CONSERVANCY of Southwest Florida
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Protecting Southwest Florida's unique natural environment and quality of life ... now and forever.

Reptile Rendezvous
Pre and Post-Program Activities

Grade Level: 6-8

Next Generation Sunshine State Standards

- SC.6.L.15.1; SC.6.N.2.2
- SC.7.L.15; SC.7.L.15.3
- SC.8.N.4.1; SC.8.N.4.2

Program Overview

Reptiles Rock! Meet live reptiles up close and investigate what makes reptiles so unique. Uncover how reptiles have survived for millions of years and their importance in our local ecosystem and beyond.

Learning Objectives Students will be able to:

1. Analyze and describe how reptiles are classified according to shared characteristics.
2. Explore the scientific theory of evolution by examining the evolutionary history of reptiles.
3. Investigate adaptations that help reptiles survive in various environments.
4. Explain how scientific research influences reptile protection and management in Florida.

Pre-Program Activity 1: Reptile Research

Duration of Activity: 1-2 hours

Materials: computer & projector, computer lab

Directions:

1. Show any of the following videos. The videos are all introductory videos about reptiles and vary in length.
    - Reptiles (Discovery Channel) https://www.youtube.com/watch?v=TAtGDQkZzZ8 approx. 3.05 mins
    - Reptile Round-Up (Animal Atlas) https://www.youtube.com/watch?v=RsY7G0ZieH8 approx. 22.34 mins
    - Animal Planet 2015- Reptile Documentary https://www.youtube.com/watch?v=VxqxDopjiwI approx. 1 hour
2. Have each student select a Florida reptile of choice. Some ideas are:
   Lizards: Iguana, Brown Anole, Green Anole, Eastern glass lizard (a legless lizard!), Gecko, Scrub lizard
   Alligators: American alligator, saltwater crocodile
   Snakes: Eastern indigo snake, Florida pine snake, King snake, Red rat/Corn snake, Yellow rat snake, Banded water snake, Black racer, Eastern diamondback rattlesnake, Pygmy rattlesnake, Cottonmouth/Water Moccasin, Coral snake, Timber rattlesnake, Copperhead, Coachwhip
   Turtles: Gopher tortoise, Box turtle, Peninsula Cooter, Yellow-bellied slider, Red-eared slider, Mud turtle, Chicken turtle, Diamondback terrapin, Green sea turtle, Loggerhead sea turtle, Leatherback sea turtle, Hawksbill sea turtle, Kemp's Ridley sea turtle
3. Go to the library or computer lab and have students research their chosen animal, focusing on the following questions (or any others that you choose):
    1) Is it native to Florida? If it is exotic, how did it get to Florida?
    2) What are its characteristics?
    3) What type of habitat does it live in?
    4) What does it eat?
    5) Is it venomous?
    6) Does this animal have any adaptations to help it survive in its habitat?
    7) What role might this animal play in the ecosystem? (*predator, scavenger, prey, keystone species, etc.)*
    8) Any other 'fun facts'?
4. Have students create a 1-2 page report about their chosen animal and share with the rest of the class if time allows.

Pre-Program Activity 2: Native vs. Non-Native Species Inventory

Duration of Activity: 1 hour

Materials: computer & projector, pencil, clipboards, graph paper & Species Inventory worksheet (provided)

Background:

Nonnative species are animals living outside captivity that did not historically occur in Florida. Over 500 nonnative fish and wildlife species and 1180 nonnative plant species have been documented in the state. Most nonnatives are introduced species, meaning they have been brought to Florida by humans. The greatest pathway by which non-native fish and wildlife species find their way into Florida's habitats is through escape or release by pet owners. Examples include Burmese pythons, red-eared sliders (turtles), Muscovy ducks, brown anoles, Nile monitors (lizards) and feral hogs.

Native species are those that historically occurred in Florida. Examples include our most common owl, the barred owl; popular freshwater sportfish such as the Florida largemouth bass; eastern gray squirrels, raccoons, rat snakes, and alligators.

Directions:

1. Ask students to define a native species and a non-native species. Discuss various native and non-native species that are found in Florida (see background). Display a list of non-native reptile species for students to see. This list can be found on the Florida Fish and Wildlife website: http://myfwc.com/wildlifehabitats/nonnatives/reptiles/
2. Introduce the term Invasive Species and discuss current invasive reptiles such as the Burmese Python. (http://myfwc.com/media/2812584/burmesepython.pdf) and the Argentine Tegu (http://myfwc.com/media/2380549/Tegu-brochure.pdf).
3. Find the Brown Anoles on the Non-native Reptiles page and click on the link.
   Explain that Brown Anoles are not from Florida but from Cuba, and the native species of Green Anoles have been affected by the presence of Brown ones because they are taking all the resources that they need to survive. Anecdotal and some experimental evidence suggest that the brown anole is primarily responsible for reduced numbers of green anoles (Anolis carolinensis), particularly in human-altered habitats. Brown anoles displace green anoles to higher in trees, and adult male brown anoles sometimes prey

upon smaller green anoles (e.g., Gerber 1991, Echternacht 1999, Campbell 2000).

Therefore, Brown Anoles are considered an Invasive Species. An invasive species can be a plant, animal, or pathogen that is non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause harm. Explain to students that their assignment is to count how many Brown Anoles they can spot around their school and also observe their behavior.

4. Pick an open place outside near your school where students can move around (ideally a place with a few trees and some shade).
5. Bring Species Inventory worksheet, pencil and clip boards if possible.
6. Ask students to try to find Green Anoles in the trees or around them, but explain to students that they are difficult to find.
7. Once you are back in the classroom compile and discuss the data. Explain that sometimes these two similar species compete for resources and the Brown Anoles are out-competing the Green Anoles.
8. Create a bar graph of the species abundance of brown anoles and green anoles with the data collected.

(see below for worksheet)

Species Inventory Worksheet

Name:_____

Species Abundance	
Brown Anoles	
Green Anoles	

Brown Anoles

Green Anoles

Post-Program Activity 1: Lizard Evolution & Adaptation Virtual Lab

Duration of Activity: 1.5 hours

Materials: computer & projector, "Origin of Species-Lizard Evolutionary Tree" video, "Lizard Evolution-Virtual Lab" website, "Lizard Evolution-Virtual Lab" worksheet

Background:
Species of Caribbean anoles can be categorized into groups, called **ecomorphs**, according to their body characteristics (morphology) and the ecological niches they occupy. In this virtual lab, students will take measurements of lizards from eight species belonging to different ecomorph groups. Adaptations to an organism's habitat have led to many different body types. Species of Caribbean anoles can be categorized into six groups according to their body characteristics (morphology) and the ecological niches they occupy. The groups are referred to as ecological **morphotypes,** or **ecomorphs**. For example, in the film we first meet the grass-bush anoles, which live on grass and small bushes. These anoles are small and have long legs and strikingly long tails that help them balance on thin branches and blades of grass. The body features of the six ecomorphs are adaptations that enable the lizards to be successful in their particular habitats. In the film, it is shown how the long legs of the trunk-ground anoles enable them to move faster on the ground than the short-legged twig anoles. The long-legged adaptation helps the trunk-ground anoles not only catch prey on the ground but also avoid predators that live in their habitats. However, when placed in the habitat of the twig anoles, where twig anoles can move easily with their short legs, the trunk-ground anoles are clumsy. Losos also illustrates how the canopy anoles, with their large toe pads, are adapted to living on leaf surfaces in the canopy.
The "Origin of Species-Lizard Evolutionary Tree" video can give the educator more information on the virtual lab lesson. The video is approximately 18 mins long.
http://www.hhmi.org/biointeractive/origin-species-lizards-evolutionary-tree

Directions:

1. Stimulate prior knowledge: Ask students to define the term ADAPTATIONS. An adaptation is a trait that helps an organism survive in its environment. Organisms evolve (change, advance, develop) and adapt to their environment to become better fitted to survive and pass their genes on to the next generation.

2. Have students come up with 1-2 adaptations that reptiles have to survive in their environment that they may remember from the Reptile Rendezvous presentation. Have students discuss this with a neighbor. After students have shared, discuss a few of the adaptations mentioned as a class.
3. If time allows, show the "Origin of Species-Lizard Evolutionary Tree" video. Short clips of this video will be shown during the virtual lab. So you can choose to show the whole video now and have the option to skip the short clips during the virtual lab.
4. The virtual lab can be completed as a class or individually if a computer lab is available. Depending on the grade level it may be best to complete the lab as a class.
5. Follow the following link to the "Lizard Evolution-Virtual Lab". http://www.hhmi.org/biointeractive/lizard-evolution-virtual-lab Click on the "Enter Virtual Lab" icon under the Summary label.
6. Follow the Virtual Lab prompts to complete Module #1. This module will have students classifying different types of anoles into categories, take measurements of the hind leg lengths, body length , tail length and toe pad size of various anole species, compute ratios based on measurements, graph data and reexamine the initial grouping of anoles into different categories based on the data found. Throughout the virtual lab, students are also shown researchers data to compare their results with results found in the field by biologists. By the end of the virtual lab, students will have gathered data on various different anoles and will be able to categorize the anoles based on morphological adaptations and ecological niches or habitats.
7. Provide students with the "Lizard Evolution-Virtual Lab" worksheet provided. This can be completed during and after the virtual lab.

(see below for worksheet)

LIZARD EVOLUTION VIRTUAL LAB

Answer the following questions as you complete the virtual lab.

1. At the beginning of the virtual lab, you were asked to sort eight lizards into categories. What traits or characteristics did you use when sorting the lizards into groups? Color? Size? Shape?

2. An adaptation is trait that is common in a population because it enhances the ability to survive and reproduce in a particular environment. Provide one example and an explanation of on adaptation in the *Anolis* lizards.

3. Provide one evolutionary explanation for why lizards living in the same part of the habitat (i.e. grass, tree limbs, etc.) would have similar characteristics?

4. What is an ecomorph? Give one example from the virtual lab.

5. At the end of the virtual lab, you looked again at the eight lizards that you had sorted. Did you change any of the categories? If so, what traits or characteristics did you use when sorting lizards into groups this time? If so, why did you change your categories? If not, then why did you not have to make any changes to your categories?

Post-Program Activity 2: Reptile Thermal Ecology

Duration of Activity: 1 hour

Adapted from Anniston Museum: Reptiles: The Beautiful and the Deadly
Activity Guide: Lesson #2
http://annistonmuseum.org/uploadedFiles/Rep%20teachers%20guide.pdf

Materials: set of 27 children's play blocks, sheet of black paper, sheet of white paper, thermometer

Background: Temperature is probably the most important single physical factor in the ecology of reptiles and amphibians and a great portion of the daily activity of many species is devoted to responding to the thermal environment. Unlike mammals and birds that internally produce large quantities of metabolic heat (warm-blooded, or endothermic), most reptiles have to rely on the external environment as a heat source (cold-blooded, or ectothermic). All of the heat that enters or leaves an animal's body passes through the body surface that is exposed to the outside world. The more surface that is exposed, the more heat can enter or leave. The smaller the surface area, the less heat can enter or leave. The amount of heat stored in the body is determined by body volume. The larger and bulkier the animal, the more heat it can store. An important factor in heat exchange with the outside environment is the surface of an animal's body compared to the body volume. For a given shape (a cube for example), as size increases the surface to volume ratio decreases. Reptiles often position themselves to either gain the most heat possible (example: exposing the whole side of the body to the sun) or to minimize the heat from the sun (exposing the narrowest part of the body to the sun). Upon reaching the ideal temperature, a reptile may seek relief from the heat by crawling into a shaded area or into water. Color is important to reptiles for various reasons. Light colors are often found in populations where heat from the sun is intense; light colors reflect heat. Dark colors are often found in animals from cooler areas; dark absorbs heat. Many reptiles can change the skin color from light to dark.

Directions:

1. Briefly review the characteristics of reptiles. Ask students to brainstorm ideas of characteristics they may remember from the Reptile Rendezvous program.
2. Tell students that we will be focusing on the importance of temperature. Temperature is probably the most important single physical factor in the ecology of reptiles and amphibians.
3. Next, explain the concept of surface to volume ratio using children's play blocks. One block has 6 sides so its surface to volume ratio is 6:1. Now arrange 27 blocks of equal size into a larger cube shape. Now the surface to volume ratio has changed to 54:27 (54 exposed sides: 27 blocks) or when the numbers are reduced it becomes a surface to volume ratio of 2:1. Ask students to imagine that a single block is a reptile – maybe a tortoise. The single block with the 6:1 ratio has a greater surface to volume ratio and would heat up rapidly in the direct sun. Also with its small volume, it would not hold heat for an extended period. Ask students to imagine the larger block that you have created with the 27 small blocks is a larger tortoise. The larger block (created from the 27 smaller blocks) has a smaller surface to volume ratio (2:1) and would take a longer period of time to heat up and due to its greater volume would hold the heat longer also. So this larger "tortoise" could stay in the sun much longer than could the smaller one. Now arrange the 27 blocks in a straight line and ask students to imagine it is a snake. Have students try to figure the surface to volume ratio (Answer 110:27 or a little more than 4:1). Ask them to consider how shape is important. The "snake" could not withstand periods in the sun as long as the larger block "tortoise" even though the total volume (number of blocks) is the same because it surface to volume ratio is larger. We know this may be difficult for some students to totally understand but in all probability they will get the general idea. Surface to volume ratio is essential to understanding an animal's size and shape.
4. Next explain that color is important to reptiles for various reasons. Light colors are often found in populations where heat from the sun is intense; light colors reflect heat. Dark colors are often found in animals from cooler areas; dark absorbs heat. Many reptiles can change the skin color from light to dark.
5. Place a thermometer under a sheet of black paper and place it in the sun or under a heat lamp. Place another thermometer under a sheet of white paper. Show that temperatures under the lack paper are warmer. Explain that reptiles like crocodiles may be light in color to reflect heat because they live in the tropics; alligators, on the other hand, live in the cooler sub-tropics and

may have darker skin to absorb heat. Use a cutout of a black paper lizard. Demonstrate that if the cutout is positioned perpendicular to the sun it absorbs the full impact of the sun's heat. If it is turned so that the length of the paper lizard is parallel to the rays of the sun (only the thickness of the paper is exposed to the heat), it remains cooler.

6. Pass out the "Reptile Thermal Ecology" worksheet. Have students complete the worksheet individually, in pairs or as a class.

(See Student Worksheet below)

Name _____

Reptile Thermal Ecology

List the characteristics of Reptiles:

DEFINE
Ectotherm: _____

Endotherm: _____

Questions:

1. What was the temperature of the thermometer under the black paper? What was the temperature of the thermometer under the white paper?

2. Think about surface to volume ratio. What could be one reason that baby tortoises are not seen in the sun as often as adults?

3. How does an animal's shape change the surface to volume ratio? Hint: think about the large cube-shaped pile of 27 blocks as a tortoise and the long line of 27 blocks as a snake. What happens to the surface to volume ratio?

4. What could be one reason that no reptile gets as large as an elephant? How long might it take for an elephant-sized reptile to warm up? Or cool down?

5. On a cool March morning in Florida, would a baby or an adult timber rattlesnake heat up more quickly? Which one would have to retreat to a shaded area first?

6. Why do most reptiles and amphibians in cold climates “brumate” (hibernate) during winter months? Why is it possible for most mammals to stay active? Remember cold-blooded reptiles rely on outside temperatures to stay warm.

7. How can a reptile adjust its temperature by behavior?

8. A reptile must have heat to digest food. How does the size and shape determine how quickly it can digest its food?

9. Reptile eggs require heat. In cool northern climates, many female reptiles hold the eggs inside their body until the babies are fully developed and then the young are born alive. Why is size and shape important for a snake that holds its eggs (hint: the mother snake positions herself in the sun for warmth)?

10. What could be one explanation as to why alligators are darker in color than most crocodiles? Remember crocodiles live in warmer climate than alligators.