

How Animals Adapt to Hot Desert Environments

Deserts are characterized by a very dry climate with high daytime temperatures and cold night temperatures. Vegetation is sparse — mainly scrub grass, small shrubs, and cacti. The most common desert animals are reptiles, insects, and a few birds. With the exception of small rodents and pack animals, there are few mammals. Most desert animals are experts at three things:

- avoiding heat
- getting rid of heat
- conserving, or saving, body moisture

To avoid the heat, desert animals have a variety of strategies. One example is the **Costa's hummingbird**, a hummingbird with a green back and metallic purple crown and throat, which migrates to cooler climates. Desert toads hibernate deep underground in the dry winter. They live off stored fat, and come out to breed and feed when rain fills the ponds. Many desert animals have dens or burrows underground in the cooler sand and some rodents and snakes only come out at night. Vultures, which are large desert birds of prey with featherless heads, hooked bills, and large wings, avoid the heat by soaring high above the hot sand during the day. Vultures are sometimes called carrion-eaters because they often feed on the rotting flesh of animals that have died in the desert.

Apart from avoiding the heat, desert animals also have interesting adaptations for getting rid of heat. Many have longer



limbs or bigger appendages than similar animals in other environments. The advantage of this is that heat is lost more quickly from objects with a large surface area than from those with a small surface area. For example, **jack rabbits** that live in hot deserts have longer ears than their relatives that live in cold climates. Some lizards have extra flaps of skin with many blood vessels passing through them, and these are useful for cooling the blood. Desert animals are also usually lighter in color than similar non-desert animals. This lighter color helps keep desert animals cool because it reflects the sunlight and heat.

Water in the desert is in short supply, so desert animals have developed ways to conserve the little moisture they do get. Many desert animals, particularly insects, survive on only the water they get from the plants they eat, and do not drink at all. Generally, desert animals do not excrete much liquid waste because this wastes precious fluids. Some animals have kidneys that can reabsorb moisture from urine back into the blood, and other animals excrete

only solid waste. Some beetles have waxy exoskeletons that help prevent moisture loss.

One particularly well-adapted desert animal is the **kangaroo rat**, a rodent with numerous strategies for surviving in the desert. During the day, kangaroo rats stay in cool underground dens and seal off the entrances to keep the heat out. Kangaroo rats get all the moisture they need from their food, even from seeds. With nasal passages that can reabsorb moisture before they breathe it out and kidneys that concentrate urine, the bodies of kangaroo rats are so adapted to desert life that they never have to drink.



As has been described in previous sections of this manual, camels use a combination of survival strategies that involve conserving moisture and food rather than avoiding or getting rid of heat. Camels do not pant, and their body temperature can rise six degrees above normal before they start perspiring. Camels store water in their blood and food in the fatty tissue of their humps, so are able to go without food and water for about five days. After going without water, camels can drink vast quantities, up to 21 gallons (100 L), to replenish their body fluids. Like kangaroo rats, camels concentrate their

urine. Camels are also adapted to deal with another characteristic of a hot desert — blowing sand. They have muscular nostrils that they can close and two rows of eyelashes to keep out the sand.

The two charts below show examples of desert animals and the adaptation strategies of several animals found in the desert (Costa's hummingbird, desert toad, jack rabbit, vulture, stork, kangaroo rat, camel, beetle). Some of these animals are discussed in Background Information. Others have been added as further examples teachers and students might wish to investigate.

Resources

There are excellent student resources about hot deserts. Here are a few examples:

- <<http://www.eagle.ca/~matink/themes/Biomes/deserts.html>>
- Steele, Christy. *Desert Animals*. Austin, TX: Raintree Steck-Vaughn, 2002.
- Taylor, Barbara. *Desert Life*. Toronto, ON: Stoddart, 1992.

Examples of desert animals

Small animals	Large animals	Birds	Insects
desert toad	bighorn sheep	Costa's hummingbird	beetles
kangaroo rat	camel	vultures	dragonfly
jack rabbit	gazelle	ostrich	locust
bat		barn owls	yucca moth
snake			

Adaptations of some desert animals

Animal	Physical adaptation	Behavioral adaptation
Costa's hummingbird		migrates
desert toad	stores fat	hibernates, burrows
jack rabbit	large ears	
vulture	large wings	soars above heat
kangaroo rat	concentrates urine, nasal adaptation water from food	nocturnal, builds dens seals entrances
camel	does not pant, delays perspiration stores water, stores fat concentrates urine	
beetle	waxy exoskeleton water from food	

ACTIVITY 1

Studying Examples of Desert Animals

Purpose

To become familiar with desert animals.

Material

Chart, Examples of desert animals.

Teacher-produced control and working sets of desert animal pictures (e.g., Costa's hummingbird, desert toad, jack rabbit, vulture, stork, kangaroo rat, camel, beetle) and corresponding labels.

Books, pictures, and movies about these and other desert animals.

Zoology journals and pencils.

Presentation

- Most Montessori teachers present this concept in Years 2 and 3.
- Announce that the students will have an opportunity to investigate what kind of animals live in deserts. This activity can be presented in parts, over one or several days.

PART 1

- With the students, discuss deserts — where they are, what they look like, what kinds of animals and vegetation they have, the relative length of summer and winter. Discuss the three things desert animals must do to adapt to extreme heat (avoid heat, get rid of heat, save moisture).



- Invite the students to share any experiences they have had with deserts.
- Demonstrate the chart, Examples of desert animals, and with the students read the examples of each kind of animal aloud.
- Demonstrate the picture cards and labels.
- Invite a student to choose an animal label, read the name aloud, and place the label under the chart.
- Invite another student to look through the picture cards, find a picture that corresponds to the label, and place the picture to the right of the label, under the chart. Discuss what kind of animal it is (small, large, bird, insect) and what the animal looks like (e.g., furry, feathered).
- Repeat with the remaining pictures and labels until all have been placed in vertical rows under the chart. Point out

that the pictures and labels represent just some of the animals on the chart.

PART 2

- Reshuffle the labels and cards and put the chart aside.
- Distribute the individual picture cards from the working set among the students and follow the procedure for presenting nomenclature material (see the section at the front of the manual).
- Continue until all of the pictures and labels have been placed.
- Encourage the students to continue matching the cards on their own, using the control set and chart to check their work.
- Invite the students to look at the resources about desert animals.
- Ask the students to use their journals to write a short paragraph about one of the animals discussed in the activity (its name, what it looks like, where it lives, and one other interesting detail).

Extensions

- Research a desert animal not discussed in the presentation (e.g., owl, rattlesnake, lizard). Write an illustrated paragraph about that animal.

- Make labels and picture cards of other animals shown on the chart, then practice matching them to the blank chart.
- Make a labeled poster showing ten pictures of different desert animals.
- Watch a movie about desert animals.
- Find and read a story about desert animals.
- Research and write a short illustrated report about camels.



ACTIVITY 2

Investigating Ways Desert Animals Adapt



Purpose

To learn how desert animals have adapted for survival.

Material

Chart, Adaptations of some desert animals.

Teacher-produced control and working sets of desert animal pictures (e.g., Costa's hummingbird, desert toad, jack rabbit, vulture, stork, kangaroo rat, camel, beetle) and corresponding labels.

Two sets of corresponding text cards for Physical Adaptation and Behavioral Adaptation, from the chart, Adaptations of some desert animals.

Books, pictures, and movies about these and other desert animals.

Zoology journals and pencils.

Presentation

- Most Montessori teachers present this concept in Years 2 and 3.
- Announce that students will have an opportunity to investigate how desert animals adapt to extreme heat. This activity can be presented in parts over one or several days.

PART 1

- With the students, review deserts — where they are, what they look like, what kinds of animals and vegetation they have, the relative length of summer and winter.
- Review adaptation with the students. Define and discuss physical and behavioral adaptation strategies desert animals use for surviving extremes of heat (e.g., storing food, concentrating urine, long limbs and appendages, burrowing).

PART 2

- Demonstrate the chart, Adaptations of some desert animals.
- Demonstrate the labels, picture cards, and two kinds of text cards. Ask the students to sort the cards into four piles: label, picture, Physical Adaptation, Behavioral Adaptation. Other than the

four piles, do not organize the cards and labels in any particular order.

- Invite a student to choose an animal label, read the name aloud, and place the label under the chart.
- Invite another student to look through the picture cards, find a picture that corresponds to the label, and place the picture to the right of the label.
- Invite two other students to look through the two piles of text cards and place beside the label and picture the one or two text cards that describe how the animal adapts (behavioral and/or physical). Discuss how the adaptation allows the animal to survive extreme heat.
- Repeat with the remaining labels, pictures, and text cards until all have been placed in vertical rows under the chart.

PART 3

- Reshuffle the labels, picture cards, and text cards.
- Distribute the labels, picture cards, and text cards among the students and follow the procedure for presenting

nomenclature material (see the section at the front of the manual).

- Continue until all of the pictures and labels have been placed.
- Encourage the students to continue matching the cards on their own, using the control set and chart to check their work.
- Invite the students to look at the resources about desert animals.
- Ask the students to use their journals to write two short paragraphs, with an illustration, about the adaptation strategies of one of the animals discussed in the activity (its name, what it looks like, where it lives, and its physical and/or behavioral adaptation strategies).

Extensions

- Research and make a poster showing the ways one desert animal adapts.
- As a group activity, make a poster illustrating different kinds of desert adaptation strategies.
- Write a short fictional story about how one young desert animal adapts to extreme heat.