

REPTILES, AMPHIBIANS, AND FISH

3 - 8 Science Unit Study



THE GOOD AND THE BEAUTIFUL

REPTILES, AMPHIBIANS, AND FISH

CREATED BY THE GOOD AND THE BEAUTIFUL TEAM



Table of Contents

Unit Information	ii
Read-Aloud Book Pack and Correlated Books	iii
Grades 7–8 Lesson Extensions	iv
Supplies Needed	v
Vocabulary	vii
Lesson 1: Reptiles, Amphibians, and Fish	1
Lesson 2: Turtles	9
Lesson 3: Snakes	12
Lesson 4: Lizards	25
Lesson 5: Crocodilians	34
Lesson 6: Tuataras	41
Lesson 7: Frogs and Toads, Part 1.	45
Lesson 8: Frogs and Toads, Part 2.	48
Lesson 9: Newts and Salamanders	53
Lesson 10: Caecilians	58
Lesson 11: Fish	63
Lesson 12: Saltwater Fish	67
Lesson 13: Freshwater Fish	75



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UNIT INFORMATION

Student Journal



All The Good and the Beautiful science units include activities in a student journal. Each student should have his or her own student journal, and the parent or teacher will direct the student regarding when to complete the activities as directed in the lessons. Science journals can be purchased by going to goodandbeautiful.com/science and clicking on the *Reptiles, Amphibians, and Fish* unit link.

Science Wall



All The Good and the Beautiful science units include vocabulary words to be placed on your science wall, which is a wall or tri-fold presentation board in your learning area on which you can attach the vocabulary words and other images. **Cut out the vocabulary word cards at the beginning of the unit.** The course will indicate when to place them on the wall.

Lesson Preparation



All The Good and the Beautiful science units include easy-to-follow lesson preparation directions at the beginning of each lesson.

Activities and Experiments



Many of The Good and the Beautiful science lessons involve hands-on activities and experiments. An adult should always closely supervise children as they participate in the activities and experiments to ensure they are following all necessary safety procedures.

Unit Videos



Some lessons include videos that were created by The Good and the Beautiful. Have a device available that is capable of playing the video from goodandbeautiful.com/sciencevideos or from the Good and Beautiful Homeschooling app.

Content for Older Children



Some lessons include extra content that is more applicable for older children (grades 7–8). Parents or teachers may choose to skip this content if instructing only younger children.

Content for Younger Children



Some lessons include extra content that is more applicable for younger children (grades 3–6). Parents or teachers may choose to skip this content if instructing only older children.

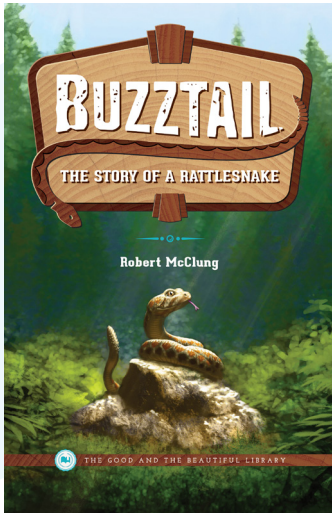
Versions

New discoveries are being made on an ongoing basis. This course is reviewed and revised periodically to keep information as up-to-date as possible. This version is the second edition of this unit.

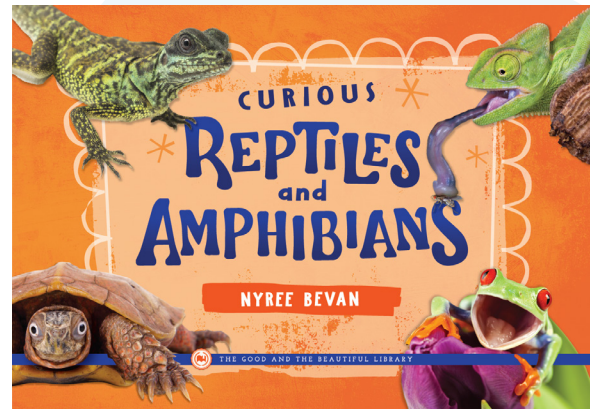


READ-ALoud BOOK PACK

The books below are optional read-aloud books that complement this unit. These books can be purchased as a book pack by going to goodandbeautiful.com/science and clicking on the *Reptiles, Amphibians, and Fish* unit.



Buzztail: The Story of a Rattlesnake
by Robert McClung



Curious Reptiles and Amphibians
by Nyree Bevan



CORRELATED BOOKS

The Good and the Beautiful Library has several books that correlate well with the *Reptiles, Amphibians, and Fish* unit. It can be a wonderful experience for children to read books on their levels related to the subjects they are learning in science. The library includes both fiction and nonfiction books organized according to reading level. Find the correlated books by going to goodandbeautiful.com/science and clicking on the *Reptiles, Amphibians, and Fish* unit.

LESSON EXTENSIONS

Each lesson has an optional lesson extension for children in grades 7–8. Complete the lesson with all the children and then have the older children complete the self-directed lesson extension. These extensions are located in the 7–8 student journal.

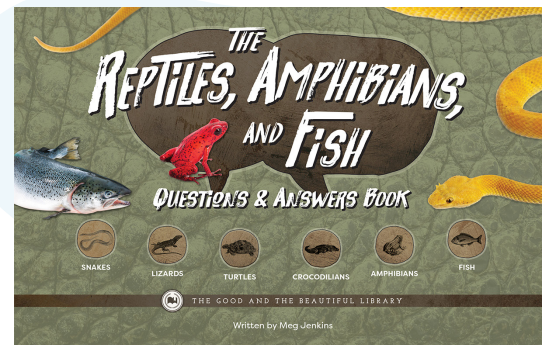
The answer key for the lesson extensions can be found on the Good and Beautiful Homeschooling app in the science section. Visit goodandbeautiful.com/apps for information on accessing the app. The app can be accessed from a computer, phone, or tablet.

The amount of time it will take to complete each lesson extension will vary for each child. The average time is about 10–15 minutes per extension. Parents/teachers and children may choose to omit parts of the lesson extension if desired. Encourage the children to stretch their capabilities, but also reduce work if needed.

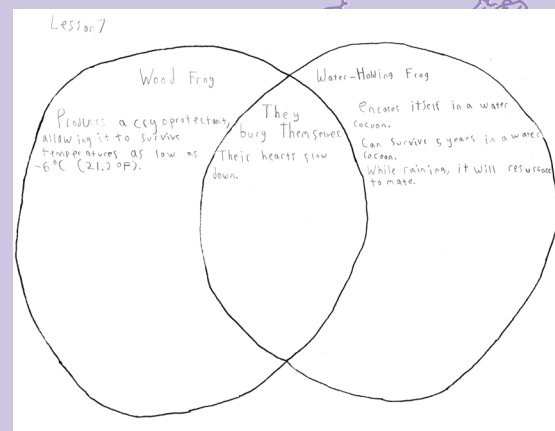
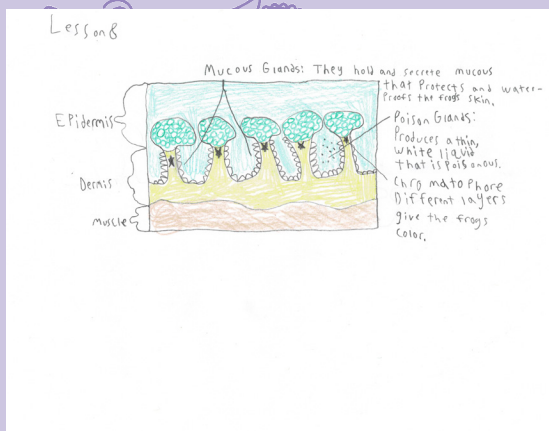
Some of the grades 7–8 lesson extensions have the children summarize the material read. Teach the children to look for key information, summarizing the most important points. Students can also add notes with their thoughts and the facts that are most interesting to them.

Optional Grades 7–8 Reading Book

We recommend *The Reptiles, Amphibians, and Fish Questions & Answers Book* as extra reading for students in grades 7–8. This book can be purchased by going to goodandbeautiful.com/science and clicking on the *Reptiles, Amphibians, and Fish* unit.



The Reptiles, Amphibians, and Fish Questions & Answers Book by Meg Jenkins



SUPPLIES NEEDED

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Lesson 1

- Flashlight for each child (optional)
- Tape
- Body temperature thermometer
- Air temperature thermometer or house thermostat
- A device with a weather app

Lesson 2

- Scissors
- Tape

Lesson 3

- 1 game marker for each player (a coin, bean, pebble, etc.)

Lesson 4

- White school glue
- Scissors
- Glue stick

Lesson 5

- White school glue or glue stick

Lesson 6

- Colored pencils or markers in blue, green, and brown

Lesson 7

- Colored pencils

Lesson 8

- 1 party blower or noisemaker or straw per child
- Roll of masking tape, painter's tape, or duct tape
- Glue stick
- Device with a weather app

Lesson 9

- 2 freezable plastic containers, with lids, big enough to hold 1 c of liquid
- 1 c water
- Permanent or dry-erase marker
- 1 c maple or corn syrup

Lesson 10

- 2 hard-boiled eggs (leave shell on one of the eggs)
- Food coloring (any color)
- 2 glasses
- Tap water

Lesson 11

- Glue stick
- 2 Tbsp ground coffee or black pepper
- Paper coffee filter
- 2 clear cups
- A rubber band
- Water

Lesson 12

- Glue

Lesson 13

- None



VOCABULARY

Instructions: Cut out the vocabulary cards in this section. Place them on your science wall when prompted to do so in the lessons. Review the vocabulary words several times during this unit and, if desired, at various times throughout the school year.

Reptiles



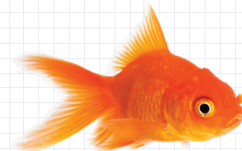
vertebrates that have scaly skin, are ectothermic, breathe oxygen using lungs, and lay eggs



Amphibians

vertebrates that have wet skin, can live in water or on land, are ectothermic, and typically breathe oxygen through their skin, gills when young, and lungs as an adult

Fish



an aquatic vertebrate that is covered in scales, usually has fins, is ectothermic, and breathes oxygen through gills



Vertebrate

an animal having vertebrae or backbones

Ectotherm

an animal that depends on external sources for its body heat

Venom

a toxin capable of causing injury or death through injection into prey

Constrictor

a type of snake that wraps around and compresses its prey



Permeable

having openings that liquids or gases can pass through

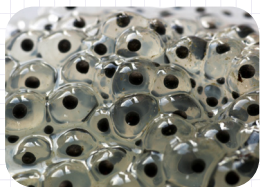
Semipermeable

allowing certain substances to pass through

Tadpole



aquatic frog larva that has an oval-shaped body; a long, flat tail; and gills



Frogspawn

a cluster of frog eggs surrounded by a gelatinous material that floats on water

REPTILES, AMPHIBIANS, AND FISH

Objective

Help the children learn about the different body features of reptiles, amphibians, and fish that enable them to live in various habitats.



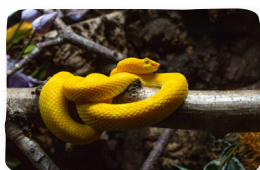
Preparation:

- Before the lesson begins, cut out the “Hiker Hunt Cards” and place them throughout the room, allowing them to be partially visible. See the “Hiker Hunt Activity” for suggestions on where to place them.

Activity Supplies:

- Flashlight for each child (optional)
- Tape
- Body temperature thermometer
- Air temperature thermometer or house thermostat
- A device with a weather app

Introduction



Read to the children: Trekking through the lush, green Costa Rican rainforest, a hiker discovers a brilliant blue poison dart frog clinging to a tree trunk. Carefully

climbing down to the river’s edge where the silver tilapia fish streak by, the hiker almost steps on a venomous sunshine-yellow snake.

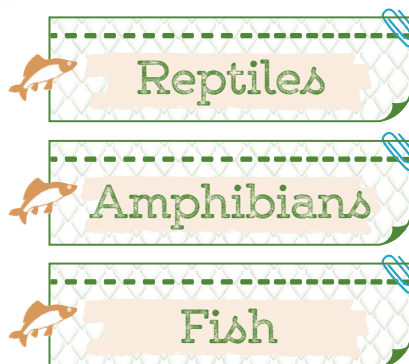
What could the animals in these groups possibly have in common? They all have backbones and use external sources to control their body temperatures. From the slithering and slimy to the creepy and crawling, and on to the animals that move through the water with the greatest of ease, reptiles, amphibians, and fish are a fascinating group to study.



Science Wall



Place the vocabulary cards **REPTILES**, **AMPHIBIANS**, and **FISH** on your science wall. Read and discuss the words and definitions.



Hiker Hunt Activity



Read to the children: Let’s imagine we are world-traveling hikers searching for interesting vertebrates (animals with backbones) living in the rainforest of Costa Rica. But beware: you might encounter some dangerous animals, so be careful where you step and what you touch!

Hiker Hunt Cards



Fer-de-lance



White-lipped mud turtle



Red-eyed tree frog

Snake Shuffle Game



Snake Shuffle Cards

BONUS CARD!

Q: Can all snakes swim?

A: Yes

All snakes have the ability to swim from the time they hatch or are born.

Move ahead **2** spaces.

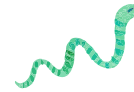


Q: True or False? Snakes cannot blink.

A: True

Snakes do not have eyelids, so they can't blink. Their eyes are protected by a transparent (clear) scale that covers the entire eye.

If answered correctly, move ahead **1** space.



Q: True or False? Snakes can regulate their own body temperature internally.

A: False

Snakes are ectotherms, which are animals that rely on external sources, such as the sun, to regulate their body temperature. This is why snakes like to sunbathe on rocks!

If answered correctly, move ahead **1** space.

Q: True or False? When a snake gets cold, it moves quickly to warm up.

A: False

When a snake gets cold, it slows down. Snakes aren't able to warm themselves up by moving faster or covering up like humans can. They must have an external source of warmth, such as the sun.

If answered correctly, move ahead **3** spaces.

Q: Do snakes chew their food?

A: No, they swallow their food whole.

Even though snakes have teeth, they don't use them for chewing food. Their teeth are pointed backward in their mouth to help them grip the food that they're swallowing.

If answered correctly, move ahead **1** space.



BONUS CARD!

Q: Do snakes have to eat every day?

A: No

Snakes digest their food very slowly and have a very slow rate of metabolism, so they can go without food for days. Some snakes, like the king cobra, can survive for MONTHS between meals.

Move ahead **2** spaces.

Q: Do constrictors kill by suffocating their prey?

A: Not usually. The squeezing cuts off the blood supply of their prey.

For a long time, we thought constricting snakes killed by cutting off the oxygen supply, but scientists recently learned that lack of blood circulation is the more accurate cause of death.

If answered correctly, move ahead **3** spaces.

BONUS CARD!

Q: Name two animals that prey on snakes.

A: Birds of prey, foxes, other reptiles, bobcats, raccoons, skunks, etc.

Move ahead **2** spaces.





Objective

Help the children learn the distinguishing characteristics of lizards, identify several types of lizards from around the globe, and understand that lizards can live in most climates.



Preparation:

- ☐ Cut out the "Locate-a-Lizard Cards."
- ☐ Cut out the lizard circles on the "Locate-a-Lizard World Map" in each student journal.

Activity Supplies:

- White school glue
- Scissors
- Glue stick

☐ Lizard Facts

Read to the children: Take a look at this Indo-Chinese forest lizard. What type of animal do you think a lizard is? Lizards are reptiles!

- Most lizards have thick, scaly skin that can protect them from injury and help retain moisture.
- A few lizard species have a venomous bite!
- Some lizards live on land, and some spend most of their time in water.
- Lizards breathe oxygen with lungs and are ectothermic.

Lizards—fascinating, often quick-moving creatures—lead lives full of adventure. Some can leap through the tallest of trees, glide through water, or scramble across the hottest deserts. Around 5,000 different species of lizards make their homes in many habitats around the world. Like the other reptiles we have studied, when the air is cool, lizards have difficulty moving, so you may have seen one perched on a limb or rock as it absorbs the heat of the sun. With their quick movements, varied



colors, and flicking tongues, they are so unique that we marvel at their fun antics.

☐ Molting Activity



Read to the children: Lizards have some features that set them apart from other animals. One of their most visible traits is the thick, scaly skin that most lizards have. It gives some protection from enemies and allows them to absorb a lot of sunlight while also keeping them from dehydrating too quickly.

□ Locate-a-Lizard Activity



Have the children turn to the “Locate-a-Lizard World Map” activity in Lesson 4 of their student journals. Place the “Locate-a-Lizard Cards” facedown on the table in front of the children, and place the cut-out lizard circles faceup on the table near the cards.



Read to the children: There are so many varieties of lizards, and they have such diversity in color, size, shape, habits, and features. Let’s take a look at some lizards and where they can be found in the world by playing a matching game. I will read the description, and you try to identify where in the world this lizard can be found.

Have a child select any card, keeping it facedown. Read the description on the card, but do not show the children the picture. In their student journals, have the children find the lizard circle that they think best matches the lizard card and locate where that lizard belongs on the map. Use the answer key to check the answers and make adjustments. Have the children glue the lizard circles onto the map page. An answer key for this activity can be found at the end of this lesson.

□ The Lizard Lifestyle

Read to the children: Most lizards hatch from eggs that are laid by the mother, then buried underground or hidden beneath logs or rocks. However, some species give birth to live young. These lizards develop in eggs that are kept safe inside the mother’s body until they hatch. Whichever way, baby lizards are born wriggling and hungry, and they are instinctively able to hunt for themselves and hide from predators.

You may have seen a lizard flicking its tongue in and out. A lizard uses its tongue to test and smell the air around it, often sensing a tasty meal nearby before it is seen. Some lizards use their tongues to grab prey



and bring it to their mouths. Others use their jaws for *prehension*, which means to grasp or hold something. For smaller lizards a meal may include mosquitoes, cockroaches, worms, or spiders. Large lizards, such as the African Nile monitor, crush birds, frogs, and small mammals with their strong jaws. Depending on the species, lizards can be herbivores, carnivores, or omnivores.

Lizards are equipped to protect themselves from predators in amazing ways. The frilled lizard has a ruffled-looking layer of skin around its neck that it can spread outward when it encounters a possible predator. This makes it appear larger than it really is, and the predator often decides this fancy-collared, frilled reptile looks too daunting to be devoured!



God equipped lizards with complex eyes that work to magnify what the lizard sees so that it can tell how far away another creature is. Even though some lizards have no eyelids and therefore cannot close their eyes, they have excellent vision, and some can even look in one direction with one eye and another direction with the other.

□ Lesson 4 Extension



Have children grades 7–8 complete the self-directed Lesson 4 extension titled “North America’s Venomous Gila Monster” in their student journals.



Locate-a-Lizard World Map

Key



CROCODILIANS

Objective

Help the children learn the differences between and characteristics of the different types of crocodilians.



Preparation:

- ☐ Cut out the “Identifying Crocodilians Pictures.”
- ☐ For younger children, cut out the labels for the “Compare-a-Croc Facts” page, found in the 3–6 student journal.

Activity Supplies:

- White school glue or glue stick

☐ Crocodilians

Read to the children: Have you ever wondered about the differences between alligators and crocodiles? Have you ever heard of gharials [GARE-ee-ulls] or caimans [CAY-mins]? All of these belong to an order of reptiles called *crocodilians*, a group of mysterious, ancient-looking creatures that have fascinated people for centuries. Some Ancient Egyptians kept crocodiles as pets, and they valued them greatly—they even had them embalmed and buried with the family in elaborate tombs.



Just like the Egyptians, we still find crocodiles and other crocodilians intriguing today. Perhaps it is because of the contrast we see in their activity—they can lie motionless for hours at a time, hardly moving a muscle, and then strike suddenly with immense power, keen precision, and deadly impact.

The members of the crocodilian order are similar in appearance, leading many people to think of them all as crocodiles. After a closer look at their bodies, behavior, and locations, you will see that they are each, in fact, very different animals.

☐ Video: Crocodilians



Watch the video titled “Crocodilians” at goodandbeautiful.com/sciencevideos or from the Good and Beautiful Homeschooling app.



☐ Identifying Crocodilians Activity



Lay the “Identifying Crocodilians Pictures” on a table. Have the children look at all the images as they listen to you read the following paragraphs aloud. Have the children try to guess which image belongs to each description. An answer key for this activity can be found at the end of this lesson.

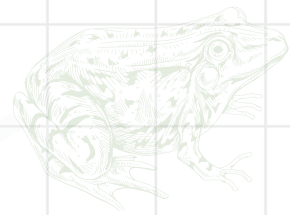
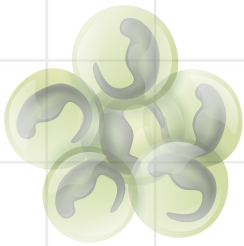
1. A **gharial** is an Asian crocodilian that lives in fast-moving, freshwater rivers in India and Nepal. It is most distinguished by a long, thin snout with a bulbous tip. They eat mainly fish, which they can detect easily with special sensory cells that are located along the body. These sensory cells



FROGS AND TOADS AROUND THE WORLD

Northern Leopard Frog

These frogs are native to North America and can be found living in ponds, marshes, swamps, and slow-moving streams. They eat mostly crickets, worms, flies, and other frogs, but their mouths are big enough to swallow even a small bird or a garter snake.



Golden Poison Frog

Golden poison frogs are the largest of the poison dart frogs and live in South America. Their skin is coated in a poison called an alkaloid toxin, which can cause the intended target to have heart failure because the toxin stops the muscles from working. Their bright yellow color warns predators to stay away.



Black Webbed Tree Frog

These Asian tree frogs have the ability to stretch their feet out and glide in the air using the strong webbing located between their toes. Their eggs are laid in aerial foam nests. The tadpoles hatch, drop from their eggs to the water below, and go through the stages of development from there.



NEWTS AND SALAMANDERS

Objective

Help the children learn about the amphibian group Caudata, which contains salamanders and newts. Help the children understand how amphibians survive freezing temperatures.



Preparation:

- ☐ The Lesson 9 activity will need to be continued the day after Lesson 9 is completed.
- ☐ Cut out the “True or False” cards.
- ☐ Note: You will need to hard-boil two eggs for the Lesson 10 “Permeable Skin Activity.”

Activity Supplies:

- 2 freezable plastic containers, with lids,
- Permanent or dry-erase marker
- big enough to hold 1 c of liquid
- 1 c of maple or corn syrup
- 1 c of water

☐ Caudate Amphibians



Read to the children: Axolotl [AK-suh-laa-tl], mudpuppy, hellbender, and siren. Would you ever think these are the common names for a bunch

of amphibians? Belonging to a group called *Caudata* [kah-DAY-tah], salamanders and newts are shaped like lizards but are actually related to frogs. Like frogs, salamanders and newts are born with gills, look just like tadpoles when they're in the larval stage, have semipermeable skin, and are ectothermic vertebrates. Newts and salamanders, however, do have one noticeable difference from frogs and toads. They keep their tails into adulthood.

There are around 750 species of newts and salamanders on our planet, but most people have never seen one! Where can they be found? Salamanders and newts prefer cool, damp places and are often found tucked under leaf litter and logs in a quiet forest or in the muddy beds of freshwater streams, rivers, and creeks.



Let's take a look at some of these beautiful, mysterious creatures that live secretive lives, creeping on the forest floors and in our waterways.

☐ Discovering Newts and Salamanders



Place the “True or False” cards on the table with the picture facing up. Read the statements on the “Discovering Newts and Salamanders” page and have the children take turns deciding if each statement is true or false. Have them find the corresponding card and flip it over to see if they are correct, then read the additional information.

☐ Science Wall



Place the vocabulary card **TERRESTRIAL** on your science wall. Read and discuss the word and definition.



True or False Cards



True or False Cards

FALSE

All salamanders and newts are carnivores. Earthworms, slugs, and snails are popular edibles for salamanders and newts, but some of the larger species can eat crayfish and small mammals such as mice and shrews. Salamanders that live in dark places rely on their sense of smell to detect food. At night they might wait patiently for the target to move near them, or creep up on their prey slowly.

FALSE

Finding an eastern hellbender in one of your local fast-flowing streams or rivers is a sign of good water quality. Reaching a length of 73 cm (29 in), this is the largest salamander species in North America. They are specially shaped to live under rocks and move upstream easily. These hidden creatures play an important role in their ecosystems. They prey heavily on arthropods and insects such as mosquitos, acting as a natural pest control.

TRUE

Most salamanders and newts are *terrestrial* (meaning “of land”), so they spend most of their adult lives on land instead of in water, where they return only when it is time to mate. However, some species of salamanders and newts live partly or fully aquatic lives. All newts are salamanders.

TRUE

You may have thought all these creatures were small, but there is a family of aquatic salamanders known as *giant salamanders*. The South China giant salamander can reach a length of 1.8 m (5.9 ft) and can live more than 50 years! These are the largest living amphibians known.

FALSE

There are two body types found in salamanders and newts. Aquatic salamanders and newts usually have webbed feet and a paddle-like tail for swimming. On the other hand, terrestrial salamanders and newts have well-developed toes for digging in the soil and a more rounded tail.

FALSE

This odd-looking creature is a mudpuppy salamander! Those frills on the sides of its head are its gills, and it lives in the mud on the bottoms of freshwater lakes, streams, and ponds. One of the few salamanders that makes noise, the mudpuppy is so named because it emits a squeak that someone once thought sounded somewhat like a puppy.

TRUE

Newts and salamanders have various means of protection. Like frogs, the skin of some salamanders and newts is toxic and can secrete poison, so some are brightly colored to warn predators to stay away. If they are caught, they are able to allow their tails, or in some cases limbs, to break off so they can slip from the predator’s grasp or bite. In time, the lost tail or limb will regrow.

TRUE

The axolotl never goes through metamorphosis—it keeps its gills and lives its adult life in a lake in the Valley of Mexico. The northern slimy salamander spends its adult life on land but must still live in a moist environment, such as soil, leaf litter, under stones, or in rotting logs of forests in the eastern half of the United States.



FISH

Objective

Help the children learn the characteristics and variety of fish.



Preparation:

- ☐ Cut out the labels from the “Fish Anatomy” page in each 3-6 student journal.

Activity Supplies:

- Glue stick
- 2 Tbsp ground coffee or black pepper
- Paper coffee filter
- 2 clear cups
- A rubber band
- Water

Features of Fish

Read to the children: Close your eyes and imagine that you are fully immersed in some kind of water, such as a pool or lake. You are not allowed to use your arms or legs to move, and you have to get your oxygen from the water, not the air. Would you be able to survive?

One amazing type of animal—the fish—may be the most extravagantly designed creature of all God’s creations. With fins for swimming and gills for breathing, fish can survive in water where many other animals cannot. Fish are vertebrates and ectotherms, with a stunning variety of colors, shapes, patterns, and sizes.

Video: Fish Features

Watch the video titled “Fish Features” at goodandbeautiful.com/sciencevideos or from the Good and Beautiful Homeschooling app.

Younger children may want to have their “Fish Anatomy Activity” in front of them during the video so they can complete it as they hear the information presented.



Fish Anatomy Activity



Have the children turn to the “Fish Anatomy” worksheet in Lesson 11 of their student journals. Based on the information presented in the video, have the children work together or with you to find the corresponding labels and glue them onto the correct boxes on the “Fish Anatomy” page. Direct older children to write the words in the boxes. An answer key for this worksheet is at the end of this lesson.

Science Wall



Place the vocabulary cards NARES, DORSAL, and CAUDAL on your science wall. Read and discuss the words and definitions.



Hidden in Plain Sight



STONEFISH

Found in the coastal waters of the Indo-Pacific, the stonefish is a venomous fish whose sting is quite dangerous to humans. It is not an aggressive fish, however, and will only sting for protection.

EUROPEAN BULLHEAD

The European bullhead is a type of sculpin. This small fish can be found in stony, pebbly areas of fresh or brackish lakes, rivers, and streams where the water is cold. When it heads out to hunt for prey, its coloring allows it to blend in with its surroundings.



LEAFY SEA DRAGON

Found along the southern coast of Australia, the leafy sea dragon is related to both seahorses and pipefish. Its plantlike appearance makes it very easy for this fish to hide among the algae that grow in the rocky reefs where it lives.



☐ Saltwater Fishing Activity



Place the cut-out “Fantastical Fish” cards in front of the children. As you read the descriptions below, have the child make a match between the picture of the saltwater fish and the label with its name, and then place the matches in front of him or her. Smaller images are provided here for parents to assist the children with matching the name to the correct fish.

Once all fish have been matched to their names correctly, ask each child to pick his or her favorite fantastical fish and set it to the side. You may need to make copies for multiple children if they select the same fish.

Read to the children: Saltwater fish decorate the waters of the ocean in every shade of the color spectrum. Their bizarre shapes provide endless wonder and curiosity for those who study them.

More than 75% of all saltwater fish live near the edges of the continents, in the area called the continental shelf. Let’s dive in and explore some of the saltwater fish that make the ocean their home.

Seahorse

Seahorses, named for their horse-shaped heads, are found in tropical and temperate coastal waters, typically among seaweed or other marine plant life. These cute fish are covered in tiny spinelike plates from their heads to their tails. Their tails can grasp, and they slowly propel themselves through the water by moving their dorsal fin. To move up or down in the water, they adjust the amount of air in a tiny pocket inside their bodies called a swim bladder.



Fangtooth

The fierce-looking fangtooth has the largest teeth compared to its body size of any known fish in the oceans. These creepy-looking fish can be found in the depths of the ocean where very little light can be found. Their dark-brown color works as camouflage, and their many sharp teeth are useful when hunting for food.



Frogfish

Short, stocky, and covered in spines, frogfish move slowly along the ocean floor, then rapidly strike at their prey. Found in tropical and subtropical regions of the Atlantic, Pacific, and Indian Oceans, as well as the Red Sea, they can be spotted in a wide variety of colors.



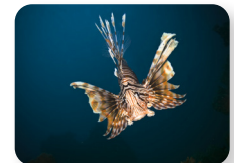
Whitemargin Stargazer

These strange fish are most often found buried in the sand in coastal reefs with just their mouths and eyes showing. They have been dubbed “the meanest fish” because they not only have double-grooved poison spines, but they also have electric organs that can deliver a shock of up to 50 volts, depending on the water temperature at the time.



Lionfish

Found near coral reefs and along rocky crevices, lionfish are easy to spot due to their distinct appearance. Covered in white, orange, brown, red, or black stripes, they are a sight to behold. With a mane-like appearance, these fish can now be found along the eastern coast of the United States, probably introduced by the home aquarium trade.



Boxfish

Boxfish, most commonly found in coral reefs around the world, are slow-moving fish that are easy to spot due to their distinctive square-like shape. Other than their eyes, mouths, tails, and fins, boxfish are encased in a hard carapace. It is made up of fused plates and can take the shape of a triangle, square, or pentagon.

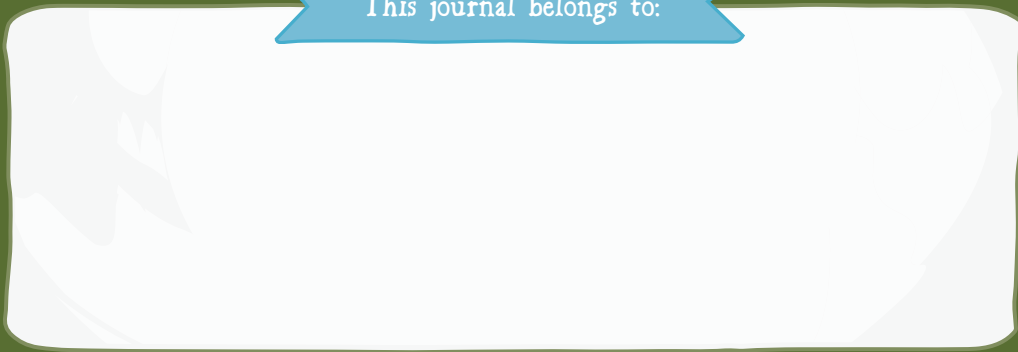


REPTILES, AMPHIBIANS, AND FISH

Grades 3-6

STUDENT JOURNAL

This journal belongs to:



THE GOOD AND THE BEAUTIFUL

INSTRUCTIONS

This student journal accompanies *The Good and the Beautiful Reptiles, Amphibians, and Fish* science unit. It contains all of the worksheets and journal pages that are needed to complete the unit. Each student will need his or her own copy of the student journal.

Have each student take his or her time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries when they've finished.

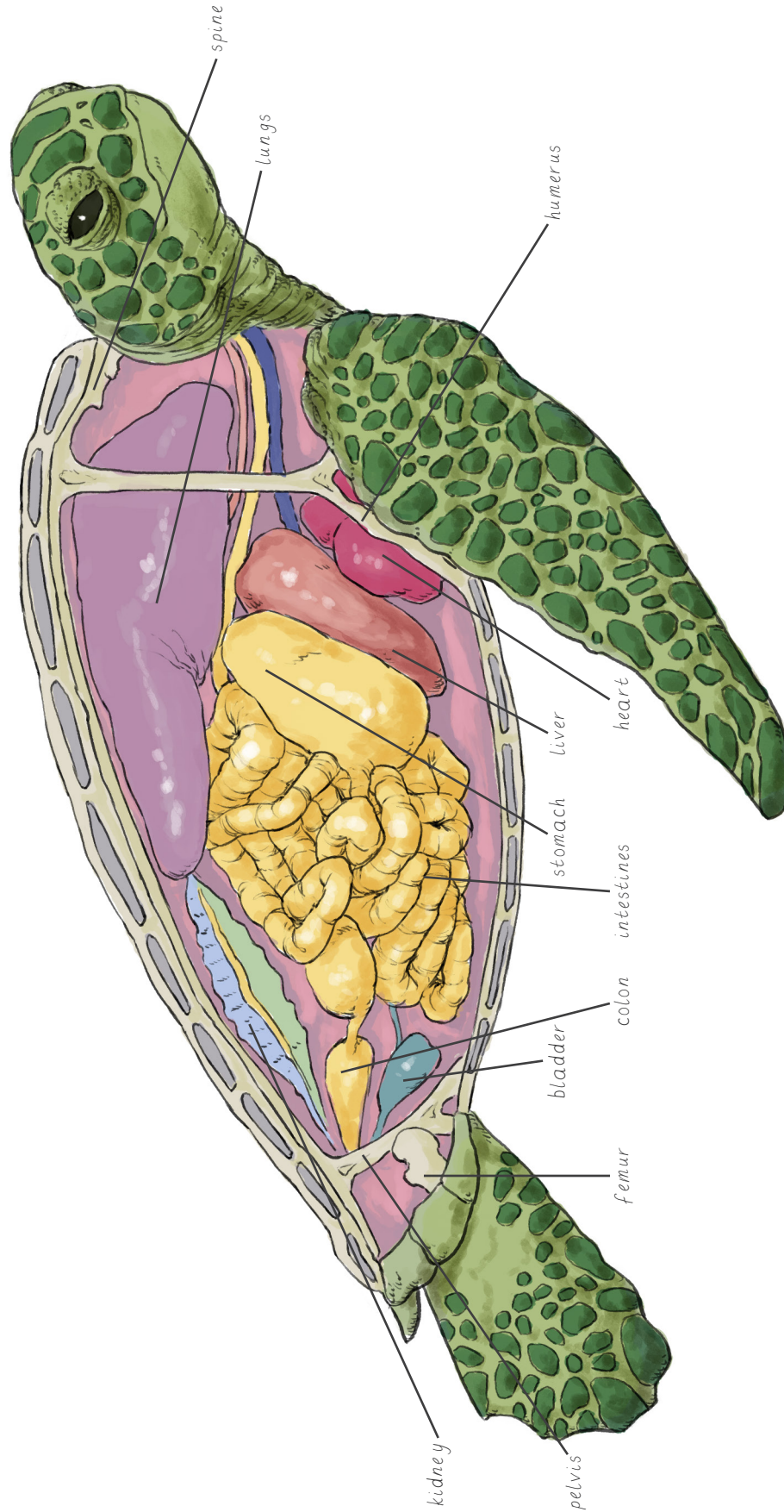


TABLE OF CONTENTS

Lesson 1. . . . .	.1
Lesson 2 . . . . .	.3
Lesson 3. . . . .	.7
Lesson 4 . . . . .	.9
Lesson 5. . . . .	.11
Lesson 6. . . . .	.15
Lesson 7 . . . . .	.16
Lesson 8. . . . .	.17
Lesson 9. . . . .	.21
Lesson 10 . . . . .	.22
Lesson 11 . . . . .	.23
Lesson 12 . . . . .	.25
Lesson 13 . . . . .	.26



WHAT'S UNDER THE SHELL?



LOCATE-A-LIZARD WORLD MAP



Lesson
4



TUATARAS AND LIZARDS:

COMPARE AND CONTRAST



Decide whether each characteristic below best describes tuataras, lizards, or both. Color the box under the correct heading.



TUATARAS

BOTH

LIZARDS

Reptiles

☐
☐
☐

Two rows of teeth on top

☐
☐
☐

Diurnal

☐
☐
☐

Nocturnal

☐
☐
☐

Prefer cooler temperatures

☐
☐
☐

Prefer warmer temperatures

☐
☐
☐

Ectothermic

☐
☐
☐

Skin molts

☐
☐
☐

Regrows a lost tail

☐
☐
☐

External ears

☐
☐
☐

No external ears

☐
☐
☐

Parietal eye

☐
☐
☐


PERMEABLE SKIN ACTIVITY

Observations:

Draw a picture and/or write how Egg #1 compares to Egg #2.

Egg #1

Egg #2

Question: What does this activity tell you about the difference between your skin and the skin of a caecilian or other amphibian?

FRESHWATER FISH SCRAMBLE

Match the picture of the fish with the description, and then unscramble the letters next to the picture to determine the fish's name.

HINT: Some letters have been placed for you.

I come in many patterns of color, but here I **appear to have spots**.



s s b a
b s

With my **yellow hue**, I appear golden in the shallow waters that I favor. My mouth is large, and I have many **sharp teeth**.



n s a m o l
s

Found in the United States, Canada, and Mexico, I eat other small fish with my **big, wide mouth**.



e k p i
 e

I leap through the air with my **tail held high** and splash in the water when I migrate.



t o t u r
t

I can be found on every continent except Antarctica. I have **whiskers**, which is how I got my name.



a f t c h s i
c

I like to swim in brackish water, weaving my **long, thin body** through the plant life.



e w a l y l e
w e

WORD BANK: trout, salmon, catfish, walleye, bass, pike

REPTILES, AMPHIBIANS, AND FISH

Grades 7-8

STUDENT JOURNAL

This journal belongs to:



THE GOOD AND THE BEAUTIFUL

INSTRUCTIONS

This student journal accompanies *The Good and the Beautiful Reptiles, Amphibians, and Fish* science unit. It contains all of the worksheets and journal pages that are needed to complete the unit. Each student will need his or her own copy of the student journal.

The lesson extensions are also found here. These extensions are optional for older students (grades 7–8) to complete on their own. Each extension is accompanied by lined paper so the student can keep his or her work in one place.

Have each student take his or her time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries when they've finished.



TABLE OF CONTENTS

Lesson 1. . . . .	.1
Lesson 2. . . . .	.5
Lesson 3. . . . .	.10
Lesson 4 . . . . .	.13
Lesson 5. . . . .	.17
Lesson 6. . . . .	.20
Lesson 7 . . . . .	.23
Lesson 8. . . . .	.26
Lesson 9. . . . .	.31
Lesson 10 . . . . .	.34
Lesson 11 . . . . .	.37
Lesson 12 . . . . .	.40
Lesson 13 . . . . .	.43



LOCATE-A-LIZARD WORLD MAP



Lesson
4



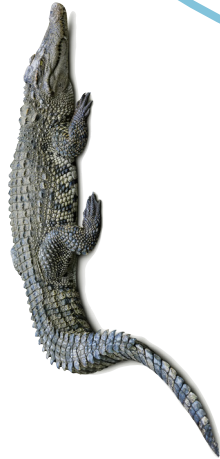
COMPARE-A-CROC VENN DIAGRAM

Alligators



Both

Crocodiles





EXTENSION

Instructions:

1. Read the article below.
2. With a parent's permission, go to goodandbeautiful.com/sciencevideos and click on the link called "Alligator Bellowing" under the *Reptiles, Amphibians, and Fish* section to watch a video of this interesting behavior.

Crocodilian Behavior

With the combination of ambush-style hunting, the strongest bite force of any animal, and an oversized mouth full of sharp teeth, there is little wonder why crocodilians are feared around the world and viewed as stealthy, dangerous creatures.

However, there is more to crocodilians than their incredible strength and predatory nature. They have some intriguing behaviors!

Vocalizations

Vocalization is an uncommon behavior in reptiles. Crocodilians, however, have an assortment of communication methods and are the most vocal of all reptiles. A mated female has what is called a **hatching call** to alert others as she deposits her eggs in a nest, babies will vocalize a **chirping call** from within their eggs as a signal to the mother that they are ready to hatch, and young crocodilians will sound **distress calls** when they face imminent danger or attack. Perhaps the most impressive vocalization is performed by a male alligator at breeding time, called a **bellowing call**. He will raise his head and tail out of the water, and as he inflates his body with air, he makes a deep, grumbling, guttural call. Just before bellowing, he emits an infrasonic signal that causes the water surface to visibly tremble. It is believed its purpose is territorial or to advertise his availability to mate.

Hunting Behavior

Crocodilians are known for a spin move called a "death roll." This technique is used to subdue, drown, and dismember their prey, but it is also an effective method of self-defense along with their tough scales that act as body armor.



Strategizing Behavior

Crocodilians are difficult to study in the wild, but research has become easier due to programs at many zoological parks and farms. An interesting behavior has been repeatedly observed in which American alligators appear to

lure birds by using the birds' preferred nesting materials as bait. Using its snout, the alligator will collect twigs and sticks and wait patiently for hours with these sticks resting right on top of and beside its mouth. When an unsuspecting bird approaches to collect a prime piece of brush to add to its nest, the alligator will open its mighty jaws in an alarmingly rapid strike, making a snack of the bird. This behavior suggests that crocodilians are watchful, even studious, and are able to learn bird behavior through observation and use objects as hunting tools. This sort of sophisticated behavior has not been observed in many other animals.

Parental Behavior

There is a softer side to this violent creature: crocodilians are known to possess the strongest parental instinct of any reptile. In fact, the level of parental care in crocodilians is strangely similar to that of many mammals. In some species the mother will assist the young in the process of breaking out of the egg by gently rolling the egg in her mouth and massaging it with her tongue. Once hatched, she may carry the young to the water in her mouth and feed them. In the time between their hatching and her next mating season, ranging from several weeks to a year, she will care for the hatchlings. Incredibly, in cases where the mother crocodilian is not available, a father has been observed acting in her place to care for the young! Some will protect their own offspring for up to two years.

TUATARAS AND LIZARDS:

COMPARE AND CONTRAST

Characteristics of tuataras and/or lizards:

Decide whether each characteristics below best describes tuataras, lizards, or both. Find the characteristic in the word search below, then circle the words in **blue** for tuataras, **green** for lizards, or **brown** for both.



- | | |
|---|--|
| <input type="radio"/> Reptiles | <input type="radio"/> Ectothermic |
| <input type="radio"/> Two rows of teeth | <input type="radio"/> Molts |
| <input type="radio"/> Diurnal | <input type="radio"/> Regrow lost tail |
| <input type="radio"/> Nocturnal | <input type="radio"/> No external ears |
| <input type="radio"/> Cooler temperatures | <input type="radio"/> Parietal eye |

C	A	H	W	S	G	H	O	X	Q	J	K	C	W	P	R	C	K	G	H	R	N	L	T
O	D	E	E	B	K	M	Y	N	L	K	I	X	C	V	E	M	F	E	R	T	O	Y	W
O	Q	E	B	F	T	I	H	J	K	L	Q	U	E	T	P	E	A	X	C	V	C	B	O
L	I	O	E	W	D	V	H	N	L	T	R	Q	W	D	T	S	T	G	B	V	T	M	R
E	G	J	K	D	E	D	R	M	H	J	K	Q	W	R	I	S	X	T	G	V	U	E	O
R	A	R	E	G	R	O	W	L	O	S	T	T	A	I	L	G	A	F	R	X	R	O	W
T	W	F	C	N	Q	L	F	C	W	L	K	V	W	R	E	B	O	P	Q	G	N	W	S
E	E	B	T	R	K	W	Q	R	I	H	T	A	V	E	S	S	W	W	Y	T	A	F	O
M	Y	E	O	F	D	A	D	F	J	L	W	S	Q	U	I	R	P	W	R	N	L	T	F
P	T	K	T	K	Q	L	J	H	F	W	X	X	M	Q	I	G	D	V	C	M	A	U	T
E	V	W	H	M	Q	D	J	I	W	V	N	Q	M	M	E	E	T	K	S	F	R	W	E
R	S	F	E	Q	O	O	N	E	R	O	W	O	F	T	E	E	T	H	L	A	F	E	E
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T	K	W	M	O	W	M	D	O	Q	X	G	I	W	K	L	X	W	M	F	A	C	G	H
U	E	R	I	P	E	C	C	U	K	D	V	Y	K	L	D	C	S	B	M	P	A	B	J
R	V	L	C	J	L	S	S	H	E	D	I	U	R	N	A	L	J	J	K	Q	V	T	L
E	O	E	A	H	L	R	E	E	K	L	Q	X	U	E	G	G	M	Q	P	G	O	H	G
S	O	N	O	E	X	T	E	R	N	A	L	E	A	R	S	H	H	K	L	K	O	X	R
A	Q	T	Q	F	D	W	E	P	Z	C	B	M	N	C	X	Q	R	U	P	O	E	R	Y
W	F	G	H	W	D	G	R	E	T	R	T	Y	P	A	R	I	E	T	A	L	E	Y	E
K	L	F	L	L	Q	I	M	E	R	I	S	F	H	K	Q	R	Y	I	O	P	F	T	Q
V	C	L	K	J	P	H	N	E	F	Q	L	W	K	J	T	R	R	U	T	U	L	L	D
L	V	T	K	Q	V	I	D	L	E	X	T	E	Q	Q	W	A	Y	H	L	X	W	A	C



EXTENSION

Instructions:

1. Read the information below.
2. In your student journal, create a compare-and-contrast chart, develop a Venn diagram, or write a few sentences comparing the processes the wood frog and water-holding frog go through in order to survive their extreme habitats.

Frogs: Surviving Extremes

Making up an order of the amphibian class, frogs have many essential features they have developed to survive in their environment. Their long, powerful legs enable them to escape from predators, and their smooth, porous skin absorbs oxygen from water and helps control body temperature. Many of the world's frog species live in ideal moist, temperate climates that don't require further special physical features to survive. But are there frogs that live in extremely cold places? What about extremely hot and dry climates? There are frogs that thrive in these environments, and they have special physical characteristics and behaviors that enable them to live there.

Extreme Cold

As the ambient temperature drops below the freezing mark in locations such as Alaska and Northern Canada, as well as southward through the Eastern United States, ice crystals begin to form. As soon as ice touches the thin skin of a frog, the frog starts to freeze. One special species, the wood frog, huddles down under the leaf litter to hibernate. There it begins producing a kind of antifreeze substance, allowing it to survive temperatures as low as -6°C (21.2°F).

When ice crystals begin to form in the wood frog's body, the frog's liver starts converting sugars into **glucose**. This glucose is then pumped through the frog's body as the heart slows down and prepares to stop completely. Together with **urea**, another protective substance this frog produces, the chemicals act as **cryoprotectants**, which keep more ice crystals from forming and prevent the frog's cells from shrinking and being damaged by the cold.



The frog's lungs, heart, and other organs come to a stop and won't start working again until the frog thaws in warmer temperatures. The wood frog can survive with around 60–70% of the water in its body frozen.

Scientists are starting to study these frogs in the hopes of learning how to better protect organs that are on their way to transplant patients.

Extreme Heat

On the other side of the world, a stout, broad-headed gray frog lives in opposite conditions from the wood frog. Found in Australia's arid regions, the water-holding frog lives in a habitat where water can be very scarce. Because of its dry habitat, the water-holding frog has developed the ability to go through a process called **estivation**.

During dry periods, the water-holding frog buries itself in sandy ground up to depths of 1 m (3.3 ft), and all its metabolic and other living processes slow down. Here, the frog builds a hardened watertight cocoon around itself from shed skin and mucus. Inside this cocoon, the frog can hold large amounts of water in its bladder or pockets under its skin. In this state, the frog can go up to five years without drinking any water.

When the brief and infrequent rains come, the frog eats its shed skin for energy and emerges from the ground to breed, eat as many insects as it can, and absorb as much water as possible before going back underground to wait out another dry season in its protective shell.



BRUMATION ACTIVITY

Fill in the blanks from the information presented in the lesson.

Word Bank: burrowing brumation cold torpor

Unlike other animals, amphibians cannot avoid the _____ by migrating or growing thick winter coats. Salamanders and newts usually end up _____ into the ground for a period of _____, also called _____.

Observations:

WATER

SYRUP

Circle the correct answer.

Did the water freeze?
yes or no

Did it expand?
yes or no

Did the syrup freeze?
yes or no

Did it expand?
yes or no





EXTENSION

Instructions:

1. Read the following article and, in your student journal, write your theory for the cause of the population decline of the southern dusky salamander.
2. What do you think can be done to protect southern dusky salamanders?

The Case of the Missing Salamander

If you're interested in salamanders, North America is a great place to explore. The continent boasts more salamander species than anywhere else in the world, particularly in the southeastern United States. The warm, humid air and abundance of wetlands and moist forests create the perfect environment for these amphibians. One salamander native to North America is called *Desmognathus auriculatus*, commonly known as the **southern dusky salamander**.



detrimental to the wetland areas that dusky salamanders require because pollutants can easily build up and become trapped in stagnant water.

Another theory is that these salamanders were infected with an unknown pathogen. A

disease could explain the shockingly rapid population decline in the 1970s, but could it also be an ongoing reason southern dusky salamanders have been unable to bounce back?

Southern dusky salamanders used to be plentiful throughout their wide range, which extended across the coastal and swampy regions of the southeast. However, their population drastically decreased in the 1970s and has not recovered. Dusky salamanders are currently found in just one percent of the range they previously inhabited and have even become locally extinct from some of the areas in which they used to thrive.

Human activity is a common threat to wildlife, so researchers have been exploring whether or not it is playing a role in the decline of southern dusky salamanders. However, some of the places where dusky populations have declined are remote areas that are largely undisturbed by humans.

What could have caused their decline? One theory to explain their disappearance from these areas focuses on the salamander's reliance on the availability of clean water sources for breeding and laying eggs. Wetlands can be drained when the flow of rivers and streams is redirected through dam construction and channelization for agricultural purposes. Agricultural development, sewage disposal, and other toxic runoff from urban and suburban areas cause water pollution that may affect the southern dusky salamander. Pollutants can be especially

Of significant concern to batrachologists (a subdiscipline of herpetology) is a microscopic single-celled fungus called *Batrachochytrium salamandrivorans* (Bsal) that feeds on a salamander's sensitive skin. Its name literally translates to "salamander devourer," and it has been known to devastate salamander populations in Europe and Asia. Although Bsal has not been found yet in the US, scientists believe it is inevitable due to the importation of salamanders for the pet trade, and some fear it may have already arrived without having yet been detected.

Are there other possible explanations for the demise of so many dusky salamanders? Parasites such as flatworms or chigger mites could play a role. Chigger mites, which feed on the blood of humans and animals alike, have been observed on southern dusky salamanders in Texas.

Although their numbers continue to decline, the southern dusky salamander species as a whole has not yet landed on the US Fish and Wildlife Service's Endangered Species List. The service has recently been petitioned to add dusky salamanders to the list, as there is a very real concern that their population may not recover. Despite efforts by concerned scientists, the mystery of their disappearance remains unsolved.

LIFE CYCLES AND WATER

First, draw a saltwater scene (the ocean) and a freshwater scene (a river or a lake) in their boxes. Then, draw arrows to show the way a fish with each life cycle moves between the types of bodies of water. Draw a **green** dot next to the arrow where the fish starts and a **red** dot where it finishes.

SALT WATER



Anadromous



Diadromous



Catadromous

FRESH WATER



EXTENSION

Instructions:

1. Read the information below, and then write one paragraph in your student journal about the features of a piranha that make it a unique fish.
2. In your student journal, brainstorm about the impact on an ecosystem when a predatory species is introduced by human means. You may write or draw your theories, then discuss them with your parent or teacher.

Predatory Piranhas

When we think of fearsome predatory fish, we often picture sharks gliding stealthily through the ocean in search of their next meal, but there are also many carnivorous fish that make their homes in rivers and lakes. The **piranha**, whose name translates to “tooth fish” in the Tupí language spoken by some Indigenous Brazilians, is an example of a meat-eating freshwater fish. Popular culture often portrays these fish as ravenous monsters, but are piranhas really the frenzied feeders they’re made out to be?

It is true that most piranhas do eat meat, but most species are not strictly carnivorous and will eat whatever is available. Most could be more accurately described as scavengers, rather than predators, although they will kill if necessary and have been known to take bites out of each other in times of food scarcity. Among the many items on an omnivorous piranha’s typical menu are shrimp, worms, insects, birds, amphibians, plants, fruits, and seeds. There are even a few species that are primarily herbivores.

In the broadest definition of the word, “piranha” is the common name given to roughly 40–60 different species that are native to the rivers and lakes of South America. They are not naturally found anywhere else in the world, although there are small populations elsewhere, due to pets being released into lakes where they can potentially become an invasive species. However, **ichthyologists** [ik-thee-OL-uh-jists] (scientists who study fish) often have much stricter standards when classifying piranhas. Many only count three to four of the numerous species as “true piranhas.”

Whether or not a species is considered a “true piranha” depends on the structure of its most notable feature—its

mouth full of sharp, pointed teeth. Every fish species on the earth has teeth, but the distinct teeth of a true piranha are **tricuspid**, which means that each tooth has three sharp points perfect for tearing their food. Over the course of their approximately 10-year life span, it is common for piranhas to lose and replace teeth, but not individually. Instead, a quarter section of their teeth fall out all at once and are usually replaced within a few days.



A mean-looking set of teeth isn’t the piranha’s only claim to fame. They also possess extremely powerful jaw muscles. In fact, black piranhas hold the title for having the most powerful bite of any bony fish on record. A 1.14 kg (2.5 lb) black piranha was

once verified to be capable of chomping down with an incredible 72 pounds of force. That is almost 30 times its body weight!

Perhaps the most well-known species is the red-bellied piranha, which is often the type you would see at an aquarium. Their silvery scales and patches of red provide camouflage as they swim through the muddy waters of their habitat. Camouflage is important to all piranha species because they are preyed upon by many larger animals such as crocodiles, jaguars, herons, and the pink boto dolphins of the Amazon River. Predators are also the main reason that piranhas can usually be seen in small groups, or **shoals**. Twenty sets of razor-sharp teeth are better protection than one!

So despite their bad reputation, piranhas aren’t exactly the vicious killers they’re made out to be. It would surely be very unwise to submerge your hand in a piranha’s habitat, but they are rarely responsible for serious attacks on humans and generally would rather scavenge than hunt.