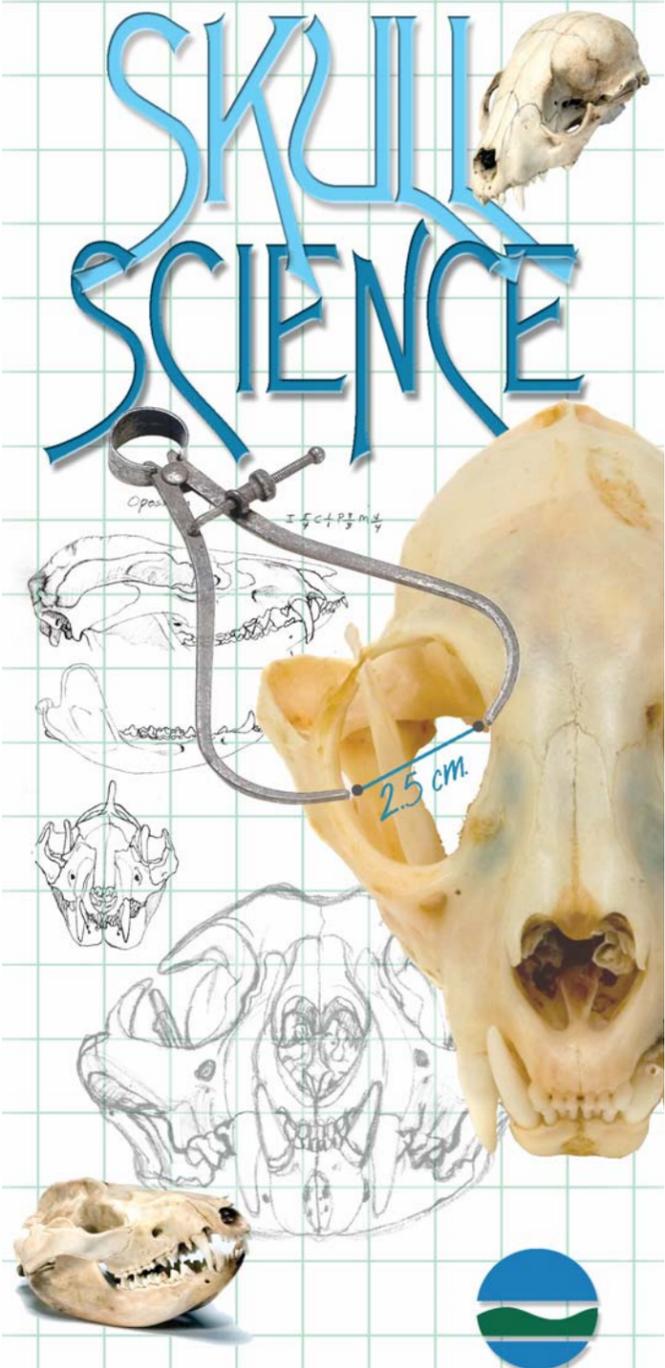


# SKULL SCIENCE



NYS Department of Environmental Conservation

**D**id you ever find a bone while exploring the woods and wonder what animal it belonged to? Bones, especially mammal skulls and jaws, can tell you a lot about the animal they came from. Whether it's just a partial jaw or a full skull, the bone's size, shape and structure provides you with clues to the mammal's identity and habits.

If you're lucky enough to find an entire mammal skull, the first thing you should look at is its general size and shape. Is it large like a deer, or small like a rabbit? Is the skull streamlined and narrow like an opossum, or broader and rounder like a raccoon? Are there teeth, and if so, how many and what do they look like?

Teeth are great visual clues to an animal's identity. They indicate what and how an animal eats. In many mammals, the teeth are quite distinctive. By examining the dentition (number and form of the teeth), you can tell whether the animal is a meat-eater (carnivore), plant-eater (herbivore) or both (omnivore). Sharp, pointed teeth such as canines and carnassials (last upper premolar and first lower molar that meet with a scissorslike action) are used for tearing and shearing meat, indicating a carnivore. Broad, somewhat flat teeth are used for crushing and grinding vegetation, indicating an herbivore. Since omnivores, such as raccoons and humans, eat both plants and meat, they have sharp teeth in the front to rip and cut, and flattened teeth in the back to mash their food.

The condition of teeth (and bones) can provide you with information about the animal's history. For instance, heavily worn, damaged and cracked teeth may indicate that an animal is old. Likewise, chipped, broken or missing teeth, or broken bones could mean the animal was in an accident or fight.

Text by Eileen Stegemann  
Artwork - Jean Gawalt / Layout & design - Frank Herec

In addition to teeth, other skull structures can tell you whether an animal is a meat-or plant-eater. For example, there are numerous sites on the skull for muscle attachment, which vary from species to species. In carnivores and omnivores, there is a ridge on top of the skull called a sagittal crest. The site of muscle attachment for the strong muscle that controls the crushing lower jaw, the sagittal crest is quite pronounced on opossum and fisher, and less pronounced on coyote, raccoon and otter. Since herbivores typically have smaller jaw muscles, they lack an obvious crest.

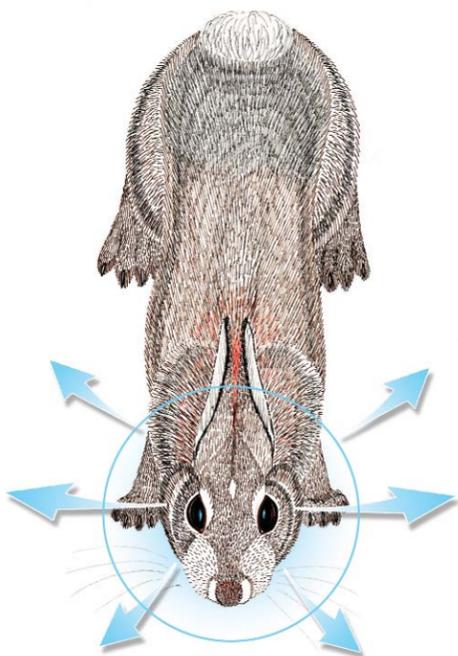
Another interesting feature on a skull is the position and size of the eye sockets. Predators, such as coyote and otter, generally have forward-facing eyes. This provides them with 3-D vision, enabling them to more accurately locate and follow prey. In contrast, prey species, such as rabbits, have relatively large eyes located on the sides of their head. This gives them great peripheral vision, aiding them in locating predators and warning them about sneak attacks.

While all mammal species have specific traits and adaptations, keep in mind that animals can also be highly variable within a species, adjusting to available conditions. For example, coyotes are generally meat eaters, but will also eat fruit. Raccoons and opossums are considered omnivores, but they may be entirely carnivorous or vegetarian depending on food availability. And while deer are herbivores, they have been observed to eat fish on occasion.

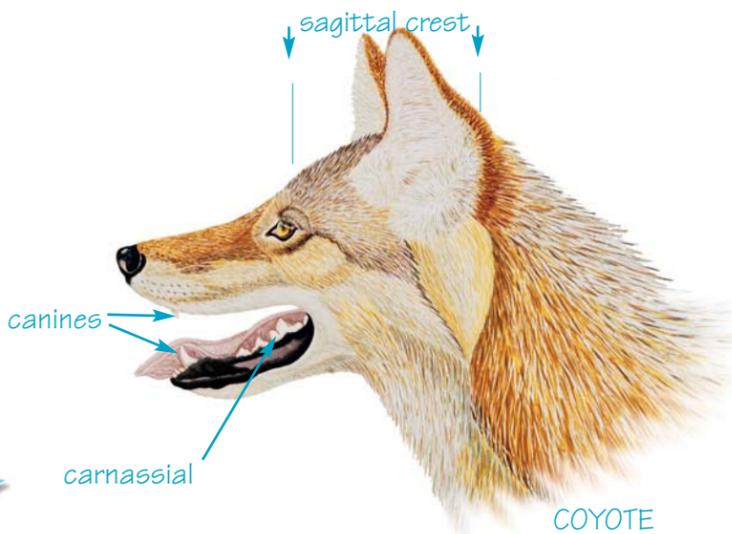
So next time you're in the woods, or even in your own backyard, look around and see if you can spot any mammal bones. While finding a complete skull is rare, you'll be amazed at what you can find, and surprised at the amount of information those bones reveal.

The following are a few mammals whose bones you might find in New York's outdoors.

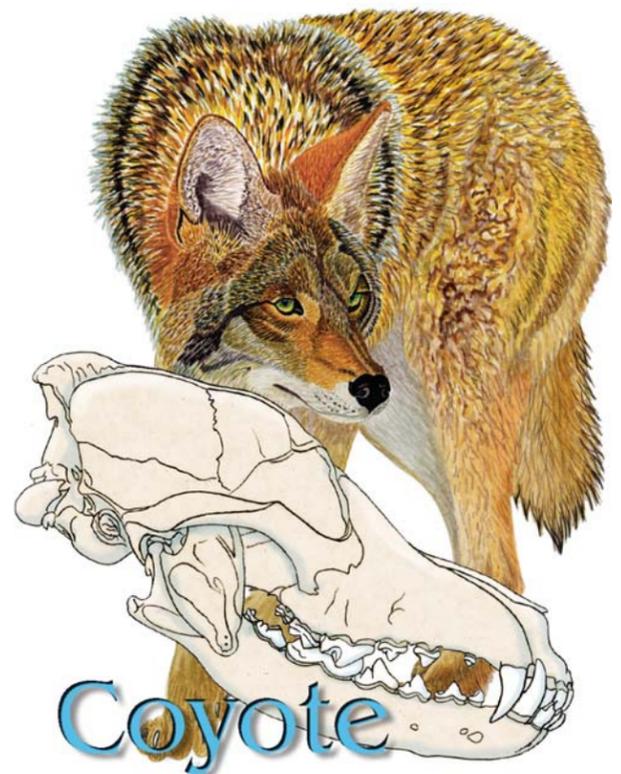
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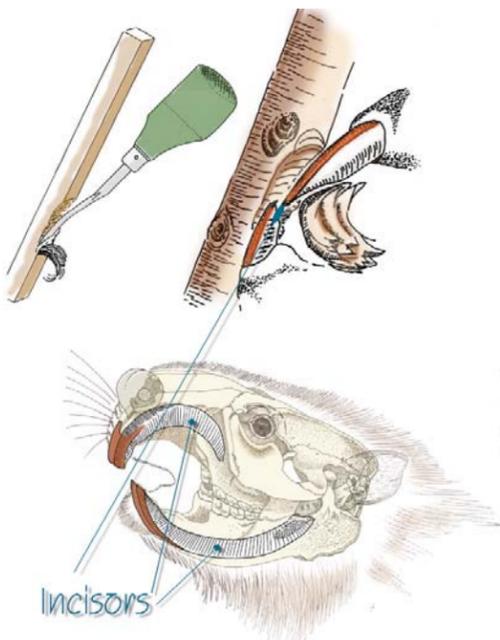
Rabbit's peripheral vision



Skulls and teeth reveal a lot about an animal's habits. This coyote has forward-facing eyes for binocular vision, canines for puncturing flesh, and a heavy carnassial pair for crushing bones. In contrast, a rabbit has eyes on the side of its head to see danger approaching from almost any direction.

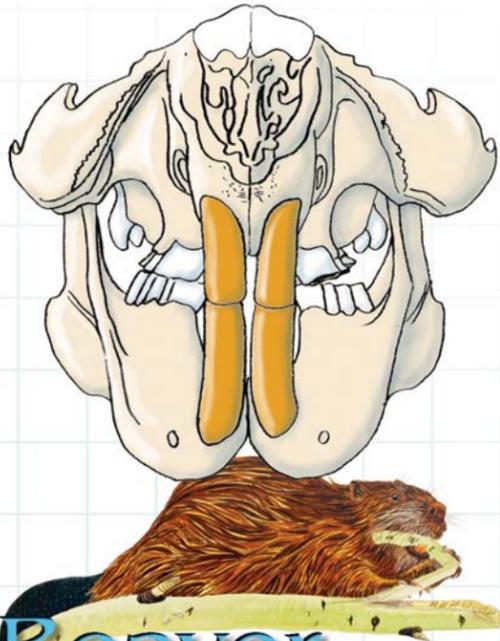


**A** dog-like animal, the coyote's skull is rather long with a large braincase and an elongated snout. Like other predators, the eyes are located on the front of the head, giving the coyote binocular vision and better depth perception. Though largely a meat eater, a coyote's diet consists of a wide range of available foods, including deer, rabbits, rodents, carrion, fruit, birds and insects. The coyote's teeth are specially adapted for eating meat. It has large, round, pointed canines for grabbing and stabbing prey, and blade-like premolars and molars for both shearing and crushing bones. The skull has a low sagittal crest for muscle attachment to the crushing lower jaw.



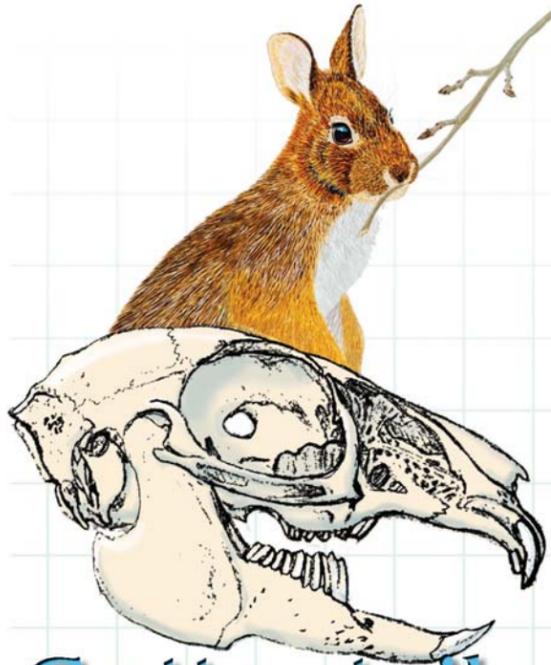
Beaver's incisors remove wood like a chisel.

Rabbits snip twigs neatly (left), while deer shred the edges (right).



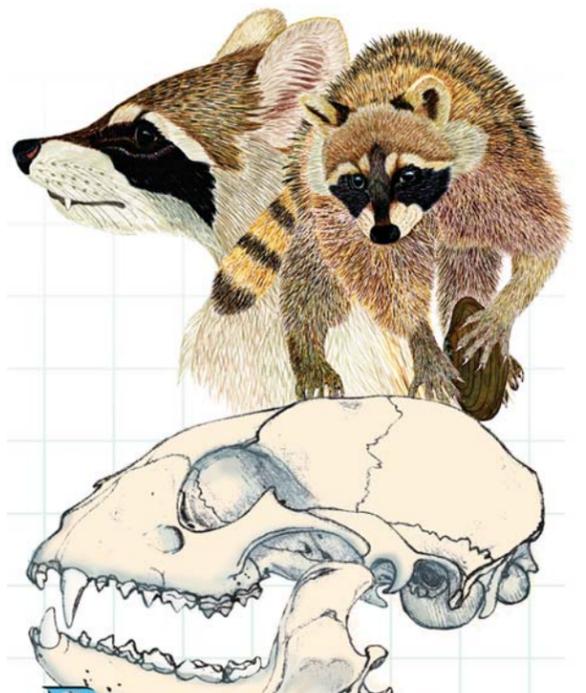
## Beaver

The continent's largest rodent, the beaver has a thickly muscled body supported by large bones. Its skull and jaws are heavy to support the four large bright-orange incisor teeth (two on top, two on bottom). Like all rodents, the beaver's chisel-like incisors are deeply rooted in the skull and continue to grow throughout the animal's life. They use these sharp teeth to fell trees for both food and building material. The incisors automatically sharpen one another when the uppers meet the lowers. Constant gnawing keeps the teeth from growing too long. The beaver's molar teeth function much like a wood rasp, shredding and grating woody plant fibers. Eye sockets and ear openings are located high on the beaver's skull, enabling this animal to see and hear while floating on the water's surface.



## Cottontail

Closely related to rodents, the eastern cottontail rabbit is an herbivore, eating a variety of plants, including tender green vegetation, garden produce, bark and buds of trees, vines and shrubs. Its jaw contains both upper and lower front incisors which enable it to neatly snip off plants. Unlike rodents, the cottontail has two pairs of upper incisors—a small incisor lies behind each large, deeply-grooved upper incisor. Popular prey for a number of predator species, the cottontail's skull has very large eye sockets located on its sides. This eye placement provides a wide field of vision, enabling the cottontail to more effectively spot predators. You can test this: try to sneak up on a rabbit, even one that is facing away from you! In addition, the cottontail has very thin, light bones, which help the animal to run more quickly.



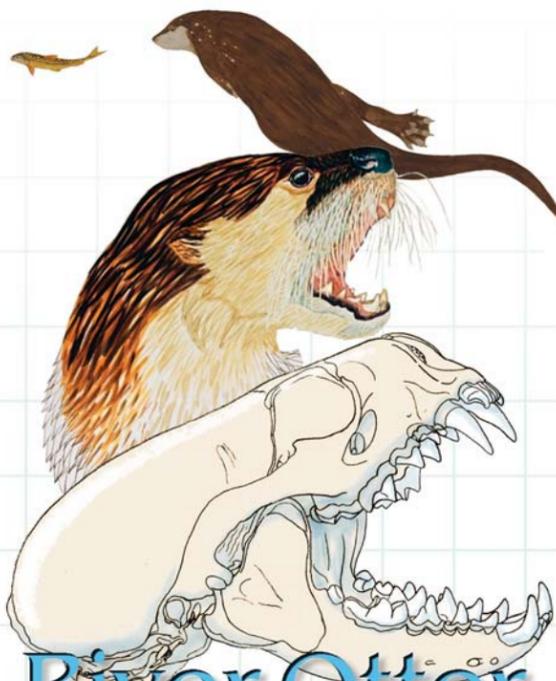
## Raccoon

Its "masked" face familiar to many, the raccoon is a mischievous creature often known for getting into people's garbage. An omnivore, it will eat vertebrates, invertebrates, fruits, nuts, berries, mice, young birds, crayfish, frogs and turtle and bird eggs. It has a broad, rounded skull with a large brain case, and with eye sockets that face forward like a predator's. The jaw contains canines and ripping teeth as well as grinding teeth, but like a bear, the raccoon has broad, low-crowned molars shaped for crushing rather than cutting. The raccoon's scientific name, *lotor*, refers to its habit of washing food before eating it.



## Deer

An herbivore, the white-tailed deer is considered a browser or grazer, eating leaves, stems, buds of woody plants, fruits, vines, mushrooms, grasses and acorns. The white-tail's broad molar teeth are high-crested and quite sharp for cutting, slicing and grinding. Like all mammals, the teeth wear down progressively as the deer grows older. Because a white-tail lacks upper incisors, it tears, shreds or roughly shears off vegetation when eating, rather than neatly snipping it like a rabbit. One distinguishing feature of a deer's elongated skull is the large gap on the lower jaw between the front incisors and back teeth. A prey species, the deer's eyes are set somewhat to the side for better peripheral vision.



## River Otter

A large, mostly aquatic weasel, the river otter's streamlined body is perfectly shaped for moving quickly through water. Its skull is slightly flattened with an elongated braincase, and its eye sockets are set high on the head, close to the nose. This eye placement enables this predator to accurately view the surroundings while floating on the surface. The river otter eats fish and crustaceans, amphibians (particularly frogs), insects, birds and mammals. It has large, sharp canines for grasping prey, and its other teeth are adapted for slicing and crushing. Otters range over wide territories, and their high metabolic rates make them voracious eaters.



## Opossum

The opossum is North America's only marsupial. Recognized by its long, bare, prehensile tail used during climbing, it is a primitive animal with a very small braincase. Opportunistic, the opossum is an omnivore, eating whatever is available, such as fruits, berries, insects, reptiles, amphibians, smaller mammals, carrion and garbage. Its skull can be distinguished from other mammals' by the large number of teeth—a total of 50 in an adult, including 10 upper and 8 lower incisors, large canine teeth, and a number of grinding teeth. The opossum's skull contains a number of strong muscle attachment sites, including a tall, well-defined, blade-like sagittal crest.