. For example, let's say a mouse (primary consumer/herbivore) eats grass, and a snake (secondary consumer/carnivore) eats the mouse. A hawk that eats the snake is a tertiary consumer.



Some animals are **omnivores**—consumers of both plants and animals. Omnivores can eat almost anything. Bears, raccoons, and humans are all omnivores. They may occupy many levels of a food chain. When you eat an apple, you're a primary consumer. When you eat a hamburger, you're a secondary consumer. Do you eat any carnivores? If so, you're also a tertiary consumer.



Predators and Prey

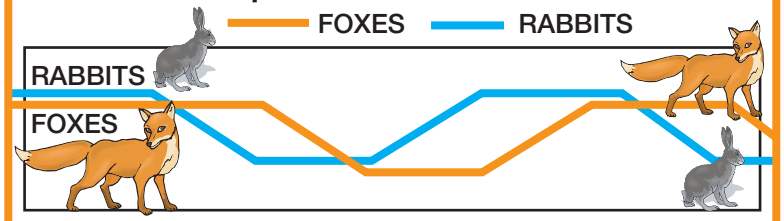
Let's learn a little more about the consumers in a food chain. Animals that hunt and eat other animals are **predators**. The animals they eat are their **prey**. Take another look at the diagram on page 9. Can you find the animal that is both predator and prey—that is both hunter and hunted?

At the top of a food chain are animals that are not food for any other animals. These animals are *top predators*. In the natural world, top predators have no enemies. Lions, orcas, alligators, and polar bears are all top predators. People are the only animals that pose a serious threat to their survival. As a result, humans are the highest top predator.

All these animals are top predators.

Producers, predators, and prey, along with air, water, and other parts of an area are all part of an **ecosystem**. An ecosystem is a collection of living and nonliving things and the ways in which they affect each other. In an ecosystem, groups of predators and prey affect each other's numbers. For example, let's look at rabbits and foxes in this diagram.

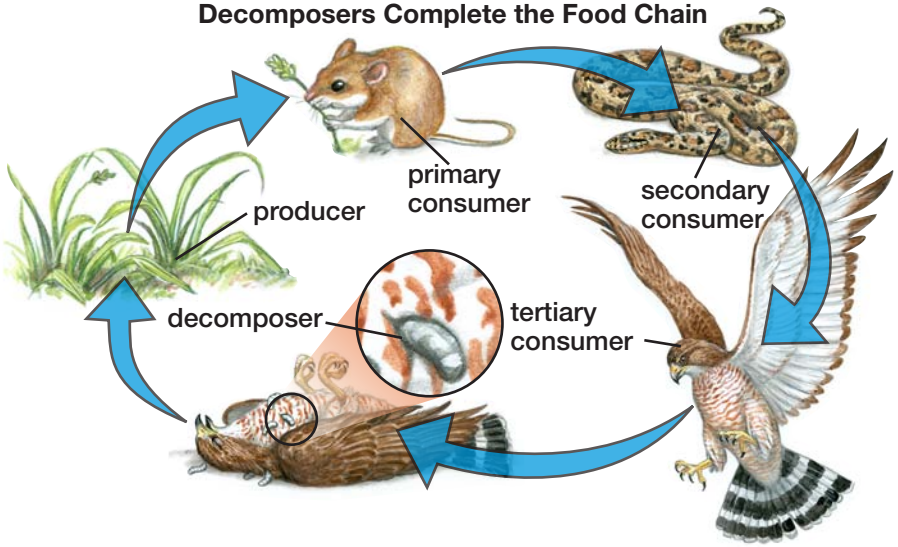
The Interdependence of Foxes and Rabbits



When foxes eat lots of rabbits, the rabbit population drops. As there are fewer rabbits to eat, the fox population drops. Then the rabbit population climbs again. Then the foxes have more food so their numbers climb again. The two species keep affecting each other's numbers.

Some carnivores in a food chain are not considered predators because they do not hunt. These carnivores, called **scavengers**, are like the cleanup crew of an ecosystem. They mainly feed on dead animals. Vultures and other scavengers make use of the energy of dead animals so it is not wasted.

Decomposers Complete the Food Chain



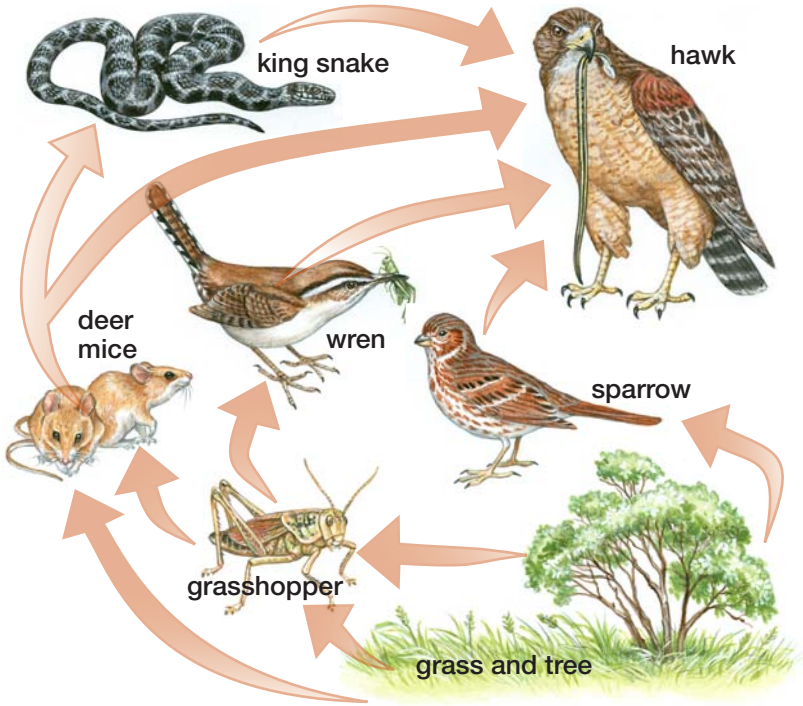
Decomposers, the last link in a food chain, are nature's recyclers. Their job is to make sure that none of the energy in an ecosystem is wasted. They break down, or decompose, any leftover living material and make the energy available for other living things. Bacteria and fungi are two types of decomposers. They break down dead plant material, such as branches and autumn leaves, and return the nutrients to the soil. Decomposers also break down the waste and dead bodies of animals.

When decomposers recycle nutrients, the energy is again available to nourish producers (plants), and the cycle begins again. Without decomposers, Earth would be covered with trash and waste. The flow of energy would be a one-way street instead of a cycle.

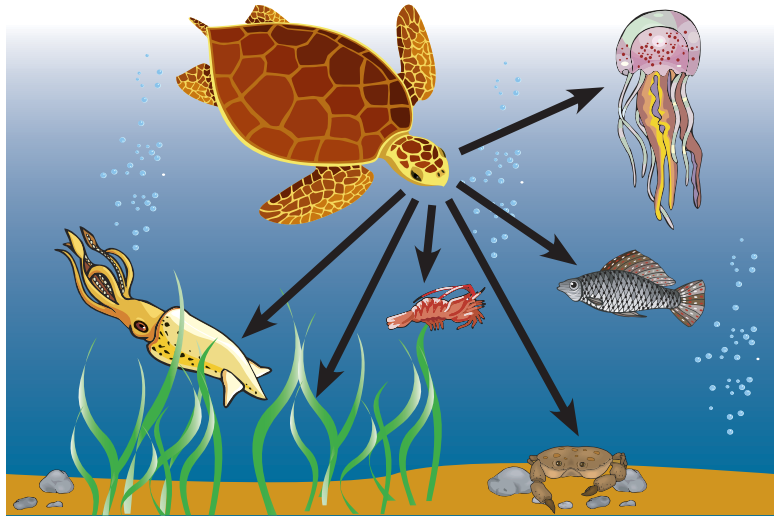
Food Webs

A food chain is a simple way to learn how energy passes through levels in an ecosystem. But in nature, the patterns of eating are rarely as simple as those shown in a food chain. Most animals eat a variety of foods to meet their food and energy needs. In turn, prey animals are usually hunted and eaten by a variety of predators. When we show all these eating patterns in a diagram, we end up with a complex web of relationships between living things, which is called a **food web**.

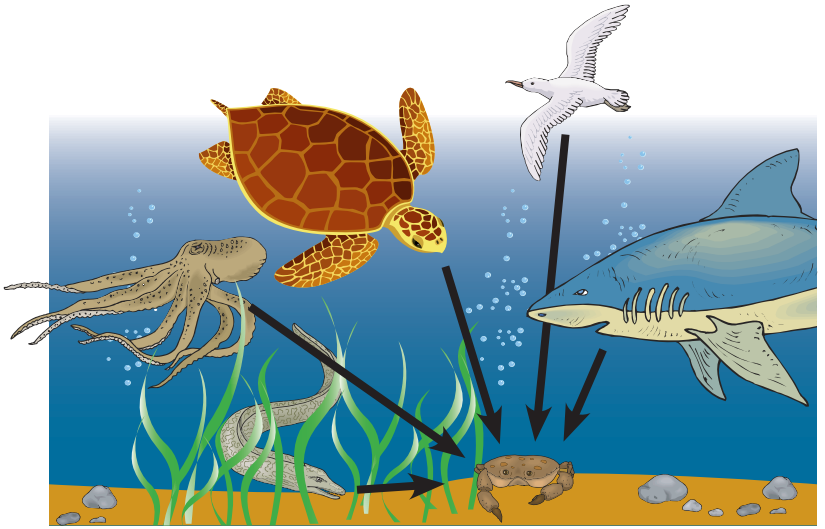
A FOREST FOOD WEB



Let's look closely at a few parts of a food web in an ocean ecosystem. The first diagram shows one predator that eats many types of prey as well as a few plants. The second diagram shows several predators that eat the same prey.



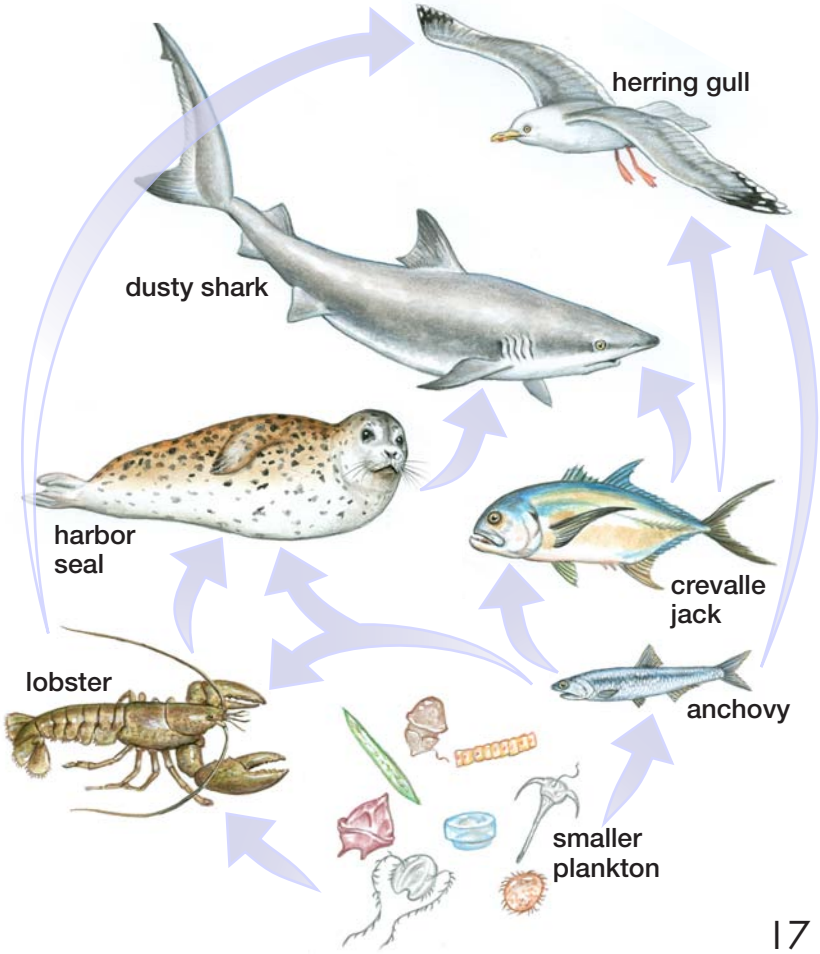
A loggerhead sea turtle eats many types of food.



Many types of animals eat crabs.

Now imagine combining the diagrams on page 14 with diagrams showing the diets of other ocean species ranging in size from tiny plants and animals to whales. The result is a food web, which is much more complex than a food chain. The diagram on this page gives you a basic idea of an ocean food web. But the page is not large enough to include all the details.

AN OCEAN FOOD WEB



Energy Pyramid

An energy pyramid shows how energy is lost as it passes from one part of a food chain or food web to the next part. Let's explore how an energy pyramid works.

When an herbivore—a primary consumer—eats plants, only a fraction of the energy from the plant is used by the animal to grow. The rest of the energy is lost as waste or is used for movement, digestion, and reproduction. Because most of the energy is used up, only some of it is passed on when the herbivore is eaten by a carnivore.

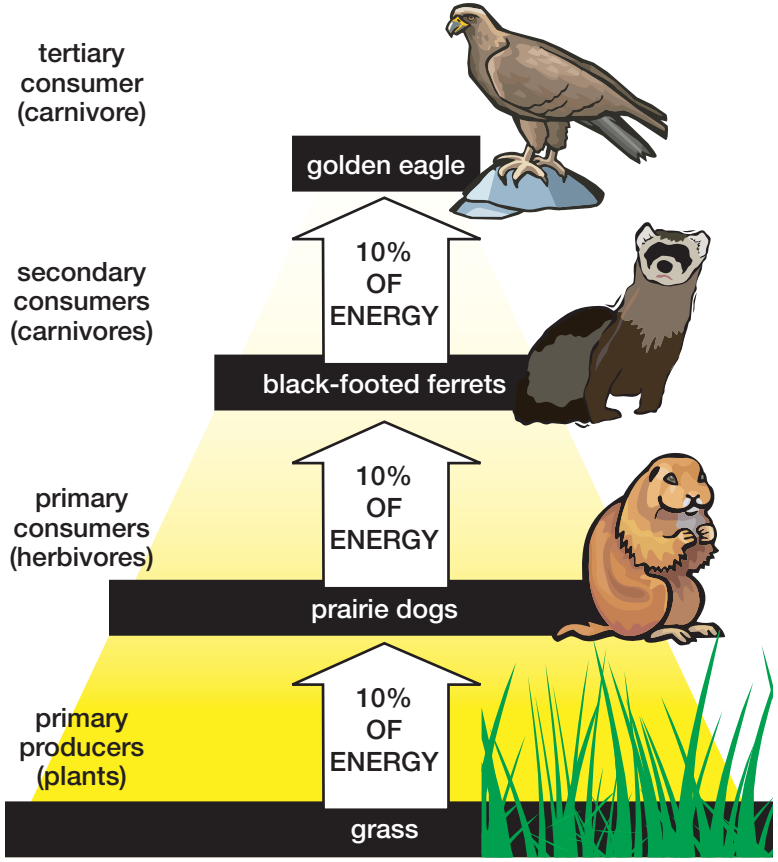
The carnivore—a secondary consumer—takes in that small amount of energy when it eats the herbivore. Most of that energy will be lost as waste or used up by the carnivore. Only a fraction of the energy from the herbivore it ate will become part of the carnivore's body.

Now imagine that another carnivore—a tertiary consumer—eats the first carnivore. Can you see how little energy is available to this animal?

Scientists estimate that about one-tenth of the energy is passed along from one link in the food chain to the next. Because such a small amount of energy is passed along at each level, an ecosystem needs many more:

- producers (plants) than consumers (animals)
- primary consumers than secondary consumers
- secondary consumers than tertiary consumers

Most food chains have only four or five links before the decomposers. A food chain cannot have too many links. Otherwise, the animal at the end of the chain would not get enough food—or energy—to stay alive. Let's follow the energy through a food chain to see what happens to it at each level.

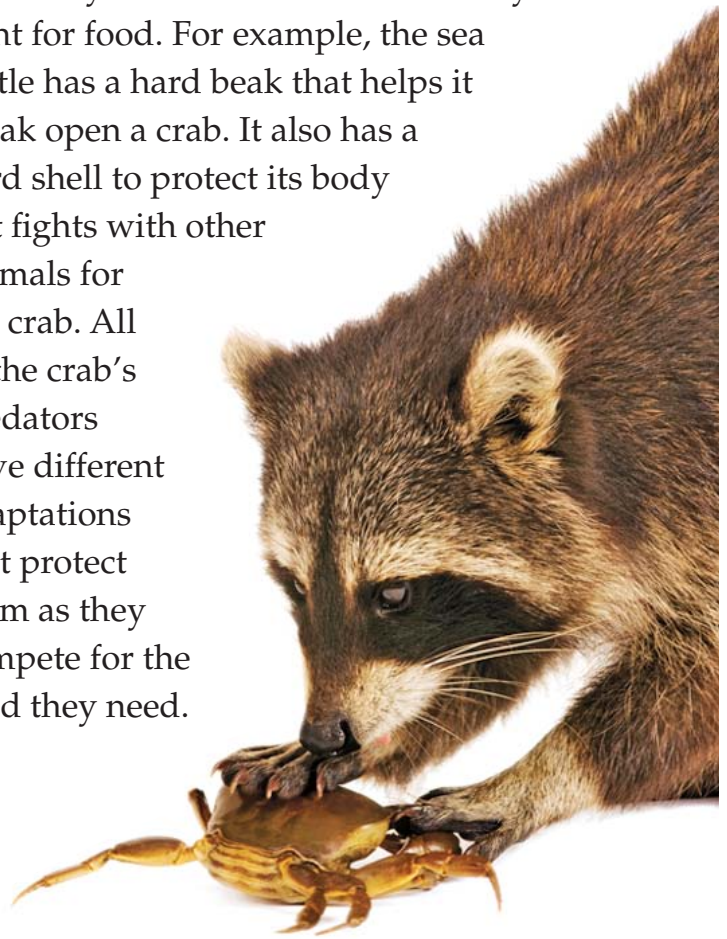


In an energy pyramid, only about ten percent of the energy passes to the next level.

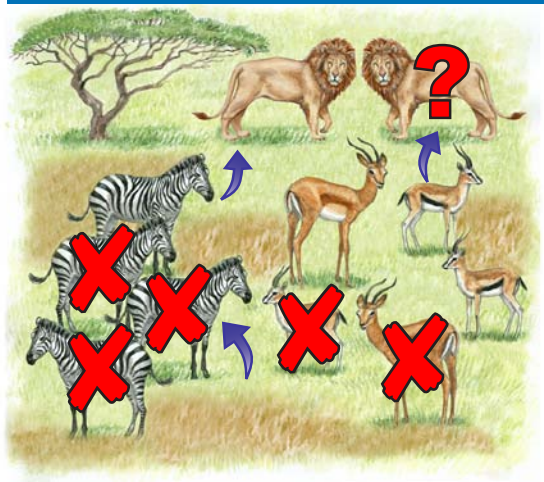
Survival

Take another look at the second diagram on page 14. All those animals are in **competition** with each other for the same crabs. How does nature help them all survive?

Each species has adaptations—special body parts or behaviors—that help its members find what they need to survive. Often they must fight for food. For example, the sea turtle has a hard beak that helps it break open a crab. It also has a hard shell to protect its body if it fights with other animals for the crab. All of the crab's predators have different adaptations that protect them as they compete for the food they need.



CHANGES IN AN ECOSYSTEM



What happens to secondary consumers?

A change at one level affects the living things at all higher levels of a food web. If the grass dies, then antelopes and zebras suffer. What happens to the lions?

Changes in an ecosystem can make it harder for a living thing to survive. Changes can also affect all the other living things in its food web. Imagine that a disease kills a type of grass (a producer) on an African savanna. Antelopes and other herbivores (primary consumers) that need the grass for energy will suffer. Some herbivores will start eating other plants. Other herbivores will move to a different area or die. What will happen to the carnivores (secondary consumers) that need those herbivores for energy?

This type of "chain reaction" can cause a group of living things—or a whole species—to become extinct. It shows the importance of protecting every link in every food chain in an ecosystem. All the links are connected, and any disturbance echoes through the whole ecosystem.

Changes to an ecosystem can have many causes. Diseases, natural disasters, and human-caused threats such as oil spills, pesticides, and other things can harm food chains and food webs. Scientists are now concerned about the impact of global warming on food webs. Even small increases in ocean temperatures are affecting the tiny **organisms** that are the foundation of ocean food webs.

All these things can change an ecosystem.

Foxes were brought to the Aleutian Islands.

Another serious threat to food webs is caused by people introducing a new producer or consumer into an ecosystem. Sometimes people introduce a new species on purpose, such as bringing cattle to raise for food. Sometimes non-native species arrive by accident, such as rats that came to North America on boats from Europe. Not all introduced species cause harm. But those that do are called *invasive species* because they invade an ecosystem.

An invasive species can do terrible damage to an ecosystem. In the 1700s, foxes were introduced to Alaska's Aleutian Islands to increase the fur trade. Native seabirds, which weren't used to predators, became easy prey for the foxes. With far fewer seabirds, the islands' lush vegetation disappeared. The vegetation could only survive with the help of the nutrients in bird droppings.

Without the bird waste, the soil on the islands could not support lush plant growth.

Conclusion

In this book, you've learned about producers, which make their own food from the Sun's energy. You've also learned about consumers, decomposers, and parasites. In an ecosystem, each of these links in the food chain has an important role in passing on energy to other living things. A change in one link can affect a whole ecosystem.

Remember Ana from page 4? She was a primary consumer when she ate oatmeal and drank orange juice. When she ate yogurt, a product of an herbivore, she became a secondary consumer. And if you're wondering if she's ever a tertiary consumer, the answer is yes. Her mom is making crab wraps for dinner.

The energy taken in by Ana, as well as by all living things, will someday be passed along to nourish other life forms. Nature makes sure that energy is never wasted.

Glossary

carnivores animals that eat only other animals (p. 8)

competition the struggle between organisms of the same or different species for limited resources, such as food, light, or territory (p. 18)

consumers organisms in a food chain that eat other organisms, especially live ones (p. 5)

decomposers organisms in a food chain that break down organic matter (p. 12)

ecosystem a biological community of organisms together with their habitat (p. 11)

food chains groups of plants and animals that all have a relationship with each other through what they eat (p. 6)

food web the interconnected feeding relationships within an ecosystem (p. 13)

herbivores animals that eat only plants (p. 6)

omnivores animals that eat both plants and animals (p. 9)

organisms living things (p. 20)

photosynthesis the process by which plants convert energy from the Sun into food (p. 5)

predators animals that hunt and eat other animals to survive (p. 10)

prey animals that are hunted and eaten by a predator (p. 10)

producers organisms in a food chain that are able to make their own food (p. 5)

scavengers animals that eat animals that are already dead (p. 11)

Index