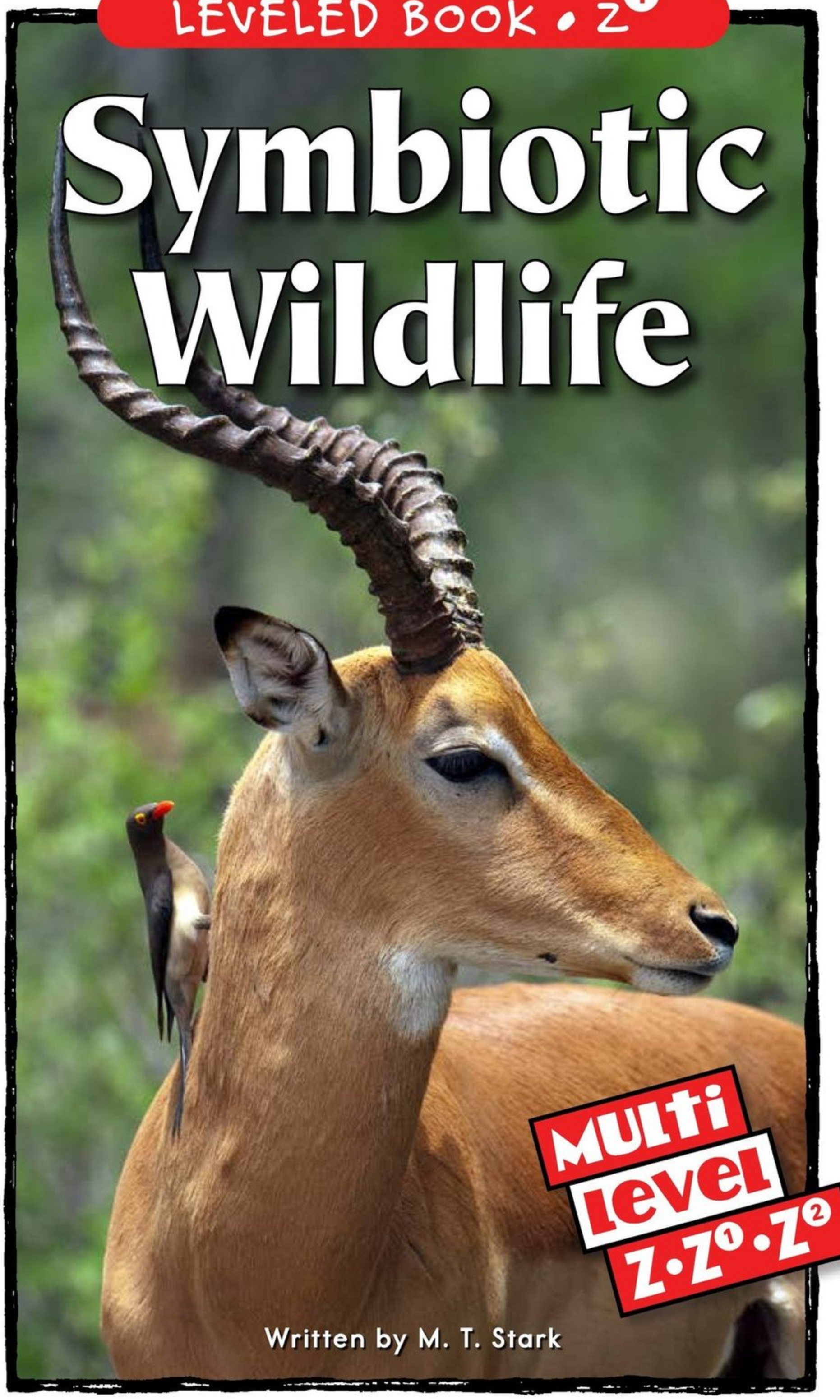
LEVELED BOOK • Z[1]

Symbiotic Wildlife



Multi level Z[1]•Z[2]

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Focus Question

How do symbiotic relationships work, and why are they important?

Words to Know

assumes	mucus	species
fertilized	nocturnal	sustainability
interdependent	parasites	symbiotic
intimidating	refuge	venomous

Front cover: A yellow-billed oxpecker positions itself on the neck of an impala before cleaning its ears.

Title page: A greater short-nosed fruit bat feeds on a banana plant. The banana is a bat-dependent plant. Pollen is carried on the bat's fur to other banana plants, allowing them to reproduce.

Page 3: A school of yellow tang fish clean the algae from a green sea turtle.

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Symbiotic Wildlife
Level Z1 Leveled Book

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Correlation

LEVEL Z1	
Fountas & Pinnell	W–X
Reading Recovery	N/A
DRA	60

Table of Contents

A crocodile opens wide for a small Egyptian plover bird.
The plover cleans bits of leftover food from the croc's teeth.

Introduction

Living in the wild is challenging. Food can be scarce, good homes are hard to find, and pests are—well, pests. Plus, there's almost always something out to eat you.

Those reasons are why many **species** in the wild form unusual relationships in which they work together at separate tasks that benefit each other. For example, one may offer safety from predators in exchange for a good cleaning or a steady supply of food. Such partnerships are called **symbiotic** relationships.

The word *symbiosis* comes from the ancient Greek words for "with" and "living." Scientists first applied the word to wild species in 1877 while writing about lichens—complex (and sometimes colorful) organisms typically made up of a fungus and a type of algae that work and live closely together.

Since then, scientists have identified symbiotic relationships that exist all around us—in deep oceans and dry deserts as well as in mountains and forests. Researchers have discovered unexpected partnerships, such as between a **venomous** sea anemone (uh-NEM-uh-nee) and a colorful clownfish, or a towering tree and a ground-dwelling rodent.

In the wild, these unusual partnerships are not only fascinating but can also mean the difference between life and death for the species involved. Bees, for instance, would have a hard time surviving without the nectar of flowers and, similarly, those same flowers would have a tough time reproducing without the help of bees that distribute their pollen.

Pals and Partners

You may have your own symbiotic relationship at home. Your pet dog, for instance, provides you with love, companionship, and protection. In return, your dog gets food, attention, and a safe place to live. You both benefit.

A group of starlings stick close to a red deer for the chance to pick insects off its body.

Symbiotic relationships aren't always equal, but those that have endured over thousands or even millions of years tend to last for one reason: both species benefit enough to make the relationship worthwhile. Some scientists believe that these symbiotic relationships—with different species **interdependent** on one another—are a big reason we have so many diverse plants and so much diverse wildlife on Earth.

Let's look at some examples of the many types of symbiotic relationships to see how different kinds of living things work together in the natural world.

Word Wise

The partners in a symbiotic relationship are called *symbionts*.

Finding Food and Giving Protection

Sometimes it's nice to know someone's got your back.

Clownfish, such as the colorful ones that live in the Indian Ocean, need all the help they can get to stay safe from predators. One way they do this is by seeking **refuge** in the tentacles of venomous sea anemones.

Although anemones look like plants, they're actually marine animals that attach themselves to rocks or other surfaces and then wait for prey to come to them. When small fish or shrimp brush against an anemone's soft tentacles, they are exposed to a toxin. The toxin paralyzes them long enough for the anemone to pull them to its mouth and eat them.

Anemones have a different relationship with clownfish, though. Clownfish have figured out a way to build up immunity to the anemone's venom. They do this by touching the anemone's tentacles once or twice, taking a break, and then doing it again and again. This repetition gradually provides the clownfish with a protective layer of **mucus** on its skin.

Sea anemone

A cautious striped clownfish hides from predators among the protective tentacles of a venomous sea anemone.

The mucus shields the clownfish from any harmful contact with the anemone and allows the fish to swim among the anemone's tentacles without getting hurt. So, when a predator arrives to have a clownfish for lunch, the clownfish can dive into the safe arms of the anemone.

When the predatory fish gets too close to the anemone, the anemone's stinging cluster of tentacles kill it and provide a meal for both members of this partnership.

In Africa, ostriches and zebras often feed together and use their combined sensory strengths to help keep each other safe from predators. Ostriches have good eyesight, and zebras have excellent hearing. Together, the two species have a much better chance of detecting a stalking lion or other predator on the prowl than they do alone, which helps them get a head start on escaping to safety.

Africa's impalas and baboons have a similar relationship. Impalas have superb hearing, sight, and sense of smell. If they detect danger first, their alert body language and horn shaking warn the baboons to beware. The baboons then sound the alarm, using their loud screams and **intimidating** teeth to scare predators away.

Groups of ostriches and zebras often feed together and warn each other if they detect approaching predators.

Helping with Personal Hygiene

Some animals need a friend's help to clean those hard-to-reach places. On many ocean reefs, a silvery little fish called a *cleaner wrasse* provides just such a service. The tiny wrasse sets up a "cleaning station," and large fish, such as angelfish or butterflyfish, wait patiently for their turn.

A giant moray eel has its teeth and mouth cleaned by a bluestreak cleaner wrasse.

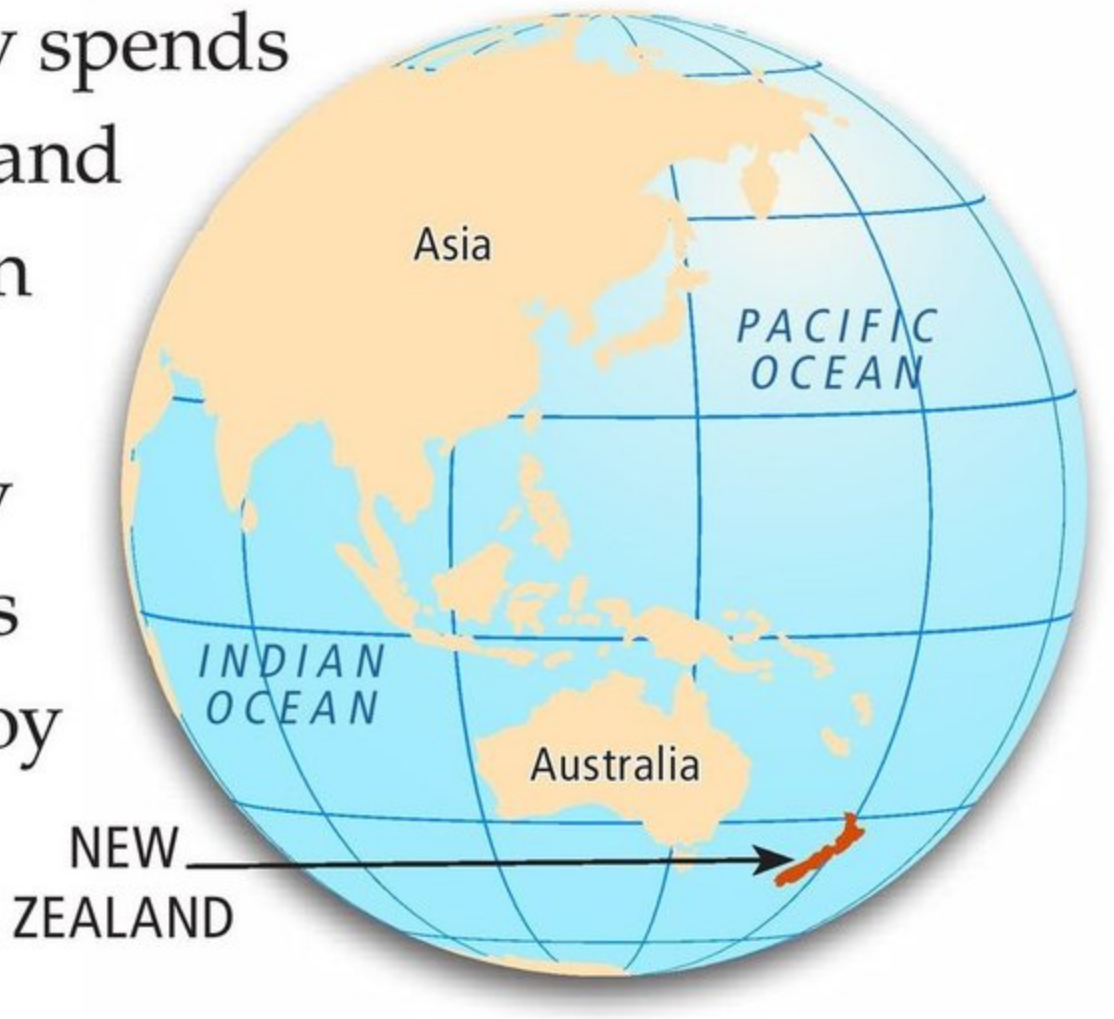
So why doesn't the larger fish just eat the wrasse? It's because the wrasse has developed a certain way of swimming—some have described it as a sort of "hypnotic dance"—that calms the larger fish and eventually leads it to open its mouth to let the wrasse inside. The wrasse then darts in and out of the larger fish's mouth and gills, clearing them of fungus, **parasites**, dead skin, and other debris. The wrasse gets a snack and leaves the larger fish clean and healthy.

Some of Darwin's ground finches provide a similar cleaning service to tortoises on the Galapagos Islands. When a tortoise is ready for cleaning, it **assumes** a particular posture, extending its neck and legs so that a neighboring group of ground finches can swoop in and peck away at parasites that the tortoise is unable to reach. The tortoise stands absolutely still as the finches do their work. The finches get fuller stomachs, and the tortoise leaves cleaner than before.

Darwin's ground finches cling to the neck and legs of a giant tortoise as they pick ticks from its body.

Sharing a Home

Sharing a home can be tricky, especially when it's with a species that's nothing like you. Two of nature's most improbable roommates live on the high shoreline cliffs of New Zealand. One of them is a slow-moving, lizardlike reptile called a *tuatara* (too-uh-TARR-uh), which usually can't be bothered to build its own nest. The other is a fast-flying bird called a *sooty shearwater.* The two species share a home, but not at the same time. The tuatara is **nocturnal**, so it usually spends the day in the burrow and goes out at night. When home, it performs housecleaning duties by eating the burrow bugs and parasites that annoy the shearwater.



While the tuatara is performing its housecleaning duties, the sooty shearwater hunts. The shearwater returns to the shared burrow at night, loosening the burrow dirt and producing droppings that attract insects that the tuatara loves to eat.

It's a perfect arrangement for this odd couple. Although they rarely see each other, they share both a home and a welcome partnership.

The tiny burrowing owl builds its nest underground in abandoned burrows. It warns neighbors of approaching predators.

Burrowing owls, the smallest owls in North America, make great neighbors. They can't actually dig holes, but they do use them as safe places to hide from predators. Because of their small size, the owls are a perfect fit for abandoned burrows that were once home to prairie dogs or gopher tortoises. When a tiny owl chooses an empty burrow, the former occupant may have relocated to the burrow next door. Each animal helps the other by sounding a warning if a predator approaches.

Forest mice and burrow beetles also have a home-sharing arrangement that benefits both species. While the mouse sleeps in the burrow, the beetle roots through the mouse's fur, snacking on fleas. When the mouse is away, the beetle scours their home for other burrow bugs. The beetle eats well, and the mouse gets a pest-free home.

Some ocean animals share homes as well. Survival is the goal of all animal species, but it can be hard to survive when you can't see danger. That's the plight of snapping shrimp, which live on the ocean floor. The near-blind shrimp dig burrows into the seabed. As they move sand to build their homes, the shrimp are at risk of being eaten by hungry predators.

Fortunately, the shrimp have a clever partner that can easily spot trouble—the alert and sharp-sighted goby fish. As shrimp dig in the sand, goby fish hover nearby and act as lookouts. When danger appears, the fish flick their tails, touching the shrimps' antennae and sending a signal to the shrimp that they'd better take cover.

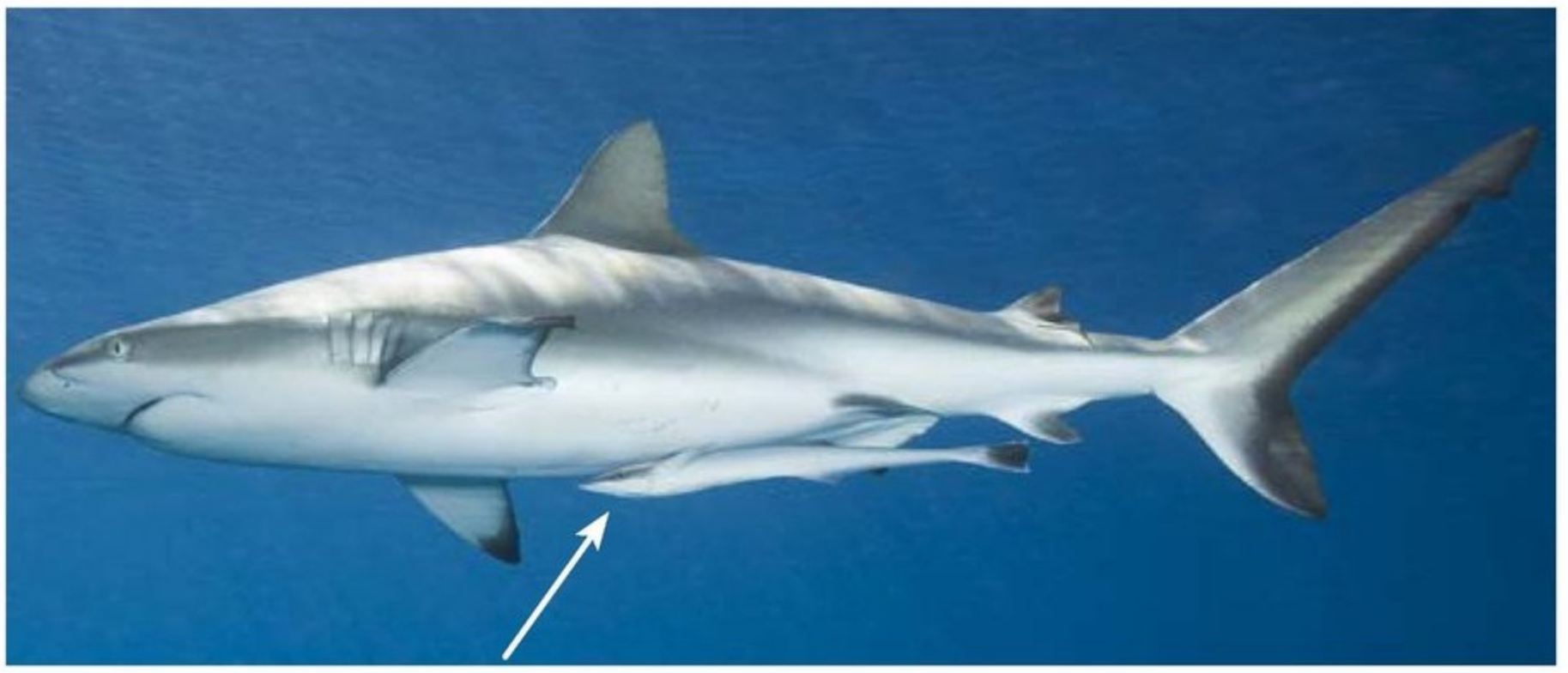
In return, the shrimp share their burrows with the goby fish. The fish have a safe place to sleep at night as well as a convenient place to hide. It's a perfect partnership for these symbiotic sea dwellers.

A goby fish and a snapping shrimp team up to build a home.

The huge grizzly bear and the small red squirrel depend on each other and nuts from the white pine tree to maintain a healthy diet.

Teaming Up to Find Food

High in America's Rocky Mountains, grizzly bears, red squirrels, and white bark pine trees are part of a cycle that helps them thrive. The pine trees provide pine nuts, a high-calorie food source for both bears and squirrels. Red squirrels eat some of the nuts and bury others to eat later. The bears' strong sense of smell helps them locate and consume the buried pine nuts. The droppings that the bears leave behind after digesting the nuts distribute some of the tree seeds, which causes new trees to sprout and grow. The new trees will eventually provide even more pine nuts for future generations of both bears and red squirrels.



A small remora fish (arrow) attaches itself to a shark's belly to travel with it and share its meals.

Hitching a Ride

Most small fish wisely keep their distance from sharks. A slender fish called a *remora,* though, does everything it can to get up close and personal with sharks. In fact, each remora has a flat, ribbed disc on the top of its head that functions as a suction cup to help the fish attach itself to the underside of a shark.

Remoras are capable of swimming on their own, and they often do, but hitching a ride on a shark or other large creature is sometimes just an easier and more efficient way to get around. Once attached, a remora goes everywhere the shark hunts and feeds, eating any scraps of food that escape the shark's powerful jaws.

The remoras provide a service, too, consuming parasitic hitchhikers and helping to keep their host animals clean.

Remoras aren't the only creatures with strange things on their heads. Some hermit crabs that live in the Mediterranean Sea wear an odd-looking hat. The hat is actually a hitchhiking sea anemone. The sea anemone's long tentacles are venomous, but the hermit crab is protected from them by its hard shell. The anemone protects the hermit crab from predators. In exchange, the anemone benefits from the crab's messy habits when it eats scraps of food that the crab doesn't eat.

Not all symbiotic hitchhikers are in the sea. In Africa, a small bird called an *oxpecker* often hitches a ride on the back of a hippopotamus instead of exerting energy searching for insects on its own. The bird picks bugs off the skin of the hippo and eats them. The oxpecker gets a meal and easy transport, and the hippo gets picked clean of pesky insects.

A group of oxpecker birds hitch a ride on the back of a hippopotamus. In return for the ride, they pick the hippo clean of bugs.

A long-nosed bat feeds on the nectar and pollen of the pollen-rich agave plant. Bats are the main pollinators of agaves and cacti within their range.

Pollinating and Fertilizing

Bats do more than just inspire spooky stories. For many plants around the world, bats are their ticket to survival. In return, those plants provide sweet nutrition for their furry, winged friends.

Bats are part of an important group of animals called *pollinators*. These animals transport pollen from the stamens, or male parts of flowers, to the pistils, or female parts, as they eat, allowing the plants to be **fertilized**, reproduce, and grow.

Often working at night, bats love to sink their heads deep into the center of a flower to drink sugary nectar and eat the protein-rich pollen. After visiting a blossom, the bats are often speckled with bits of sticky pollen. That pollen is then transferred to the next flower that the bat visits, providing a regular exchange of pollen between flowers and a steady source of nectar and delicious pollen for the hungry bats.

Like bats, honeybees are active pollinators and are essential to plant reproduction. The bees enter flowers to get to their nectar and often fly away covered with flecks of pollen, which are deposited at the next stop. Hummingbirds operate in much the same way, collecting pollen on their feathers and bills as they dart from flower to flower.

Flowers offer more than food to some pollinators. Female yucca moths, for example, are picky about where they lay their eggs. They prefer spreading their hundreds of eggs on several yucca flowers. Not only do the eggs find safe homes, but the flowers also benefit because the female yucca moth is spreading pollen as she flits from flower to flower.

A honeybee spreads pollen from one dandelion to the next as it gathers nectar.

Pods of Brazil nuts clustered high in the Brazil nut tree

Spreading Seeds

If you're a tree or another plant, you need a way to spread your seeds to new areas. Otherwise, you'll only grow in one place, which leads to crowding and competition for light and water. The odds of your species surviving aren't as good as they would be if you could disperse your seeds far and wide to spread new plants that will grow and produce seeds of their own.

Many trees and other plants rely on animal partners to help disperse their seeds. One of the most interesting pairings, found in the Amazon rainforest, is that of the Brazil nut tree and a cat-sized rodent called an *agouti*.

The Brazil nut tree is a towering tree that can grow to a height of 200 feet (61 m) or more. Its grapefruit-sized seedpods, which are hard and tough, typically don't split open when they hit the ground, even though they sometimes plummet from heights of 100 feet (30.5 m) or more.

The strong jaws of the small agouti can crack open tough pods. New Brazil nut trees will sprout from droppings left by the agouti.

What the fall cannot do, the agouti can. The agouti is equipped with strong teeth and powerful jaws that enable it to break through a seedpod's thick shell and feast on its contents. The agouti eats some of the seeds and scatters others throughout the forest by burying them far from the parent tree. The seeds eventually sprout into trees, and the long process begins all over again.

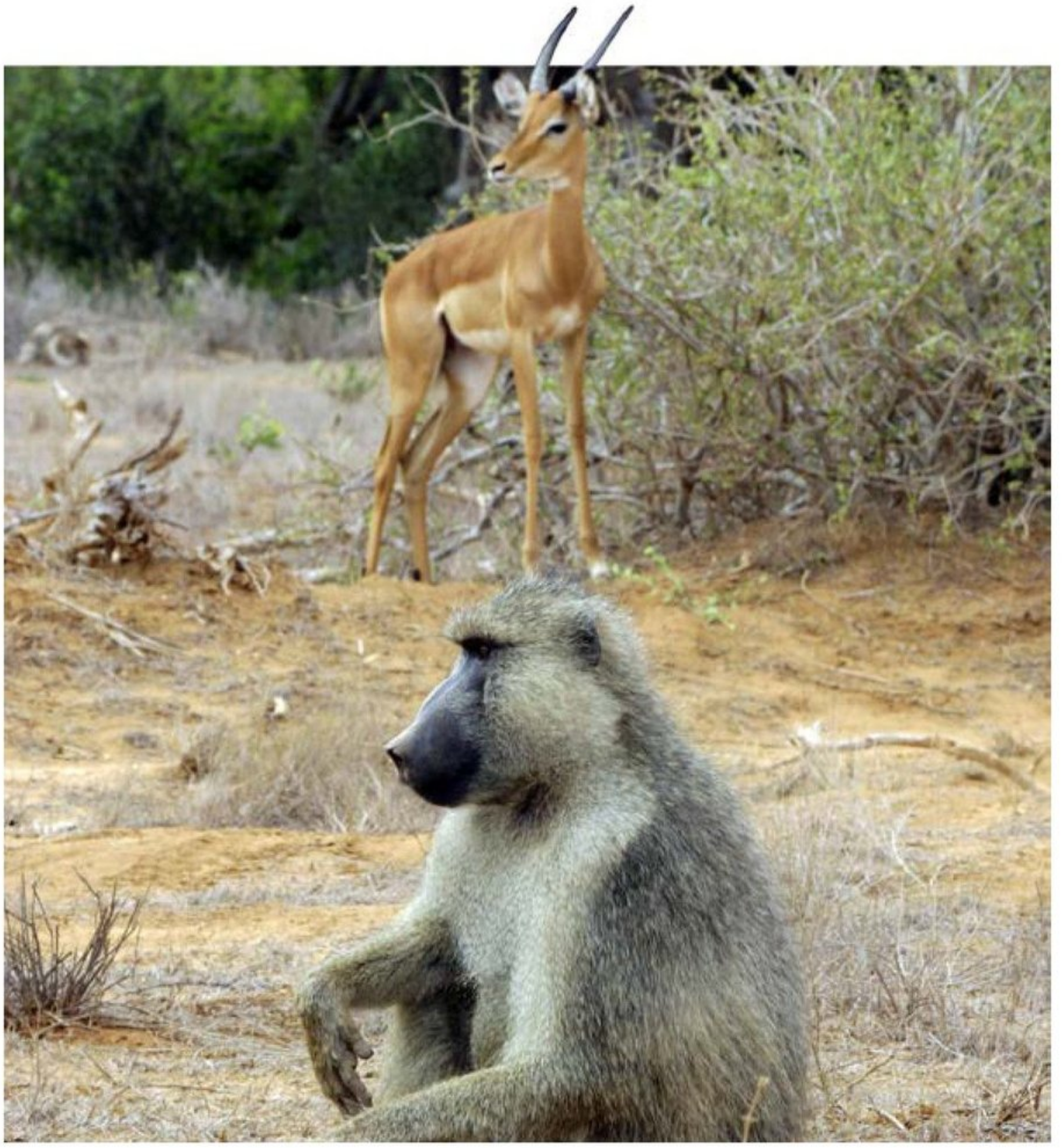
Mistletoe plants in the desert rely on a bird called a *phainopepla* (fay-no-PEHP-luh) to spread. The phainopepla snacks on mistletoe seeds, which are buried in the plant's berries, by using its beak to separate the skin from the berries and then disperses undigested seeds wherever it leaves its droppings.

Conclusion

The world would be a very different place without symbiotic relationships. In the absence of these natural partnerships, many species would be more vulnerable to predators and pests, more likely to be isolated in smaller patches of habitat, less apt to bloom and spread, or faced with fewer choices for food. Not only would the partners suffer, but so too would other inhabitants of our ecosystems.

Scientists are still learning about how these special relationships work and are discovering new ones all the time. From shallow, sunlit waters to deep, dark caverns, Earth is full of symbiotic partners that help each other survive and thrive.

Sooty shearwaters and tuataras have a special living arrangement on the shoreline cliffs of New Zealand.



Grazing impalas stir up bugs, which gives baboons an easy meal. Baboons pay them back by sounding a warning if danger approaches.

Although each symbiotic relationship is a little different and provides each species with a slightly different benefit, all have a positive impact on the world, promoting diversity and **sustainability** for all living things.

The end result is that fish, birds, humans, and many other organisms on our planet have a better chance of surviving, reproducing, and living longer, healthier lives.

Glossary

assumes *(v.)* places oneself in a particular position or role (p. 11)

fertilized *(v.)* combined male and female reproductive cells to create a new animal or plant (p. 18)

interdependent *(adj.)* dependent on each other, as in people, groups, or organisms in an ecosystem (p. 6)

intimidating *(adj.)* frightening or overwhelming (p. 9)

mucus *(n.)* a thick, slimy liquid created in a body to protect tissues and keep them wet (p. 7)

nocturnal *(adj.)* active at night rather than during the day (p. 12)

parasites *(n.)* plants or animals that grow on and feed off others (p. 10)

refuge *(n.)* a place of safety, comfort, or protection (p. 7)

species *(n.)* a group of living things that are physically similar and can reproduce (p. 4)

sustainability *(n.)* the use of natural resources in a way that prevents them from being used up or permanently damaged (p. 23)

symbiotic *(adj.)* of or relating to a beneficial relationship between different kinds of organisms (p. 4)

venomous *(adj.)* having the ability to inject venom, a poisonous fluid, by striking, biting, or stinging (p. 5)

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A Reading A–Z Level Z1 Leveled Book
Word Count: 2,469

Connections

Writing

Imagine you are a scientist studying the ocean. What symbiotic relationships would you see? Write a journal entry detailing your discovery.

Science

Choose and research one symbiotic relationship from the book or another source. Write a report that includes details about both species and their partnership.