Amplify CKLA

GRADE 3

Unit 2

Rattenborough's Guide to Animals

Reader

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Amplify CKLA | Core Knowledge®

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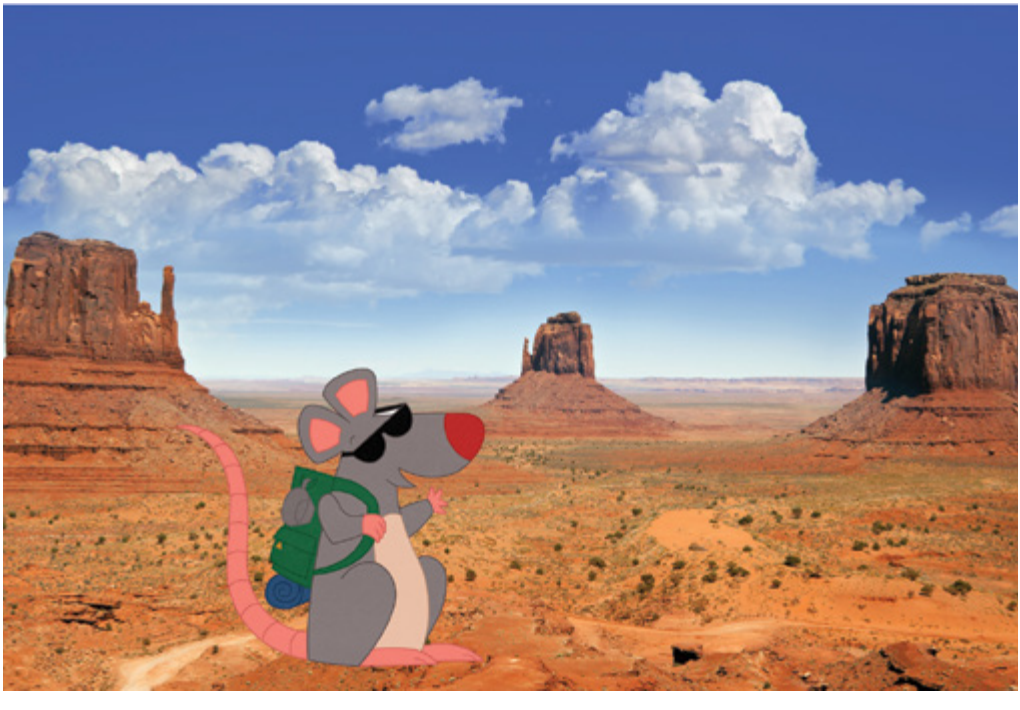
Unit 2 Reader

Chapter 1 Introduction: Meet Rattenborough

Greetings! Rattenborough, the famous explorer and animal expert here! Remember me? I taught you all about animals and **habitats** when you were just little kids in first grade. I've been busy since then traveling around the world. But, I'm back now to teach you everything I've learned about animals during my travels.

First, let's take a quick look at what you learned in first grade. Do you remember what a **habitat** is? A **habitat** is the place where animals and plants live. We learned that there are different **habitats** all over the world with different kinds of animals and plants living there.

We visited a desert **habitat** where it was very hot and dry. It hardly ever rains in a desert so the plants and animals that live there have to be able to get by with very little water. I bet you remember that cactus plants live in the desert, along with snakes and lizards.



*Rattenborough in one **habitat**.*

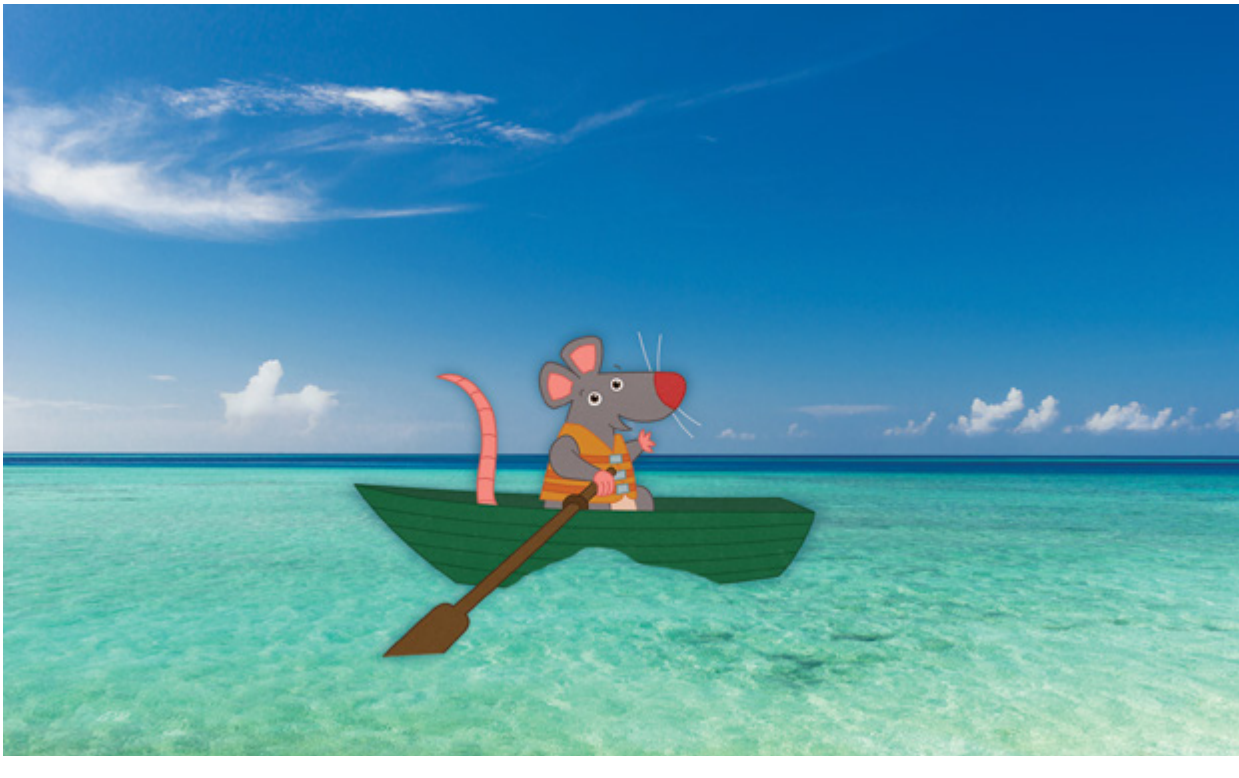
We also visited an African savanna. A savanna is also called a grassland. There were lots of interesting animals living there—zebras, elephants, and even lions! To be perfectly honest, I was always a little nervous while we were in the savanna!

Next, we checked out some different kinds of forests. We went to a hardwood forest full of trees with leaves that change color and drop off in the fall. We saw squirrels, deer, and even bears. We saw lots of different kinds of birds in those tall trees.

Then, we visited a tropical rainforest that was very hot, humid, and wet. There were lots of birds in this forest, too. These birds were colorful, tropical birds like toucans and parrots.

*Rattenborough in three **habitats***

Last, but not least, we visited freshwater and saltwater **habitats**. In the freshwater **habitat**, we saw fish, turtles, ducks, and beavers. In the saltwater **habitat** of the sea, we saw starfish, crabs, lobsters, and sharks!

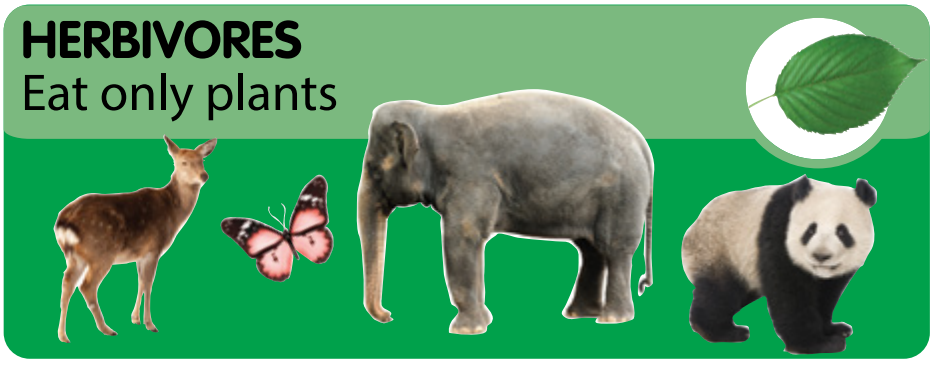


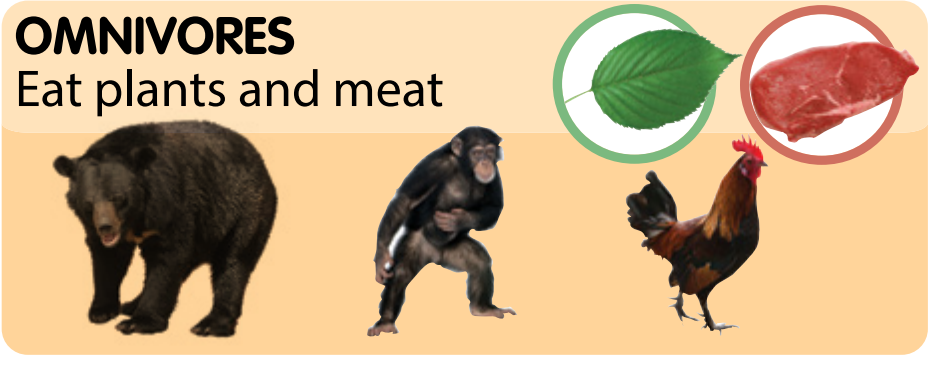
Rattenborough in two water ***habitats***

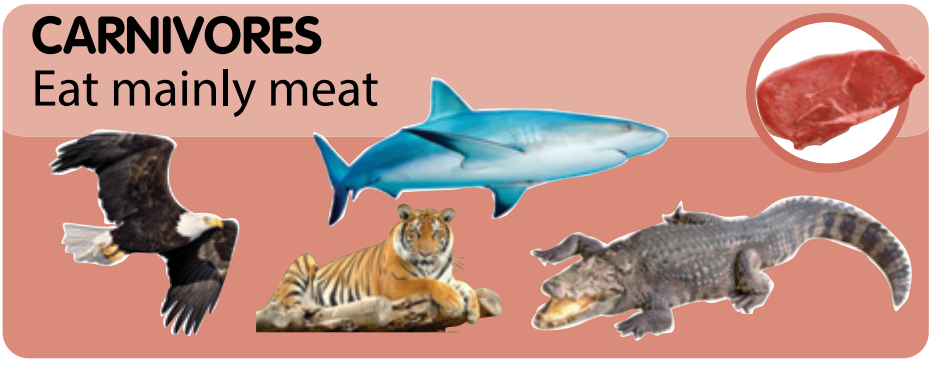
Besides learning about **habitats** in first grade, we also studied the different kinds of things that animals eat. Do you remember talking about **herbivores**, **carnivores**, and **omnivores**? We learned that you can sort animals by what they eat.

So, get ready because we are going to learn a lot more about how to sort animals. Rattenborough, your personal animal expert, at your service!

See you next time!







Different animals eat different things.

Chapter

2 Classifying Living Things

Rattenborough here! Do you remember who I am? I'm here now to help you learn about how scientists sort, or **classify**, living things into groups. Since I am an expert on animals, we will focus mainly on animals.

First, I'm going to ask you two very important questions. How do you know if something is living or nonliving? What important **characteristics** do all living things have?

- All living things create energy from food.
- All living things can have babies or make other living things just like themselves.
- All living things have a **life cycle**. They start out small and then grow.
- All living things change to fit in better with their **habitat**.

*All living things are **classified** by their **characteristics**.*

Plants make up one group of living things. We know this because plants have the same **characteristics** that all living things have.

- Plants create energy from food. They make their own food using the sun, water, and gases in the air.
- Plants make seeds that become new plants.
- Plants grow from small seeds into seedlings and become adult plants.
- Plants can **adapt** to their **habitat**. For example, all plants need water, but cacti are really well adapted to retain water.

*Plants have the **characteristics** that all living things have.*

Animals of all shapes and sizes are living things, too. So, animals also have the same **characteristics** that all living things have.

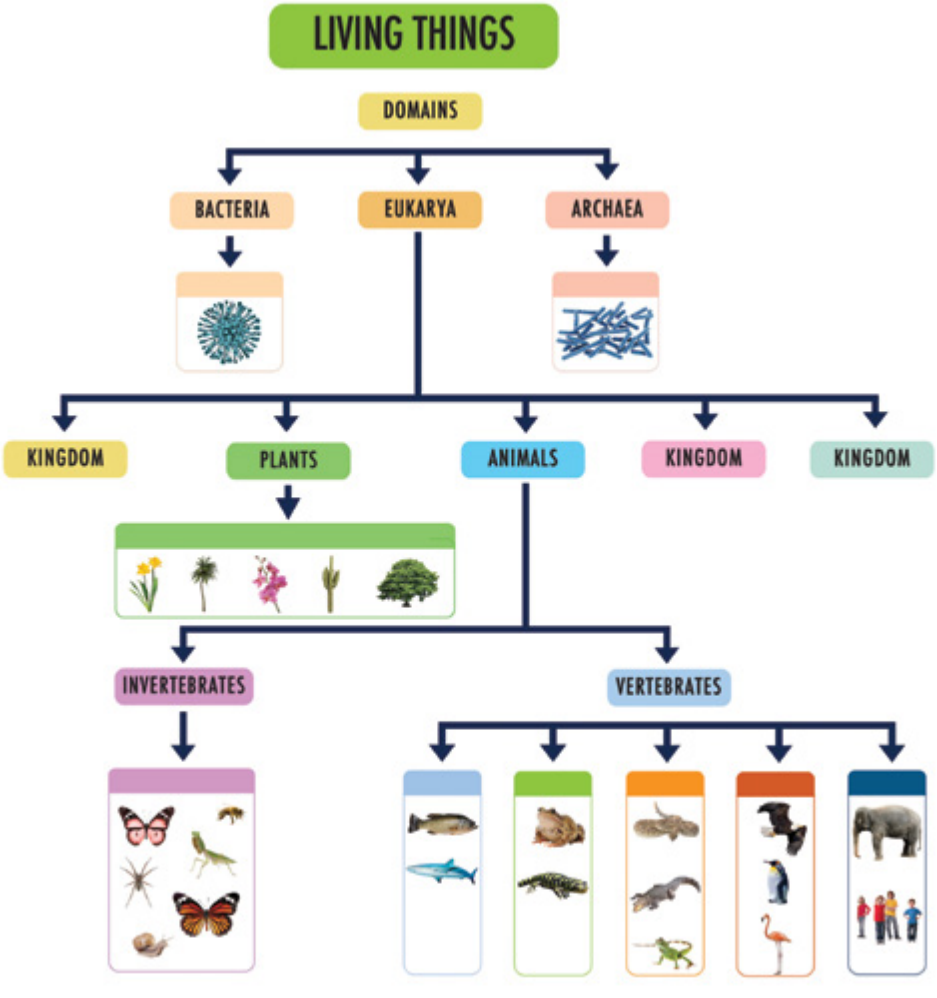
- Animals get energy from the food they eat.
- Animals can have babies.
- Baby animals are small but grow into adult animals.
- Animals can **adapt** to their **habitat**. For example, the fur of polar bears looks white so they can blend in with the snow where they live.

*Animals have the **characteristics** that all living things have.*

Plants and animals are both living things, but plants and animals are different in important ways. For example, animals eat other organisms for food, but plants make their own food.

Scientists study how living things are alike and different and sort, or **classify**, them into three domains. From one domain, living things are classified into large groups called **kingdoms**. There are five **kingdoms** of living things. You have just learned about two—the plant **kingdom** and the animal **kingdom**. (You will learn about the other **kingdoms** in later grades.) The living things in each **kingdom** can then be sorted into more specific groups.

Scientists study animals within the animal **kingdom** and **classify** them by the **characteristics** they share with other animals. One way scientists **classify** animals into more specific groups is by checking if an animal has a backbone. Insects do not have backbones, but birds and fish do. So, animals with a backbone are in different, more specific groups within the animal **kingdom**. Insects make up the largest group in the animal **kingdom**. But there are other large groups of animals, such as birds and fish. You will learn more about other major groups in future chapters.



*Scientists **classify** living things into three domains and then five **kingdoms**. They **classify** animals into other groups by their **characteristics**.*

We **classify** the things around us so we can get to know our world better. As we learn about living things, we also learn about ourselves and our place in the world.

So far, scientists have **classified** over 1 million different kinds of animals. Most of these are insects! Many scientists think there may be close to 10 million other animals that still have not been **classified**!

That's all for now! Rattenborough, over and out! I'll be back in the next chapter to tell you more about how animals are **classified** into different groups.

Insects are the largest group of animals.

Chapter

3 Vertebrate or Invertebrate?

Rattenborough, here again! You have learned that scientists who study the animal **kingdom classify** animals into different groups, based on different **characteristics**. Some **characteristics** scientists study are:

- what makes up the animal's skin, such as hair or **scales**
- whether animals give birth to live babies or lay eggs
- whether mothers feed their babies milk from their own bodies
- whether animals are **warm-blooded** or **cold-blooded**

*Scientists **classify** living things by different **characteristics,** such as what is on their skin, if they lay eggs or have live babies, how they feed their babies, and whether they are **warm-blooded** or **cold-blooded**.*

Another key **characteristic** that scientists study is whether animals have a backbone. Animals that have a backbone are called **vertebrates**. Humans are **vertebrates**. Place your hand on the back of your neck until you feel a bump. Now, rub your hand up and down the middle of your back. Do you feel bumpy bones that run in a row down your back, from your neck down to your waist? That's your backbone. Another name for a backbone is a **spine**.

The backbone or **spine** wraps around and protects an important part of your body called the spinal cord. The spinal cord is a bundle of nerves. Messages travel up and down your spinal cord from your brain to other parts of your body. This is the way that your brain sends signals telling the other parts of your body what to do.

*Humans have a backbone and are classified as **vertebrates**.*

Many other animals also are **vertebrates**. All **mammals**, **reptiles**, fish, and birds have a backbone, so they are all **vertebrates**. They have some type of spinal cord, too.

Animals with a backbone come in all different shapes and sizes. Apes, rhinos, horses, rabbits, bats—and yes, rats and humans, too—are all **mammals** and **vertebrates**. Lizards, turtles, snakes, and crocodiles are **reptiles** and **vertebrates**. Huge sharks and tiny goldfish are also **vertebrates**. Small hummingbirds and large eagles are **vertebrates**, too.

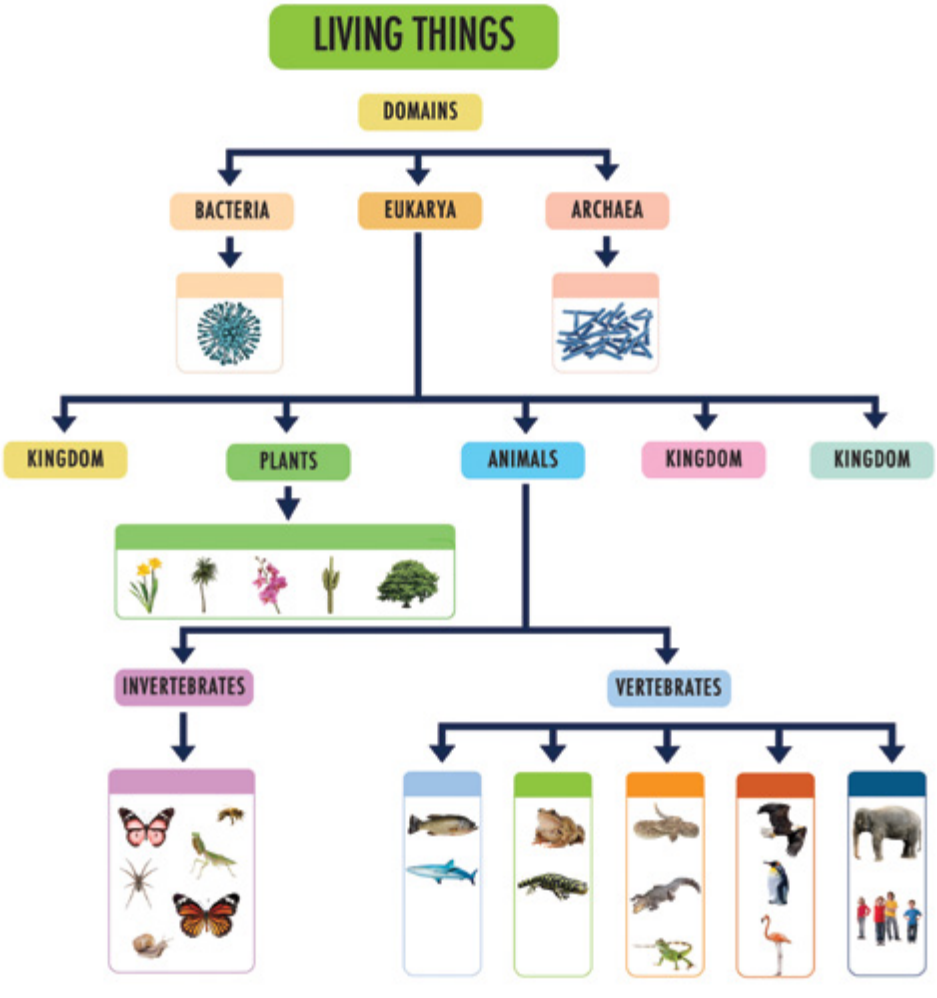
But there are many more animals that do not have a backbone. Animals without a backbone are called **invertebrates**. Insects are the largest group in the animal **kingdom**. Insects are also the largest group of **invertebrates**. Insects include flies, wasps, beetles, cockroaches, ladybugs, and butterflies. Other kinds of **invertebrates** include earthworms and spiders.

Some interesting **invertebrates** live in the sea. Lobsters, shrimp, and crabs do not have a backbone. The giant octopus is an **invertebrate** as well. Have you ever seen a jellyfish or a starfish? They are also **invertebrates**. So, these animals do not have a backbone or spinal cord.

Chapter 4 Warm-Blooded and Cold-Blooded Animals

Rattenborough, here again! In Chapter 2, you learned how scientists **classify** living things into one group called **kingdoms**. You learned about the animal and plant **kingdoms**. You also learned that animals and other living things are classified into more specific groups.

Today, you will learn more about the animal **kingdom**. You will learn that there are many kinds of animals that have different **characteristics**. Scientists study these different **characteristics** to divide the animal **kingdom** into more specific groups.

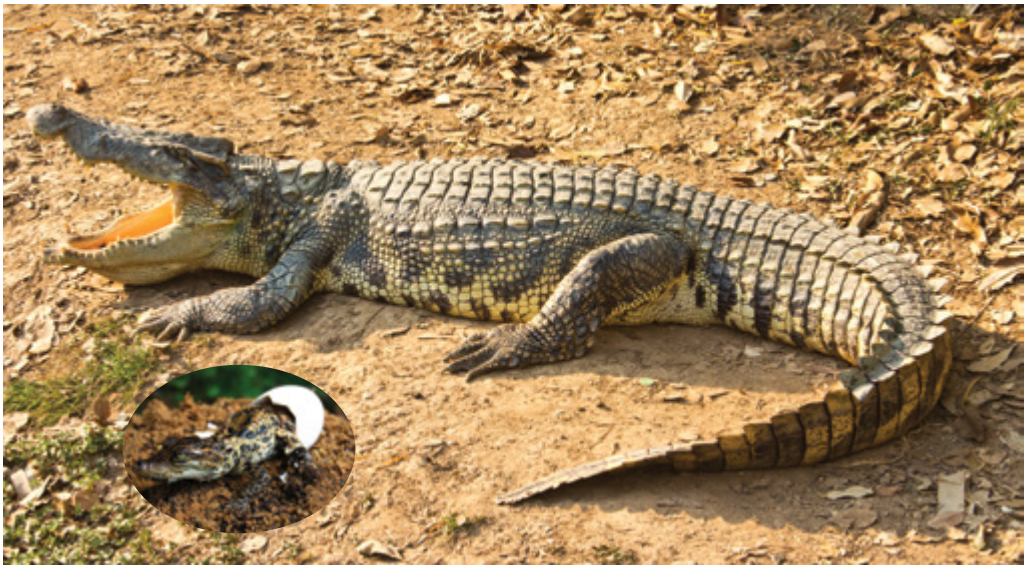


*Scientists **classify** living things by different **characteristics**.*

Many animals—such as cats, mice, rats, cows, elephants, tigers, and even people—belong to a group called **mammals**. So, you and I are **mammals**! All **mammals** have hair, but some have more hair, or fur, than others. You have to get pretty close to an elephant to see its hair, but it is a **mammal**.

Another **characteristic** of **mammals** is that many can give birth to live babies. Some **mammal** babies begin breathing, moving, and looking for food as soon as they are born. **Mammal** mothers make milk to feed their newborns. This is another key **characteristic** of all **mammals**. Some mammals lay eggs, too!

Do you think this crocodile is a **mammal**?



Answer: No!

Why not?

- Crocodiles have **scales**, not hair or fur.
- All crocodiles lay eggs and baby crocodiles hatch from those eggs. Crocodiles do not have live births.
- A baby crocodile does not get milk from its mother. Its first meal might be a bug. Later, he'll eat bigger animals.

Crocodiles belong to a different group of animals called **reptiles**, along with snakes, lizards, and turtles.

Scientists also **classify** animals as **mammals** or **reptiles** based on how the animals control their body **temperature**. Animals need to keep within their limits of body temperature, as some have tighter limits than others. Some animals need to keep a relatively **constant temperature** inside their bodies for their bodies to work properly. If an animal gets too hot or too cold, its body will not work the way it should. An animal may become sick or even die.

Mammals are **warm-blooded** animals. When **warm-blooded** animals are in a cold place, they use energy from food they eat to help keep their bodies warm. Some **warm-blooded** animals shiver to keep warm. When they shiver, their bodies make heat to keep warm.

When **warm-blooded** animals are somewhere hot, their bodies react in a different way to cool off. Some **warm-blooded** animals, like people, sweat to stay cool. Dogs pant to stay cool. Other **warm-blooded** animals drink lots of water as a way to cool off. Did you know that cows need to drink almost a bathtub full of water a day?

Warm-blooded animals act in different ways to maintain a **constant temperature** inside their bodies. **Mammals** can live in **habitats** with different **temperatures** because their bodies do not rely on the environment. **Warm-blooded** animals, like **mammals**, must eat often to make energy to heat or cool their bodies. Most **warm-blooded** animals need to eat every day. Some need to eat every hour!

Reptiles are **cold-blooded** animals. The body **temperature** of **cold-blooded** animals changes depending on the outside **temperature**. They become hot when it is hot outside and cold when it is cold outside. But **cold-blooded** animals must also keep a **constant temperature** for their bodies to work properly.

Cold-blooded animals do not use energy from their bodies to stay warm or cool. Instead they use what is around them to keep warm or keep cool. Crocodiles stay in water or mud in order to stay cool on hot days. If they need to warm up on cooler days, they bask in the sun.

While **warm-blooded** animals can live in just about any **habitat**, **cold-blooded** animals can only live in certain **habitats**.

Cold-blooded animals do not need to eat as often as **warm-blooded** animals. This is because they do not need lots of food to make energy to warm or cool their bodies. Most crocodiles only eat once a week, but they can live for months and sometimes years without eating!

Cold-blooded animals like these crocodiles cool off by taking a swim when it's too hot. When it's cool outside, they warm up in the sun.

Chapter

5 Fish

Rattenborough here again! You have learned that scientists study the **characteristics** of animals. They do this to divide the animal **kingdom** into different groups, such as **mammals** and **reptiles**. Today you are going to learn about another group of animals within the animal **kingdom**—fish.

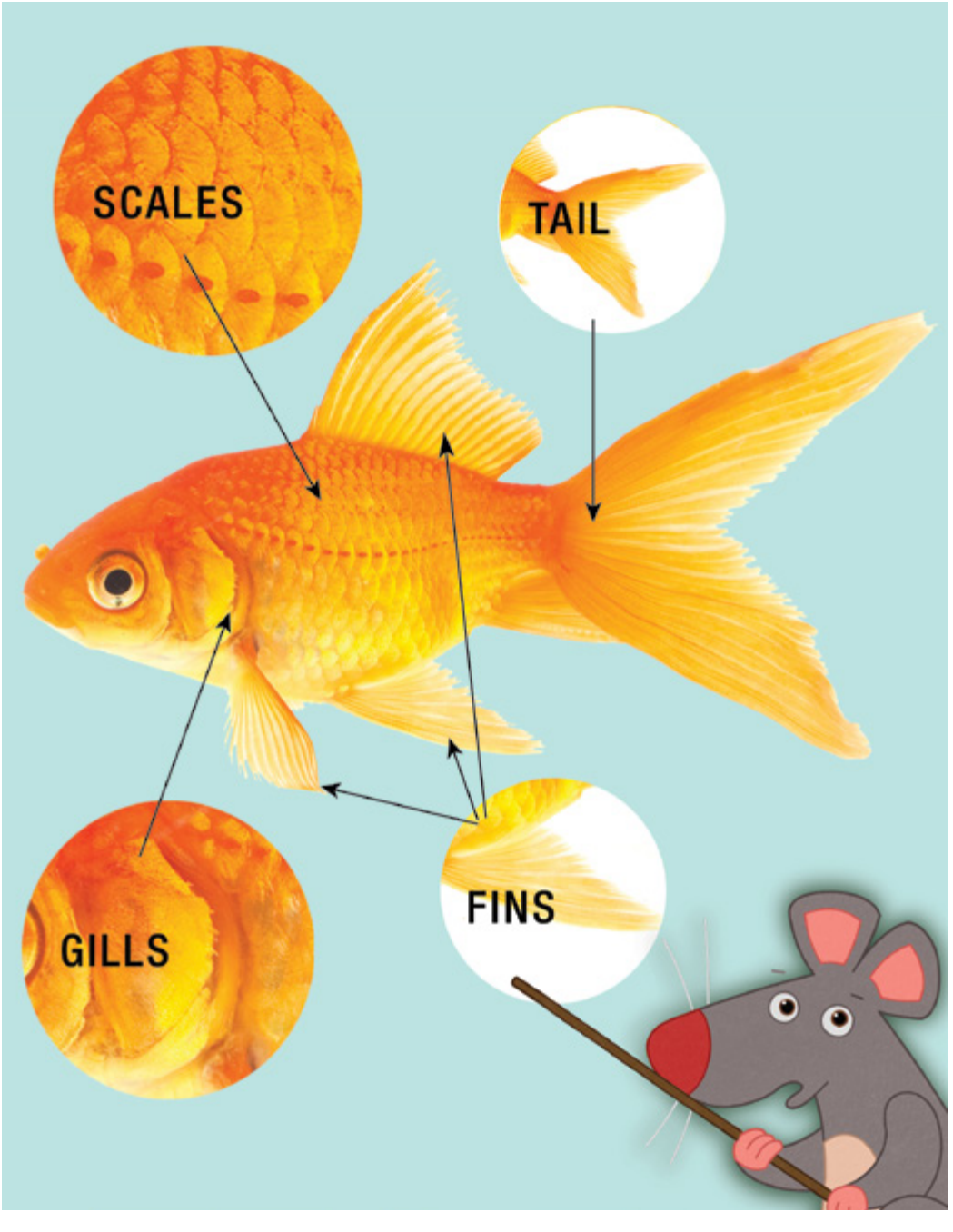
Fish are **aquatic** animals, meaning that they spend their lives **underwater**. Most fish are **cold-blooded**. Their body **temperature** changes with the **temperature** of the water. Fish are also **vertebrates**. In fact, they are the largest group of animals on Earth that are **vertebrates**. Earth is covered mostly by water, so it makes sense that fish are the most common **vertebrates**. There are many different types and sizes of fish.

Fish come in many sizes and colors.

Fish lay eggs **underwater**. They also eat and sleep under water. Fish do not sleep in the same way **mammals** sleep. Fish can't close their eyes because they don't have eyelids. When they sleep, they float around or find a place to hide while they rest.

Like other animals, fish need to breathe **oxygen**. But fish do not have lungs like people and they do not breathe **oxygen** from the air. Instead, they have **gills** just behind their heads. Fish **gills** take **oxygen** out of the water, so that fish can breathe. But **gills** do not work well outside water. They cannot take **oxygen** out of the air. A fish will die quickly—within several minutes—if it is removed from water.

Fish have **scales** that cover their skin. **Scales** are rounded and smooth, and there is usually an inner and outer layer. The **scales** protect the skin and help fish move easily through the water. Fish also use the different **fins** on their body and their tails to swim. They are able to glide through the water, rapidly changing direction by using their **fins** and tail.


SCALES
TAIL
GILLS
FINS

Most fish live in saltwater, because most water on Earth is salty. Tropical fish that live in the warm ocean are very colorful. They look as if an artist painted interesting patterns on their bodies. Many fish also live in freshwater, including streams, rivers, lakes, and ponds.

These tropical fish live in a saltwater ***habitat****.*

Some fish travel in groups called **schools**. One type of fish that travels in **schools** is salmon. Salmon live in both saltwater and freshwater. Some types of salmon are born in freshwater streams and rivers. After about a year, they make their way to the ocean where they live for one to five years. Then, they **migrate** back to the exact same stream where they were born. They lay eggs and the **life cycle** begins again.

Salmon don't use a map to help them find their way back home. Most scientists think they use their strong sense of smell to find their way. They swim upstream, against the river's current, sometimes swimming hundreds of miles. They leap over waterfalls and rocks to get to the same stream where they were born. They go through all this hard work to reach their home to lay their eggs.

Hopefully, along the way, a grizzly bear or fisherman won't catch them first. It just so happens that salmon are among the tastiest of all fish!

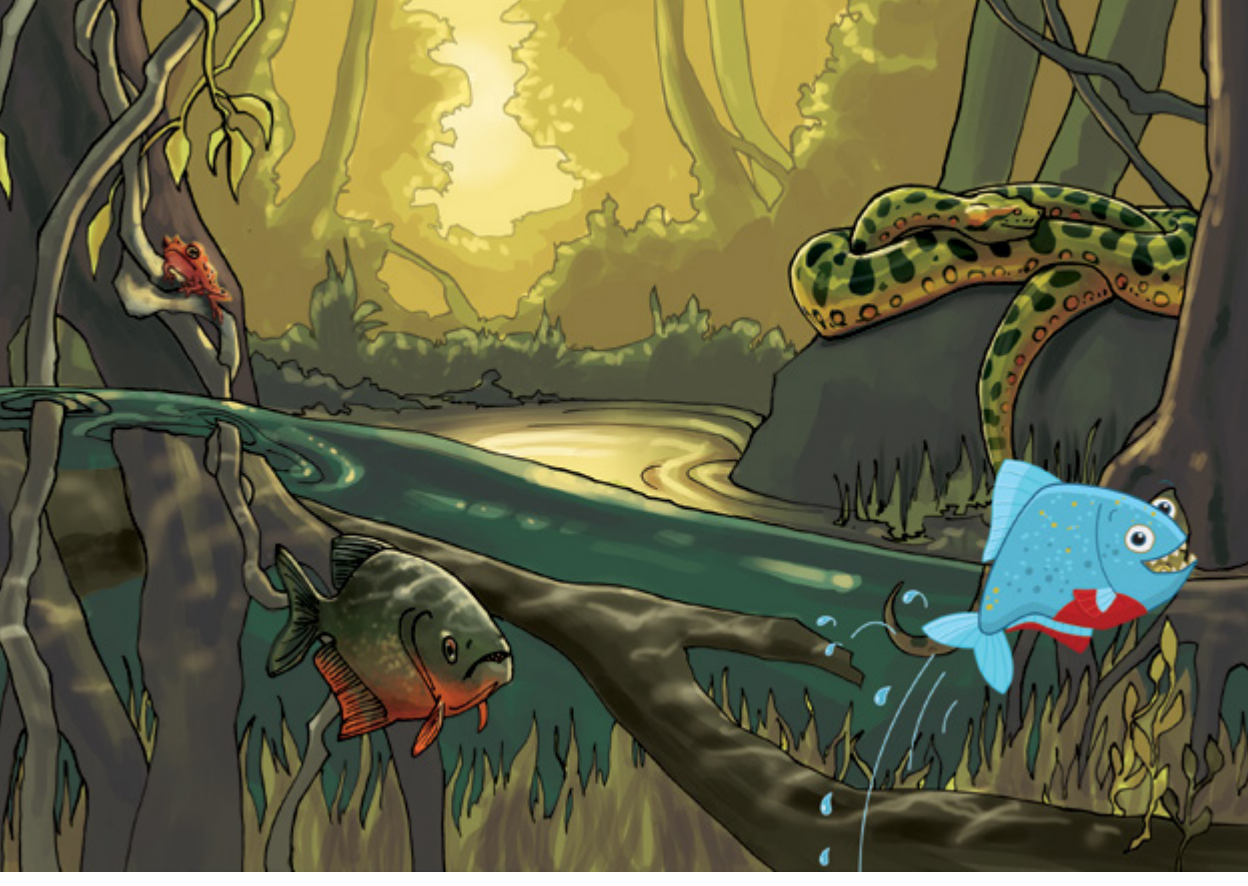
Chapter

6 Fish: Fins and Gills

Read-Aloud

Hello everyone! I'm back after a delightful rest! Today I'm going to tell you more about my friend Paolo Piranha and the group to which he belongs. So far, you've learned that scientists **classify** living things by common **characteristics** in order to study them and show relationships.

You have learned about **cold-blooded** and **warm-blooded** animals. Who remembers if Paolo is **cold-blooded** or **warm-blooded** and can explain what that means? Ah, bravo! Right! Paolo Piranha's internal body **temperature** varies with his surroundings. When Paolo is swimming in warm water, his body **temperature** is higher than when he is swimming in cold water. His body **temperature** is not **constant**; it makes adjustments to the surrounding **temperature** easily.



Rainforest with Paolo

Who remembers another way scientists **classify** animals? I'll give you a hint. It has to do with bones. Right! Some animals have backbones—what's another word for animals with backbones? Yes, animals with backbones are called **vertebrates**. And those without backbones are called invertebrates. Paolo is one of many kinds of animals capable of swimming. Having a strong backbone is one type of body design that helps Paolo and other fish to be good swimmers.

You have also learned a little bit about taxonomy, the science of **classification**. Fish are members of Animalia [an-uh-may-lee-uh], or the animal **kingdom**, just like you and me, but they belong to a different animal group. You are a **mammal** like Hilda Hippo and myself, Ebenezer is a bird, and Paolo is a fish! Fish are **vertebrates** and they are **cold-blooded**. There are many different types and sizes of fish, represented by many species. Today I'm going to teach you a little more about **aquatic** species of animals that are classified as fish. So, to say that in three words: fish are **aquatic**! They don't live on land. They live in water! All species of fish are **aquatic**.

Fish make up the largest group of **vertebrates** on Earth. Let's take a look at my picture that shows a view of planet Earth from space. There is a *lot* more water than land. Nearly three quarters of the earth's surface is covered by water. Fish are swimming about in the earth's waters—from ponds and streams to rivers, lakes, and oceans. They have **adapted** to almost every water **habitat** on Earth except for some very hot springs and the extremely salty Dead Sea. Aside from these places, fish can live anywhere! It's no wonder that fish make up the largest group of **vertebrates** on Earth.

Earth's oceans and fish

Most of those wet, watery fish **habitats** are salty because most of the earth's water is salt water. If you ever swim in the ocean, you may get a little taste of the salty sea. Sharks, cod, and flounder are all saltwater fish.

Freshwater fish live in lakes, rivers, streams, and ponds. What do you think fresh water is? Bass and trout are common freshwater fish, and some humans actually find them very tasty. Come to think of it—I find fish quite delicious when I can get my paws on fish scraps!

Some fish, such as salmon, spend part of their lives in freshwater rivers and part in the salty seawater. Salmon begin their lives in rivers where they stay for anywhere from six months to three years, depending on the species. Then they make an often-dangerous journey out to sea, facing **predators** and changing water **temperatures** along the way. They live in the saltwater ocean for about four years before returning to the freshwater rivers to lay their eggs. Their migration often covers several hundred miles.

Let's stop for a moment to think about the different ways that taxonomists **classify** Paolo, a South American piranha from the Amazon River. He's a **cold-blooded**, **aquatic vertebrate**. He's a fish to be sure. The question is whether he is a saltwater fish or a freshwater fish. Which of these types of water is his home? That's right! A freshwater river. Paolo's home is the Amazon River, one of the largest rivers in the world. Piranhas live in freshwater environments, mostly rivers, so they are classified as freshwater fish.

Red-Bellied Piranha

Sometimes animals are classified by their physical **characteristics**. Though piranhas do have very sharp teeth, they are not the bloodthirsty **carnivores** they are sometimes perceived to be, always ready to attack humans. Indeed, members of the red-bellied species of piranha do hunt the meat of other fish in large groups, but that's not all they eat. Most piranhas are **omnivores**. You have reviewed **carnivores** and **omnivores** earlier in this domain. Who can tell me what the difference is? That's right—as **omnivores**, most piranhas eat both animals and plants, eating seeds and fruit that fall into the water. Many piranhas also feed on carrion, animals that have already died. You will continue to hear about the different foods that many different animals eat—this will help you describe animals. Later you will hear about how the shape and size of animals' teeth give you clues about what they eat.

So, you already know several common **characteristics** of fish. But there are more. Can you think of any others? I'll give you a hint. You know that all animals need to breathe **oxygen** in order to live. Fish do not have **lungs**, so we have to wonder how in the world—or in this case under water—do they breathe?

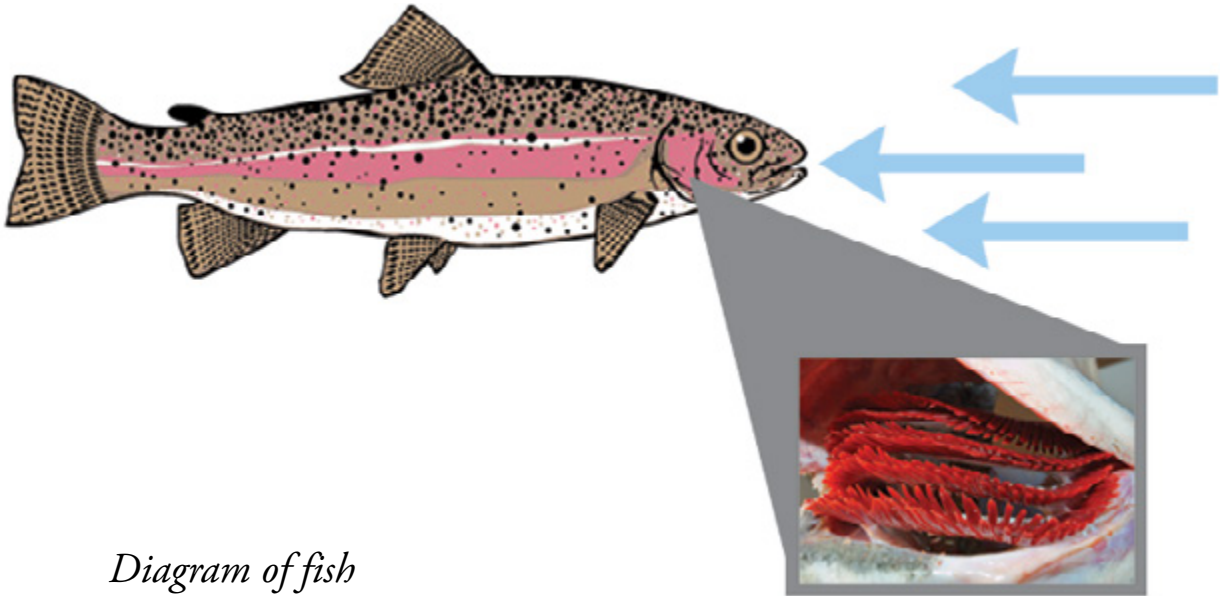


Diagram of fish

Look closely at this fish and see if you can spot its breathing machine. The **respiratory**, or breathing, organs of a fish are called **gills**. All fish have **gills**. They take water in through their mouths and the water passes over their **gills**. The **gills** take in **oxygen** from the water, allowing them to breathe. You will die quickly if you don't get enough air because you draw **oxygen** out of the air. But fish will die quickly if they do not have water, because their **oxygen** comes from water.

The African lungfish is the only fish I know that has lungs in addition to **gills** and can **survive** for long periods of time out of the water. We call this an exception to the rule, or a "pattern-breaker." Before the dry season, when the water dries up and leaves a sun-baked riverbed behind, the lungfish buries itself deep in the mud and builds a cocoon-like sheath around itself, staying there for a year or more until water returns to the river. Okay then, fish breathe with **gills**, and you breathe with lungs. That's one big difference between you and fish. What's another?

Think about how you swim—with your arms and legs, of course! Take a close look at the fish. Do you see any arms and legs? Nope! So, what helps a fish move through the water? Yes, a fish has **fins**—all kinds of **fins!** It has **fins** on the sides of its body for steering, **fins** at the back for powerful speed, and **fins** at the top and bottom to help keep balance. Fish couldn't begin to move without those wonderfully flat **fins** and their flexible tails. Have you ever worn flippers? Flippers are designed to be like fish tails to help people move more quickly through the water.

Fish scales

Well, everybody, you've spotted the **gills** and **fins** of a fish, but what about the rest of a fish's body—what about the skin? Hey! Look at me! There I am, taking a close look at fish skin through my magnifying glass. Fish skin is very different from your skin. Fish have scaly skin to help protect them and help them move more easily through the water. These hard overlapping **scales** are rounded and smooth. And fish have more than one layer of skin—just like you!

Many scientists believe that fish appeared in the oceans more than 400 million years ago. It's hard to imagine how many fish live in all of the earth's waters today. More than thirty thousand species are known, but a vast amount of the world's oceans have yet to be explored. What scientists actually know for certain is like one drop of water in a vast bucket! Scientists discover more and more all the time. Maybe one day you will be one of those scientists who will discover something new!

Most fish—such as salmon, goldfish, tuna, and eel—**spawn**, or reproduce, in a very unique way. When fish spawn, the mother releases her eggs into the water and the male **fertilizes** them, or makes them complete and able to grow into baby fish. Once these soft eggs are fertilized, they are often buried along the river bottom. Here, they develop and eventually hatch into tiny fish called larvae [lahr-vee], the early form of fish. Some sharks, on the other hand, are among the few examples of live-bearing fish. Almost the opposite of external spawning, the mother shark's eggs develop internally, remaining inside her body until they are born as live young, rather than as eggs.

Fish eggs and shark mother with baby

Bony fish, cartilaginous fish, and jawless fish

Taxonomists have another way of grouping fish. They have divided all fish into three classes, or classifications. Most fish belong to the class called bony fish. These fish have skeletons that are made of hard, bony material. Most of them have a swim bladder, kind of like an internal "floatie," which helps them float. Perhaps you know of some fish that are considered bony fish—bass, clownfish, minnows, and sunfish are just a few! Another smaller class has some well-known members. As you have heard earlier, fish like the shark and the stingray have skeletons made of cartilage. This class of fish has tooth-like **scales**, and some of them breathe through spiracles—small **gill** openings on the tops of their heads! The last class of fish is not as familiar to most of us—these fish are jawless and include some interesting members like the hagfish and the lamprey.

Earth's underwater world—Paolo's world—is a fascinating place, much of which has not yet been explored. Perhaps some of you will become scientists and study **aquatic** creatures like Paolo. Today, we've only talked about fish, but not all sea animals are fish. There are many other **vertebrates** in the ocean, such as dolphins, sea snakes, and sea turtles. The sea is also home to tens of thousands of species of **invertebrates**—animals you may have seen before, such as crabs, clams, sand dollars, and squid.

Let's review the **characteristics** of fish. How many fish **characteristics** can you name? Great job! Now, I'm going to read you some riddles of sea creatures. See if you can identify which ones are fish and which ones are not.

1. I am a jellyfish. My soft body has no bones, and I have neither **gills** nor lungs for breathing. **Oxygen** moves easily through my thin skin. Sometimes I lay eggs, but I may also give live birth. I am **cold-blooded** and will surely die if left out of water. (No, I am not a fish, even though the word is in my name; I am classified as an **invertebrate**.)

2. I am a **cold-blooded** eel. My slimy, snakelike body is covered in **scales** and hides my backbone from view. I have **gills** and **fins**, and I lay my eggs in the water where I live. (Yes, I am a fish.)

3. I am a sea horse. My long body is encased in bony rings. I breathe with **gills**, and my **fins** help me glide through the water. I am the male, and I carry eggs in my pouch until they are ready to hatch. (Yes, I am a fish.)

4. I am a whale, one of the largest animals of the sea. I breathe with lungs and give birth to live babies. Even though I am not covered in hair, I do have a few bristles of hair here and there on my head. (No, I am not a fish, but I am a **vertebrate**. I am a **mammal**.)

Sorting **aquatic** creatures is not as easy as it looks, is it? Next time, things will be even more interesting as we learn about some **aquatic** animals that can live on land as well. How do you think they can do that? You will find out more the next time we meet!

Chapter

7 Amphibians

Greetings once again from your pal and animal expert, Rattenborough! Are you ready to learn about another group of animals within the animal **kingdom**? The group we are going to talk about today is really interesting. They live both in water and on land. This group of animals is called **amphibians**. The word **amphibian** comes from Latin meaning "both sides of life."

Amphibians are classified into three more specific groups. Frogs and toads are the largest group. Salamanders and newts make up another. Animals in the third group do not have legs, so they look more like large snakes. We don't know as much about this group of **amphibians** because they live mostly underground.

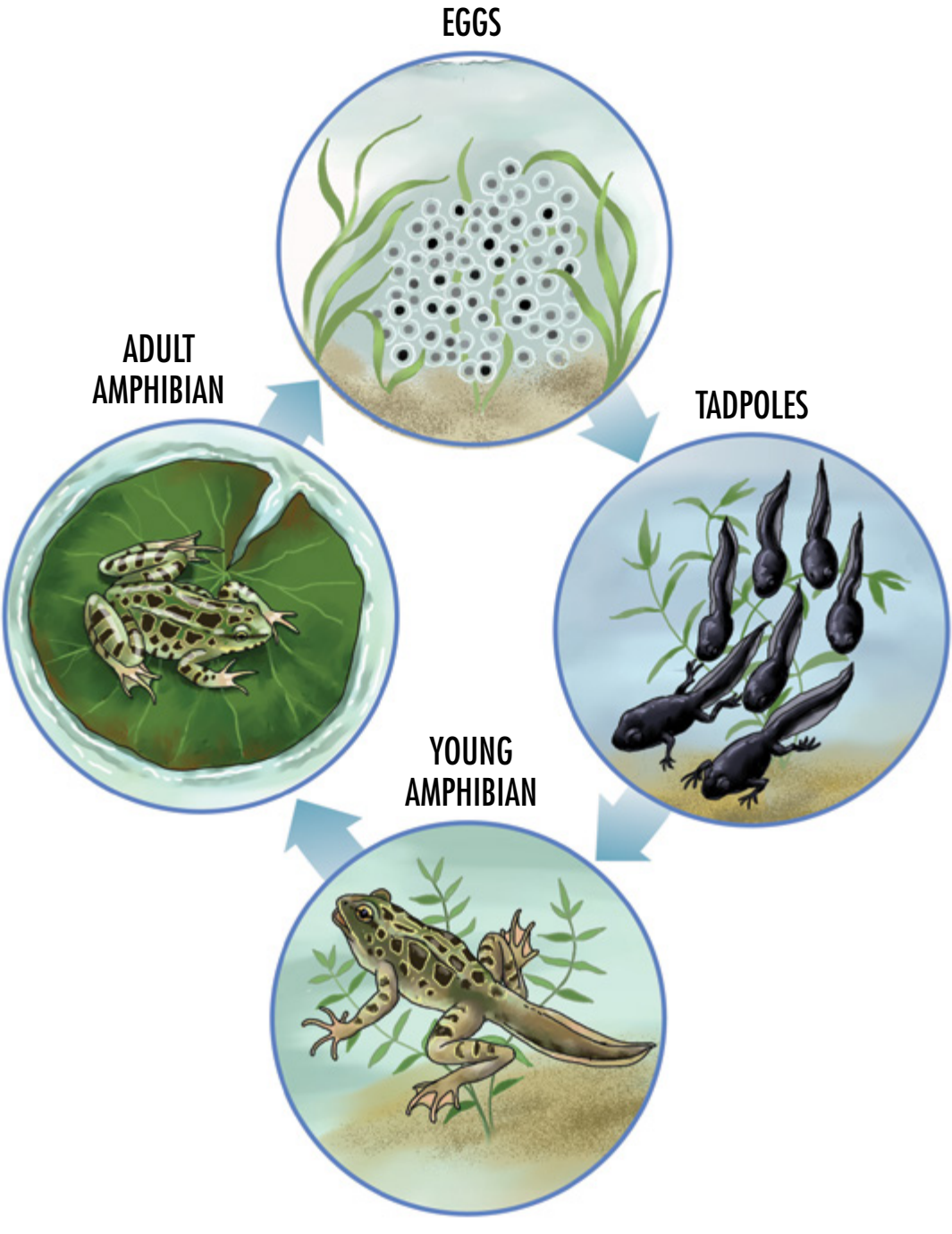
To understand the **life cycle** of an **amphibian**, let's take a closer look at an American toad.

Like all **amphibians**, toads are **cold-blooded**. An **amphibian's** body **temperature** changes as the outdoor **temperature** changes. Some **amphibians hibernate** during the winter. Some toads dig deep underground. Other **amphibians** like frogs bury themselves in mud at the bottom of a pond. **Hibernating amphibians** can **survive** for months. They do not eat or move, using only the fat stored in their body to stay alive. Frogs and toads—and all **amphibians**—are also **vertebrates**.

A toad's **life cycle** begins as one of thousands of soft, slimy eggs. The mother lays her eggs close to shore in a pond, lake, or calm spot in a river or stream.

But most of these eggs will never hatch. Instead, they will be eaten by fish or other animals. If the water moves the eggs away from the shore and into direct sunlight, the eggs will dry out and die.

Out of the thousands of eggs laid, a few hundred toad eggs manage to hatch into **tadpoles**. A **tadpole** is very fragile. Its young body is made up mainly of a mouth, a tail, and **gills**. At this stage, **tadpoles** are **aquatic**. Like fish, they use **gills** to breathe underwater.

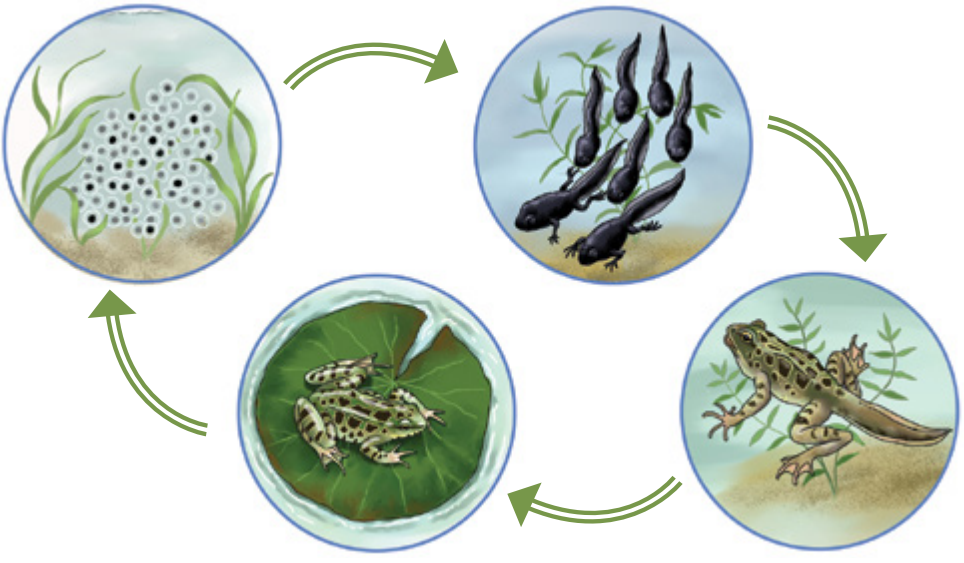


*The **life cycle** of a frog or toad*

After a while, **tadpoles** begin swimming around and eating tiny **aquatic** plants. **Tadpoles** tend to stay together in **schools**, like fish. However, this makes it more likely that other animals will be able to catch and eat them. Most **tadpoles** end up as fish snacks.

If a **tadpole survives** for a month, skin will begin to grow over its **gills**. After about six to nine weeks, the **tadpole** also starts to grow little legs. As its body changes, the young frog or toad starts to look less like an **aquatic** animal and more like a land animal.

After a few months, a toad will make its way out of the water to land. At this stage, it may still have a tail, but that won't last long. By this time, its **gills** have become lungs. That means the toad now breathes **oxygen** from the air instead of **oxygen** from the water, like fish. Soon, it will be a full-grown adult toad living and hopping around on land. Adult **amphibians** are **carnivores**, eating insects, small **reptiles**, and even mice.



*Bottom: A young **amphibian** leaving the pond for land.*
*Top: The **life cycle** of a frog or toad*

Adult toads are very good swimmers and can even swim underwater. But they cannot use their lungs to breathe underwater. Instead, their thin, moist skin absorbs **oxygen** from the water.

Amphibians are a very interesting animal group. **Amphibians** are animals that have both **gills** and lungs at different times in the life cycle. As adults, they live on land but lay eggs in the water. The Latin meaning of the word **amphibian** makes perfect sense!

*This toad may be preparing to **hibernate** for the winter.*

Chapter

8 Tree Frogs

As you have learned, **amphibians** are **vertebrates** that spend part of their lives in water and part of their lives on land. They start out like fish because they are born with **gills** and can breathe underwater. They later develop lungs, so they can breathe air and live on land. Tree frogs are one type of **amphibian**. They are different from most **amphibians** because they spend most of their lives in trees.

The American green tree frog can be found in most parts of the southeastern United States. A typical American tree frog is only about two inches long, so they are pretty small. But they can be loud if there are a few hundred of them gathered together.

An American green tree frog

If you live in the southern United States, near water and lots of trees, your summer nights may be filled with the gentle chirps of tree frogs.

American tree frogs range in color from lime green to yellow. A tree frog's most distinct **characteristic** is its long toes with **suction cups**. The **suction cups** allow a tree frog to cling to and climb anything. A tree frog can even stick to a window.

Tree frogs like to stay in the trees, so you are more likely to hear them instead of see them. They will leave the trees to lay eggs. They are most likely to come down to the ground after a heavy rain, when everything is nice and wet.

*This tree frog's long toes with **suction cups** help it climb this branch.*

If you do see one, don't worry! They are pretty friendly. They are easy to catch, too. If you catch one, it might sit on your hand or crawl around on your back.

You will probably only find them at night because they are **nocturnal**. This means they sleep during the day and are active at night. They eat small insects, such as crickets, moths, and other **nocturnal** insects.

Like other **amphibians**, American green tree frogs lay their eggs in or near the water. Most of them like to lay their eggs very close to water, but not quite in it. Their favorite place is on a tree limb or leafy branch that has fallen into a pond.

*The American green tree frog is **nocturnal**.*

Different kinds of tree frogs have been around since long before the dinosaurs roamed the earth. You can find many different types of tree frogs in parts of North and South America, Europe, and Southeast Asia. This is a red-eyed tree frog, which you can find in Mexico and much of Central America.

Most tree frogs prefer a fairly warm, wet **climate**. If you live in a place with tree frogs, consider yourself lucky. In the summer, you can fall asleep each night listening to the steady song of a tree frog **orchestra**.

This type of tree frog lives in Mexico and Central America.

Chapter

9 The Poison Dart Frog

A poison dart frog lives in the rainforests of South America. It is a tiny frog. It is only an inch and a half long.

It is cute, but it would be a mistake to pet this frog. Frogs like this one **secrete** poison. That means the poison seeps out from its skin. Some poison dart frogs secrete a mild poison. Others secrete a poison that is strong enough to kill humans. The poison helps protect the frog. It tells other animals to leave the frog alone.

The native people of South America collected poison from this kind of frog. They dipped darts into the poison. Then, they used blow guns to fire poisoned darts at their enemies. This is why the frogs are called poison dart frogs.

Many poison dart frogs are brightly colored. You might think this would be a dangerous trait. After all, many animals are camouflaged. Their camouflage helps them hide from **predators**. Why, then, would an animal be brightly colored? Why would it stand out? Wouldn't that make it easy for **predators** to spot?

Sapphire blue species of poison dart frog.

Scientists think that is precisely the point. They have noted that many **poisonous** animals are brightly colored. They think the color serves as a warning sign. It tells other animals, "Watch out! You don't want to eat me! I will poison you!"

Poison dart frogs are **amphibians**. That means they live in water and on land.

Poison dart frogs lay eggs. The female lays the eggs in a moist spot. Then, the male fertilizes the eggs. Eventually, **tadpoles** hatch out of the fertilized eggs.

Poison dart frog.

Some **amphibians** lay a lot of eggs and leave the young to fend for themselves. Poison dart frogs are not like that. They are dedicated parents. The adult frogs carry their newly hatched **tadpoles** up into the canopy, or tops, of trees above the rainforest. They carry the baby **tadpoles**

*Poison dart frogs have brightly colored skin that gives off the warning to **predators** of their toxicity.*

on their backs, one at a time. The parents secrete sticky mucus. This sticky mucus keeps the **tadpoles** from falling off the parents' backs during the climb up to the canopy.

For many species, the mothers do much of the childcare. This is not true of poison dart frogs. Mothers and fathers both take care of the young. Moms and dads both carry the **tadpoles** up into the canopy.

The parents deposit the **tadpoles** in small pools of water that form in plants at the top of the canopy. The **tadpoles** live in these pools for a while. They breathe underwater, using **gills**. They eat tiny animals that live in the water. If there is not enough food, the mother may lay eggs in the pool. The **tadpoles** can eat the eggs.

Eventually, the **tadpoles** experience a metamorphosis, or change. They grow legs. They develop lungs. They change into frogs. Once this happens, they are ready to leave the water.

The **habitat** of the poison dart frog is under threat. It is threatened by logging and farming. If trees are cut down, these frogs have nowhere to live. In recent years, lots of trees have been cut down in South America. Some people cut them down to sell the wood. Some cut them down to set up farms. As a result of this tree cutting, some kinds of poison dart frogs are now endangered.

Strawberry Poison-dart Frog.

Chapter 10 Reptiles: Cold-Blooded Scaly Vertebrates

Read-Aloud

Hello, students. As you can see, Anna Anaconda is our starting place for today's lesson. She is a green anaconda, one of the largest snakes in the world. When she unwinds, she is about as long as six of you stretched head-to-toe across the room, and she weighs about five hundred pounds! That's more than about eight of you put together!

Anna Anaconda belongs to a group of animals that shares a lot of the same **characteristics** as the **amphibians** you learned about last time. Who knows the name of the group used by taxonomists to **classify** snakes? Yes, snakes are **reptiles**. **Reptiles** include crocodiles, alligators, lizards, turtles, and tortoises. But right now I want to focus on one **reptile** only: Anna. It's no secret that she has a very high opinion of herself—she was quite fond of telling me so when I visited Peru. She thinks she is rather pretty, and I quite agree!

Rainforest with piranha, toad, and Anna Anaconda

In spite of her heavy body, Anna is a very good swimmer. Unlike some of her reptilian relatives, she is an **aquatic** snake, preferring swamps and rivers to the land.

Snakes often have a bad reputation. Some snakes are **venomous**, releasing **poisonous** liquid called **venom** when they bite. Anna's teeth are actually quite small and she is not **venomous**, so you need not worry about that. However, some people fear anacondas because they are members of a family of snakes called constrictors. Does anyone know what that means? Constrictors catch and kill their prey by coiling, or wrapping, around to prey and squeezing them very tightly. Anacondas' jaws open

so wide that they can swallow animals whole—fish, caiman, even jaguars and small deer. The anaconda's powerful muscles crush the bones of its prey as it constricts. Once swallowed, the anaconda slowly digests its meal.

Uh oh, some of you look fearful. Don't worry. You're safe. Anacondas are not native to North America; you'll find them far, far away on the continent of South America. That's where I met Anna! Anna was sure to tell me that as far as she knows, there is no documented record of an anaconda ever killing a man, woman, or child. She and all anacondas are **nocturnal** animals and they hunt at night, eating frogs, toads, birds, fish, and turtles. She doesn't have to hunt very often because one animal will satisfy her appetite for a long time.

Well, that's a lot of information about Anna's **characteristics**, the ways by which scientists **classify** her as belonging to the animal class called **reptiles**, or reptilia. Anna and other **reptiles** share some common **characteristics** with **amphibians**. Many scientists believe **reptiles** evolved from **amphibians**. **Reptiles** are all **vertebrates** because they all have backbones, and they are all **cold-blooded** because their internal **temperatures** change with their surroundings. Most **reptiles** can adjust

their body **temperatures** by basking in the sun to stay warm, or by hiding under a rock to stay cool.

Just like **amphibians**, **reptiles** live on land and in water. However, these two groups do—of course—have their differences. **Amphibians** depend upon water to stay alive much more so than **reptiles**. **Amphibians**' thin, wet, slimy skin needs moisture to absorb **oxygen** from the air, but **reptiles**' skin is waterproof. Unlike toads and salamanders, Anna and other **reptiles** do not breathe through their skin, which is hard, dry, and scaly. They use only their lungs to breathe air, which means they are able to withstand very harsh dry weather, conditions under which **amphibians** would not be able to **survive**. Of course, because they have lungs, this also means that **reptiles** cannot stay underwater very long without coming to the surface to breathe.

Amphibians usually spend part of their lives entirely in water, but this is not true of **reptiles** as a group. Whereas **amphibians** begin life with **gills**, **reptiles** are born with lungs and are never dependent upon **gills** for breathing. Remember how different baby **tadpoles** look from adult toads? This is not the case for **reptiles**. Baby **reptiles** usually look a lot like their parents. They do not undergo metamorphosis the way that **amphibians** do.

From top left going clockwise: gecko, iguana, gecko, chameleon. Bottom: Komodo dragon

Let's take a look at some of the animals that belong to the animal group classified as **reptiles**. These include lizards, geckos, iguanas, and chameleons. Unlike snakes, most lizards have four legs. Chameleons have a keen sense of sight and very long tongues. Their brilliant colors—all shades of pink, blue, red, orange, turquoise, and green—help them camouflage when they come face-to-face with their enemies.

Earth's largest living lizard is the Komodo dragon. It can grow to be ten feet long and may weigh as much as 150 pounds! These giant island **carnivores** eat animals as large as goats, pigs, and deer.

Saltwater crocodiles are the largest **reptiles** on Earth, some weighing up to one ton. Looking like very large lizards, crocodiles make their homes in tropical **climates**, and are often seen floating like logs in the water with only their nostrils, eyes, and ears showing. Like Anna, they are **nocturnal** hunters, hunting at night. Crocodiles have the most powerful bite in the entire animal **kingdom** and are fierce hunters, living off fish and small **mammals**. Some live to be more than one hundred years old!

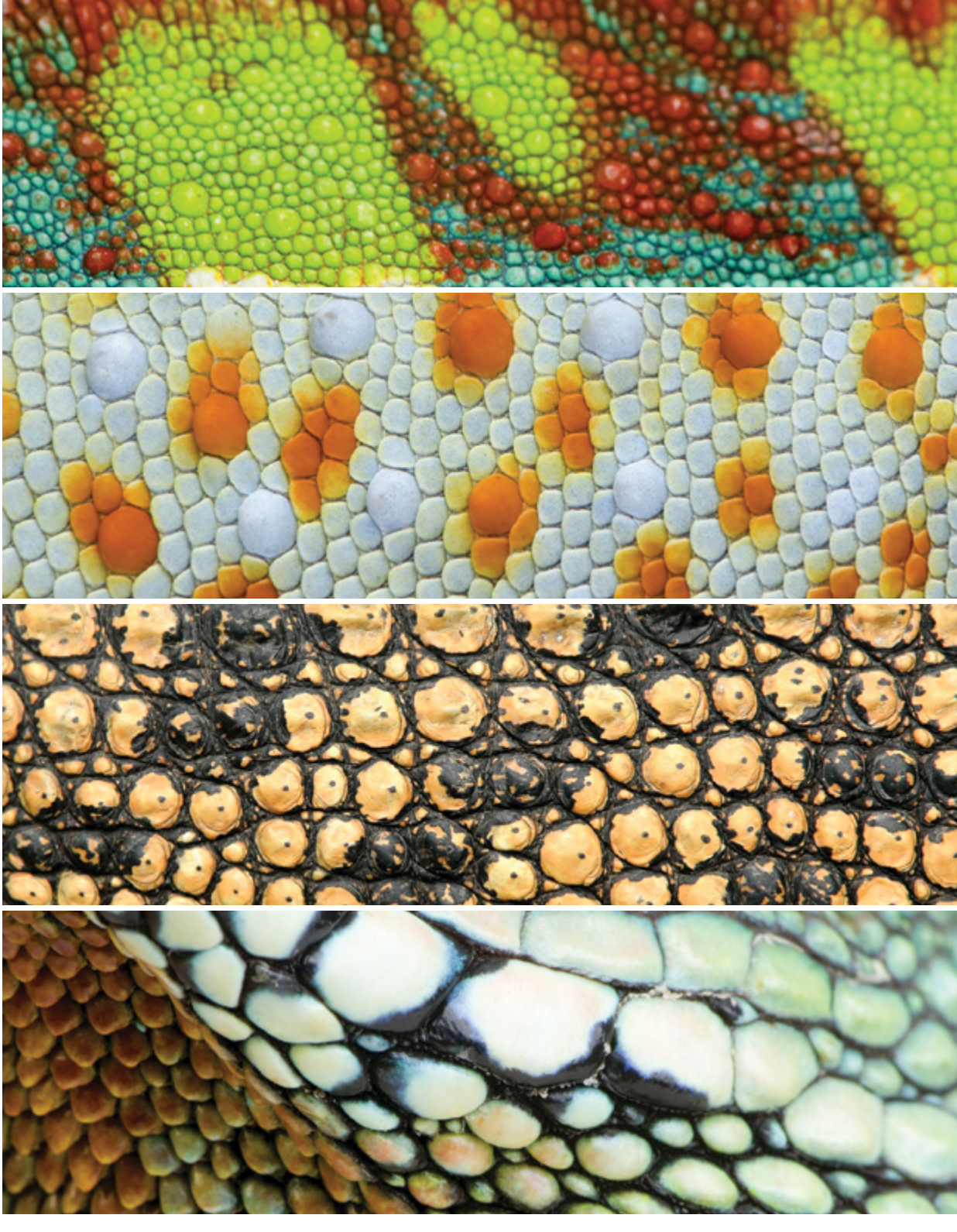
Alligator and crocodile

Alligators resemble crocodiles, but they are usually less **aggressive**, or boldly forceful, and live in freshwater **habitats**. Can you tell the difference between an alligator and a crocodile? Alligators usually have a wide, rounded, U-shaped snout, and crocodiles tend to have longer, more pointed, V-shaped noses.

Look at all of these **reptiles** side by side: chameleons, Komodo dragons, crocodiles, and alligators. What do you notice about their skin? Is it rough or smooth? Does it look thick or thin?

Remember when I mentioned that **reptiles**' skin is waterproof, and that it is hard, thick, and scaly? Their type of scaly skin protects them from overheating, and because their skin is waterproof, it keeps water *inside* their bodies. Because **reptiles**' skin is very **sensitive** to—or easily affected by—**temperature**, it becomes hot or cold very quickly when exposed to sun or shade. Like many **amphibians**, some **reptiles** shed their skin. Many lizards and snakes shed their skin several times a year as they grow. Snakes do not eat their shed skin the way **amphibians** do.

Turtles and tortoises are the only **reptiles** with bony shells as part of their skeletons. Their backbones are actually fused to their shells. These shells may be flat or domed. Some turtles, like spiny softshell turtles, have softer shells so that they can swim faster, but some land-dwelling tortoises, like Galapagos tortoises, need hard, leathery shells to protect them from **predators**. Their legs vary in appearance, depending upon where they live as well. Sea turtles have oar-shaped flippers for moving through water **effectively**. Many turtles have claws which help them



Reptile *scale*

Frog and snake eggs

dig, and pond turtles also have webs between their claws to effectively maneuver, or move, through water. Land tortoises—like the giant Galapagos—have huge, column-shaped legs with claws. These claws help them dig into the ground to move across it. Some turtle species live for more than a century! That's a very long time indeed.

Body coverings are an important difference between **amphibians** and **reptiles**. Another thing that sets the two groups apart is their eggs. Remember the picture that showed strands of thousands of soft eggs that Tabitha Toad laid in the pond? Most **reptiles**

lay far fewer eggs, and they lay their eggs in nests on land. **Membranes**, soft outer coverings, that provide protection and also help to hold in necessary water for eggs to grow, usually coat the inside of reptilian eggs. In most **reptile** species, the eggs are also covered in leathery, **calcified** shells. A few snakes and lizards give birth to fully formed, live young instead of laying eggs. The garter snake, a snake that is right here in North America, is one of these exceptions to the rule; so is the Solomon Island Skink, a lizard whose **habitat** is near the continent of Australia.

Like **amphibians**, **reptiles** live all over the world. They prefer hot, low areas like rainforests, prairies, deserts, and oceans, but they can be found everywhere except near the cold South Pole.

If you are as fascinated as I am with **reptiles** and **amphibians**, you may want to think about becoming a herpetologist. Yes, indeed—*herpetologist* is the name given to a scientist who specializes in herpetology, the study of certain crawling animals, specifically, **reptiles** and **amphibians**. With more than 5,600 species of lizards alone, that should keep you busy for a lifetime!

Chapter

11 Reptiles

Hi again, it's Rattenborough! You have already learned a little about today's group of animals, which are **reptiles**. You already know that **reptiles** are **cold-blooded** animals and **vertebrates**. But did you know that **reptiles** live both on land and in water like **amphibians**? **Reptiles** have lungs from the time they are born, not **gills**, like **amphibians**.

You may also already know that **reptiles** lay eggs. Some **reptile** eggs have soft shells and some have hard shells. They lay their eggs on land. A few snakes hold the eggs inside their bodies until they hatch. Very few rare **reptiles** do give birth to live young, never making real eggs.

Many different groups of animals are classified as **reptiles**. These include animals such as crocodiles, alligators, turtles, tortoises, snakes, and lizards.

Crocodiles, turtles, snakes, and lizards are all ***reptiles****.*

Some people may think **reptiles**, mainly snakes, are scary. Most **reptiles** will not harm people. But there are some **reptiles** that you should try to avoid. The black mamba is the best example. This is the longest and most **venomous** snake in Africa. It is also the deadliest snake in the world. A mamba **injects venom** whenever it bites something. A mamba bite can kill any animal—even a human—in less than 20 minutes!

Rattlesnakes, copperheads, and water moccasins are types of **venomous** snakes found in the United States. Rattlesnakes, or rattlers, are easy to spot because they have "rattles" that shake on their tails. You know when there is one nearby because you can hear the rattles shaking.

Copperheads have a triangle-shaped head and dark stripes. They are normally less than three feet long. They prefer to live in rocky, wooded areas. They only bite humans if they are attacked or startled.

Water moccasins live in the water so they are hard to spot. They have a dangerous bite, but rarely attack humans. If you live in a southern state like Florida, Alabama, Mississippi, or Louisiana, you are more likely

Rattlesnake

Copperhead

Water Moccasin

to see one. They live in swamps or shallow lakes. You might want to avoid swimming in shallow waters if you live in those states.

Some people think snakes are slimy because their skin looks shiny, but most **reptiles** have thick, dry, scaly skin. **Reptiles** are known for **molting**, or shedding their skin. **Reptiles** shed their skin several times during their lives. Snakes, for example, shed their skin in one big piece. They do this when they grow too big for their current skin.

The biggest **reptile** is the saltwater crocodile, which lives mainly in Australia and a few parts of India and Asia. Male saltwater crocodiles can grow to be 20 feet long or more! Attacks on humans are rare. If they do attack a human, it's usually not a happy ending.

Crocodiles have the most powerful bite in the entire animal **kingdom**. Their bites are ten times stronger than that of a great white shark. Despite their power when they bite and snap their jaws shut, it is fairly easy to hold a crocodile's mouth closed. They open their mouths using a weak set of muscles. In fact, a third grader may be able to hold a crocodile's jaw shut . . . would you like to try?

This snakeskin has been left behind by a large snake after it ***molted****.*

Chapter

12 Birds

Yoo hoo—over here! It's Rattenborough! So far, you have learned about the following groups of animals within the animal **kingdom**: **mammals**, **reptiles**, fish, and **amphibians**. Do you remember all of their different **characteristics**? Do you remember that we said that fish were the largest group of **vertebrates** in the animal **kingdom**? Well, today we are going to talk about the second largest group of **vertebrates**—birds.

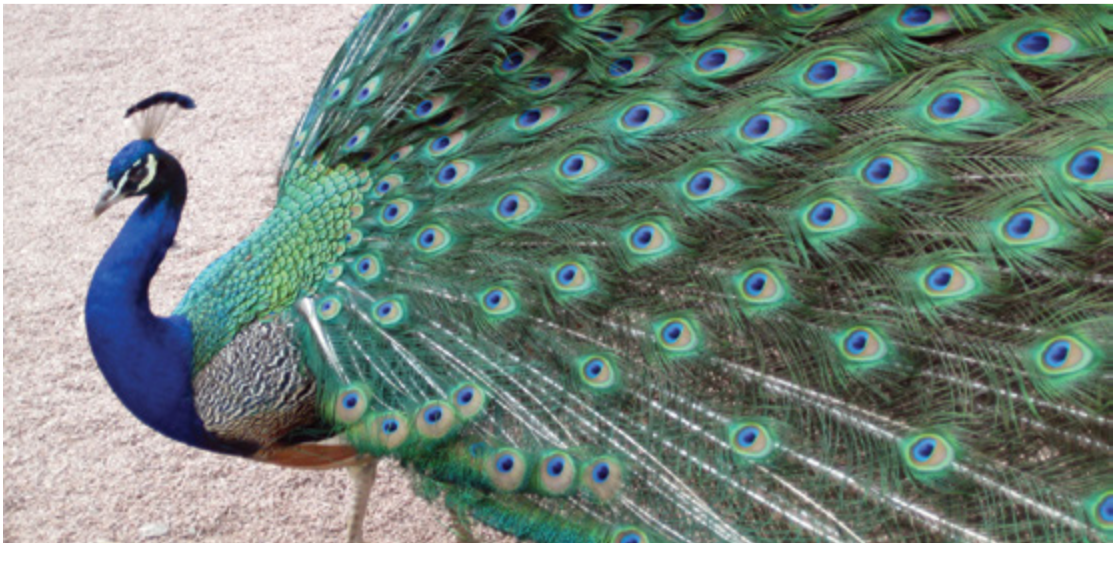
Birds belong to a group all their own. Birds, like all living things, are highly adaptive, meaning they can **survive** in many different **habitats**. You can find them in deserts and in the coldest places on Earth. Many love forests. There are only a few birds found way out to sea, many miles from land. But if you are out in a boat only a few miles from land, you may see many sea birds, such as seagulls.

Different kinds of birds live in many different ***habitats****.*

Like **mammals**, birds are **warm-blooded**. Many birds **migrate** when the seasons change. In late fall, they fly in groups called **flocks** from colder places to warmer places. Then, in the spring after winter is over, they **migrate** back to the place where they were in the fall. Birds are the only animal besides some insects and bats that are able to fly like an airplane.

All birds have wings, but not all birds are able to fly. Penguins are probably the best known birds that do not fly. Penguins make up for not flying by being great swimmers. Ostriches, the largest of all birds, can't fly either, but they sure can run very fast! They also lay the world's largest eggs.

Besides wings, all birds have two legs and a mouth without teeth, called a beak. A key **characteristic** of birds is that they all have **feathers**. **Feathers** help these **warm-blooded** animals fly and help them maintain a **constant** body **temperature**. Bird **feathers** come in all kinds of colors and sizes. A bird's **feathers** are also called **plumage**. Peacocks have the fanciest **plumage** of all. They like to show off by fanning their long, colorful **feathers**.



*All birds have wings and **feathers**, but not all birds can fly.*

Most birds are nesting animals. Many birds make their own nest, often high up in the trees or in thick bushes. They use bits and pieces of nature, such as twigs and parts of plants, to create their nest. Other birds build their nests in tree holes. Some bird nests are made of mud.

Most birds lay eggs in their nests. Some lay a bunch of eggs and some lay only one or two. The nest needs to be in a safe place to protect the little eggs from the weather and other animals that might eat the eggs. Birds sit on their eggs to keep them warm and safe until the eggs hatch. Once they hatch, the baby birds need to eat. Mother and father birds fly out from the nest and find food for their babies. They fly back to the nest and place the food in each baby's beak.

Many birds are **omnivores**. Some birds eat seeds and berries. Some eat insects. Some, like the great blue heron, eat fish. Hawks eat little **mammals**. Other birds, like tiny hummingbirds, eat **nectar** from flowers. All birds drink water.

Birds are also known for their songs. Their songs are used to **attract** mates and to claim a place as their own. Sometimes it seems as if they sing because they want to. Maybe they sing just to remind us how beautiful and interesting the animal **kingdom** is!

Different kinds of birds eat different types of food.

Chapter

13 Mammals

Aha! Now we get to an animal group that I really know a lot about! I, Rattenborough, am part of this group of animals myself! I'm talking about **mammals**. Do you remember the **characteristics** that scientists use to identify **mammals**? Hair is one major **characteristic**. Other characteristics include some mammals having live births, laying eggs, and giving milk. They breathe **oxygen** from the air using their lungs. **Mammals** are also **warm-blooded**, and they are **vertebrates**.

Most scientists agree that **mammals** are the smartest creatures in the animal **kingdom**. All animals **communicate** in some way. Dogs **communicate** by barking and wagging their tails. Cows moo. Some cats meow, others roar. One group of **mammals**, primates, uses complex **communication**. Humans use **language** to talk. They also **communicate** with their faces and hands. Some apes and chimpanzees have even been taught to use sign **language** to **communicate**.

Mammals communicate *in different ways.*

There are two other **mammals** that also seem to use an advanced form of **communication**. In fact, you may not even realize that these animals are **mammals** because they live in the ocean. Dolphins and whales are classified as **aquatic mammals**. Dolphins and whales, like other **mammals**, do not have **gills** like fish, so they cannot breathe underwater. Instead, they use blowholes at the top of their heads to blow out water and suck in air. Dolphins and whales rise to the surface of the water and poke their heads into the air to breathe.

Whales and dolphins **communicate** by sending out sound waves through the water. These waves, called **sonar**, help them find their way through the ocean. The sound waves bounce off objects and echo back to the whale or dolphin. The whale or dolphin can tell the size, shape, and speed of objects, and the distance away from them based on the time it takes the echo sound to travel back to them. They also use their sounds to "talk" to each other!

You might think dolphins would be classified as fish, but they are classified as ***mammals****.*

Dolphins and whales also give birth to live young. No eggs needed! They even feed milk to their young. If you study them closely, you will learn that dolphins and whales have hair, not **scales**. They also have very thick skin. Their skin protects them from the cold and animals that are their **predators**.

You might also be surprised to learn that bats are also **mammals**. Bats fly like birds, but they do not have the other **characteristics** that birds have. Bats have fur, not **feathers**. Their arms have wing-like flaps of skin, but they are not like bird wings. Bats also give birth to live young and they produce milk. So, scientists **classify** bats as **mammals**.

*Bats are also **mammals**.*

Here's an interesting fact: not all **mammals** give birth to live young. The duck-billed platypus and spiny anteater both lay eggs like birds and some **reptiles**, but have all the other **characteristics** of **mammals**. Good luck finding one. They are very rare!

Mammals have their fair share of odd members, like the duck-billed platypus. But the basic **characteristics**—hair, backbone, milk, **warm-blooded**—are always present in **mammals** no matter what.

A duck-billed platypus

Chapter

14 Jane Goodall

Jane Goodall is a very famous **primatologist**. She is a scientist who studies a group of **mammals** called **primates**. **Primates** are a group of **mammals** that includes humans, monkeys, gorillas, and chimpanzees. Jane Goodall has spent her whole life studying chimpanzees. She has focused on studying animal **behavior** in chimpanzees. Her discoveries have made her one of the best known scientists in the world.

Goodall was born in 1934 in London, England. When she was a little girl, her father gave her a toy chimpanzee. It looked so real that people who visited her house were afraid of it, but she loved it!

When Goodall was 23, she went to Africa. She began studying chimpanzees with a well-known scientist named Louis Leakey. After a year of working in Africa, Goodall went back to England and studied at the University of Cambridge. Can you guess what her favorite subject was? Chimpanzees!

Jane Goodall

After finishing **school**, Goodall returned to Africa and spent the next 45 years studying chimpanzees in the wild. Her discoveries during those years completely changed the way people think about **primates**.

Before Goodall's work, people thought chimpanzees were **herbivores**. She discovered that they eat meat, too. More importantly, Goodall discovered that chimps were quite **intelligent**. She **observed** them making and using tools! Before that, people thought humans were the only animals that made and used tools.

When you hear the word *tool*, you may think of a hammer, saw, or shovel. Chimps don't use those kinds of tools. A tool is something used to help make a job easier. Tools can be very simple. A rock becomes a tool if you pick it up and use it to crack open a walnut.

*Goodall studies chimpanzees, a type of **mammal** belonging to the **primate** group.*

Goodall **observed** chimps using blades of grass and sticks as tools. Chimps like to eat termites, a type of insect that is like an ant. Termites live in holes underground. To catch these tasty insects, Goodall **observed** a chimp sticking a blade of grass into a termite hole. The termites crawled onto the grass. Then, the chimp took the grass out of the hole and ate all the termites. Before Goodall wrote about this **behavior**, people did not realize how clever chimps and other **primates** are.

Goodall gave names to all the chimps in the group she was studying. She got to know them pretty well. Over time, she learned that chimps were smart animals. She learned that chimps express many of the same feelings as people. They can feel happy, sad, and mad. Chimps can also be mean. Goodall saw them attack and eat small monkeys, not out of hunger, but because they didn't want them around.

A chimpanzee uses a plant stem as a tool.

Goodall is more than a scientist. She is also an **activist**. An **activist** is someone who works hard to solve a problem and change something in the world. Goodall works as an animal rights **activist** to protect chimpanzees and their **habitats**. She tells others about human damage to **habitats**, such as hunting and pollution, and works to stop these problems. She loves working with young people and teaching them how to protect animals. She has written many books and has been the subject of books and movies. She has won many awards for her work in protecting chimpanzees. As of 2015, she was 81 years old and still working to spread the message that animals need to be protected!

Jane Goodall continues to work as an animal rights ***activist****.*

Chapter 15 Scientists Who Classify Animals

Rattenborough, here once again! You have been learning about how scientists study the **characteristics** of living things. They **classify** all living things into one of five large groups called **kingdoms**. You have been learning a lot about how animals are sorted into more specific groups within the animal **kingdom**.

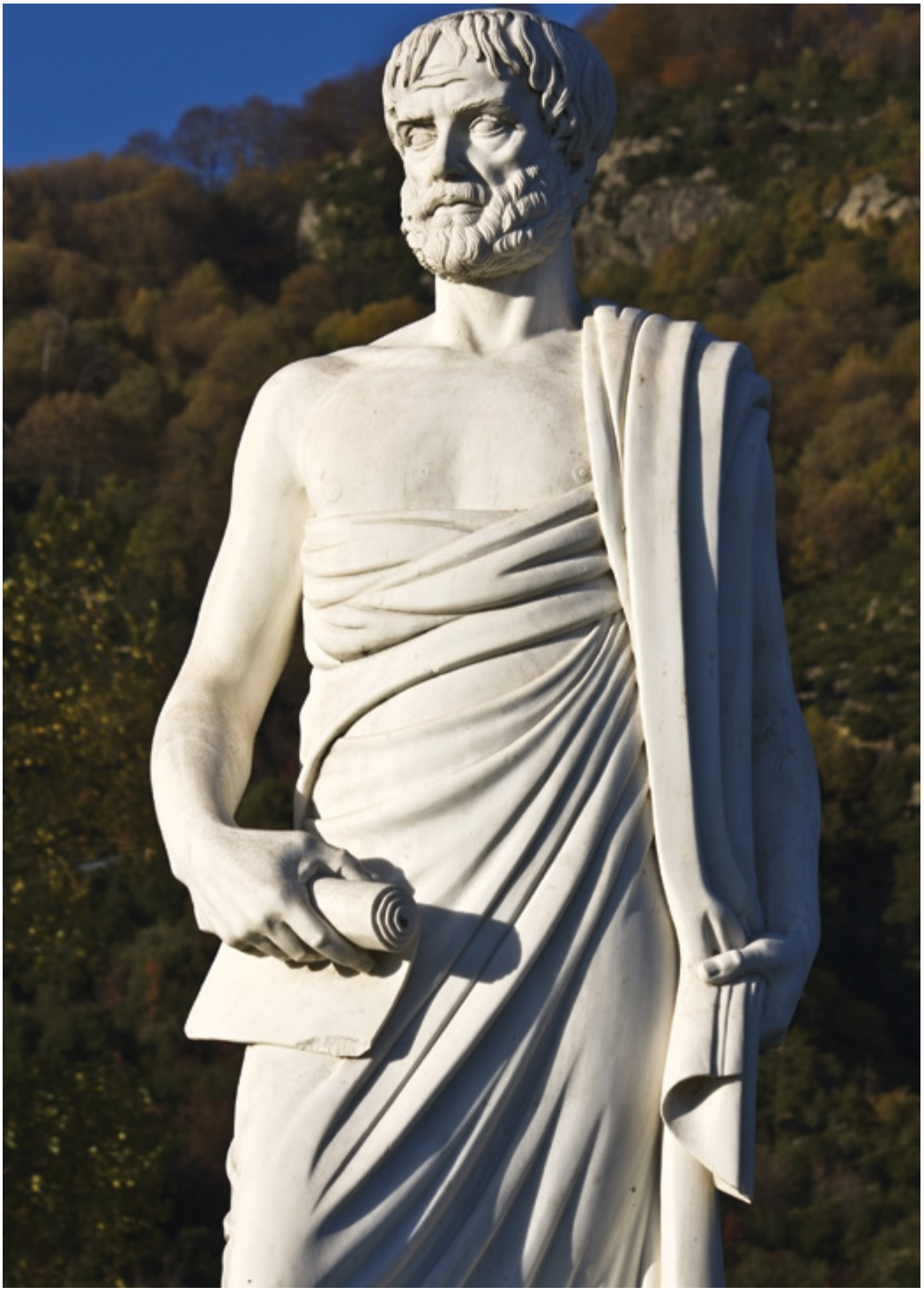
The scientists who study animals and their **characteristics** are called **zoologists**. **Zoologists observe** animals to see the ways they are the same and the ways they are different. For example, **zoologists** discovered that some animals are **warm-blooded** and some are **cold-blooded**.

Zoologists also **classify** animals by whether or not they have a backbone. Animals with a backbone and a spinal cord are called **vertebrates**. Animals that do not have a backbone are called **invertebrates**. We learned that there are five groups of **vertebrates**—fish, birds, **amphibians**, **reptiles**, and **mammals**. The largest group of **vertebrates** is fish.

Zoologists also study other **characteristics** of animals. They study animal body parts and how they are alike or different. All animals need to breathe **oxygen**. But they may have different organs that help them breathe. Fish and young **amphibians** have **gills** that help them get **oxygen** out of the water. **Mammals**, **reptiles**, and adult **amphibians** get **oxygen** from the air using lungs.

Zoologists also study how different animal babies are born and cared for. Do you remember which group of animal mothers feed their babies milk from their own bodies?

Everything we have learned about animals was discovered by scientists. There have been many scientists who have been interested in animals since long, long ago. A Greek man named Aristotle first **classified** animals over 2,000 years ago. He wrote a book called *A History of Animals*. As scientists have discovered and learned more about animals, the **classification** system has changed. There is still much to learn about animals. After all, there are thousands of new animals yet to be discovered and **classified!**



A statue of Aristotle

Every single day, scientists learn new facts about animals. Scientists even find new animals they didn't know existed. There is no end to new knowledge if you study living things!

Today, there are about one million scientists around the world who are studying and **classifying** animals, even as you read this. Every one of them spends the day **observing**, experimenting, and finding new information. This adds to our knowledge about the world we live in.

Do you remember which group of animals feed their babies milk from their own bodies?

If you want to be a **zoologist** when you grow up, there is plenty to study. You never know when someone is going to learn something that changes the way we think about the world. Who knows? Maybe you will be the first to find a **feathered** fish or a flying snail. It may sound silly now, but a hundred years ago, nobody knew that whales **communicated** with each other. What will you discover?

*What kind of animals would you like to **observe** if you were a **zoologist**?*

Chapter 16

Vertebrate Animals Around the World

Read-Aloud

All My Best Friends Represent **Vertebrates**! Now that you've learned about each **vertebrate** group, you know about many **characteristics** that taxonomists use to **classify** these animals. Who wants to try naming the five groups of animals that make up **vertebrates** in the animal **kingdom**?

Why do scientists **classify** organisms? Because there are so many living things on Earth, it gives scientists a way of studying them by showing their relationships. And how do they **classify** them? They look for common, or shared, **characteristics**. What are some of these common **characteristics**? You've learned that some animals are **warm-blooded** and others are **cold-blooded**. Some are **vertebrates** and others are **invertebrates**. You've also learned that there are many other ways to

classify animals into smaller and smaller groups. The scientific classification system, taxonomy, uses these names—**kingdom**, phylum, class, order, family, genus, and species—to describe the groups from largest to smallest.

When they **classify** animals, taxonomists compare and contrast animal **habitats**, physical **characteristics**, skin coverings, feeding habits, and **reproduction**. Today we're going to look at seven different locations on planet Earth, one on each of the continents of the world. We can use our new skills to practice **classifying** a few of the animals that live in each place.

First stop, the American desert! Here are some examples of animals you may find in this North American desert: the western diamondback rattlesnake, the Gila [hee-luh] woodpecker, the desert bighorn sheep in the background, the roadrunner, the banded Gila monster, the bobcat, and the turkey vulture. Just by looking at these animals, are you able to **classify** them? The bobcat and the sheep are both covered in fur, so we know they are **mammals**. What about the Gila monster? It's a **reptile**, one of only two **venomous** lizards in America. What kind of animal is this rattlesnake, which is also covered in **scales**? Yes, it is a **reptile**—it is

Sonoran Desert

venomous as well, and it is one of the few **reptiles** that gives birth to live young.

Great job! Let's move on to the Amazon Rainforest in South America. Native to the rainforest are the spotted jaguar, the green anaconda, the three-toed sloth, the red-bellied piranha, the blue-and-yellow macaw, the pink-toed tarantula, and the caiman, which looks like a small crocodile. The anaconda and the caiman are both covered in **scales**. The bird should be an easy one to spot—the only one with wings and **feathers** is the macaw. And the piranha should be familiar to all of you—these are Paolo's fish relatives. The jaguar and sloth

both belong to the same group. Who can name that group? Great—they're **mammals**; we can tell because they are covered in fur. As you have learned, **mammals** give birth to live babies. Does this dark, hairy spider belong to one of the **vertebrate** groups we've studied? No, the pink-toed tarantula is an **invertebrate**. It's **cold-blooded**, has an exoskeleton, and is a member of the arachnid group.

South American Rainforest

Alpine Mountains

Let's look at some of the animals that make their homes high in the Alpine mountains of Europe. What do you see in the background, there on the rocks? The rock ptarmigan [tahr-mi-guhn] lives in the Alps. So does the black Alpine salamander, the marmot, the golden eagle, the Apollo butterfly, and the pine marten. Which one do you think is not a member of any of the **vertebrate** groups we've studied? Yes, the butterfly is an **invertebrate**, and is classified in the largest group of animals on Earth: insects! The black Alpine salamander shares **characteristics** with both a lizard and a frog. Think about how you would **classify** it. It's a moist-skinned **amphibian**, but an unusual one that lives only

on land and gives birth to fully developed live young. What two-legged, **feathered** animals do you see? Yes, the birds pictured are the ptarmigan and the golden eagle. And **mammals**—are there any fur-covered creatures in the Alps? Yes, the marmot and the pine marten.

The Ganges [gan-jeez] **Delta** of India, on the continent of Asia, is home to swamps, forests, and creeks. The animals that live there include the black-crowned night heron, the wild boar, the Olive Ridley turtle, the Ganges River dolphin, the Indian python, the blue-eared kingfisher, the mugger crocodile, and the chital. Can you spot the **cold-blooded reptiles** here?

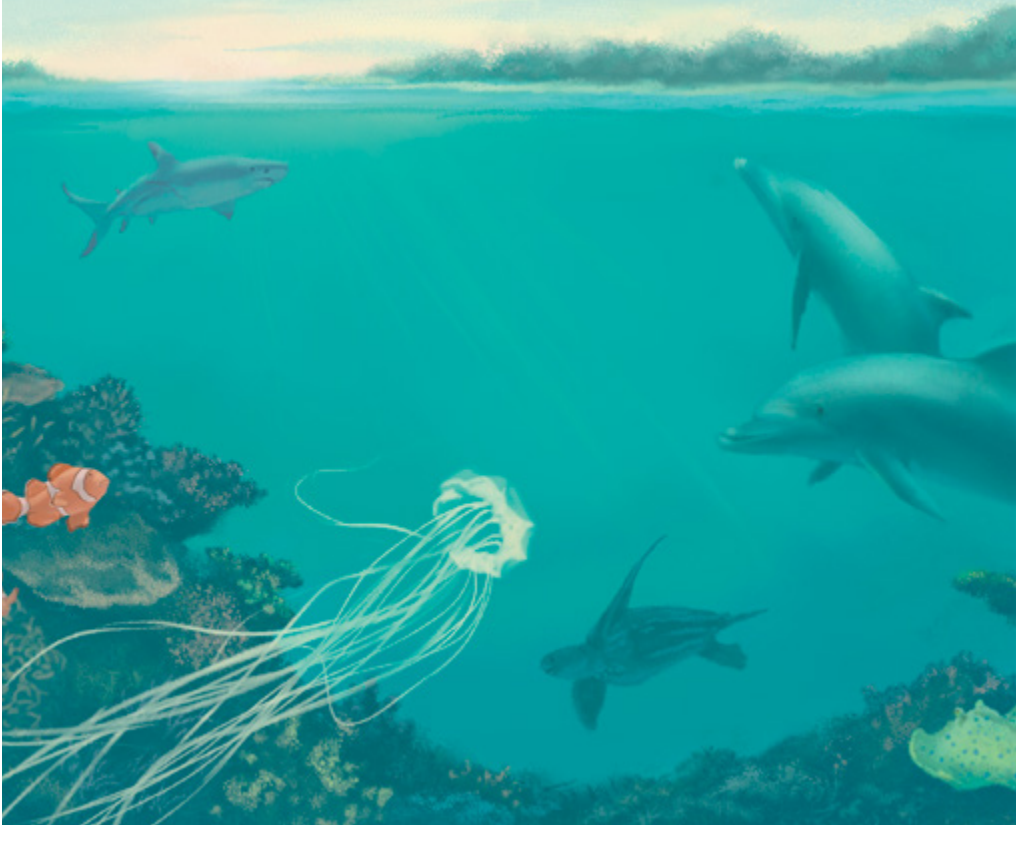
*The Ganges **Delta***

You bet—the crocodile, the turtle, and the python are all representatives of the **reptile** group. Which ones are **warm-blooded mammals**? Yes, the boar, or wild pig, and the chital, a common deer of the area. The polluted waters of the Ganges River have ruined the **habitat** for a number of animals, and this river dolphin is endangered because of the river's pollution. Only one of four river dolphin species in the world, it is a **mammal** just like its ocean-loving relatives. The Ganges river dolphin is sometimes called the blind dolphin; each of its eyes lacks a lens to give it clear vision, but it still uses its eyes to help it find direction. And, of course, our **feathered** friends of the sky—the kingfisher and the heron—are both birds.

African savanna

I bet you've seen pictures of the many large game animals that make their homes in the savannas of Africa. They include the giraffe, the elephant, the hyena, the wildebeest, the lion, the zebra, and the impala. All of these animals belong to the same group of **vertebrate** animals. What are they? Yes, **mammals**! Birds, like the hornbill and the quelea [kwee-lee-uh], live there as well. And **venomous reptiles**, snakes like the gaboon and the black mamba, are deadly to their prey in the savannas.

The Great Barrier Reef of Australia is home to many different sea animals. Animals here include the bottlenose dolphin, the anemonefish, the blue spotted stingray, the box jellyfish, the black-tipped reef shark, and the leatherback sea turtle. Is the jellyfish a fish? Who remembers? No, in spite of its name, the jellyfish is an **invertebrate** and has no **gills**. Be sure to notice the jellyfish's many long **tentacles**. So, do you think the anemonefish is a fish or not? Yes, it is indeed a fish, also called the clown fish because of its colorful markings,

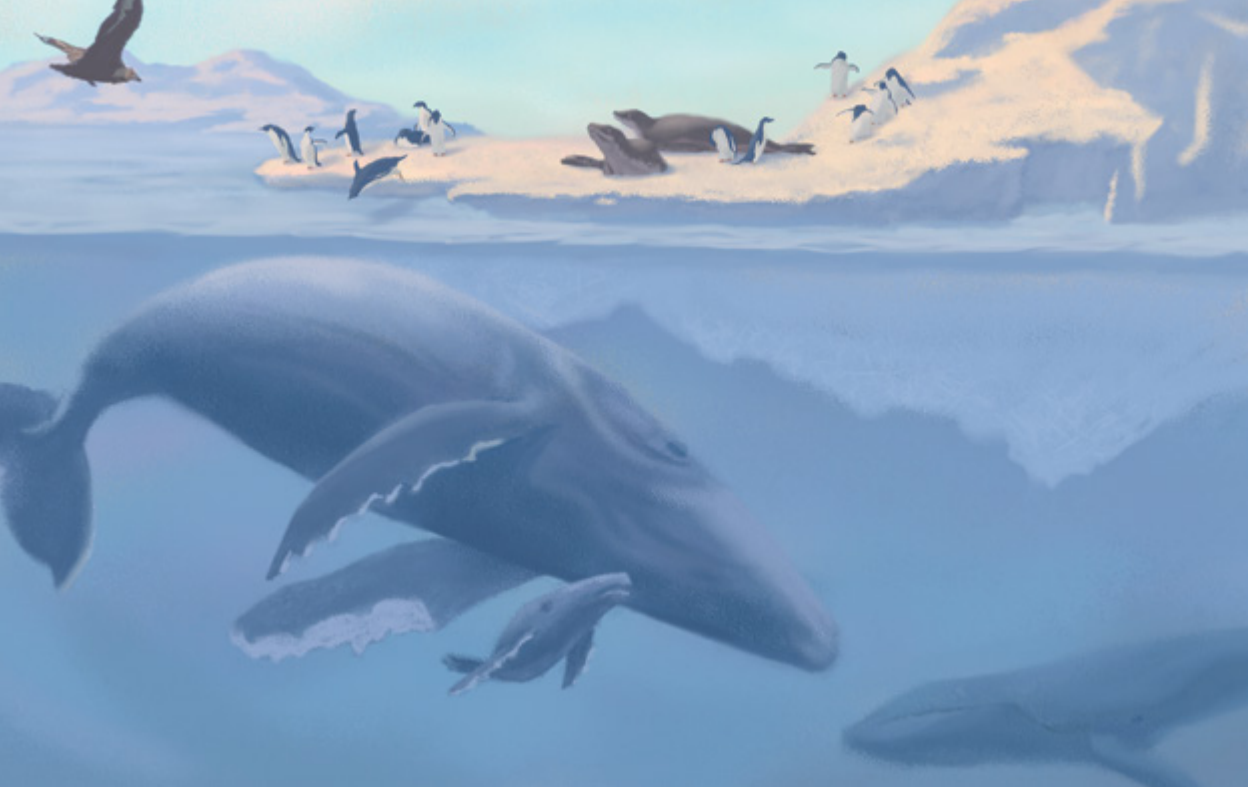


Coral reef

and it lives among the tentacles of another **invertebrate**, the sea anemone. The sea turtle belongs to the **reptile** group, and you probably remember that the dolphin is a milk-producing **mammal** that breathes with its lungs. How about the shark? Yes, it is a fish too. It breathes through **gills**, and unlike the dolphin, does not provide milk for its young. And the stingray? A fish, too—a relative of the shark.

Finally, let's look at Antarctica, the southernmost continent and one of the coldest places on Earth. Emperor penguins live in its icy waters, along with blue whales and humpback whales. Leopard seals, skua, and snow petrels spend half the year in darkness in this frozen coastal region. Only two **vertebrate** animal groups are found on the land in Antarctica. What are they? That's right, **mammals** and birds. You learned that these two groups also share another common **characteristic** as well. **Mammals** and birds are both **warm-blooded**. The energy in the food they eat is used to warm their bodies and keep them from freezing.

These Antarctic animals **survive** in harsh frozen conditions, and they are largely dependent on krill, tiny shrimp-like crustaceans with exoskeletons that live in the waters beneath the ice packs. They are the primary, or main, source of food for the **predators** of Antarctica.



Antarctic ice shelf

As you can imagine, living in the extreme cold of Antarctica presents a major challenge to **cold-blooded** animals. A few fish have **adapted** in an interesting way to **survive** in the cold waters surrounding Antarctica. The icefish has a special chemical in its body that acts like an **antifreeze** and keeps it from freezing!

A few **invertebrates** have found other interesting ways to **survive** the cold **temperatures** of Antarctica. Some mites **survive** by living in the fur of **mammals** or in the **feathers** of birds, close to the warmth of their **warm-blooded hosts**. Now you've seen a sample of the animals that live on each of the seven continents.

There are so many interesting facts about Earth's animals! Before I go, let's each share one interesting fact that you have learned about **vertebrate** animals. Think for a moment about the interesting fact that you wish to share. Turn to your neighbor and share your **vertebrate** fact.

It's been so much fun for me to be with you again. I'm so proud of all that you've learned about the animal **kingdom** over the past few days. I'll look forward to seeing you again soon. In the meantime, I encourage you to keep your eyes open. As you see an animal or read about an animal, think about how you would **classify** it. Next time we're together, perhaps you can tell me about your discoveries. Until then, goodbye!

Chapter

17 Deep-Sea Fish

Oceans are very, very deep bodies of water. However, people cannot go very deep into the ocean. Even with all the right **scuba gear**, including a tank of **oxygen**, there is a limit to how deep you can go underwater. The deeper you go, the higher the **water pressure** gets because of the **weight** of all the water around you.

You can notice **water pressure** if you swim to the bottom of a pool. If you rest on the floor of the pool for a few seconds, you will start to feel the pressure in your eardrums.

The deeper you go in the ocean, the higher the **water pressure** gets. If you dive a few hundred feet down, you will start to feel like someone is squeezing your head and chest. At 1,000 feet, you might pass out. Go deeper than that and you might be crushed by all the **water pressure**!

*Scuba divers feel more **water pressure** the deeper they dive in the ocean.*

How deep are oceans? That depends on where you are in the world. Some parts are a few yards deep, while others are around 10,000 feet. The deepest part of the ocean is more than six miles deep! Down there, the **water pressure** is very strong. It is so strong, it would feel as if someone dropped 3,300 elephants on you at the same time. In other words, you would be crushed to the size of an ant, maybe smaller.

No creature that lives on land can **survive** the **water pressure** of the deep ocean. Most fish can't either. However, there is life down there—lots of it! How do we know? Scientists have created special **submarines** called **submersibles** that can go deep in the ocean.

Some **submersibles** can carry a person or two. Others are controlled remotely from the surface. With a light and a camera, a **submersible** can be used to explore the deepest parts of an ocean. Scientists developed the first **submersible** about 50 years ago and have been discovering some pretty crazy-looking fish ever since!

*A **submersible** exploring deep underwater*

Fish that live deep down in the ocean are unlike any other living things. They have incredibly thick bodies because they need to withstand all that **water pressure**.

No sunlight reaches the bottom of the ocean, so it's completely dark down there. Many deep-sea fish glow! Lantern fish are the most common deep-sea fish. In fact, they are among the most common of all **vertebrates**. There are billions of them down there!

Lantern fish

The anglerfish is easily one of the strangest creatures on Earth. Have you ever seen anything so ugly? Anglerfish are known for their huge mouths and scary teeth. What is more amazing is that they have a built-in flashlight on their head used to **communicate** with other fish.

Humans have only managed to explore a tiny part of the deep seas. If you are interested in discovering new creatures, then you might want to think about becoming a deep-sea **marine biologist**, which is a scientist who explores ocean life.

An anglerfish

Chapter

18 The Komodo Dragon

You have probably heard or read at least one fairy tale with a dragon as a character. In these stories, dragons fly around breathing fire and frightening innocent people, until a brave knight comes along and kills the dragon. Well, you won't find fire-breathing dragons in a book about animal classification. There is no proof that these fairy tale dragons ever **existed**.

There is, however, one real dragon that does **exist**: the **Komodo dragon**. No, it does not breathe fire and it does not fly. It's just a big **reptile**. They can be pretty mean. It's rare, but they have attacked and even killed humans.

Fire-breathing dragons are found only in fairy tales and movies. The ***Komodo dragon*** *is a large* ***reptile*** *found in Indonesia.*

These dragons are named after the **island** of Komodo, which is part of Indonesia. They can be found on four or five other Indonesian **islands**, as well, but overall they are pretty rare.

They prefer hot, dry places. They dig **burrows** two to three feet deep in the ground. Like most **reptiles**, they spend most of their time sleeping or simply relaxing.

A **Komodo dragon** can be as big, or bigger, than a crocodile. They weigh up to 150 pounds and can be over ten feet long from tail to head. The largest one on record weighed 370 pounds, or as much as about six third graders.

*A **Komodo dragon** can be as large, or larger, than a crocodile.*

Like many **reptiles**, they can't hear or see very well. Instead, they have a strong sense of smell. They do not use their **nostrils** to smell—they use their **tongue**! They can smell food several miles away if the wind is blowing in the right direction!

Speaking of food, Komodo dragons are **carnivores**, so they eat mainly meat. For the most part, they eat dead animals. But if there are no dead animals around, they hunt for food.

Komodo dragons *use their tongues to smell!*

They have sharp claws and teeth and, when needed, can move pretty fast. They are the only lizards known to attack, kill, and eat animals that are bigger than they are. They might hunt a goat, deer, and even water buffalo!

Young **Komodo dragons** eat insects, smaller **mammals**, and birds. How? They climb trees and catch them. They will eat anything they can get their claws on, as long as it's meaty.

You definitely don't want a **Komodo dragon** to bite you or even lick you! Its **saliva** is loaded with dangerous germs that can make people very sick. The best way to **observe** a **Komodo dragon** is at a zoo, unless you are very brave or very foolish!

*The safest way to **observe** a **Komodo dragon** is at a zoo.*

Glossary for *Rattenborough's Guide to Animals*

A

absorb—to take in or soak up (**absorbs**)

activist—a person who strongly believes in changing something and works hard to try to make change happen

adapt—to change

adaptive—easily changes to live in different environments

adult—grown-up

amphibian—an animal that can live on land and in water (**amphibians**)

animal—a living thing that is not a plant (**animals**)

aquatic—living, growing, or found in water

Aristotle—a Greek man who lived long ago and was one of the first people to write about classifying animals

attract—to draw or pull toward a person, place, or thing

B

behavior—how a person or animal acts

burrow—a hole in the ground dug by an animal for safety or for living (**burrows**)

C

calcified—hardened, especially by deposits of the mineral knows as calcium salts

carnivore—an animal that mainly eats meat (**carnivores**)

characteristic—something that makes a person, thing, or group different (**characteristics**)

classify—to put things into groups based on similarities or type classification to (**classification, classifying, classified**)

climate—the usual weather patterns in a particular area

cold-blooded—only able to control body temperature by using surroundings; Reptiles are cold-blooded

communicate—to share information with others through language, writing, or gestures (**communication**)

constant—unchanging

creature—an animal (**creatures**)

crocodile—a large reptile that lives near water and has thick, scaly skin and very strong jaws (**crocodiles**)

D

damage—harm

deadliest—most likely to cause death

delta—a triangular area found where a stream or river flows into a bigger body of water and deposits mud and sand in a fan-shaped area (**deltas**)

duck-billed platypus—a mammal that has a bill like a duck and lays eggs

E

echo—a sound that is repeated when sound waves bounce off the surface of an object

exist—to be alive (**existed**)

extinction—the state of no longer existing, usually referring to plants or animals that have died out completely

F

feather—one of many light, soft parts that covers a bird's skin (**feathers**)

fin—a bony **spine** covered with skin that sticks out from a fish's body and helps it swim (**fins**)

flexible—bendable

flock—a group of birds (**flocks**)

fragile—easily harmed

G

gill—one of a pair of organs fish use to breathe underwater (**gills**)

gnaw—to bite or chew something over and over

H

habitat—a place where plants and/or animals live and grow (**habitats**)

herbivore—an animal that only eats plants (**herbivores**)

hibernate—to spend a season with slow or no movement of body functions (**hibernating**)

hover—to float in the air close to something

I

inject—to force in fluid, like poison, usually by piercing the skin (**injects**)

intelligent—smart

invertebrate—an animal without a backbone (**invertebrates**)

island—an area of land completely surrounded by water (**islands**)

K

kingdom—a major group into which all living things are classified (**kingdoms**)

knowledge—information

Komodo dragon—the largest, living lizard (**Komodo dragons**)

L

language—words used to communicate

life cycle—the stages through which a living thing goes from birth until death

M

mammal—an animal that usually gives birth, has hair, feeds milk from its own body to its young, and is warm-blooded (**mammals**)

marine biologist—a scientist who studies underwater sea life

metabolism—the process that occurs when food is changed to energy in cells of the body

migrate—to move from one place to another

molt—to shed skin (**molting**, **molted**)

moss—a very small green or yellow plant that grows on moist rocks, tree bark, or wet ground

N

nature—everything in the outside world that is not made by people

nectar—sweet liquid that comes from flowers

nocturnal—active during the night

nostril—one of the openings of the nose (**nostrils**)

O

observe—to watch closely and carefully (**observing**)

ocean—an enormous body of saltwater

omnivore—an animal that eats both plants and meat (**omnivores**)

orchestra—a group of musicians who play instruments together

organ—an important body part that performs a specific function (**organs**)

oxygen—a colorless gas that animals must breathe to stay alive

P

pelt—the skin of a dead animal with hair or fur on it (**pelts**)

penguin—a bird that cannot fly, has black and white feathers, and uses its wings for swimming (**penguins**)

plumage—birds' feathers

pollution—making land, water, or air dirty, thus causing damage

predator—an animal that hunts other animals for food (**predators**)

primate—a mammal such as a monkey, ape, or human (**primates**)

primatologist—a scientist who studies primates

R

reproduction—the process that lets a plant or animal produce offspring, or young, of their own kind

reptile—a cold-blooded animal with tough, scaly skin that uses its surroundings to control its body temperature (**reptiles**)

rodent—a small mammal with large, sharp front teeth, such as a squirrel, rat, or mouse (**rodents**)

S

saliva—spit

savanna—a large flat area of land with a lot of grass and few trees commonly found in Africa and South America

scale—a thin, small disc on the outside of the bodies of some animals, such as fish and reptiles (**scales**)

school—a large group of fish or other aquatic animals that swim together (**schools**)

scientist—an expert in science who has knowledge of the natural world based on facts learned through observation and experiments (**scientists**)

scuba gear—clothes and equipment used for diving and breathing underwater

secrete—to seep out from the skin (**secretes**)

sensitive—able to feel something very quickly or intensely

sign language—a way to communicate using hands to make signs that stand for letters and words

sonar—a way to find things underwater using sound waves

spinal cord—a large group of nerves that connects to the brain and sends messages to other nerves in the body

spine—backbone

startle—to surprise (**startled**)

submarine—a type of ship that carries people deep underwater for a long time (**submarines**)

submersible—a type of ship used to travel deep underwater for research that usually operates without people inside of it (**submersibles**)

suction cup—a round, shallow cup that can stick to a surface (**suction cups**)

survive—to continue to live (**survives**)

T

tadpole—the early form of frogs and toads that has gills and a tail, but no legs (**tadpoles**)

temperature—the measurement of how hot or cold something is (**temperatures**)

territorial—keeping animals or people from coming into an area already claimed

tongue—the part of the mouth used for tasting, licking, and swallowing

V

venom—poison produced by an animal used to harm or kill another animal

venomous— having or producing poisonous fluid

vertebrate—an animal with a backbone (**vertebrates**)

W

warm-blooded—having a constant body temperature; Mammals are warm-blooded.

water moccasin—a type of poisonous snake found in the southern United States (**water moccasins**)

water pressure—the weight or force of water as it presses against something or someone

weather—what it is like outside

weight—how heavy something is

wetland—an area of land covered with shallow water, such as a swamp (**wetlands**)

Z

zoologist—a scientist who studies animals and their characteristics (**zoologists**)

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