

# Secrets of the Crocodile Caves

## PROGRAM OVERVIEW

NOVA profiles the lives of two of Madagascar's many species—the crowned lemur and the cave-dwelling crocodile.



The program:

- explores Ankarana, a reserve in northern Madagascar, which is home to a region of stone forests and unique animals and plants.
- documents the crowned lemur's way of life, focusing on a troop of lemurs led by a one-eyed queen.
- discusses the evolutionary history of crocodiles and lemurs.
- explores the relationship between cave-dwelling crocodiles and a local tribe that believes they are sacred and protects them.
- features the fossa, a lemur-hunting carnivore that lives nowhere else on Earth.
- uses special filming techniques to capture the lepilemur, aye-aye, and other nocturnal animals.
- presents the lifestyle of the crocodiles, which retreat to caves to cool their ectothermic bodies.
- showcases how lemurs, crocodiles, and other animals and plants on Madagascar have developed adaptations suited to their own well-defined niches.

**Taping Rights:** Can be used up to one year after the program is taped off the air.

## BEFORE WATCHING

- 1 Ask students to find Madagascar on a world map. How might the fact that Madagascar is an island affect its biodiversity? What kinds of animals might live there?
- 2 Discuss with students the concept of an energy pyramid. Be sure to emphasize the direction of energy transfer in the pyramid from prey to predator.
- 3 As students watch, have them take notes on predator and prey relationships on Madagascar. Organize the class into three groups to take notes on 1) land animals and plants, 2) animals that live in the water, and 3) animals that primarily live in the sky. Have students create a chart with columns labeled "animal name," "eats," and "is eaten by." Students can use their notes to complete the "Home Sweet Home" activity on page 2.

## AFTER WATCHING

- 1 Ask students to describe the role played (niche occupied) by the lemur in its community, or that played by the crocodile. How are these roles alike? How are they different? What might happen if the lemurs moved into the caves and the crocodiles moved into the forest?

---

## CLASSROOM ACTIVITY

### Objective

To learn about a small segment of the complex food web of a region in Madagascar.

### Materials for each team

- copies of the “Home Sweet Home” student handout
- several sheets of unlined paper
- ruler

### Procedure

- 1 Organize students into groups of three so that one member of each group has notes on the different categories outlined in the Before Watching activity #3 on page 1. Provide copies of the student handout and other materials to each group.
- 2 Discuss with students the concept of a food web. They are probably familiar with a simple food chain (e.g., grain is eaten by mice that are eaten by an owl). A food web is a more complex model of feeding relationships that includes many interconnected food chains.
- 3 After watching, have students in each group identify all the plants and animals on the student handout and draw arrows from each plant or animal to the animal that eats it. Then, using their program notes and student handout, have students draw a food web for the plants and animals of northern Madagascar. Note to students that these plants and animals are only a small part of the food web in this region of Madagascar. Ask students to draw arrows from an animal or plant to the animal that eats it to illustrate how energy flows through the food web.
- 4 Ask students to choose one food chain from their food web and use it to draw an energy pyramid. An energy pyramid shows how energy flows through the food chain.
- 5 To conclude, hold a class discussion about the balance of the food web. What might happen if one organism were taken out of the web? What if an organism, such as another species of lemur, were added?
- 6 As an extension, have students investigate what other plants and animals live on Madagascar and brainstorm how those plants and animals might fit into the food web students created.

## STANDARDS CONNECTION

The “Home Sweet Home” activity aligns with the following National Science Education Standards.

GRADES 5–8

Science Standard C:

### Life Science

Populations and ecosystems

- The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

GRADES 9–12

Science Standard C:

### Life Science

The Interdependence of Organisms

- Energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers.
- Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite. This fundamental tension has profound effects on the interactions between organisms.

*Video is required  
for this activity.*

### Classroom Activity Author

Dwight Sieggreen has been teaching middle school science for 35 years in Northville, Michigan. He currently serves as president of the National Association of Presidential Awardees for Excellence in Science Teaching.

## ACTIVITY ANSWER

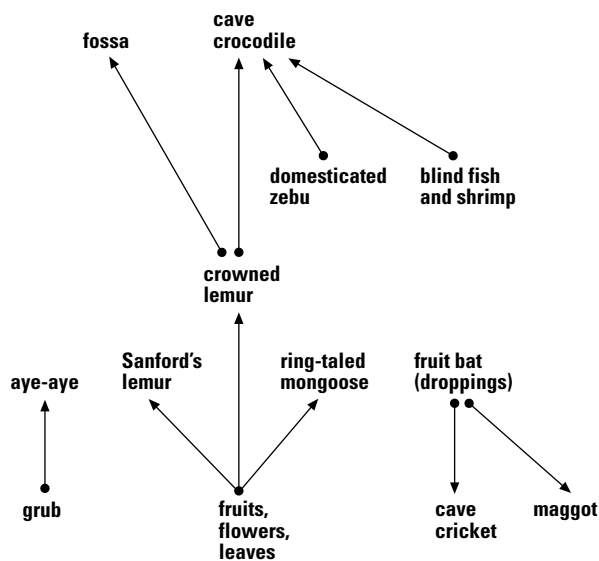
As you review completed food webs with students, remind them that the animals and plants they used for their food web are just a small segment of the living organisms on Madagascar. The real food web is far more complex. The web below shows some of the interactions among plants and animals.

Some of the foods crowned lemurs eat are figs, flowers, and leaves. (They also eat tamarind pods, tree fruits, cicadas, screw plants, and other items not shown in this film.) Two of the crowned lemur's predators are crocodiles and fossas. The crowned lemur's competitors include Sanford's lemurs and ring-tailed mongooses.

If the fig trees were struck by disease, the population of crowned lemurs might decrease. Predator populations might also decrease. Since figs are not only a staple for crowned lemurs, but also for their competitors, the populations of many species dependent on figs would decrease. Their predators would grow hungry and possibly starve.

The animals that crocodiles eat that are shown on this program include crowned lemurs, domesticated zebu, and blind fish and shrimp. The population of crocodiles is affected by the availability of their prey.

## SAMPLE FOOD WEB



## LINKS & BOOKS

### Links

NOVA Web Site—Secrets of the Crocodile Caves  
[www.pbs.org/nova/croccaves/](http://www.pbs.org/nova/croccaves/)  
*In this companion Web site for the NOVA program, view panoramas of Ankarana, learn about the legends of Madagascar, find a who's who of crocodile species, and explore the anatomy of a crocodile.*

Madagascar: Biodiversity and Conservation  
[ridgewaydb.mobot.org/mobot/madagascar/](http://ridgewaydb.mobot.org/mobot/madagascar/)  
*Highlights the biodiversity of Madagascar, including a section on the dry tropical forest.*

Sights & Sounds—Madagascar Dry Forests  
[www.nationalgeographic.com/wildworld/madagascar/](http://www.nationalgeographic.com/wildworld/madagascar/)  
*Shows photos and video clips of some of Madagascar's rare animals, such as fossas and crowned lemurs.*

### Books

Garbut, Nick.  
**Mammals of Madagascar.**  
 New Haven: Yale University Press, 1999.  
*Provides an overview of Madagascar's diverse group of 117 mammal species, more than 100 of which are endemic to the island.*

Tyson, Peter.  
**The Eighth Continent: Life, Death, and Discovery in the Lost World of Madagascar.**  
 New York: William Morrow, 2000.  
*Describes Madagascar through the eyes of four scientific experts—a herpetologist, a paleoecologist, an archeologist, and a primatologist—as they explore the world's fourth-largest island.*

# Home Sweet Home

Madagascar is home to a wide variety of organisms that occupy specific niches. Each species is connected to other species through a food web and depends on other species for survival. Learn about some of those relationships in this activity.

**Procedure**

- 1 Take careful notes of all the animals as you watch NOVA's "Secrets of the Crocodile Caves." Then label all the plants and animals in this illustration. Draw arrows from each plant or animal to the animal that eats it.
- 2 On a separate sheet of paper, draw a food web of all the plants and animals. Write the names of all the plants and animals and draw arrows from each plant or animal to the animal that eats it.

- 3 Choose a food chain from within your food web and draw an energy pyramid with the parts of that food chain. To create your energy pyramid, draw a triangle and divide it into a top, middle, and bottom. Show how energy flows through the food chain by writing the plant in the bottom segment, the animal that eats the plant in the middle, and the animal that eats that animal at the top.

- 2 If the fig trees were struck by disease, how would the population of crowned lemurs be affected? How would the crowned lemurs' predators be affected? How would this affect the entire food web?
- 3 Circle the crocodile. What does the crocodile eat? The adult crocodile in the Ankarana region of Madagascar is free from predators because the Ankarana tribe holds the crocodile sacred. What other factors affect the population of crocodiles? What dangers threaten the eggs and the young crocodiles?

**Questions**

*Write your answers on a separate sheet of paper.*

- 1 Circle the crowned lemur on your food web. Identify what the crowned lemur eats in the rainy and dry seasons. List the crowned lemur's predators and competitors.

