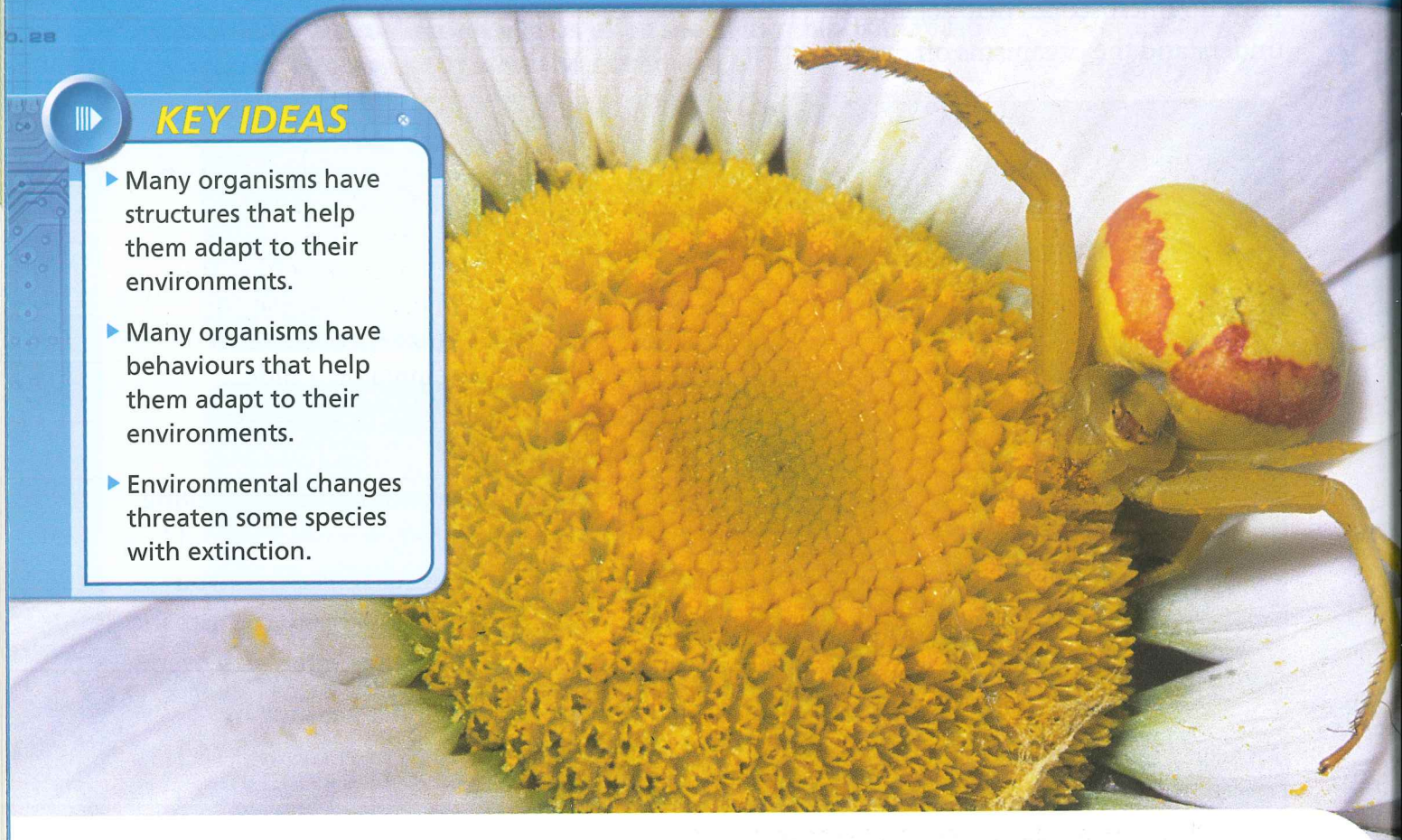
CHAPTER 4

Living things adapt to their environments.



KEY IDEAS

- Many organisms have structures that help them adapt to their environments.
- Many organisms have behaviours that help them adapt to their environments.
- Environmental changes threaten some species with extinction.

If you look closely at a yellow flower, you may discover that you are also looking at a yellow crab spider. These tiny spiders live on yellow flowers, where they are invisible both to the birds and wasps that feed on them, and to the insects they rely on for their own food.

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Characteristics for Survival

4.1

All organisms have characteristics that help them survive in their environments. These characteristics are called adaptations. Some adaptations are structures. For example, some plants have brightly coloured flowers to attract birds and insects for pollination. Cacti, which grow in dry areas, have fleshy stems to store water and short prickly leaves to reduce water loss.

Some adaptations are behaviours that help organisms survive. **Behaviours** are what organisms do, whether it is swimming, flying, or sleeping. Hibernation is an example of a behaviour that helps some organisms survive cold winter temperatures. The great variety of structures and behaviours of organisms is responsible for the diversity of life on Earth.

LEARNING TIP

Check that you understand the two types of adaptations that help organisms survive by explaining them to a classmate.

TRY THIS: LOOK AT A HUMAN ADAPTATION

Skills Focus: observing, inferring

Take a look at your thumb. It is called an opposable thumb because it can touch all the fingers on the same hand. Your thumb makes it possible for you to do many things that animals without opposable thumbs cannot do.

Have a partner time how long you take to untie one of your shoes, take it off, put it on again, and tie it again. Record your time. Now tape your thumb firmly to the rest of your hand so that you cannot use it. Try the shoe-tying task again. Record how long you take.

1. How useful is having an opposable thumb?
2. Apes, chimpanzees, and other primates (including humans) have opposable thumbs. How is this adaptation useful for helping these animals survive?

Feet for Many Purposes

Animals have feet of many sizes and shapes that are perfect

Some feet have special toes. A heron has long, spread-out toes that help it stay on top of mud (**Figure 2**). A thrush has three toes that face forward and one toe that faces backward. This shape allows the thrush to perch safely in trees, even while sleeping! A porcupine has sharp claws on its feet to help it climb.

Figure 2
A heron relies on its feet to keep it from sinking in mud.

What about feet for speed? One of the fastest creatures on Earth is the cheetah (**Figure 3**). How are a cheetah's feet built for speed?

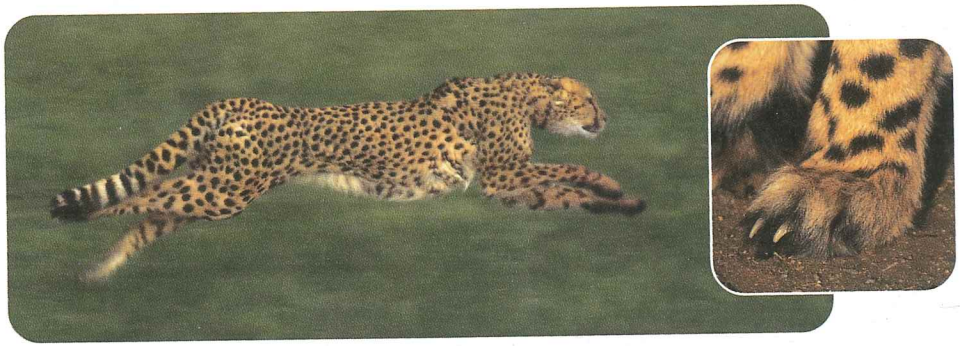

Figure 3
A cheetah can run at speeds of 110 km an hour.

Some Owl Advantages

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Eyesight

Like most birds, owls have very large eyes (**Figure 4**). Unlike other birds, which have one eye on each side of the head, an owl's eyes are at the front. Owls cannot move their eyes. They have to turn their heads to look sideways. Owls can turn their heads almost all the way around to see what is behind them. This adaptation helps to protect owls from possible predators sneaking up on them.

Owls can see well in the daylight, but their nighttime vision is amazing. Most owls are active at night. The pupil in an owl's eye can open very wide, allowing the owl to use all the available light. They can recognize and swoop down on a potential meal in almost complete darkness.

Figure 4
Owls, such as this screech owl, have very large eyes on the front of their heads.

Wings, Feet, and Beaks

Owls have wide wings, powerful feet, and a strong, hooked beak (**Figure 5**). These structures help to make owls very good hunters. Owls also have fine, fringed feathers on the underside of their wings. These feathers help to muffle the sound of the air flowing over their wings, so that owls are almost silent when flying. Consider the advantage that this adaptation gives owls when hunting! This adaptation is not present, however, in the few owl species that hunt during the day.

As an owl sneaks up on an animal, it extends its razor-sharp talons to grip its prey. If the animal is too large to swallow whole, the owl can easily rip the animal into bite-sized pieces with its powerful beak.

Figure 6
The burrowing owl blends in with its surroundings.

Colouring

Many species of owls have **colouration** that helps them blend in with their environments. This special colouring is called **camouflage.** For example, the head, wings, and back of a burrowing owl are sandy brown, and its chest is white with large brown speckles (**Figure 6**). This colouring provides excellent camouflage in the dry grassland where the owl lives.

The snowy owl has dappled white colouring—perfect for its snowy surroundings (**Figure 7**). Unfortunately, the colour advantage is lost when summer arrives. As the snow melts in the spring, however, the snowy owl moves to sit on patches of snow or ice. Scientists are unsure whether the snowy owl does this to camouflage itself or whether it is just trying to keep cool.

Figure 7
The colouration of the snowy owl provides camouflage in snow.

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Lichens [LIE-kuhns] are organisms that result from the symbiotic relationship between a fungus and a green alga (**Figure 8**). The fungus provides the alga with water, while the plant-like alga provides the fungus with food. This relationship allows both the fungus and the alga to survive in environments where they wouldn't be able to survive alone. You will learn more about other survival behaviours in Section 4.3.

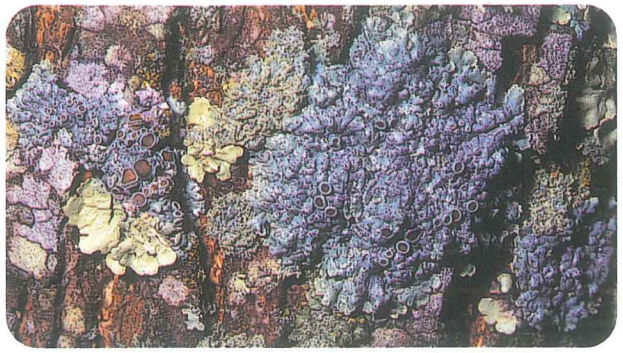

Figure 8
Lichens survive in a wide variety of environments including rocks and tree trunks.

CHECK YOUR UNDERSTANDING

1. Describe four adaptations that show why the owl is a successful organism.
2. Look at the sketches of feet shown in **Figure 9**. Describe how the structure of each foot would be an advantage in a particular environment.

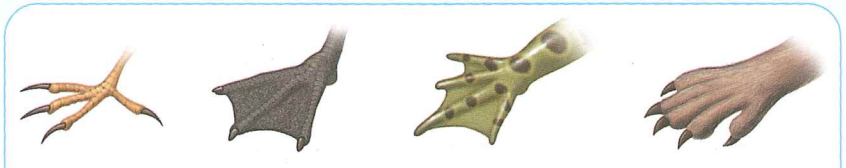

Figure 9

3. Can you spot the fish in **Figure 10**? What adaptation has increased its chances of survival?

4.3 Surviving in Extreme Conditions

LEARNING TIP

Connect new information to what you have already learned. What structures and behaviours do you think would help organisms to survive in extreme conditions?

Some organisms have adaptations that enable them to survive Earth's most extreme conditions. For example, deep in the oceans, organisms can survive with little or no sunlight. Other organisms can live in dry deserts and in regions of extreme cold. What structures and behaviours enable them to survive such harsh conditions?

Canada's Arctic is home to many animals. In the winter, food is hard to find and temperatures may drop to −45 °C. Arctic animals have structures that allow them to survive in the cold. For example, the seal and the walrus have waterproof fur, the arctic grouse has fringed toes that act like a snowshoe, and the arctic fox has a thick white fur coat.

The polar bear has several structures that help it survive the Arctic cold. The polar bear has small, compact ears and a small tail, as well as thick fur. These adaptations help to keep it warm. The polar bear's white fur also helps camouflage the bear in the snow (**Figure 1**). This helps the polar bear sneak up on and hunt seals, as well as escape human hunters. The polar bear also has behaviours that help it survive in the winter. In the spring and summer, it eats as much as it can so that it has a thick layer of blubber when the winter comes. This blubber acts like insulation to protect the bear from the cold. (You will look at how insulation works in Unit C.)

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TRY THIS: OBSERVE ADAPTATIONS

Skills Focus: observing, inferring

Look carefully at **Figures 2** and **3**. How have these animals adapted to winter?

Figure 2
A lynx

Figure 3
A snowshoe hare

Migration

Some animals have a behaviour that helps them survive the harsh winter. They move, or migrate, to a warmer place. This **migration** may not be a great distance. For example, the elk moves from the mountains to spend the winter in the lowlands. Other animals migrate great distances. For example, the humpback whale migrates from the Arctic region in the summer to the tropics in the winter. Other animals that take incredible migration journeys include the arctic tern and the Canada goose.

Long-Distance Travellers

The winner of the migration marathon is the arctic tern (**Figure 4**).

The Canada goose is another long-distance traveller. It flies all the way to the southern United States and Mexico for the winter. Geese fly in a V-formation when migrating. Why do you think they fly in this formation? Think about the way you might shape your body if you wanted to travel fast. You would try to be streamlined. The lead goose hits the air with the greatest force. It breaks up the wind so that the wind flows with less resistance over the rest of the flock. Since the lead position is very tiring, the geese take turns being in the lead!

Hibernation

Other animals cope with winter by becoming inactive. This behaviour is called **hibernation.** Animals hibernate in burrows in the ground, in tree trunks, and in snow dens. Hibernating animals include chipmunks (Figure 5), some bats, and ground squirrels. When an animal hibernates, its body temperature drops and its heartbeat and breathing slow down. This allows the hibernating animal to use less energy so that it can live off the fat reserves it stored during the spring and summer. Some hibernating animals, such as chipmunks, also store food, such as nuts and seeds, to eat during the winter months.

Figure 5
The chipmunk spends the entire winter in its underground burrow. It wakes up now and then to eat part of the food it stored over summer.

Do you think of bears when you think of hibernation? In fact, bears are not true hibernators. Their body temperature does drop a few degrees, but they are easily awakened.