

Lesson 10 – Cave Critters

Lesson Overview: Students will learn that caves provide suitable habitat for wildlife species and that the animals found within caves have a variety of adaptations that allow them to survive in such a unique environment.



Objectives:

Students will be able to:

1. Define “habitat”, “adaptation” and “biospeleology”
2. Explain the difference between “trogloxene”, “troglophile”, and “troglobite” and give at least one example of each.
3. Identify and describe adaptive advantages of animals found in and around caves.

Standards Addressed:

National Science Education Standards: 5th-8th grade

- Content Standard C: Life Science

Duration of Lesson/Time Requirement: 40 minutes; additional class time required for presentation of student created cave critters

Materials Required:

Pictures of different types of habitats

Pictures of common plants and animals

Pictures of “cave critters”

- Accidentals
- Trogloxenes
- Troglaphiles
- Troglobites

Diagram of different cave zones

Hungry Cave Critter Team Cards (Divide class evenly; 1 per student)

- Wood/pack rat (nuts & seeds, cave insects, detritus, guano)
- Cave shrimp (detritus, guano)
- Cave fish (detritus, cave shrimp, cave fish, guano)
- Cave crayfish (cave insects, detritus, cave shrimp, cave fish, guano)
- Cave salamander (cave insects, detritus, guano)

Hungry Cave Critters Food Cards (for group of 30)

- Nuts & Seeds (10)
- Cave Insects (15)
- Detritus (20)
- Cave Shrimp (10)
- Cave Fish (10)
- Guano (15)

Various art supplies for creation of a “cave critter”

Classroom Technology:

Computer with Internet connection and projection capabilities and/or SMART Board (optional)

Set-Up:

Gather necessary materials. Print off enough Hungry Cave Critter Team Cards and Hungry Cave Critter Food Cards for the class. These can be laminated for future use.

Procedure:

Introduction

Ask the students what animals they think of when they think of caves. Explain that most people think primarily of bats when they think of cave dwelling animals. However, there are many more creatures that live in caves. In addition, there are insects and other animals that enter caves just to “visit”. The study of cave life involves the animals found in a cave as well as the special environment in which they live.

Ask the students: What do all animals, including humans, need to be able to live and survive? (food, water, shelter, and space suitable to an animal’s needs). Introduce the term “habitat” or review it with the class if the students are already familiar with what it means. If necessary show the students pictures of different types of habitats and compare/contrast them. Explain that animals live in a habitat that meets their survival needs of food, water, shelter, and space. There are many types of habitats including forests, wetlands, and deserts. Each of these habitats provides what is necessary for certain animals to survive. Tell the students that caves are important habitats, or homes, for many living things. Ask the students if they would like to live in a cave and what they think it would be like.

Activity #1

Tell the students that a large variety of animals live in caves. Ask the students what reasons an animal might have for using a cave?

Explain that animals can use a cave:

- As a home to live in all of the time
- As a temporary shelter
- Because they like the darkness, temperature, or humidity
- Because they live in or near the water within a cave

Tell the students that all animals must adapt to their surroundings to survive. Ask the students if they know what it means to “adapt”. Explain to the students that plants and animals have different adaptations that allow them to survive in their habitats. An adaptation refers to the way that plants and animals can adjust or change to be able to live where and how they do. An adaptation can be a change in the physical appearance of the plant or animal or a change in its behavior that will help it survive. Ask the students if they can name an adaptation that a plant or animal has. If necessary project/show pictures of plants and animals that the class is familiar with and discuss their adaptations.

Tell the students that animals that live in caves have adaptations that provide advantages for survival deep underground, where it is always totally dark and the temperature remains nearly constant. Explain to the students that the atmosphere of a cave rarely changes, so a cave provides a relatively stable environment for an animal to live.

Write/project the term “Biospeleology” for the students to view. Ask the students if they know what it means. Review the term “speleology” with the students. The class should recall from previous lessons that “speleology” is the study of caves. Ask the students if they have ever heard the term “bio” before. Do they know what it means? Tell the students that “bio” comes from the Greek word “bios” which means “life”. Explain that “biospeleology” is the scientific study of the organisms (i.e. plants and animals) that live in caves.

Explain to the students that biospeleologists classify animals that use caves based on the amount of time they spend in the cave environment and the animal’s dependence on that environment to provide its life survival needs (food, water, shelter, space). Discuss the following groups of cave dwelling animals with the students. Show pictures of examples and discuss their adaptations.

Accidentals

Explain to the students that some animals accidentally enter a cave by wandering in, falling into a sinkhole, or getting washed in during heavy rains. These animals can exist in caves only temporarily because they cannot survive or reproduce underground. If they do not leave the cave, they die and become food for other cave animals.

Examples: frogs, fish, newts, turtles, cows, and deer

Trogloxenes – “cave guests”

Explain to the students that some animals find temporary shelter, a resting place, or a hunting ground in a cave. These animals are known as “trogloxenes”. This name comes from the Greek words “troglo” meaning “cave” and “xenos” meaning “guest”. These cave guests spend much of their time above ground. The cave provides a comfortable shelter, but the animal must periodically return to the surface for food or to mate. These animals never complete their entire life cycles in caves.

Examples: bats, bears, foxes, pack rats, snakes, raccoons, moths, swallows, vultures, groundhogs, and people

Troglophiles – “cave lovers”

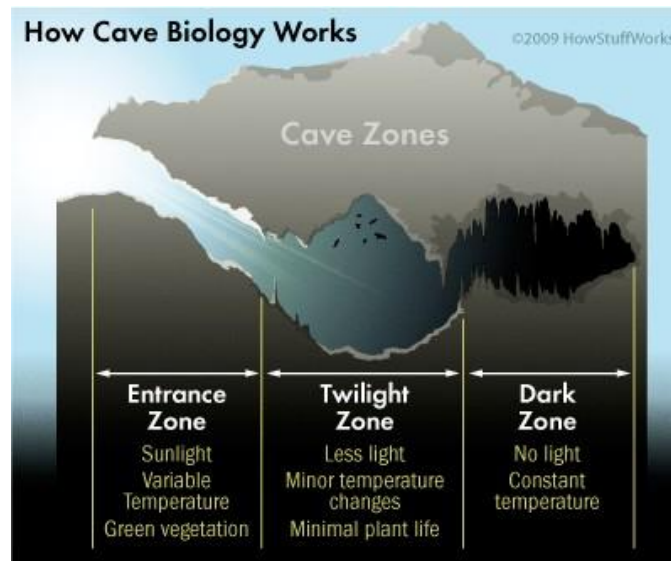
Explain to the students that some animals are adapted to spend their entire life in a cave, but they can also live in suitable habitat above ground. These animals are called “troglophiles”. This name comes from the Greek words “troglo” meaning “cave” and “phileo” meaning “love”. These animals can complete their entire life cycle either above or below ground.

Examples: beetles, crickets, terrestrial crayfish, springfish, terrestrial earthworms, millipedes, centipedes, and some salamanders

Troglobites – “cave dwellers”

Explain to the students that some animals are adapted to live their entire life in caves. These animals are called “troglobites”. This name comes from the Greek words “troglo” meaning “cave” and “bios” meaning “life”. Troglobites cannot survive above ground. The adaptations that cave dwellers have make them especially suited for their cave habitat. Some troglobites are even adapted to certain conditions found in a specific cave, making them different from similar troglobites in other caves. The adaptations that troglobites have help them find food, avoid predators, and complete their life cycles in the total darkness of a cave. Common traits of cave dwellers include: long antennae and vibration sensory organs, a good sense of smell, long fins or legs, smaller bodies than surface species, low metabolic rates, few eggs, and long life spans. Some troglobites have little or no pigmentation and small or no eyes in the adult stage. *Examples: blind crayfish, blind cave fish, blind cave salamanders, cave millipedes, rhadinid beetles, cave isopods, cave amphipods, cave shrimp, and cave spiders*

Ask the students where in a cave an animal might live. Explain to the students that troglonexes, troglaphiles, and troglobites call different parts of a cave home. Tell the students that the environment at the mouth of the cave differs greatly from the environment deep inside the cave. Project/show the students a diagram of the different zones found within a cave (entrance zone, twilight zone, and dark zone). Explain to the students that there are three different zones found within a cave and that the animals found within in each zone can be very different.



Entrance Zone

Explain to the students that the entrance zone is the area that most resembles the environment above ground. It receives sunlight and has a variable temperature. Green plants may grow in the entrance zone which may provide food and shelter for animals. Many animals may eat, sleep or nest here.

Twilight Zone

Explain to the students that the twilight zone is just beyond the entrance of the cave. There is much less light in the twilight zone with little or no vegetation. The temperature is fairly constant but fluctuates some according to the weather outside of the cave. Many troglomenes, like bats, live here. The animals found in the twilight zone usually enter and exit the cave when it is necessary.

Dark Zone

Explain to the students that the dark zone is the deepest part of the cave. There is no natural light that enters into this part of the cave and it is one of the few places to experience total darkness (the other is the bottom of the ocean). No vegetation is able to grow in this area and the temperature is constant. The dark zone is where many troglobites live.

Activity #2

Explain to the students that cave dwelling animals are adapted to exist on a limited food supply, since food is more scarce inside of a cave than it is on the surface. All of the nutrients must be brought into the cave from the outside. Ask the students what kinds of food might be found in caves and where it might come from. Explain to the students the detritus (non-living organic material), seeds, nuts, and small animals (accidentals) can be carried into the cave by flowing water. Insects and other animals that die inside a cave become food for other cave animals. In addition, insect eggs and feces (guano) of bats, cave crickets, and other animals become a food source. Explain that all organic matter is decomposed (broken down) by molds, fungus, and bacteria. The nutrients become available to microscopic animals and insects which in turn are eaten by larger animals. This transfer of energy and recycling organic matter by interconnected food chains within the cave environment is called a food web.

Tell the students that inside a cave there can be food generalists, such as cave crayfish, which eat a variety of food. There are also picky eaters or food specialists, like the guano beetle, which eat very specific foods. Explain to the students that sudden changes in the cave environment can threaten or eliminate entire populations of cave adapted specialists. For instance, if bats stopped living in a cave, the major food source would be gone for guano-eating animals.

Explain to the students that they are going to participate in an activity that will illustrate a cave ecosystem. Tell the students that inside this cave there are wood/pack rats, cave shrimp, cave fish, cave crayfish, and cave salamanders. Tell the students that they are each going to receive a card. On one side of the card it will tell them what cave critter they are and on the other side of the card it will describe what they eat. Tell the students that their cave critter identity is a secret and they should not share it with their fellow classmates. Divide the class into 5 equal groups by passing out the Hungry Cave Critter Cards.

Once the students have received their Hungry Cave Critter Cards scatter the Hungry Cave Critter Food Cards face down throughout the classroom (Note: This activity can be done outside in a large open space if time and weather allows). Explain to the students that when you give

the signal they are to collect as many food cards as they can. When you give another signal they are to stop. Explain to the students that they can only pick one card up at a time and if they pick something up that they cannot eat they must return it face down on the ground. Once the students understand the directions and are ready, give the signal to begin.

After a set amount of time give the signal to stop. Gather the students together and get their attention. Explain to the students that each animal needed at least three food cards to survive. Count up the number of animals who “survived” and those that “died” and record and/or graph them for the students to view. Tell the students that they are going to do the activity again. “Dead” animals can either exit/wait out the game or return as new “young animals” born inside the cave. Return the food cards face down in the designated playing area, however, this time remove 5 cards of nuts & seeds and 10 cards of detritus. Explain to the students that one of the entrances to the cave sealed shut and no food can wash in. Repeat the activity. Which animals survived the second time? Record and/or graph the results. Continue the activity as time allows. Manipulate the number of cards and type of cards to cause different numbers of cave animals to survive or die in each round. Do this by using different scenarios such as:

- Explain that the bats in the cave were disturbed and left the cave. Remove all of the bat guano cards.
- Explain that a predator, such as a raccoon, enters the cave and eats the cave insects, cave shrimp, and/or crayfish. Remove some or all of these cards.
- A drought occurs on the surface which means there is less detritus. Remove the detritus cards.
- A flood washes additional detritus and/or nuts & seeds into the cave entrance. Add more detritus and/or nuts & seeds cards.
- Groundwater pollution kills the cave shrimp and/or cave crayfish. Remove the cave shrimp and cave crayfish cards.

This illustrates the up and down variances in population numbers due to natural and human-related events. Record the number of survivors for each round and graph the results. Discuss the results with the class at the end of the activity.

Wrap-Up/Conclusion

Review the definition of “adaptation” with the students. Briefly discuss several types of animals found in caves and their various adaptations. Create a list of the adaptations these animals have that allow them to survive in a cave ecosystem.

Explain to the students that the cave ecosystem is very fragile. Numbers of organisms living in a cave are very small in comparison to populations on the surface. Human activities can easily upset the delicate natural balance existing in a cave environment. Due to pollution or destruction of caves many organisms are listed as endangered species, meaning they are in danger of becoming extinct, or gone forever.

Apart from the simple loss of the species, extinction of cave organisms becomes a loss of scientific resources. Tell the students that biospeleologists have been studying caves and their inhabitants for years. Some of the benefits from this research include identifying and

cataloging new organisms; discovering mechanisms that control hibernation, fertility, and metabolism; developing new drugs from cave molds; and discovering species of bacteria that have cancer-killing ability.

Tell the students that as biospeleologists they have just discovered a new species of cave critter. Have the students work independently or in small groups to design and create a cave critter using a variety of art supplies. Tell the students that their cave critter must have several of the listed adaptations. Encourage creativity. Have the students write a description of their cave critter including the purpose of its adaptations. Have the students answer the following questions:

- Where is the cave critter found in the cave?
- Why does the cave critter use the cave?
- Is the cave critter an accidental, a troglone, a troglobite, or a troglophile?
- What does the cave critter eat? Is it a food generalist or a food specialist?

As time allows in future class periods have each student or small group of students share their cave critter and explain the adaptations. Students may then add it to the “Classroom Cave”.