Wildlife Forensics

For Students in Grades 6 through 10

A 45-minute program designed to help students analyze anatomical differences in the skulls of mammals to determine characteristics and behaviors they had in life. If desired, you can include an examination of mammal pelts. This would extend the length of the program to 60 minutes. Skulls and animal furs can be purchased from education supply companies.

Goal

Students will examine mammal skulls, and with the help of the instructor, learn features that correspond to the anatomy of the animal. By looking closely at the teeth, the orientation and size of the eye sockets, the ridges and crests of bone on the skull- students will learn how to tell a carnivore from an herbivore, and a predator from prey. The NYSDEC monitors the health of wild mammal populations, and uses some of these skills to help scientists better understand the Long Island ecosystem.

NYS Intermediate Level Science & The Living Environment 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:
Intermediate Level Science:
Key Idea 3: Individual organisms and species change over time.
Key Idea 5: Organisms maintain a dynamic equilibrium that sustains life.

The Living Environment:
Key Idea 6: Plants and animals depend on each other and their physical environment.

Vocabulary List

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

Parts of a Skull Vocabulary

Maxilla – upper jaw
Mandible- lower jaw
Zygomatic arch- broad ridge of cheekbone
Sagital crest- ridge on top of skull
Molar- flat grinding tooth in back of jaw
Canine- sharp piercing tooth in corner of mouth
Incisor- tooth in front of jaw

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.

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.

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). Encourage students to look at their own hands, their neighbor's cheek, etc. to drive home the fact that we belong in this group as well.
- Humans are mammals.

Auxiliary topics:
- Mammals are vertebrates.
- Bats can fly, some other mammals can glide.
- 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, 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 indicates 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 each skull is shown, 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 and 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.

Once the students are comfortable with the parts of the skull and the teeth, examine them together in more detail. Identify the parts of the skull that show where muscles attached, the relative size of the snout, where the ears were and other processes. Next interpret these observations with them, determining animals with powerful jaws, large eyes, good senses of smell, etc.

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

Preferred skulls: start with bobcat skull, then beaver, then bear

If time allows, show the skull of a female deer. Grazing mammals have rough molars, so 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 are 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

For the full hour program, the last period of time can be used to examine the animal fur. Share pelts from some of the following species:
> Black Bear, Red Fox, Muskrat, Opossum, Raccoon, Skunk, White Tailed Deer.

Discuss 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) - 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.
- The use of pelts by humans throughout history: for shelter, clothing, ornaments, trophies

Talk further about which species of mammals live in New York and which do not. One of the topics to discuss 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, we will have a guided question and answer session. Mammal artifacts can be used to answer questions as needed.