



# NYSDEC Environmental Education

## Skull Science

For Students in Grades 3 through 6

*A 45-minute program designed to teach mammal basics (specifically New York State Mammals), as well how to use mammals' skulls to determine their diet and other characteristics. Skulls and animal furs can be purchased from education supply companies.*

### **Goal**

Students will learn what makes a mammal different from other animals, and what characteristics are shared by all mammal families. Students will understand that we are mammals. Students will have the opportunity to look at mammal skulls and examine their teeth to predict what the animal's diet was. The NYSDEC monitors the health of wild mammal populations, and uses some of these skills to help scientists better understand ecosystems throughout New York.

#### **NYS Elementary & Intermediate Level Science Core Curriculum**

##### **Standard 1:** *Scientific Inquiry*

*Key Idea 1:* The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

##### **Standard 4:** *The Living Environment*

*Key Idea 3:* Individual organisms and species change over time.

*Key Idea 5:* Organisms maintain a dynamic equilibrium that sustains life.

### **Key Terms**

**Carnivore-** animal that eats only other animals

**Herbivore-** animal that eats only plants

**Omnivore** - animal that eats plants and animals

**Incisors-** front teeth used for clipping food

**Canines-** corner teeth used for gripping and ripping

**Molars-** back teeth for crushing and grinding

**Marsupials-** family of mammals that the young develop in a pouch

**Predators-** carnivores that catch and eat their prey

**Scavengers-** carnivores or omnivores that eat dead animals

## ***Mammal Discussion***

Have a guided class discussion, allowing the students to share their knowledge with one another, as well as the instructor. There are several key topics that should be discussed, and several auxiliary topics that may be shared if brought up by the students.

### **Key topics:**

- Mammal young develop internally, protecting the embryo until birth.
- Mammals don't lay eggs, they have babies born alive (exception- *platypus and spiny anteater*).
- Mammal infants are fed milk, produced by their mother's body.
- All mammals have a 'childhood'. Some, like mice, may last a few days; others, like elephants, may exceed a decade.
- Mammals are warm-blooded (*endothermic*), their body temperature remains the same regardless of their surroundings.
- Mammals are covered with hair (although some are much more furry than others, some, like whales, have virtually no hair). Students will be encouraged to look at their own hands, their neighbor's cheek, etc. to drive home the fact that we belong in this group as well.
- Wild mammal populations often require monitoring and management in human communities.
- Humans are mammals.

### **Auxiliary topics:**

- Mammals are vertebrates.
- Bats can fly, some other mammals can glide.
- Some mammals are wild animals, others are domesticated.
- Mammals have a lot to learn, and often learn from their elders.

### **Segue topic:**

Mammals fuel their body with many different kinds of foods. Mammals eat much more than cold-blooded animals, such as reptiles. Mammals eat so much to have enough energy to keep a stable body temperature. Encourage students to think of examples of mammals that: eat only meat, eat grass, eat insects, eat berries, etc.

## ***Skull Examination***

Using the previous food topic before, or other segue explanation, help the students identify their own teeth and their function: *incisors*-clipping; *canines*-grip and ripping; *molars*-grinding and crushing.

### **Explain the following generalizations**

***Canines:*** Canine teeth are used to rip and tear meat. Long and sharp canines in an animal usually indicate that it eats meat.

***Molars:*** Molars are used to crush and grind food, first broken off by the other teeth. Flat, large bumpy molars tend to indicate that the mammal eats plants while sharp- edged molars may indicate a meat-eater.

***Incisors:*** Incisors are used for clipping off bits of food. Large flat incisors are used by plant eaters. Meat eaters have incisors, but they are usually small.

Explain the meanings of ***carnivore***, ***herbivore*** and ***omnivore***. Explain that when the students examine the skull, they shouldn't be guessing what species of animal it was, but rather what it ate when it was alive. Students will use the science words carnivore, herbivore, and omnivore to describe each specimen.

**As you show each skull, encourage students to discuss the artifact quietly. Touching should be allowed, but gently. Students should examine the teeth and skull features, and not guess what animal it was (yet).**

After the students all get a chance to take a look, ask them (by show of hands) if they think the animal was a carnivore, an herbivore, or an omnivore.

**After the first skull is examined, explain to the students that in science, guessing is encouraged, and predictions are typical in science situations. Scientists wait for results before drawing conclusions.**

Once the students come to a consensus as to the animal's diet, discuss the other skull features, and try to determine which of the mammals of New York that the skull belongs to. Discuss the habitat that the animal lives in, and whether the species can be found in the wild in New York. Some of these animals are considered nuisances by some people (deer, raccoons) in some locations. Discuss some of the experiences students have had with these mammals, and whether there is a way of avoiding negative encounters.

Repeat for at least three skulls, and show an example of carnivore, herbivore and omnivore.

*Preferred skulls: start with a bobcat skull, then beaver, then bear.*

If time allows, show the skull of a female deer. Grazing mammals have rough molars, and it may be tricky for the students. Before they guess what animal it was, show the skull of a male deer, with antlers.

Use this demonstration to then talk about the function of antlers, and compare antlers and horns.

Use the human skull to compare the lessons you have been discussing all along to the students' own physiology. Examine teeth, talk about blood vessels, nose cartilage, and other features the students have curiosity about. Show the sutures on the top of the skull, and discuss the bone plates of the human skull. Some of the students may be familiar with the 'soft-spot,' the *fontanel* on a newborn's head. Make sure that the students are able to relate the skull in the demonstration to their own body.

**One way that can be used to introduce the human skull to the group is to ask them if they want to see the skull of the 'most dangerous' mammal in New York. After showing the skull, explain that while humans are responsible for more human death and destruction, humans also have the ability to create and help others. Every day, each person has the ability and responsibility to choose to create rather than destroy. The point is to engender a sense of stewardship in the students, not to create guilt about human activities.**

### ***Fur demonstration***

Share animal pelts from some of the following species:

Black Bear, Red Fox, Muskrat, Opossum, Raccoon, Skunk, White Tailed Deer.

Describe the function of fur, and relate the wild furs to more familiar dogs, cats or other pets at home.

#### ***Fur Topics***

- **Shedding-** Many mammals have a warm winter coat and a thinner summer coat.
- **Camouflage-** Many species are colored to blend in with their surroundings. Patterns (zebras, tigers) can also augment camouflage. Some have seasonal camouflage (martens, ermines, snowshoe hares) that are white in winter and brown in summer.
- **Warning Colors-** Patterns (skunk is a good example) may warn predators to stay away.
- **Native-** Explain what it means for an animal to be 'native' to an area.
- **Domestic-** Explain the difference between wild animals, and animals that live with people.
- **Adaptations-** Some mammals have specialized hair- polar bears have hollow hair to insulate, otters and muskrats are waterproofed, porcupines and hedgehogs have quills.

Talk further about which species of mammals live in New York and which do not. One of the topics that should be discussed throughout the lesson is the way that these wild animals interact with humans. Some of these animals may be considered nuisances by one person, but a wonderful animal to attract to their backyard by another. The NYSDEC monitors wildlife populations, and often has to balance the needs of wildlife with the needs of the public.

### ***Conclusions***

Time permitting, conduct a guided question and answer session. Mammal artifacts can be used to answer questions as needed.