REPTILES, AMPHIBIANS, AND FISH

Grades 7-8

STUDENT JOURNAL

This journal belongs to:

THE GOOD AND THE BEAUTIFUL

Grades 7-8

Reptiles, Amphibians, and Fish

Student Journal

The Good and the Beautiful Curriculum

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.

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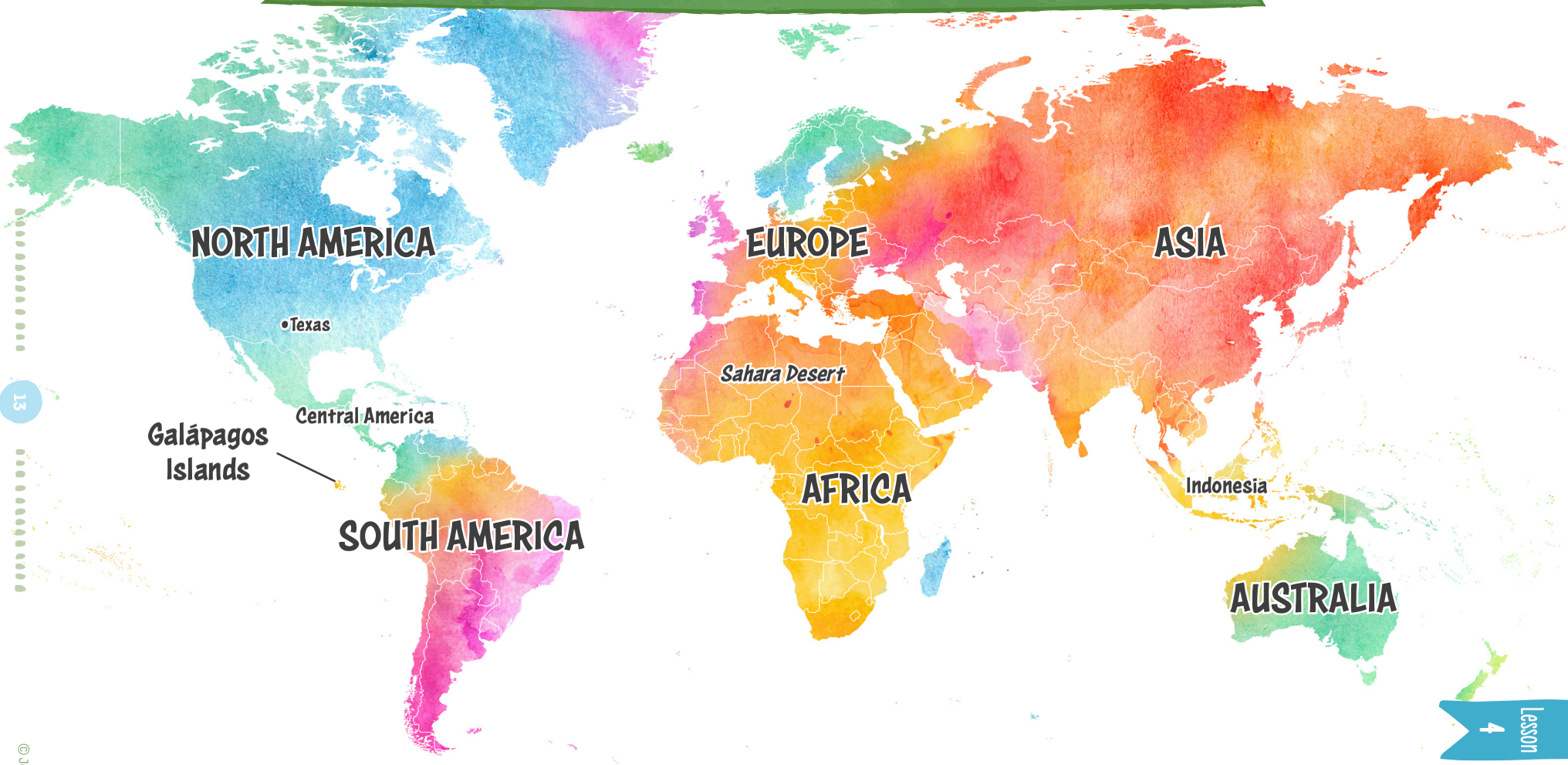
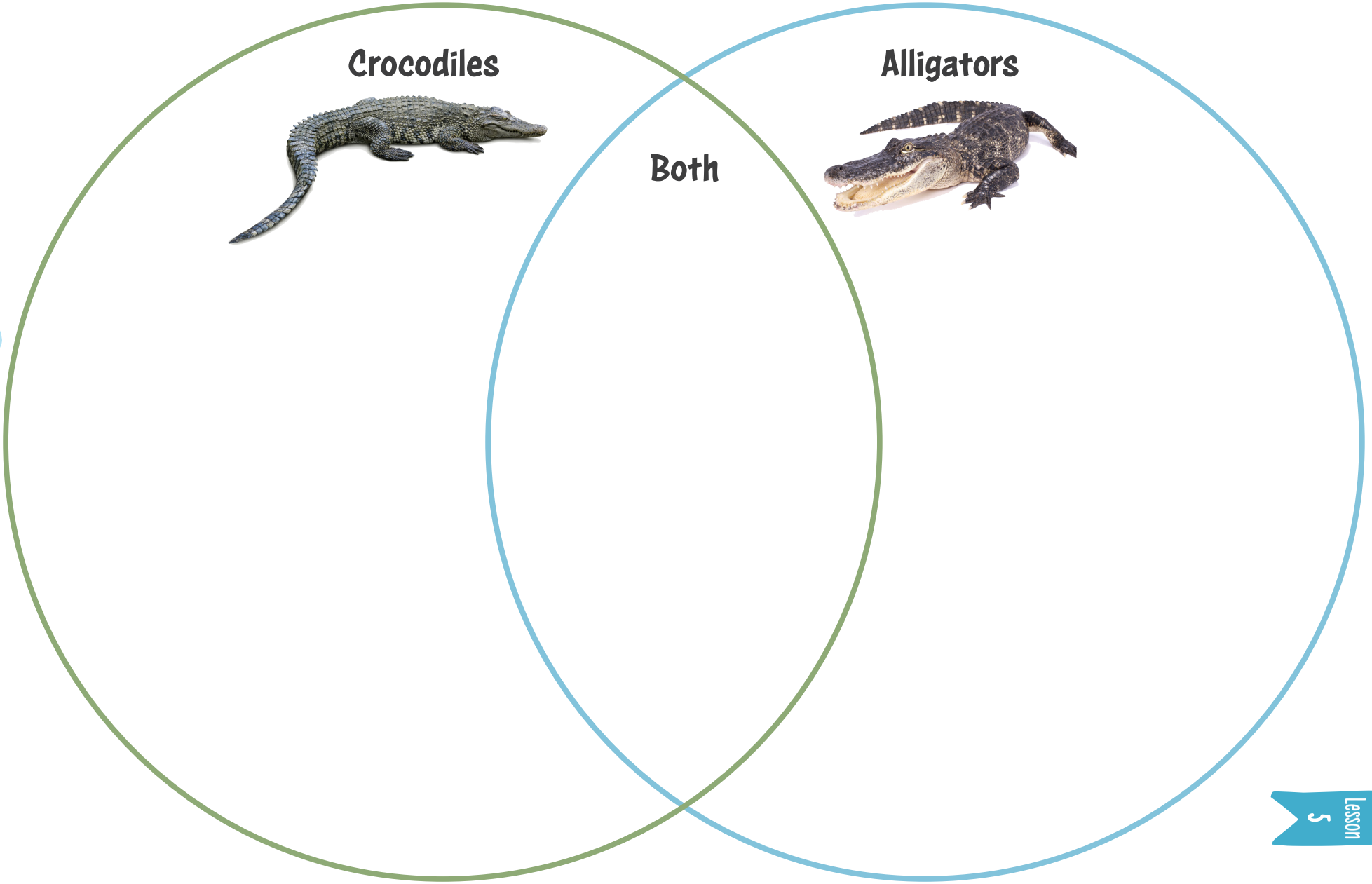
LOCATE-A-LIZARD WORLD MAP



COMPARE-A-CROC VENN DIAGRAM



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 intereting 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.

Lesson 6

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.

- ○ Reptiles
- ○ Two rows of teeth
- ○ Diurnal
- ○ Nocturnal
- ○ Cooler temperatures
- ○ Ectothermic
- ○ Molts
- ○ Regrow lost tail
- ○ No external ears
- ○ 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
A L P R V N R A R E G E O L E O S T E E O O T T
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**.

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 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?

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.

Lesson 13

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

FRESH WATER

Anadromous

Diadromous

Catadromous

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 ***tricuspids***, 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.