



Alaska's Wild Wonders

SKULL DETECTIVE

In this Issue:

Become a skull detective and explore ways to identify Alaskan mammals using skull characteristics.



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For educators:

Find the ADF&G wildlife-inspired curricula and lots of other learning resources online: alaska.gov/go/n4ug.



Do you want to be a Sherlock Bones?

Finding animal bones, especially **skulls**, can be exciting! And everyone loves a good mystery. Check out the fascinating things you can learn from animal skulls and unlock your inner Sherlock Bones! Many interesting relationships between animals are revealed by looking closely at their skulls. Skull characteristics offer clues about animal diets, and help **classify** animals into related groups.



Muskox



Porcupine

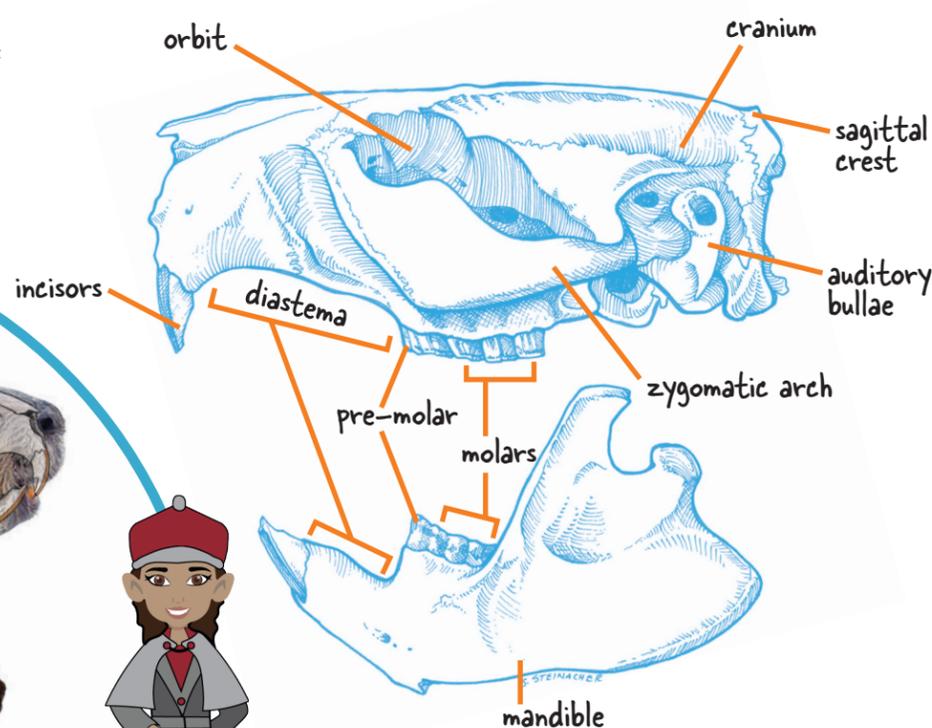
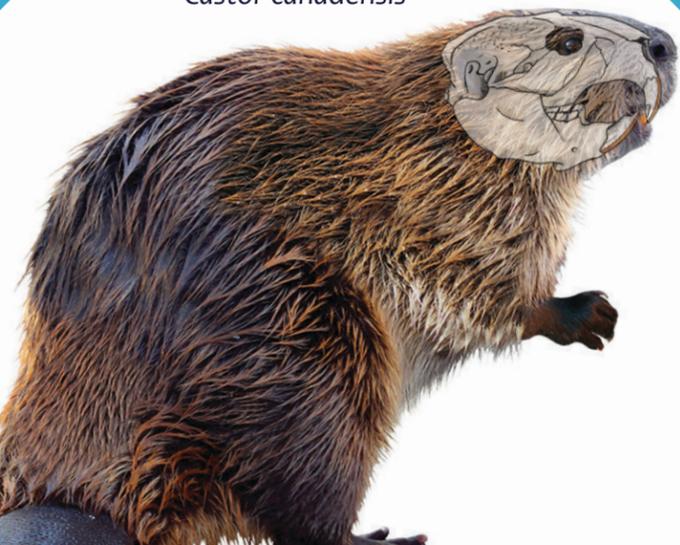


Sea otter

The main features to look at include the length of the **snout** and facial bones, the placement of the **eye sockets**, and the kinds of teeth that are in the skull. Have you ever found an animal skull in the wild?

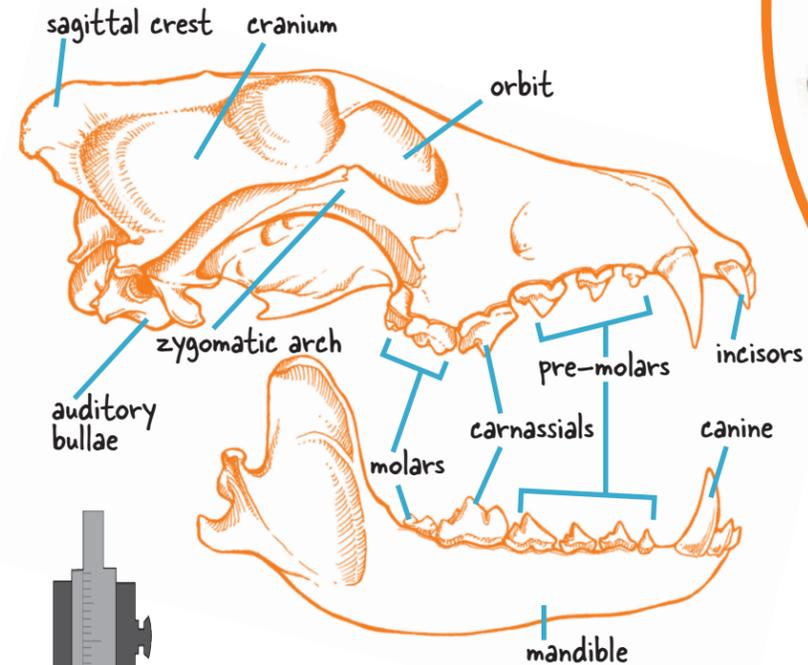
Look at all the labeled components of these skulls. You can learn a lot from a skull, even if you don't know exactly what animal it is!

Beaver
Castor canadensis

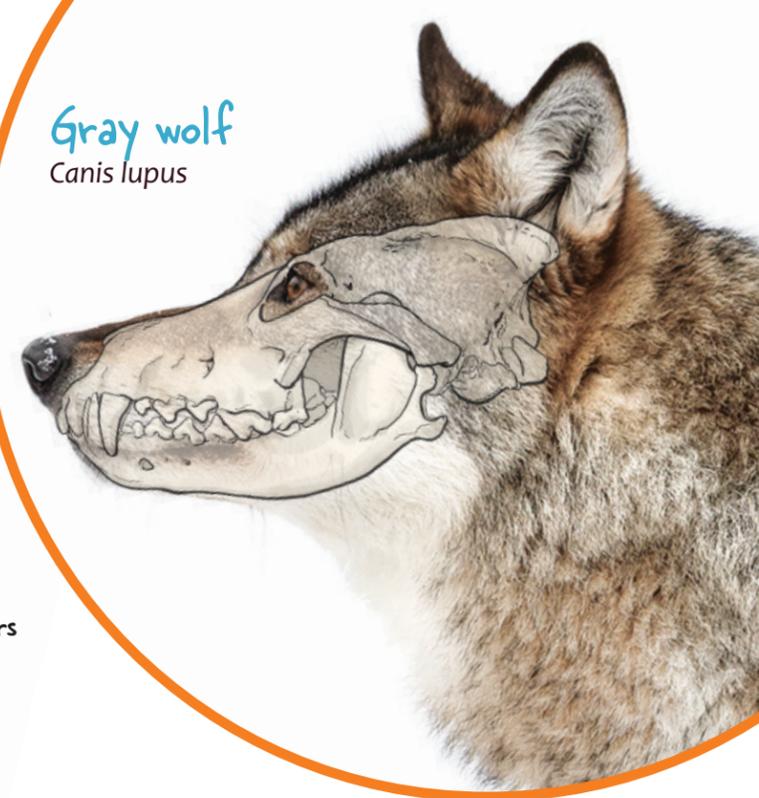


Learn as many parts of the skull as you can. This will help you to describe what you are seeing to other people.

Scientists use very specific words to describe parts of the skull. Some of them have more common and less technical names: **orbit** = eye socket, **zygomatic arch** = cheekbone, and **mandible** = lower jaw.



Gray wolf
Canis lupus



Look for clues...

Where are the eyes located on the skull – forward facing or on the side of the skull?

What do the teeth look like – are they all sharp or are some of them flat?

Does the jaw have a large space where there are no teeth?

How long is the snout – is it short, long, or medium?

Is the joint of the jaw and skull a tight fit or very loose?

Calipers are a specialized and precise tool used to measure bones, skulls, and teeth.



If you find or see a clean skull, remember that in living animals, it has muscles, nerves, and tissues within it and covering it. All those lumps, bumps, ridges, and holes on a skull are there for a reason!

For instance, the holes on a skull that are not for the eyes, mouth, or nose are called **foramina**; they are for nerves, muscles, and blood vessels to pass through.

Sharpen your skills, become a skull detective!

The eyes have it...

The location of the eye sockets (**orbits**) on a skull can tell you whether the animal is a predator or prey species, or even if it lives in the water. Eyes on the side are great for **peripheral vision** to spot predators. Eyes in the front allow **binocular vision**, giving predators looking to spot and capture prey good depth perception.

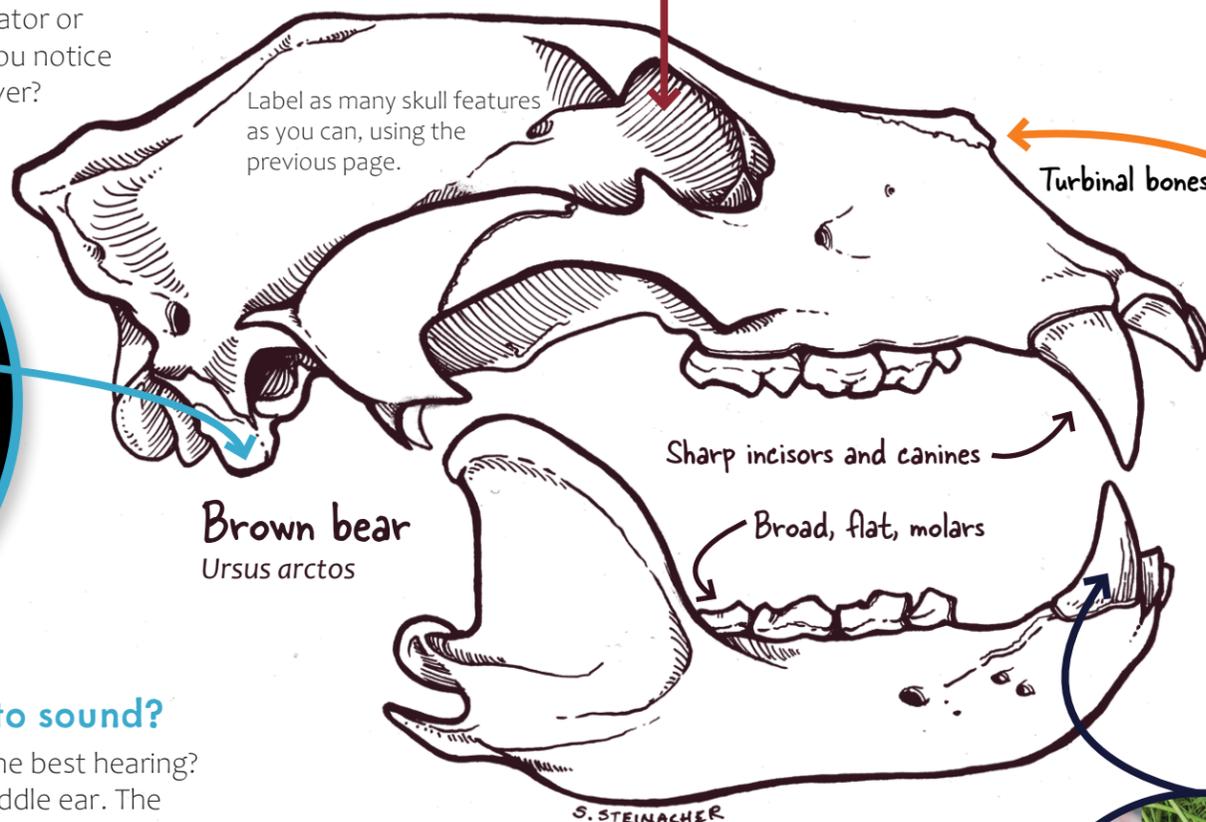
Look at the skulls on this page and the previous page. Do you think a wolverine is a predator or prey? How about Dall sheep? What do you notice about the position of the eyes on a beaver?



Sniffing out who smells the best

How do you know which animals have the best sense of smell? The fragile bones inside the nasal passage, called **turbinal bones**, increase the surface area for the smelling (olfactory) membranes – so animals with long snouts generally have a better sense of smell.

Look at the difference in snout length and turbinal bones of dogs and cats (in this case, foxes and lynx). Which do you hypothesize has a greater reliance on their sense of smell? Why?



Which animals are sensitive to sound?

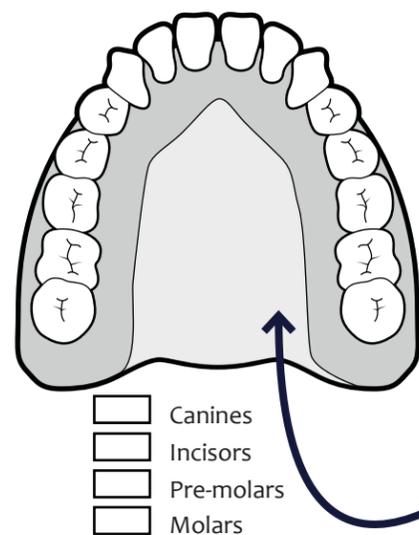
How do you know which animals have the best hearing? Check out the bone that encases the middle ear. The **auditory bullae** are generally bulb-shaped. There are a few species with inflated, or large auditory bullae that have exceptional hearing, like members of the rabbit family. Why might a snowshoe hare need good hearing?

What can you tell about a brown bear from the skull?

Make some observations about the skull above.

Do you think brown bears are carnivores, herbivores, or omnivores based on the teeth?

Do you think they smell well? Have good hearing?



You are what you eat

Taste test! Try eating different kinds of foods, and pay attention to what teeth you use for each. Which teeth would be best when biting into a piece of jerky? How about for biting a carrot? Which teeth do you use to chew popcorn?

Use the previous page and your taste tests to figure out which human teeth are canines, incisors, pre-molars, and molars. Create a color code and color all the teeth in the diagram. Are your lower teeth the same or different from your upper teeth?

Teeth as tools

Mammal teeth are specialized, especially cheek teeth (**pre-molars** and **molars**). Examining how teeth are shaped and arranged on a skull - which is called **dentition** - will describe a lot about the animals they belong to.

Carnivores, or meat-eaters, rely on their **canines**, **carnassial molars**, and strong jaws to tear into meat. Looser fitting jaws are important to **herbivores**, or plant-eaters, that use their teeth and jaws to grind their food. Herbivores also have a space between their **incisors** and cheek teeth called a **diastema**, where food can be carried or held. **Omnivores** eat both plants and prey, and have both sharp teeth for tearing meat and flat teeth with sharp ridges for grinding plants.

Check out the teeth characteristics on the diagrams on the previous page. Do you think a wolf is a carnivore, herbivore or omnivore? A beaver? What are you?

What else can teeth tell us?

Teeth are a wealth of information. In addition to identifying an animal by its skull characteristics, teeth can help determine the age of an animal, and be used for genetic samples (DNA).

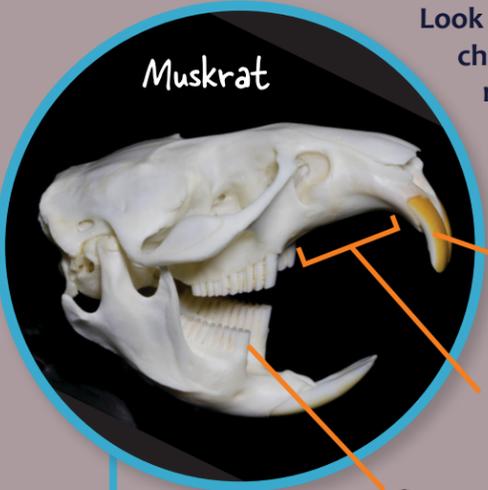


Who is related to whom?

Prior to the modern age of genetics, scientists used physical characteristics of animals to lump them into similar groups. Skulls played a major role in the **classification** of animals. Lets take a look and see why!

Order: Rodents

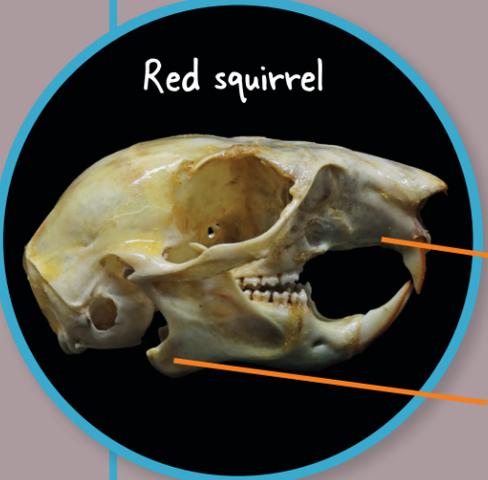
Look closer at the skull characteristics that all rodents share across different families and species.



large incisors with hardened, orange colored enamel

large diastema

flat molars for grinding foods



no canines

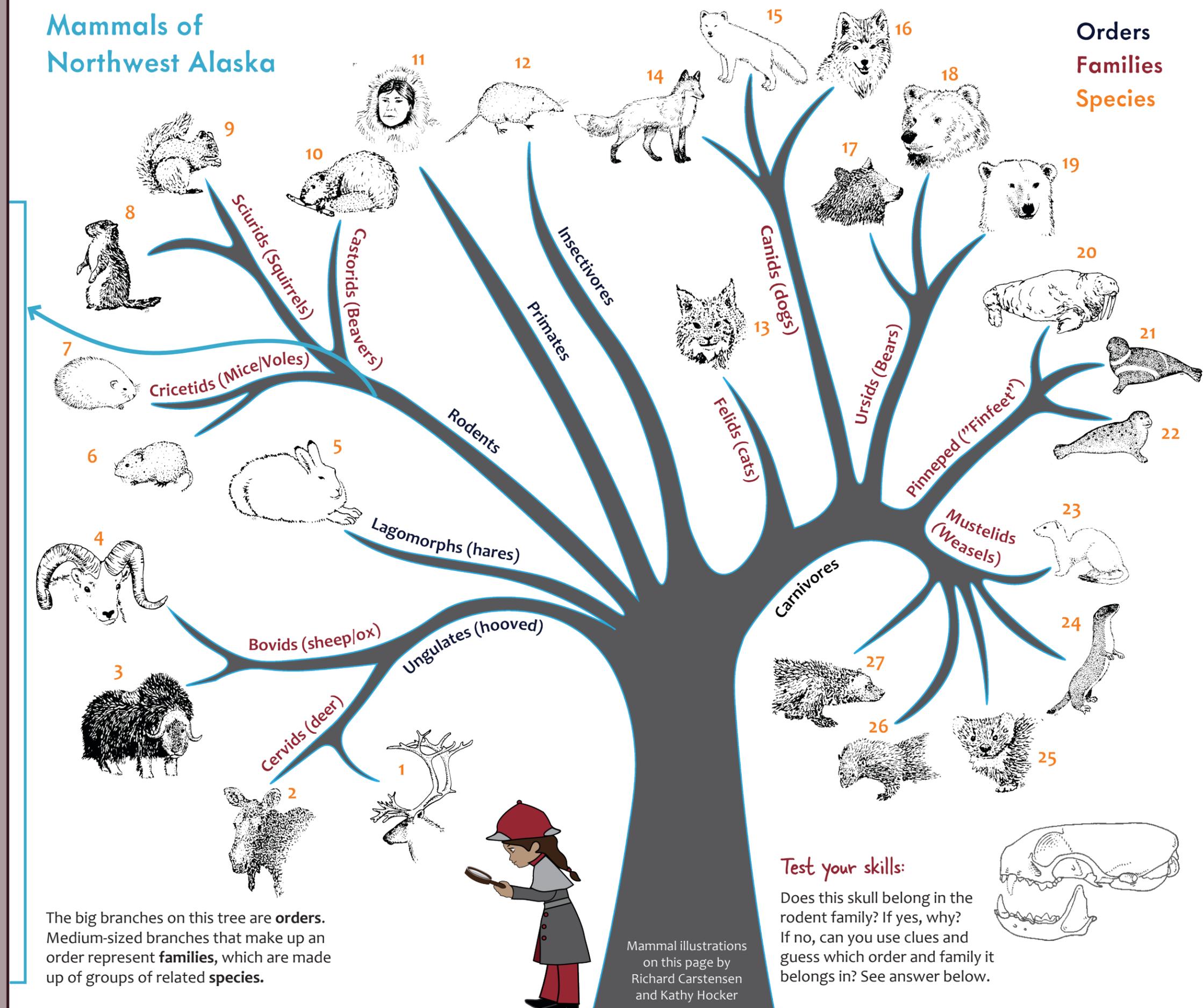
curved mandible and loose jaws for grinding foods



Did you know?

Rodent incisors keep growing their whole lives. The softer material behind the enamel wears away more quickly, while the harder enamel lasts longer, making a permanent sharp edge on their incisors for cutting food or woody material.

Mammals of Northwest Alaska



Orders
Families
Species

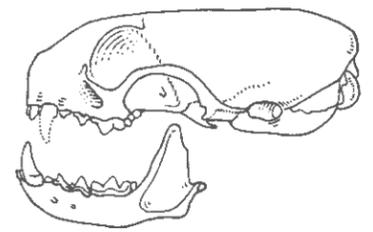
The big branches on this tree are **orders**. Medium-sized branches that make up an order represent **families**, which are made up of groups of related **species**.



Mammal illustrations on this page by Richard Carstensen and Kathy Hocker

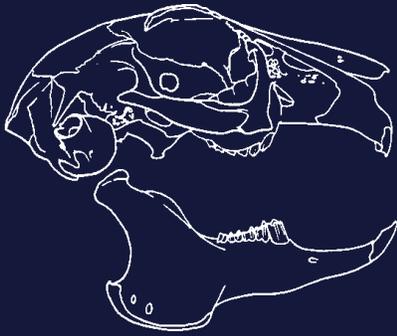
Test your skills:

Does this skull belong in the rodent family? If yes, why? If no, can you use clues and guess which order and family it belongs in? See answer below.

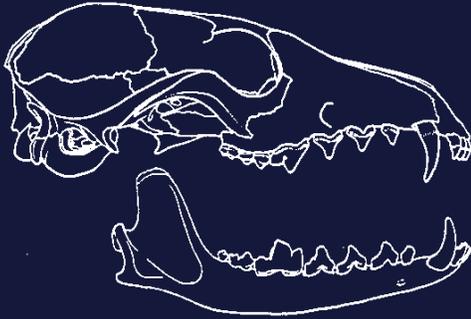


Solve this Skull Mystery! KEY in on clues...

A.



B.



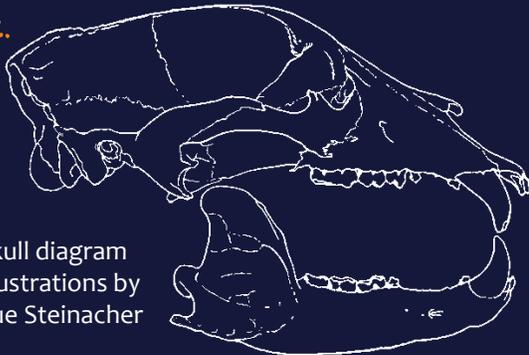
C.



D.



E.



Skull diagram illustrations by Sue Steinacher

Examine the skulls on the left and spend some time identifying features on each one. What differences do you notice? What similarities?

What kind of key?

Next, follow this simple **dichotomous key** - each point or description provides two choices - which is where the “di” comes from - to figure out how to determine each skull from the others. Once you make a choice for each number, the directions will guide you to the next number. Repeat for each skull and identify the species for A-E. Extra challenge - we only give you the scientific name.

1. Cheek teeth are flat and there is a diastema.....go to 2
Cheek teeth are sharp and/or there is no diastema.....go to 5
2. Long snout, no upper incisors, stump for antlers above orbit.....go to 3
Short snout, upper incisors, no stump for antlers.....go to 4
3. **Alces alces** - this species has antlers seasonally in males (not females)
4. **Lepus americanus** - this species has inflated auditory bullae
5. Has carnassials.....go to 6
Does not have carnassials, molars broad and flat.....go to 9
6. Skull shape round, nose short and blunt, large orbits.....go to 7
Skull shape elongated, nose long.....go to 8
7. **Lynx canadensis** - this species has cheek teeth for shearing only
8. **Vulpes vulpes** - skull is smaller in size than a wolf or coyote
9. **Ursus americanus** - also has a long/broad nose, teeth for grinding

Do you know the common name of any of these species (hint: look through the previous pages)? If not, make your best guess from your observations and the clues given with the scientific names before you check the answers below.

Can you determine which family each species belongs to?

Bonus Round:

Work with your teacher and classmates to design your own unique creature skull. Use these questions as a key to help define and classify it:

- Are the eyes facing forward or to the side (is it predator or prey)?
- Is it a carnivore, herbivore, or omnivore?
- Does it have a long or short snout?
- Does it have carnassial molars?
- Does it have a diastema?
- Does it have jaws for grinding?
- Does it have a skull appendage (horns or antlers)?
- Does it have inflated auditory bullae?

