Lessons in a Backpack

United Nations Educational, Scientific and Cultural Organization

GEORGIAN BAY BIOSPHERE MNIDOO GAMII Spirit of the Water

If Teeth Could Talk

Examining Mammal Skulls

Description of Lesson

Animal skulls can tell us many things about creatures and how they survived in their natural environment. Simple observations of an animal's skull can tell us what the animal ate, whether the animal was predator or prey, and which senses were most important to the animal's survival.

This lesson has been adapted from "Wildlife Skull Activities" by Lawrence M. Sullivan, from the Arizona Cooperative Extension, the University of Arizona College of Agriculture and Life Science. Used with permission.

Connect with the Georgian Bay Biosphere

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GEORGIAN BAY BIOSPHERE MNIDOO GAMII Spirit of the Water

At a Glance

Grade Level: 4

Learning Environment: Indoor Classroom

Prep Time: 15 minutes

Length of Lesson: 1.5 hours

Key Vocabulary: Carnivores, Herbivores, Omnivores, Canines, Incisions, molars, orbits, predator, prey

Staffing: 1 educator

Materials:
12 Skulls: raccoon, black bear, fisher, wolf, muskrat, lynx, otter, deer, moose, mink, beaver, red fox
PowerPoint DVD
Lesson Plan and Worksheet
Other resources needed:
1 copy of the Mystery Skulls Worksheet per student
Pencils
Projection unit, computer

Kit available from the NNDSB Resource Centre

Groupings: Whole class, and Small groups of 2 or 3

Teaching/Learning Strategies: Socratic dialogue

Lesson Outline

TIME	ACTIVITY	LOCATION	MATERIALS
30 min.	What did this animal eat?	Indoor	Raccoon Skull Fisher Skull White Tail Deer Skull
30 min.	What animal is this?	Indoor	Raccoon Skull Fisher Skull White Tail Deer Skull PowerPoint
30 min.	Mystery Skulls	Indoor	Picture and skull of a Mink, Moose, Otter, Beaver, Lynx, Muskrat, Wolf, Bear, and Red Fox. Worksheet Pencils

Curriculum Expectations
Grade 4 Science Curriculum

Understanding Life Systems
Overall Expectations:
2. investigate the interdependence of plants and animals within specific Habitats and Communities.

Specific Expectations
3.6 Identify animals that are carnivores, herbivores, or omnivores.

Making a Cultural Connection

In this lesson, we are using the animal teeth to tell us about the animal when it was alive. There are many more uses for the teeth and bones!

Traditionally, Ojibwe people used elk teeth to decorate Ribbon dresses. The leg bone of a moose or deer was used in the process of removing the hide of the animal. Each animal carriers the tools necessary to process and utilize it's vessel (body). Deer antlers can be used as an awl, sharpen for intricate work, or kept natural for weaving/tying. Bear bones were used as needles in the process of sewing a birch canoe. There are now metal versions of these tools available, but some people continue to use the original bone tools. Using the bones in so many different ways helped ensure no part of an animal was ever wasted.

Research Opportunity

Have students read about and research traditional Ojibwa clothing and jewellery. Make comparisons with other First Nations, and with now. Prompt student comparisons with: Why was this material used? (warmth, availability, different land/animal/resources)

Background

Animal skulls can tell us many things about creatures and how they survived in their natural environment. A few relatively simple observations of an animal's skull can tell us what the animal ate, whether the animal was predator or prey, and which senses were most important to the animal's survival.

The four most important characteristics to look at when examining a skull are the teeth, the eyes, the nasal passage, and the inner ear. These four things give information about whether the animal was a herbivore, carnivore, or omnivore.

Teeth

Carnivores

Incisors - the teeth at the very front of jaw. On carnivores mainly used for grooming.

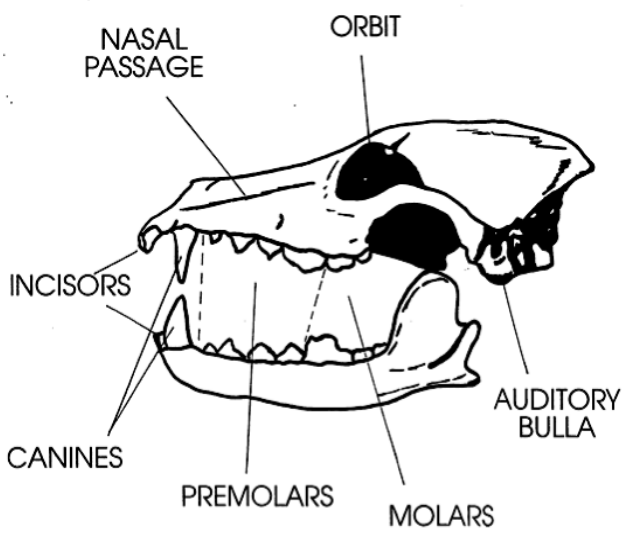
Canines - located between the incisors and premolars. Usually large, conical and pointed when found in meat-eating animals; used to kill and hold prey.

Lynx Skull - Lynx are carnivores. They have sharp canines and cheek teeth.

Cheek teeth - pre-molars and molars; are sharp and pointed for cutting and tearing flesh. Some of the upper cheek teeth overlap lower teeth, providing a scissor-like shearing action to cut meat. These teeth are referred to as carnassial teeth.

Teeth motion - with overlapping cheek teeth and long canines, carnivores do not have the ability to move the lower jaw from side to side in a chewing motion.

Colour of teeth: usually bright white because they don't get stained from plant materials.



Wolf skull (Carnivore) - Note the long, pointed canine teeth for grabbing and piercing prey. Also notice the sharp cheek teeth that are used for slicing and shearing meat in a scissor-like manner.

Herbivores

Incisors - large and well-developed, perfect for cutting plant material. Most ruminants - deer, moose, cows - do not have upper incisors or canines. Instead they have a hard upper palate that serves as a "cutting board" for the lower incisors to cut through plant stems. This allows them to eat a lot quite quickly. They then take cover, regurgitate and chew their cud while watching for predators.

Canines - resemble incisors in form and function.

Cheek teeth - large and wide with high, sharp crowns for grinding and chewing plant material. Instead of overlapping, the cheek teeth make surface contact to provide a grinding action.

Teeth motion - lower jaw has a side-to-side motion that allows them to chew food. Chewing and grinding causes their teeth to wear with age.

Teeth colour - often stained by plant material.

Omnivores

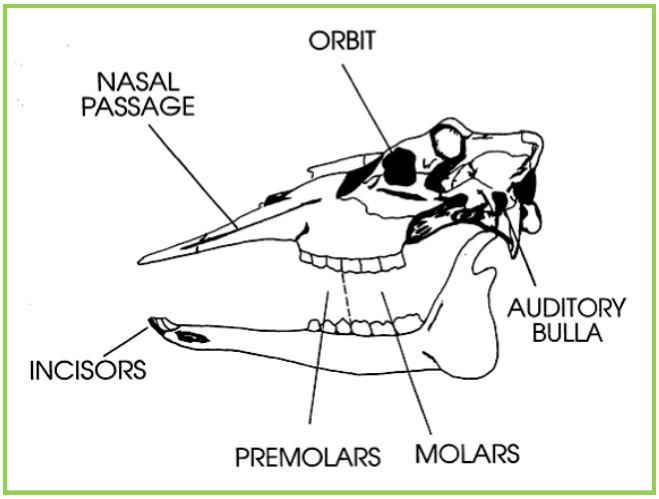
Incisors - large and well developed for cutting through plant material.

Canines – long and pointed for grabbing and holding prey.

Cheek teeth - a combination of sharp, scissor-like carnassial teeth for shearing meat, and teeth with more rounded cusps for grinding and crushing plants. There is surface contact between some upper and lower molars.

Note: Many omnivores are either predominately meat-eaters or predominately plant-eaters. The cheek teeth of these animals can usually tell us their predominant feeding strategy. For example, the black bear is an omnivore that is predominately a plant-eater and has cheek teeth more closely resembling those of an herbivore. The cheek teeth are the principle indicators.

Teeth motion - do not have side-to-side lower jaw movement. Rather than a chewing action, their cheek teeth perform both shearing and crushing actions.



Deer skull (Herbivore) - Note the absence of upper incisors and canines. Ruminants, like deer and moose, instead have a "cutting palate" that allows them to quickly cut off twigs and then retreat to a safer location to regurgitate food while watching for prey. Note the flat check teeth for grinding plants.

Moose lower jaw - Moose are herbivores. Note the teeth stained by plant material.

Raccoons are very well known omnivores.

Eyes

The size of the orbits (eye sockets), in relation to the overall size of the skull, is generally proportional to the sharpness of the animal's eyesight. The larger the orbits, the better the eyesight of the animal. As an example, the lynx (and most cats) have very large orbits and hence, very acute vision. The large eyes of cats, and many other nocturnal animals, play a role in the keen night vision.

Eye orbits at the front of the skull indicate that the animal has binocular vision – both eyes work together to produce a single image that gives both distance and depth perception. Front facing eye orbits are found in predators to allow them to accurately locate prey.

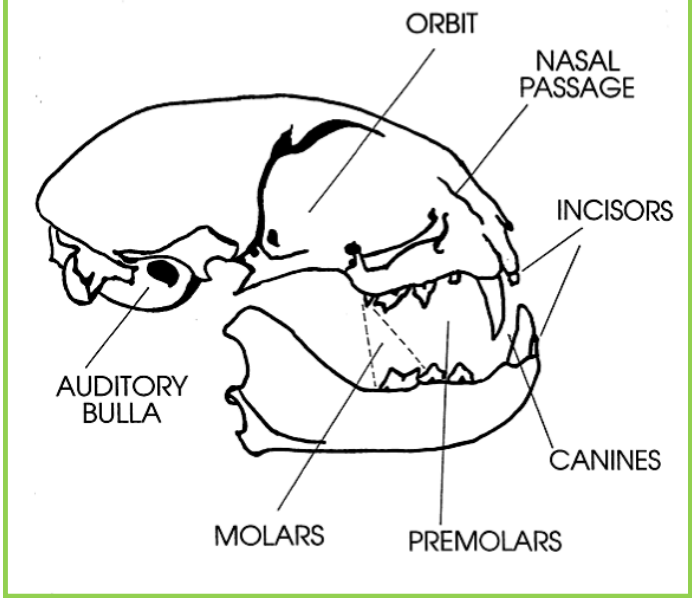
Eye orbits at the side of head indicate monocular vision, that allows an animal to individually focus on an object with one eye. This structure allows the animal to have an extremely wide field of vision - almost seeing completely behind them. This eye placement is found in prey species, so that they can always be on the lookout for predators coming in all directions.

Inner Ear

The auditory bullae (pronounce "bully") are the bony portions of a skull that encase structures of the inner and middle ear. In general, the larger, more inflated this structure, the greater the sense of hearing.

Cats have larger auditory bullae, thus very good hearing. Although their hearing is better than humans, deer have a relatively poor sense of hearing compared to cats.

Lynx Skull (Carnivore) - Note the sharp, pointed canine teeth, for grabbing and piercing prey. Note the extremely large eye sockets. The cat family has extremely good eyesight, but not as well developed sense of smell as the dog family.



Nasal Passage

The relative size of the nasal passage on a skull is an indication of the animal's sense of smell. The thin, bony structures inside the nasal passage (nasal turbinates) provide the framework for membranes which sense odour. The greater the size of these structures, the greater the sense of smell.

The short nasal passages of cat skulls tells us that cats do not have a very good sense of smell compared to many other animals and rely more on other senses to locate prey.

Conversely, the long nasal passage of a wolf indicates that wolves have a very keen sense of smell and that this sense is important to the survival of wolves.

Teaching and Learning

Students could be disturbed by skulls - go slowly, gently. After the initial introduction, most students are eager to handle skulls and to learn about them.

Caution and closely supervise students when they are handling the skulls. Skulls are breakable and difficult to repair or replace. The children should be encouraged to touch the skulls and the features pointed out in this lesson, but the teacher should retain control by holding the skull until the hands-on activity near the end of the lesson plan. If the students are seated in a circle on the floor, they can pass the skulls around the circle and there is less chance of the skulls being dropped.

The skulls used to describe Activities 1-2 in this lesson are: a fisher to represent a carnivore; a white-tailed deer to represent a herbivore; and a raccoon to represent an omnivore.

Part A: What did this animal eat?

Invite guesses and discussion to the questions posed. Show the skulls separately, ask each question about each skull and point out the feature described in the answer. Do not identify the animal until later, in Activity 2. Before posing questions, tell the students that the animals will be identified later.

Skull 1 (Carnivore - Fisher)

What did this animal eat?
Answer - This animal was a meat eater. We can tell what this animal ate by looking at the teeth.

Why are the canine teeth so long and pointed?
Answer - The canine teeth are used for piercing and holding other animals.

Why are the incisors (smaller teeth in front between the large canines) relatively small and short?
Answer - Incisors play a minor role for this animal - such as grooming.

Why are the cheek teeth (pre-molars and molars) sharp? Why do the upper and lower cheek teeth overlap?
Answer - The molars are used for cutting and shearing meat in a scissor-like action.

Could this animal chew?
Answer - The long canine teeth and the type of attachment of the lower jaw prevent this animal from having side-to-side movement of the lower jaw. This animal bit, sheared and gulped its food without any real “chewing” action.

Skull 1- This animal is a CARNIVORE (show PowerPoint slide). Carnivores eat meat. They kill and eat other animals.

Skull 2 (Herbivore - White-tailed Deer)

What did this animal eat?
Answer - This animal ate plants. We can also tell what this animal ate by looking at the teeth.

Compared to the carnivore, are these incisors relatively larger or smaller?
Answer - The incisors are relatively large and well developed.

What are these incisors used for?
Answer - They are used as blades for cutting plant parts and stripping away leaves.

Do these canines look like the canines in the carnivore?
Answer - No. The canine teeth in this animal resemble and function as incisors because as a plant eater, this animal had no use for long, pointed canine teeth.

Do the cheek teeth (molars and pre-molars) look like the carnivore’s?
Answer - No, they are large with high crowns and wide across the top for grinding and crushing plant materials.

Do the upper and lower cheek teeth overlap?

Answer - No. The upper and lower molars fit together to provide grinding and crushing surfaces.

Could this animal chew?
Answer - Yes. This animal had the ability to move its lower jaws in a side-to-side, chewing motion.

Notice there are there no upper incisors or canines. Why not?
Answer - Most ruminant (cud chewing) animals (deer, sheep, cattle, etc.) do not have upper incisors or canines. Where the upper incisors and canines would be, these animals have a hard palate that serves as a “cutting board” for the lower incisors to cut grass and other plant materials and to strip leaves off branches.

Skull 2 - This animal is a HERBIVORE (show PowerPoint slide). Herbivores eat plants.

Skull 3 (Omnivore - Raccoon)

What did this animal eat?
Answer - This animal ate both meat and plants. We see in this skull, teeth features of both carnivores and herbivores.

Why are the canine teeth long and pointed?
Answer - The long, well developed canines are used for capturing and killing other animals.

How do the incisors compare to carnivores and herbivores?
Answer - The incisors are relatively large for cutting plants and stripping leaves.

How do the cheek teeth compare to carnivores and herbivores?
Answer - This animal has both high crowned cheek teeth with sharp edges for shearing meat, and cheek teeth with wider crowns to crush bone and plant parts.

Look closely at the back molars. They look very similar to ours. Humans eat both meat and plants. Why don’t we have long canines?

Answer - We do not kill and capture animals with our teeth.

Skull 3 - This animal is an OMNIVORE. (show PowerPoint slide). Omnivores eat both plants and animals.

Part A: What animal is this?

Skull 1 (Carnivore - Fisher)

Look at the teeth. What did this animal eat?
Review the teeth characteristics of a meat eater:

Incisors - small
Canines - large, pointed
Cheek teeth - sharp with high crowns - some overlap like scissors.
Answer - This animal ate meat.

Is this animal a carnivore, herbivore or omnivore?
Answer - A carnivore. What animal is this? Invite guesses. Give hints such as, “this animal might eat your cat or dog,” or “this animal is a member of the weasel family.” Answer - This is a fisher (show PowerPoint slide).

Skull 2 (Herbivore - White-tailed Deer)

Look at the teeth. What did this animal eat?
Review teeth characteristics of a plant eater:

Incisors - large Canines - small, resemble incisors
Cheek teeth - wide crowns with surface contact between upper and lower teeth.
Answer: This animal ate plants.

Is this animal a carnivore, herbivore or omnivore?
Answer: A herbivore.

What animal is this? Invite guesses. Give hints such as, “notice the absence of upper incisors and canines,” or “this animal can run very fast to avoid danger.”

Answer - This is a white-tailed deer (show PowerPoint slide).

Skull 3 (Omnivore - Raccoon)

Look at the teeth. What did this animal eat? Review teeth characteristics of an omnivore:

Incisors - relatively large
Canines - large, pointed
Cheek teeth - both shearing and crushing
Answer - This animal ate both meat and plants.

Is this animal a carnivore, herbivore or omnivore?
Answer - An omnivore.

What animal is this? Invite guesses. Give hints such as, “this animal eats anything - opportunistic” or “you might have encountered this animal while camping.”

Answer - This is a raccoon (show PowerPoint slide).

Part C: Mystery Skulls

Additional skulls, that have not been previously examined in this lesson are numbered and placed at several different station in the room.

Using PowerPoint go through the pictures of the animals that are represented by the skulls. Ask students what they know about each animal: whether it is a carnivore, herbivore or omnivore; what it might eat; where it might live.

Hand-out worksheets. Divide students into equal groups at each skull station. Ask students to examine the skull at their station and rotate to the next skull station. Students are to individually record their observations on the worksheets by skull number. Give time limit of 5 minutes per station.

When the worksheets are completed, ask for volunteers or call on individuals to tell the class what they have entered in a particular blank on the worksheet. Proceed through the answers for each animal represented. Show photos of each animal as it is identified.

If no student is able to identify the species, tell the group what the animal is and, if desired, discuss where this animal is found, how the characteristics observed relate to the animal’s survival and habitat and other facts we may know about the animal.

For younger grades...

Distribute remaining skulls around the classroom, numbered 1-9.

Using the PowerPoint, go through the pictures of the animals represented by the skulls.

Get students to partner up. Handout Mystery Skull clue cards, one to each pair. Have each pair read its clue to the rest of the class. Explain to the students that it is their task to match up their clues with the appropriate skull. Have students locate skulls and write the correct number on their clue paper. Once they are finished ask them to sit down.

After each pair has found their skull, collect all of the skulls and go through 1-9, soliciting answers from students.

Extension Activities

Predator/Prey

Ask students to define the words “predator” and “prey.” Ask if an animal can be classified as both predator and prey. After the students provide definitions, be sure each word is correctly defined. With the help of the students, organize skulls into three groups: “predators,” “prey,” or “both.”

Predator - an animal that kills other animals for food. Some predators also eat carrion. Predators are carnivores or omnivores.

Prey - animals that are eaten by other animals. Prey animals may be carnivores, herbivores or omnivores. Example: A wolf kills a deer. The wolf is the predator and the deer is the prey

Predator and Prey = an animal that eats other animals but also may be eaten by other animals. Example: A cat kills a mouse; the cat is predator. A fisher kills the cat; the cat is prey.

Look at skulls used in lesson. Determine whether or not the animal was a predator or prey based on the teeth, eye orbits, nasal passage and auditory bullae. (In predator animals generally: canines are sharp for slicing and tearing prey; and eye orbits are forward for binocular vision helping them to judge distance and depth when attacking prey. In prey generally: large well-developed incisors for cutting plant material; eye orbits are at the side of head for a wide field of vision to watch for predators - they can almost see behind them. Ask students about the nasal passage and auditory bullae - the larger the size, the greater the smelling or hearing ability).

Other Adaptations

Looking at pictures of each animal discussed in this lesson, continue a discussion of how other characteristics such as length of legs, claws and colouration help them survive.

Create-A-Creature

Have students draw (or describe) a fictitious animal which has all of the “best” characteristics for survival. When finished, have them “show-and-tell” to the class. Give their animal a fictitious name.

The Mammal Song (For younger grades)

The Mammal Song

Sing at least eight times. First with all words and actions, then each time after substituting humming for one more of the animals.

There was a big black bear, *(hands over head looking ferocious)*

And an otter that slides, *(hands together sliding)*

A leaping deer, *(jump)*

And a muskrat that dives, *(hands together diving)*

A beaver, *(hands making teeth)*

A moose, *(hands making antlers)*

And a howling wolf, *(hands together howling)*

Na, na, na, na, na! *(Spinning around)*
Na, na, na, na, na!

With thanks to lesson contributors:
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Bart Brown, Ministry of Natural Resources
University of Arizona College of Agriculture and Life Science.

Name: _____

Mystery Skull Worksheet

Skull #	**Teeth** (Carnivore, Herbivore, Omnivore)	**Kind of Animal** (Mink, Moose, Otter, Beaver, Lynx, Muskrat, Wolf, Bear, Red Fox)
1		
2		
3		
4		
5		
6		
7		
8		
9		

Name: _____

Mystery Skull Worksheet Teacher's Copy

Skull #	**Teeth** (Carnivore, Herbivore, Omni-vore)	**Kind of Animal** (Mink, Moose, Otter, Beaver, Lynx, Muskrat, Wolf, Black Bear, Red Fox)
1	Omnivore	Black Bear
2	Carnivore	Wolf
3	Herbivore	Muskrat
4	Carnivore	Lynx
5	Carnivore	Otter
6	Herbivore	Deer
7	Carnivore	Mink
8	Herbivore	Beaver
9	Carnivore	Red Fox

Examining Skulls - Grade 1 Clue Sheet

Muskrat My front teeth are orange. My skull is very small. I live in the water.	**Beaver** My front teeth are orange. My back teeth are flat. I like to eat trees.
Mink My skull is very small. My teeth are very sharp. I live near the water.	**Otter** My teeth are very sharp. My skull is flat. I live in the water and eat fish.
Moose My skull is very big. My teeth can cut tree branches. My teeth are stained.	**Fox** My nose is very long. My teeth are very sharp. My fur is a red-orange colour.
Wolf My teeth are very sharp. My skull is very big. My nose is very long.	**Bear** My front teeth are very sharp. My skull is very large. My back teeth are stained and flat.
Lynx My teeth are very sharp. My eye sockets are very big. My skull is round like a ball.	