

# Environmental Education Teaching Games: Skullduggery



Dave Sutherland  
Community Naturalist, Boulder Colorado  
dsutherland4747@gmail.com

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## Background:

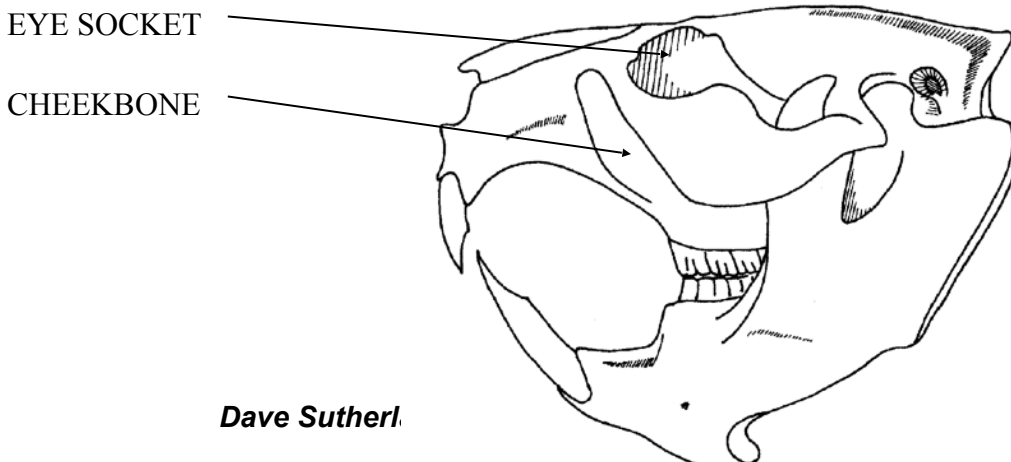
When trying to identify animals by their skulls, there are many key features to look for:

I. What kind of teeth do they have? Notice size, kind, number and color. With these clues you should be able to put them in one of the following categories:

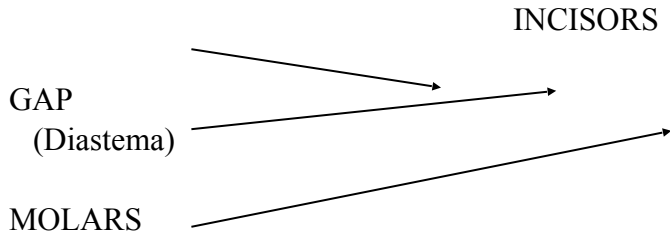
### A. **Herbivore**-The plant-eater's teeth

The skull shown below belongs to a beaver- one of many kinds of mammals that feed entirely on plants. It needs to be able to cut and grind its food. In the front of the mouth are the cutters- the **incisors**. Behind the cutters, a gap, called the **diastema** (die-AS-tem-a), gives the tongue room to move the food around. Then come the grinders- the large **premolars** and **molars** at the back of the mouth. As the beaver chews, its lower jaw moves from side to side, and ridges on the surface of the teeth grind the food into a pulp. In many gnawing herbivores, like the beaver, incisors grow continuously throughout life. Constant gnawing would otherwise wear the teeth away. Two muscle groups are primarily responsible for moving the jaw. The **temporalis** connects to the wide flange at the back of the lower jaw, passes under the cheekbone (or **zygomatic arch**), and attaches to the back of the skull. It exerts pressure on the front teeth and is more massive in rodents than most herbivores. The **masseter** connects the lower jaw to the cheekbone and exerts pressure on the molars. It is the muscle that provides power for the grinding teeth and is quite large in most herbivores.

**Skull of a Beaver**

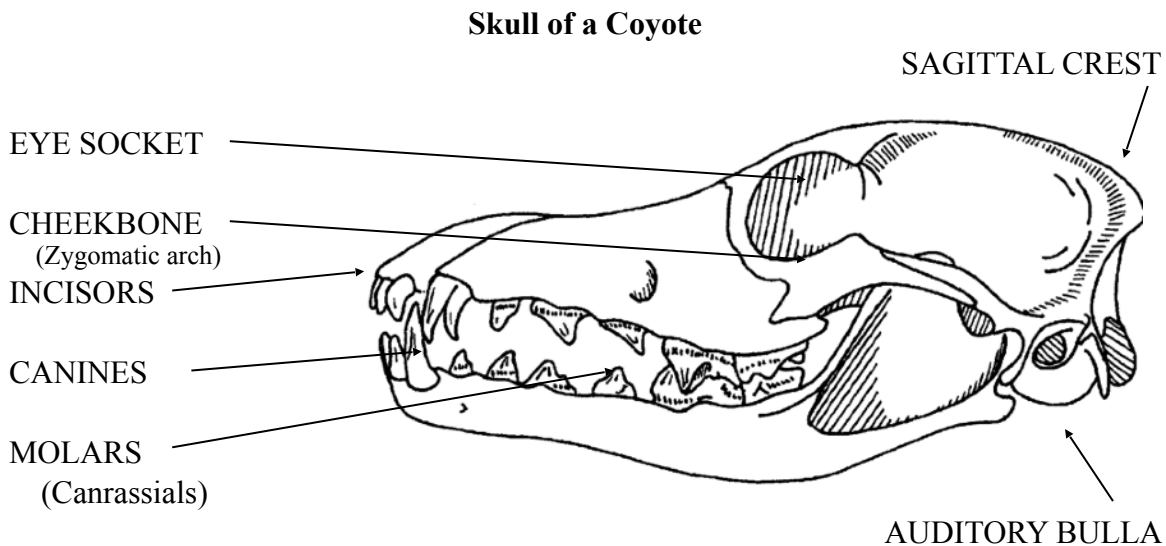


*Dave Sutherl*



**B. Carnivore** -The meat-eater's teeth

Many mammals live mainly on meat. They include wolves, foxes, and cats of all sizes, from the ones we keep as pets to lions and tigers. The skull shown below belongs to a coyote. It has sharp, closely set incisors for cutting and scraping meat. The long canines are useful for grabbing and holding prey, and for tearing at meat. The teeth at the back of its jaw, called **canrassials**, are designed for cutting. Unlike our molars, they have long, sharp edges and function more like scissors than grinders. Because they are near the hinge of the jaw, they can exert a pressure that is great enough to crack open bones. The upper molars overlap the lower molars for shearing. They cut the meat into small pieces, then swallow. They do not grind their meat up with their back teeth like we do. In most carnivores, the **temporalis** muscle is particularly strong and massive to give extra strength to the tearing, ripping teeth at the front of the mouth. Many carnivores have a **sagittal crest** – a flat, vertical ridge of bone above the braincase, to provide extra attachment for the huge temporalis muscle. Notice how the lower jaw of most carnivores is slightly curved, bowing downward in the middle. This also provides for greater pressure on the front teeth.

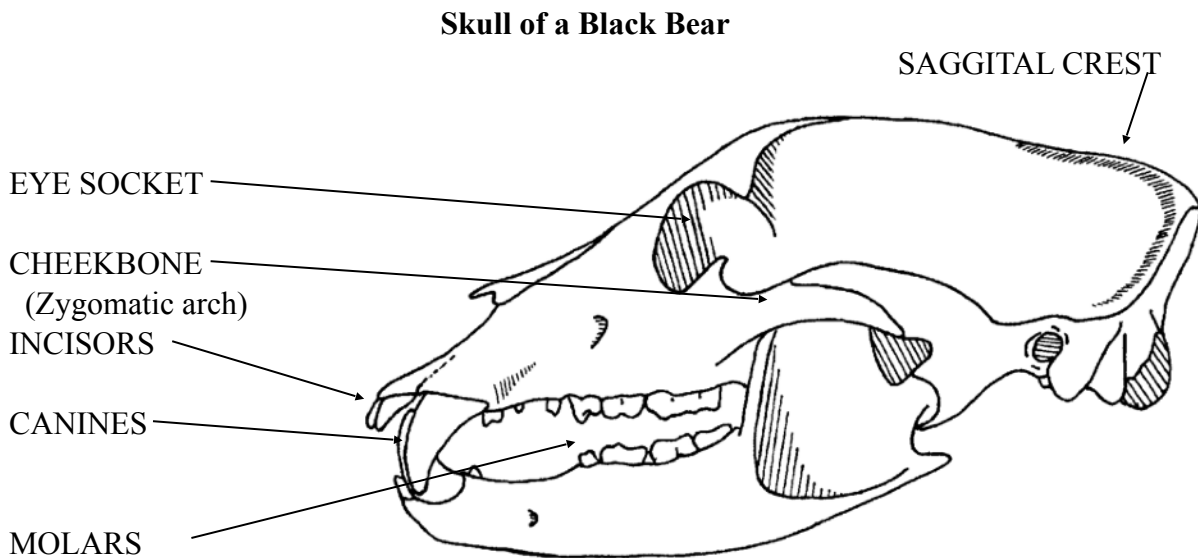


Also, notice the length of the nose! Coyotes rely heavily on their sense of smell to find prey, and their nasal passages are long and wide as a result.

At the back of the skull are two roundish bubble-shaped protrusions of bone. These are the auditory bulla – the bones that house and protect the delicate structures of the inner ear. When comparing skulls, notice how some animals have particularly large auditory bulla (such as coyotes) while others have small or almost non-existent ones (such as humans).

### C. Omnivore

Some animals eat both meat and plants and are referred to as omnivores. These include the black bear, raccoon, and humans! The skull below is from a black bear. Notice the sharp incisors and canines. These are used for cutting and tearing meat. Incisors in bears also clip grass when grazing, much like a deer. Their molar teeth are flat-crowned like ours, which are shaped for crushing. These teeth are used for grinding up plants. There is also a small diastema like herbivores have. Other than the canines, notice how similar a bear's teeth and a human's teeth are. We eat the same foods, and our dentition shows it!



II. Note general characteristics of the skull

A. **Size:** Don't be fooled by small skulls. With flesh and fur attached, the head of an animal can appear much larger than their underlying skull.

B. **Shape:** Is the skull flat or rounded? Does the snout appear long or short? Is the **cheekbone (zygomatic) arch** tall, to allow room for a huge jaw muscle, or low? Is there a sagittal crest, suggesting a life style that calls for massive pressure on the front teeth?

C. **Eye sockets:** Do the eye sockets face forward or to the sides? Many herbivores have side eyes, to see motion all around. Many predators and tree dwelling animals have front facing eyes, like we do, for better depth perception. They have to judge distances exactly to snatch a mouse or jump to another tree branch.

D. **Jaws:** How do they line up? Do they come directly together, like ours, for grinding or do they overlap for shearing meat? Is there a **diastema**? Are there any incisors on the upper jaw? Ungulates, such as deer or big horn sheep, have no front upper teeth. Instead they have a fleshy pad which functions like a cutting board for the lower teeth, allowing them to more effectively snip off plants.

E. **Suture lines:** Notice the joints between individual bones of the skull. The bones are plate-like, sutured together with zigzag edges almost like a baseball. Although the proportions are different from animal to animal, you'll find that the same basic bones make up all mammal skulls, including our own. For example, we all have cheekbones and nasal bones.

### **Basic things to look for by animal:**

Beaver-Note the self-sharpening, continuously growing front incisors. The orange-brown color is not a stain. It is a special pigment for making the enamel harder. The white inside part of the tooth wears faster than the colored side, which creates a continuously sharp cutting tooth.

Coyote - Has longer upper canines than either dogs or wolves.

Mountain Lion -Note the high sloping forehead, which all cats have, and very large eye sockets.

Black Bear - Note the very large back molars. These teeth grow in that size and stay that size regardless of the age, sex, or size of the animal.

Raccoon - it is easy to see the overlap on the rear molars for shearing. Also note how big the space where the brain lies is. Their brain is very well developed which allows for their nimble use of their hands, their mischievous behavior, and their ability to figure out how to get into locked garbage cans. In other words, they're very smart!

Human – We are mammals too, and our skulls are well adapted for our way of life. Notice the huge braincase, the very small nasal bones, the overall flatness of the face, the

forward-facing eye sockets, and the tiny cheekbone (zygomatic) arch for our small temporalis muscle.

#### Male and Female Human Skull

A- The male cranial mass is more blocky and massive compared to the females which more rounder and tapers at the top.

B- The female's Supraorbital margin (upper edge of the eye socket) is sharper while the males is rather round and dull.

C- The Zygomatic Arch (cheekbone) is more pronounced on the male skull.

D- The Mandible (lower jaw) of a female is more pointed like a "V" while the male's is wider and squared off, like a "U" - the classic "square-jawed man."

E- The superciliary arch (the brow ridge above the eyes) is large and pronounced in the male.

F – Mastoid process (triangular piece of bone sticking down just below the ear) is larger and rougher on a male than on a female.

G- The distal end of the zygomatic arch of the male usually extends as a ridge above the ear canal; in the female, it is much less pronounced.

***Dave Sutherland***

***dsutherland4747@gmail.com***