



# Cave Life: A “Jigsaw” Activity

**Lesson Objective:** After reading an assigned text on cave animal classifications or cave zones, students will be able to answer questions relative to their text and then present the information to their cooperative group members.

**Key Concepts:** cave life; cave zones: entrance zone, twilight zone, variable temperature zone and complete darkness, and dark zone; cave animal classification: troglaxenes, troglaphiles, and troglobites; cooperative learning.

**Duration:** 1 55-minute class period

**Audience:** Middle school and high school students



# Cave Life

## Teacher Copy and Activity Fact Cards

# CAVE LIFE: TEACHER COPY

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## A “Jigsaw” Cooperative Learning Strategy

### Lesson Objective:

After reading an assigned text on cave life, students will be able to answer questions about the text and present the information to their group members.

### Materials:

1. Cave Life Facts Sheets (4 different fact sheets for each group).
2. Cave Life Worksheets for each student

### Teacher Instructions:

1. Predetermine groups of 4 students and assign a different cave animal fact sheet to each group member.
2. At the beginning of class, have students get together in their assigned groups.
3. Explain how a jigsaw works:
  - a. Explain that the students will have 10 minutes to independently read their assigned section and answer the questions.
  - b. Next, the students will get together in 4 large groups to briefly discuss the answers to the questions for their assigned selections and share key concepts. (Should take no more than about 8 minutes).
  - c. Finally, they will get back together in their original groups of 4 and report out their answers and key concepts to their group members.
    - i. This will take the rest of the class period: Approximately 8 minutes per group member.
4. After the activity has been explained, begin by passing out the 4 different fact sheets to each group.
  - a. Depending on the nature of the class/groups, the teacher may decide to assign selections because some have more text than others.
5. The teacher’s role for the rest of the class is to keep track of time and monitor that each student/group remains on-task.

## Suggested Answers:

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### The 4 Life Zones of Cave

- 1<sup>st</sup> Zone = *ENTRANCE ZONE*
  - a. This life zone supports what kind of organisms?  
*ORGANISMS THAT NEED FULL SUNLIGHT FOR SURVIVAL*
  - b. What are 3 examples of organisms that are found here?  
*POSSIBLE ANSWERS: FERNS, MOSSES, SNAILS, SPIDERS, MOTHS, AND WILDFLOWERS*
- 2<sup>nd</sup> Zone = *TWILIGHT ZONE*
  - a. Where does this zone start and extend to?  
*THIS ZONE STARTS AT THE ENTRANCE OF THE CAVE AND EXTENDS TO THE FARTHEST POINT IN THE CAVE THAT SUNLIGHT REACHES.*
  - b. What are 3 examples of organisms that are found here?  
*MOSS, BATS, SKUNKS, FROGS, AND PACK RATS*
- 3<sup>rd</sup> Zone = *VARIABLE TEMPERATURE ZONE AND COMPLETE DARKNESS*
- 4<sup>th</sup> Zone = *DARK ZONE*
  - a. What characterizes this zone?  
*A COMPLETE LACK OF SUNLGH*
  - b. Describe what organisms in this zone must have in order to survive?  
*THE ORGANISMS MUST HAVE SPECIAL ADAPTATONS THAT ALLOW THEM TO SURVIVE IN DARK CONDITIONS.*

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### Trogloxenes

- 1.) What are the Greek words that “trogloxene” came from and what do the words mean?  
*“TROGLOS” (CAVE) AND “XENOS” (GUEST)*

## TEACHER COPY AND ANSWER KEY

2.) What are 3 possible reasons for these animals to spend their time in caves?

- *TO FIND REFUGE FROM THE ELEMENTS*
- *TO HIBERNATE*
- *TO BEAR THEIR YOUNG*

3.) What are 3 examples of troglomen:

*POSSIBLE ANSWERS: BATS, SKUNKS, RACOONS, MOTHS, FROGS, BEETLES, SOME BIRDS, AND PEOPLE.*

4.) What are the special adaptations these organisms have that help them survive in caves?

*NONE - THESE ANIMALS SHOW NO SPECIAL ADAPTATIONS TO CAVE ENVIRONMENTS.*

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## Troglophiles

1.) What are the Greek words that “troglophile” came from and what do the words mean?

*“TROGLOS” (CAVE) AND “PHILEO” (LOVE)*

2.) How can troglophiles live outside of a cave?

*IF THE ENVIRONMENT IS MOIST AND DARK*

3.) Why do you think a troglophile would venture outside of the cave?

*TO FIND FOOD*

4.) What are 3 examples of troglophile:

*POSSIBLE ANSWERS: EARTHWORMS, SALAMANDARS, BEETLES, CRUSTEANS (CRAYFISH).*

5.) If an animal of a particular species is a troglophile, do all the other animals of the same species also have to be one? Explain.

*SOME TROGLOPHILES MAY SPEND THEIR ENTIRE LIFE CYCLE IN A CAVE, BUT OTHER INDIVIDUALS OF THE SAME SPECIES LIVE OUTSIDE.*

## Troglobites

- 1.) What are the Greek words that “troglobite” came from and what do the words mean?

*“TROGLOS” (CAVE) AND “BIOS” (LIFE)*

- 2.) Where are troglobite found?

*THEY LIVE PERMANENTLY IN THE DARK ZONES OF CAVES AND ARE FOUND EXCLUSIVELY IN CAVES.*

- 3.) Describe how the physical adaptations of these organisms are devoted to sustaining energy.

*THE PHYSICAL ADAPTATIONS THAT PROVIDE A BENEFIT ARE ENHANCED, AND THOSE THAT DO NOT ARE DEGENERATED.*

- 4.) What are 2 features that these organisms do not have that are adaptations to the lack of sunlight?

*EYES AND PIGMENT (COLOR)*

- 5.) From which group of cave animals did troglobites evolved from?

*TROGLOPHILES*

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### As a group:

Cave animals have developed different adaptations depending on where, and how long, they live in caves. **Give a brief explanation of another group of animals that have developed adaptations specific to where they live.**

*Example Answers:*

*1. THE LONG NECK OF A GIRAFFE ALLOWS THEM TO FEED ON THE PLANT MATERIAL AT THE TOPS OF TREES. IN AN ENVIRONMENT WHERE VEGETATION CAN BECOME SCARCE DURING THE DRY SEASONS, THIS HELPS GIRAFFES EAT FOOD THAT ISN'T AVAILABLE TO OTHER (SHORTER) SPECIES.*

*2. THE KIDNEYS OF DESERT ANIMALS, SUCH AS THE KANGAROO MOUSE, HAVE EVOLVED TO RETAIN AS MUCH WATER AS POSSIBLE. THIS ALLOWS THESE SPECIES TO SURVIVE IN ARID ENVIRONMENTS.*

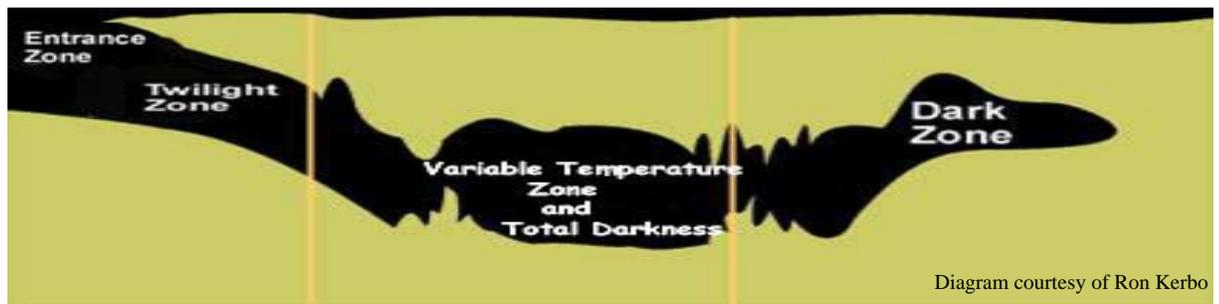


NPS Photo by Rick Wood

Cave Life

# Activity Fact Cards

# The 4 Life Zones of Caves



Cave experts are now acknowledging 4 life zones within caves: the entrance zone, the twilight zone, the zone of variable temperatures and total darkness, and the dark zone.

The **entrance zone** supports those organisms that need full sunlight for survival. For example, ferns and mosses thrive in the cool, moist condition of a cave, but require sunlight for photosynthesis. Other examples of plants and animals that may live in this zone are snails, spiders, moths and wildflowers.

The **twilight zone** is next in the series of cave zones. This area extends from the entrance of the cave to the farthest point in the cave that sunlight reaches. Some plants may be able to grow in these conditions, like moss, and many animals are found living or visiting this zone. Examples include bats, skunks, frogs, and pack rats.

There is a transition zone between the twilight zone and the final zone and it is appropriately named the **variable temperature zone and total darkness**. This zone has only recently been considered to be a distinct cave life zone, but is becoming increasingly acknowledged by cave experts.

The final zone is the **dark zone**, which is characterized by a complete lack of sunlight. Organisms that live in this zone must have special adaptations that allow them to survive in dark conditions, such as the adaptations of the non-green plants and blind cave fish. These organisms are called troglobites, and live no where else on earth but in the dark depths of caves.

# Trogloxenes



The word troglaxene comes from the Greek words “troglos” (cave) and “xenos” (guest). They are cave visitors or temporary cave residents, and move freely in and out of caves.

For troglaxenes, caves provide refuge from the elements, a cozy place to spend the winter, or an acceptable environment to bear their young. For example, some troglaxenes, like bears, prefer the constant cave temperatures for hibernation. No matter how much time they spend in caves, troglaxenes never complete their entire life cycle in them.

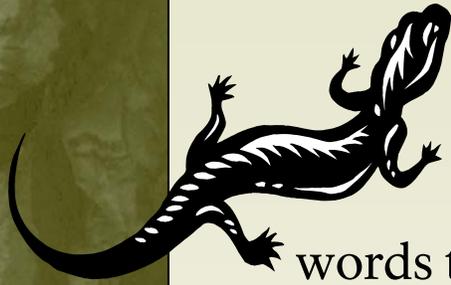


Bats are probably the best known troglaxene.

Skunks, raccoons, packrats, moths, frogs, beetles, some birds, and people are other examples of troglaxenes. Because these animals are not dependent on caves for their survival, they show no special adaptations to cave environments.



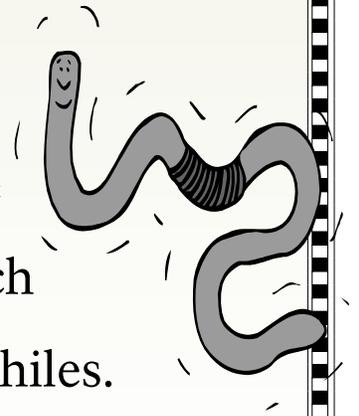
# Troglophiles



Troglophiles *love* caves. The name troglophile itself comes from the Greek words troglos (cave) and phileo (love).

Troglophiles normally live in the dark zones of caves, but they can and do survive outside caves, provided the environment is moist and dark. For example, although some troglaphiles prefer to stay in the cave, sometimes they have to venture out to find food.

Earthworms are a good example; some types of salamanders, crustaceans (such as crayfish), and beetles are also troglaphiles.



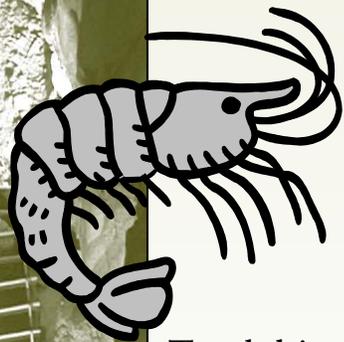
Some individual troglaphiles may spend their entire life cycle in a cave, but other individuals of the same species live outside.

# Troglobites



The word troglobite comes from the Greek words troglos (cave) and bios (life). Troglobites are life forms that live permanently in the dark zones of caves and are found exclusively in caves. Troglobites cannot survive outside of the cave environment, and they have developed special adaptations for living their entire lives in caves.

Because food sources in caves are meager, the sensory organs and physical adaptations of troglobites are devoted to sustaining energy and finding food: those that provide a benefit are enhanced; those not necessary are degenerated.



While some physical structures have been lost, others have been enhanced. Examples include longer legs and antennae, or feelers. These types of adaptations enable them to go for long periods of time with little food.

Troglobites have no eyes or eyes that are poorly developed. Eyes are not necessary because of the lack of light. Most troglobites are white to pinkish in color. They lack pigment (color) because they have no need for protection from the sun's rays or for camouflage to hide them from predators.

In general, existing troglobites have evolved from troglophiles. Examples include cave fish, cave crayfish, cave shrimp, some cave salamanders and insects.

