

Introduction to Maryland Mammals

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1. Overview

A. What Makes a Mammal?

B. Evolution & Diversity

2. Maryland Mammals

A. Classification, Numbers, etc.

B. Species Natural History

3. Resources



The goals of this presentation have been divided into three parts:

Overview of Mammals (general):

What Makes a Mammal?

Evolution and Diversity

Maryland Mammals (specifics):

Classification, Numbers, etc.

Species Natural History (13 examples)

Resources:

Books, websites, activity guides, questions

What's a Mammal ?

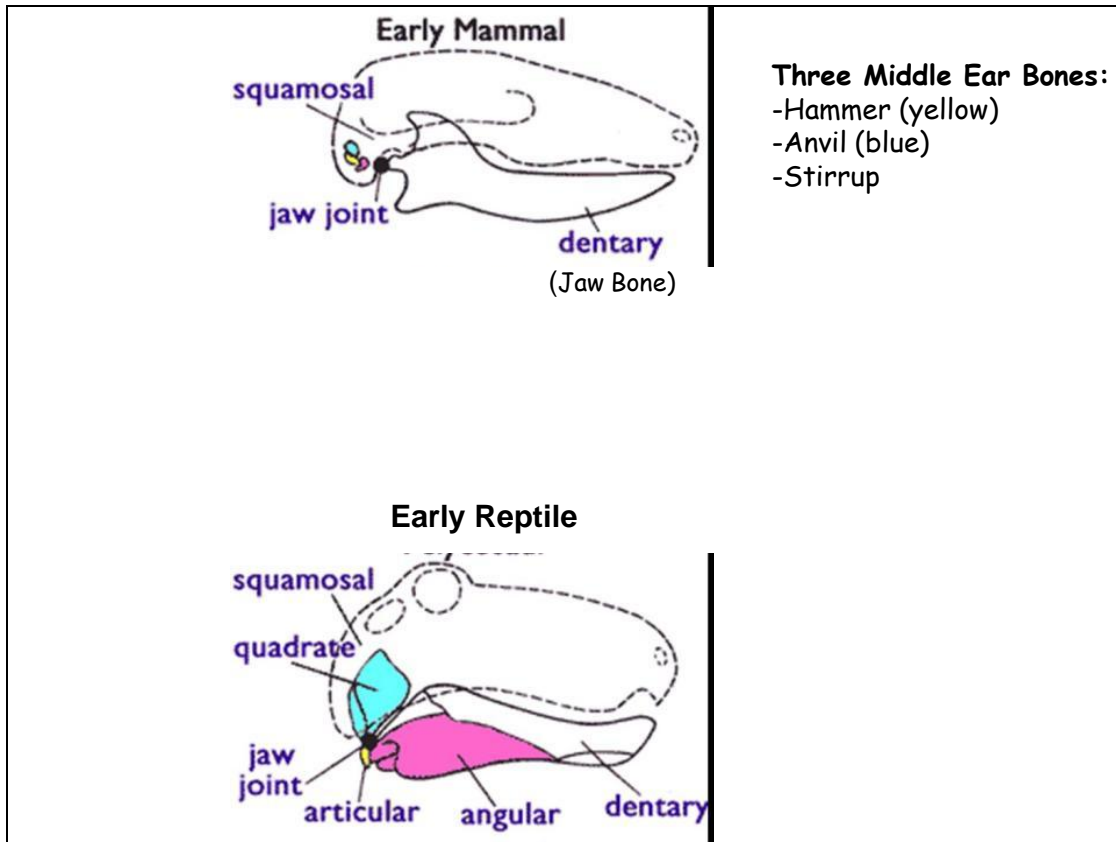
Unique Characteristics

- Hair
- Mammary Glands
- 3 Middle-ear Bones



Three Uniquely Mammalian Characteristics:

1. Hair: Fur = dense coat, pelage = coat, wool = outer fur of sheep, goat, etc.
Not always present (e.g., dolphins, naked mole rat)
Functions: Insulate (warmth), conceal, protect, (e.g., camouflage) signal, sensory (e.g., whiskers).
2. Mammary Glands:
Modified sweat glands
Function: Nurse young with milk.
3. Three Middle Ear Bones (hammer, anvil, stirrup): Smallest in human body
Function: Hearing



Three Middle Ear Bones (hammer, anvil, stirrup):

In this diagram:

- Articular = hammer
- Quadrate = anvil
- Angular = stirrup (pink)

What's a Mammal ?

Unique Characteristics

- Hair
- Mammary Glands
- 3 Middle-ear Bones

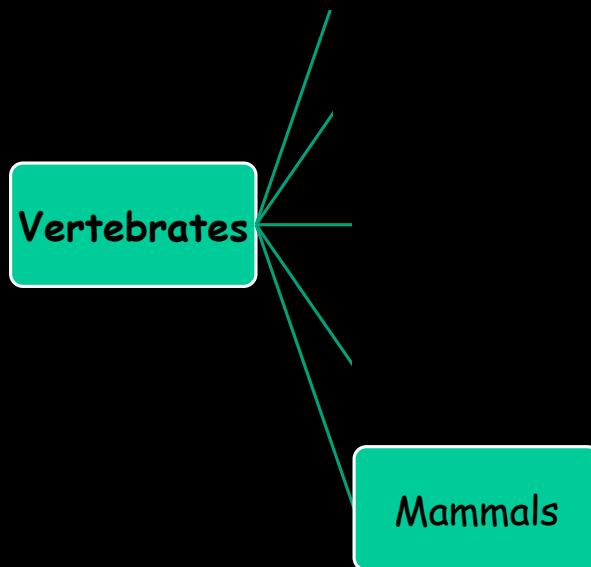


Other Characteristics

- Vertebrate
- Warm blooded
- Live birth
- Muscular diaphragm

1. Vertebrates (so are fish, amphibians, reptiles, birds)
2. Warm blooded (so are birds),
3. Live birth, with a few exceptions (Monotremes subclass discussed later)
4. Muscular Diaphragm – muscle to expand chest cavity helping more air enter lungs.
5. Other Traits (not unique to mammals):

Five Classes of the Sub-Phylum: Vertebrates



Evolution of Mammals

-First evolved during Mesozoic Era (225-65 mya)
"Age of Reptiles" - Jurassic Period

-Began as small shrew-like creatures -- evolved from reptiles

-Flourished during Cenozoic Era (~65 mya to present)
"Age of Mammals" - Tertiary Period



http://www.nmnaturalhistory.org/triassic/c_labels.html

Began arriving in the Jurassic Period (190-135 million years ago (mya)) of the Mesozoic Era (225-65 mya): "Age of Reptiles"

Mammals are the "Youngest" of vertebrate groups; comparatively recent. They began as small, shrew-like creatures; evolved from reptiles; ended up quite successful and diverse.

They really began to flourish after the extinction of the great reptiles/dinosaurs (~65 mya): Tertiary Period of the Cenozoic Era (65 mya - present) "Age of Mammals."

Diversity of Mammals: 1

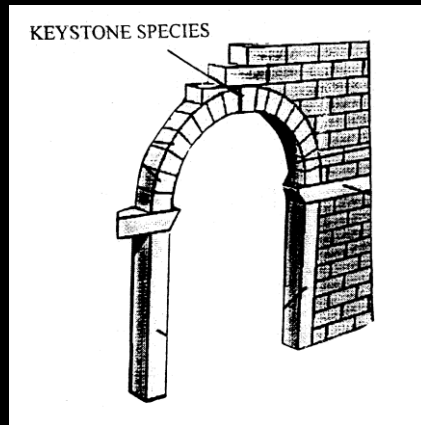
- Approx. 5,000 species:
from 3 grams (bat/shrew) to 160 tons (blue whale)
- Some are Migratory: caribou, bison, wildebeest
- Nocturnal, diurnal, crepuscular
- True Hibernators: groundhog, some bats;
Partial Hibernators: chipmunk, bear
- Fly, Glide, Walk, Burrow, Swim, Run, Jump
- Consumers: Herbivores, Carnivores, Omnivores

Diversity of Mammals: 2

- **Acute sense of smell:**
Especially carnivores, insectivores, rodents
- **Humans are not 'typical' mammals:**
Nocturnal, not monogamous, stay separate --
except to mate, rely heavily on scent communication
- **Echolocation:** Bats, some shrews
- **Problem Species:** Too few or too many
- **Some are ecologically important: Keystone Species**

Keystone Species

A species whose influence on a community is disproportionately larger than its presence



Keystone Species Analogy - A keystone is the central stone of an arch which, if removed, causes the whole arch to collapse.



Keystone Species

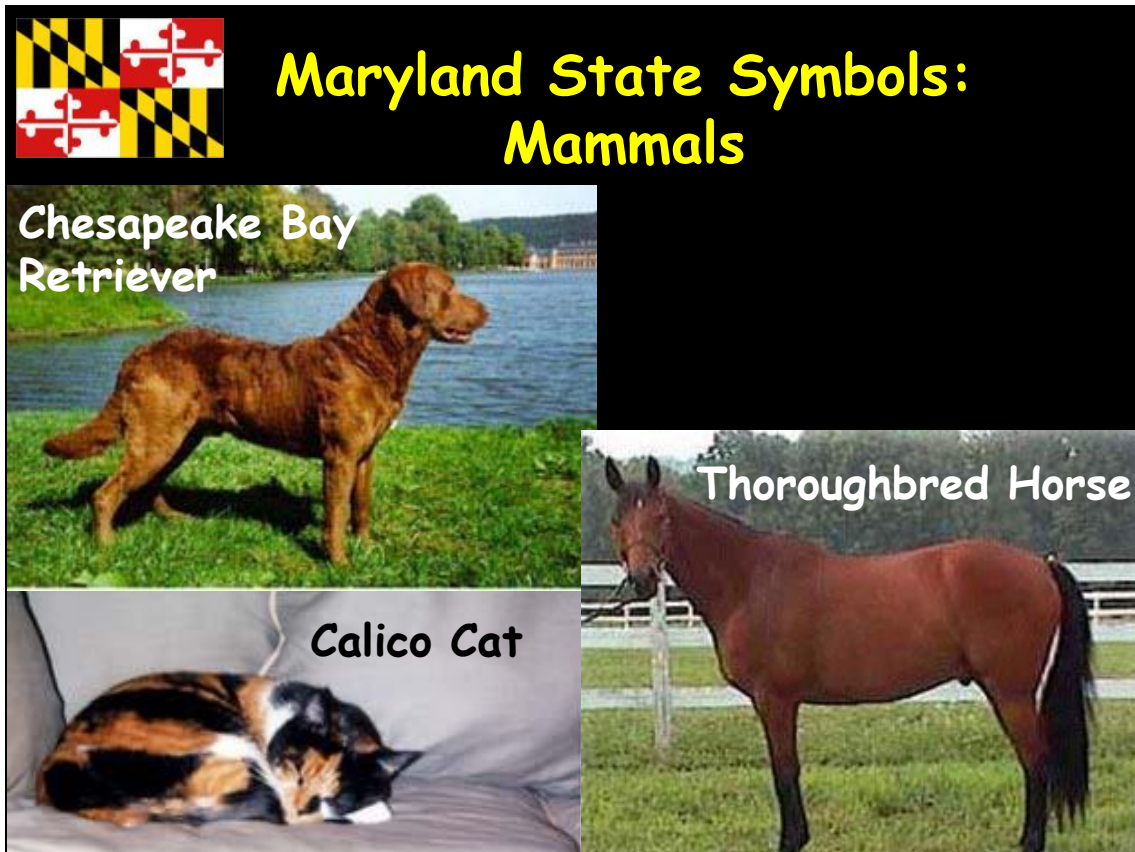
- Sea Otter:
→ sea urchins → kelp forest → fish
- Beaver:
Alters entire ecosystem
- Wolf:
In Yellowstone → elk → aspens

Three Examples of Keystone Species

Sea Otters eat a lot of sea urchins that eat kelp. Kelp provides protection for fish & other critters. No sea otters = loss of kelp habitat

Beavers: A dam can change the entire ecosystem into a pond.

Wolves in Yellowstone Park prey on elk. Elk eat young aspen trees. When wolves were removed from Yellowstone, the elk population grew and they hung out more in the meadows (no fear of predation). They began eating a lot more of the young aspen trees, thereby reducing forest cover.



The image is a slide titled "Maryland State Symbols: Mammals" in yellow text on a black background. In the top left corner is the Maryland state flag. Below the title are three photographs of mammals: a Chesapeake Bay Retriever dog standing on a grassy bank by a lake, a Calico Cat lying down on a grey surface, and a Thoroughbred Horse standing in a grassy field. Each photograph has its name written in white text over it.

Cat: Calico Cat (2001) = Black, orange, white

Dog: Chesapeake Bay Retriever (1964)

Horse: Thoroughbred Horse (2003)

What would your vote be for a State "wild" non-domesticated mammal?

Maryland Mammals

Unique Maryland Mammals: Delmarva Fox Squirrel

Some Non-native Mammals:

Nutria, Sika Deer, Norway Rat

How Many Mammals in Maryland?

~7 orders (+ marine mammals)

>20 families,

~84-95 species

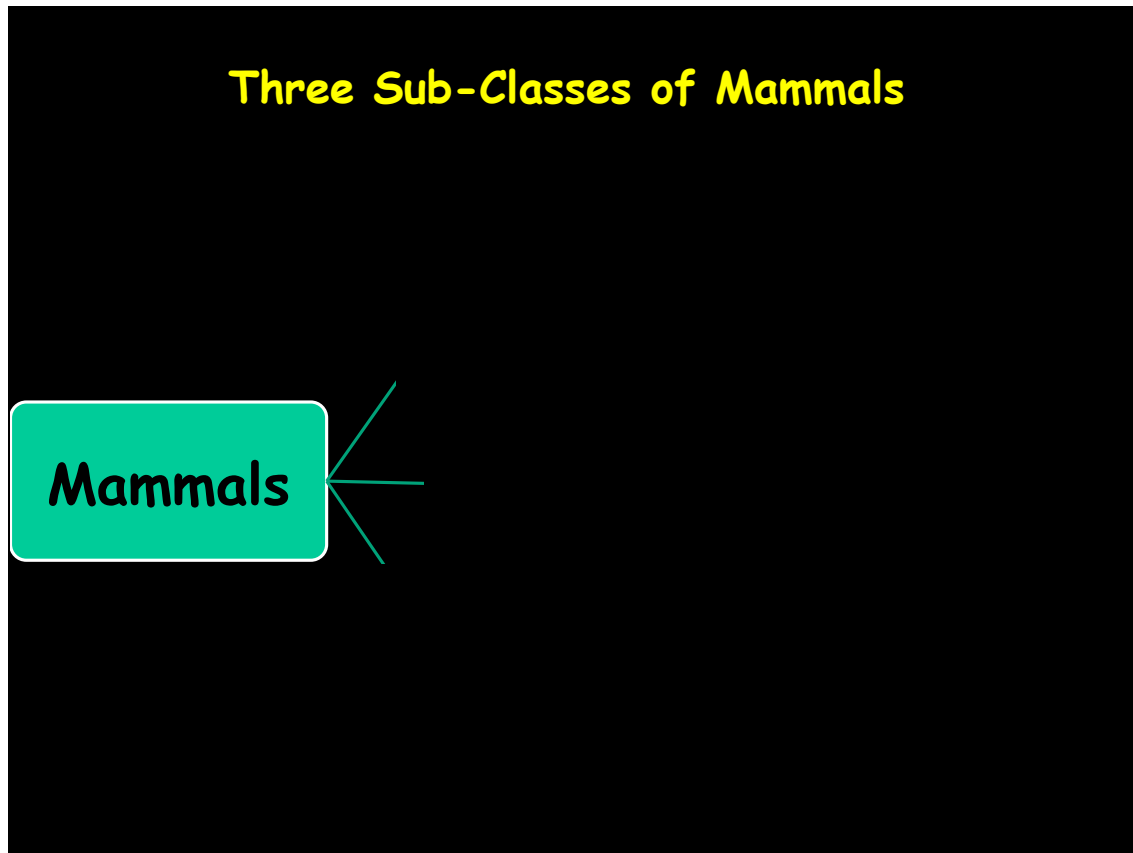


Most species in three orders: Rodents, Bats and Carnivores

Federally Endangered Species in Maryland:

Indiana Bat, Delmarva Fox Squirrel, Eastern Cougar, Gray Wolf

Mammal "Signs" in the Field: tracks, skulls, scat, holes, gnaw/scrape



Class: Mammals (5,000 species in 26 orders and **3 subclasses**)

I. Subclass: Protheria (egg-laying) - none in Maryland

Order: Monotreme: 2 families – echidnas and platypus

More primitive group: eggs, no true adult teeth (dermal outgrowths)

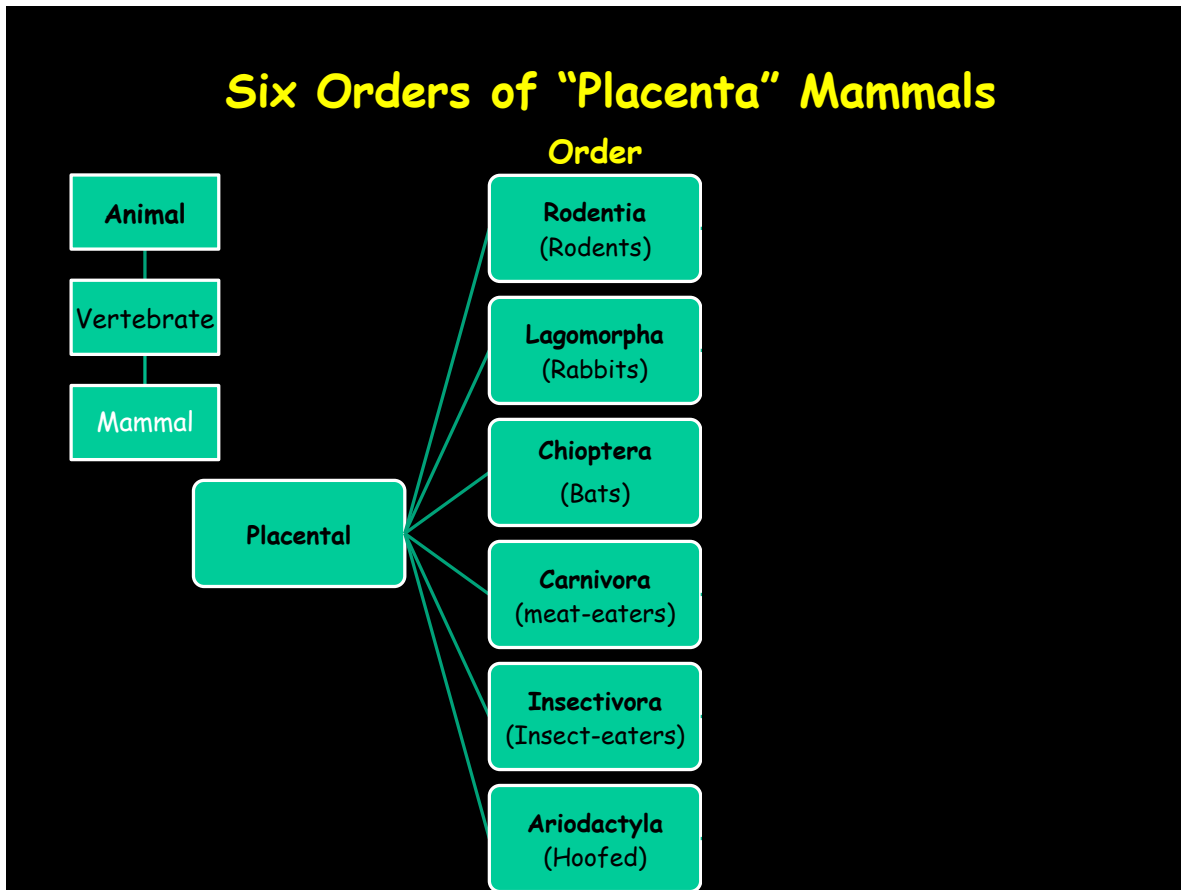
Subclass: Theria (placental)

II. Sub-subclass: Metatheria (marsupial/pouch) – 1 species in Maryland

Order: Opossum – Marsupials, true teeth. Baby is size of a bee; crawls to pocket (marsupium). Includes, kangaroo, wombat, koala, bandicoot (Aust.) Have placenta, but it is very small and primitive in structure.

III. Sub-subclass Eutheria (placental) - Maryland has 6 Orders:

- Rodents - mice, squirrels, chipmunks, moles, voles, groundhogs, beavers
- Lagomorphs – rabbits
- Chiroptera – bats
- Carnivores – dogs, wolves, foxes, bear, raccoons, weasels, skunks, cats
- Insectivores – shrews and moles
- Artiodactyla – deer



This does not include Maryland's marine mammals.

Order:
Marsupialia

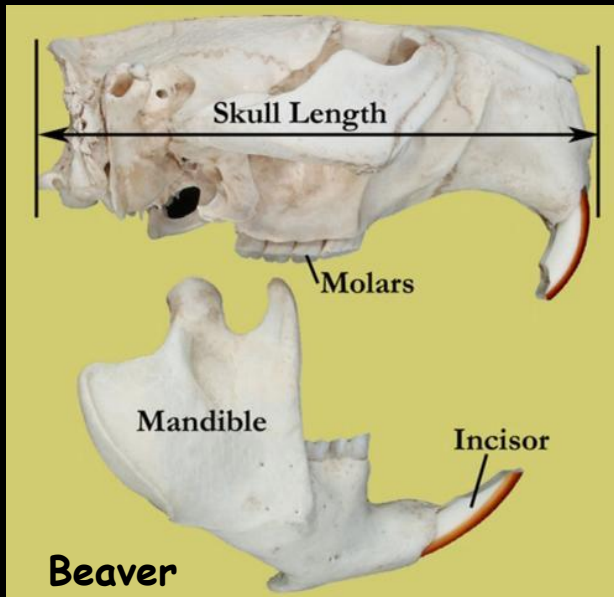
Family:
Marsupial

Virginia Opossum (*Didelphis virginiana*)

- 50 teeth (most of all mammals)
- 'Plays' dead; nomadic lifestyle
- Prehensile tail, opposable big toe
- Short lifespan (1-5 years), nocturnal
- Mates: Feb-Mar and May-June;
- 5-13 Young; 2-week pregnancy; dime-sized at birth
- 2-3 months in pouch (marsupium)



The Rodents



- Largest, most diverse order of mammals
- >2,000 species (>40%)
- Teeth continually grow
- Large space between incisors and cheek teeth (diastema)
- Mice, rat, vole, muskrat, beaver, groundhog, squirrel, chipmunk, etc.
- Important as prey (food)

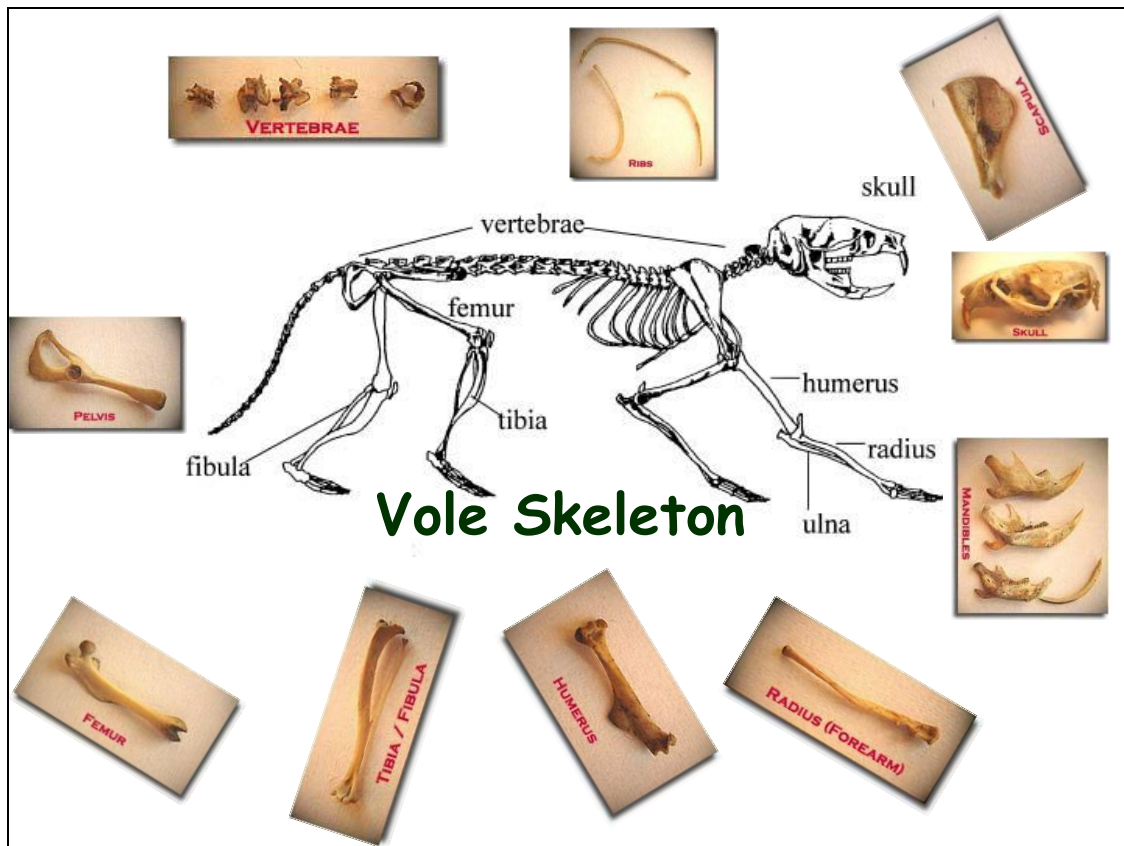
Picture is from Skulls Unlimited website.

Owl Pellets



Owls eat mammals. Their stomachs digest the meat. Most of the fur and bones are packed into a pellet and then regurgitated.

By dissecting owl pellets, you can identify the bones and skulls and learn what mammals are living in the area.



Order:
Rodentia

Family:
Castoridae

American Beaver

(*Castor canadensis*)



• Keystone Species

- Largest local rodent (30-60 lbs.), unique tail
- Semi-aquatic with many adaptations:
- Can last 15 minutes underwater
- Castor refers to castor gland at base of tail (to waterproof fur)
- Monogamous; lives 10-20 years, nocturnal, does not hibernate
- Doesn't always build dams; burrow in stream banks



Order:
Rodentia

Family:
Sciuridae

Groundhog

(Marmota monax)

- True Hibernator (December - March)
- Member of squirrel family
- Complex burrow system with many entrances
- Whistlepig, woodchuck, Punxsutawney Phil (Feb. 2)
- Mistaken for beaver or nutria



Order:
Rodentia

Family:
Sciuridae

Eastern Chipmunk (*Tamias striatus*)

- Hibernates, but not a true deep-hibernator
- Caches food
- Elaborate underground burrows - up to 100'
- No mound of dirt near burrow entrance
- Sedentary
- Each cheek capacity = large heaping tablespoon



Order:
Lagamorph

Family:
Leporidae

Eastern Cottontail

(Sylvilagus floridanus)



- Rabbits vs. Hares (altricial vs. precocial)
- Two kinds of feces to better extract nutrients:
(1) green, wet and re-eaten, (2) is darker, dry and not eaten
- Active all winter; 2-year average lifespan
- Male courtship display - runs by and jumps over her, urinates on her



Order:
Lagamorph

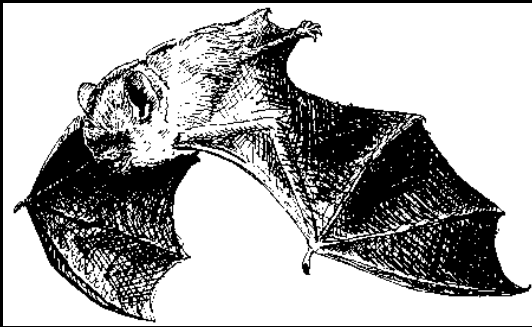
Family:
Leporidae

Eastern Cottontail

(*Sylvilagus floridanus*)



The Bats



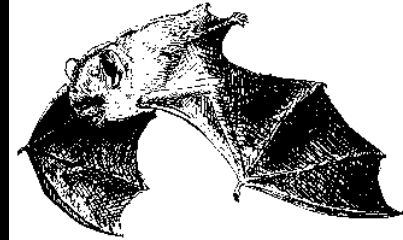
- 2nd largest order of mammals
- Only mammals capable of flight; hand-wings
- Primary consumer of nocturnal insects

Order:
Chiroptera

Family:
Vesper



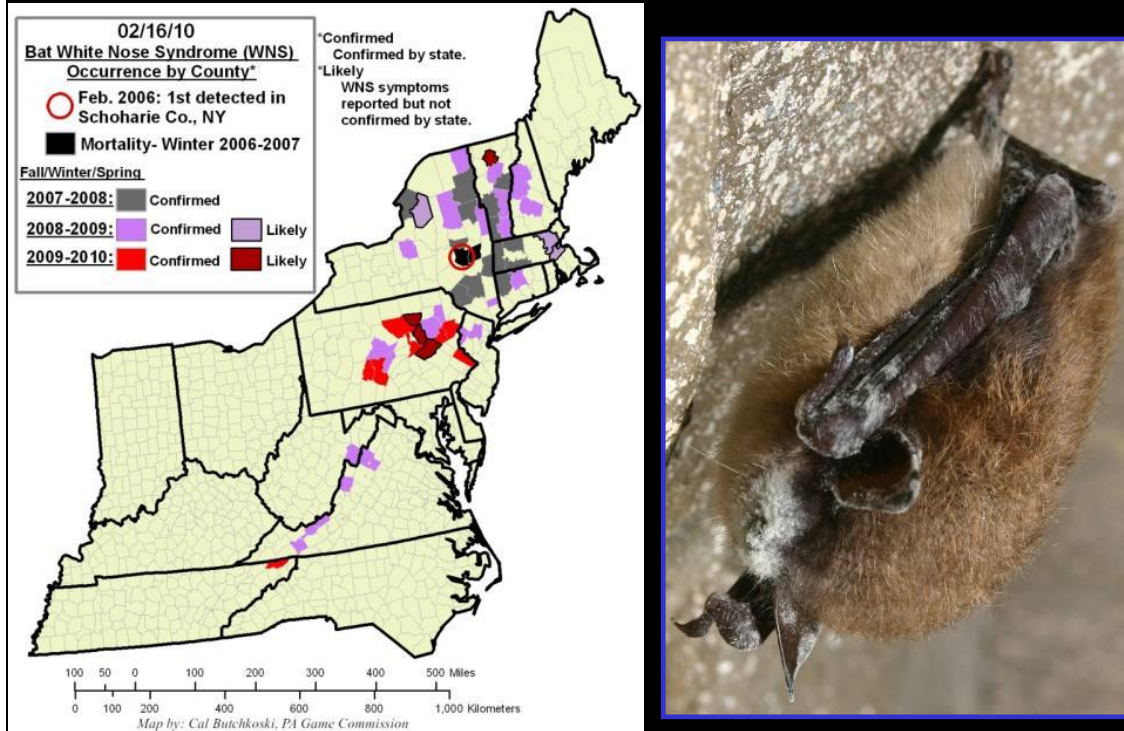
Little Brown Bat (*Myotis lucifugus*)



- 3-4" long, 8-11" wingspan
- Hibernation; Echolocation
- Insectivorous; nocturnal
- Breeds in fall; birth the following spring
- White-nose syndrome disease



White Nose Syndrome



Photos from MDDNR Website

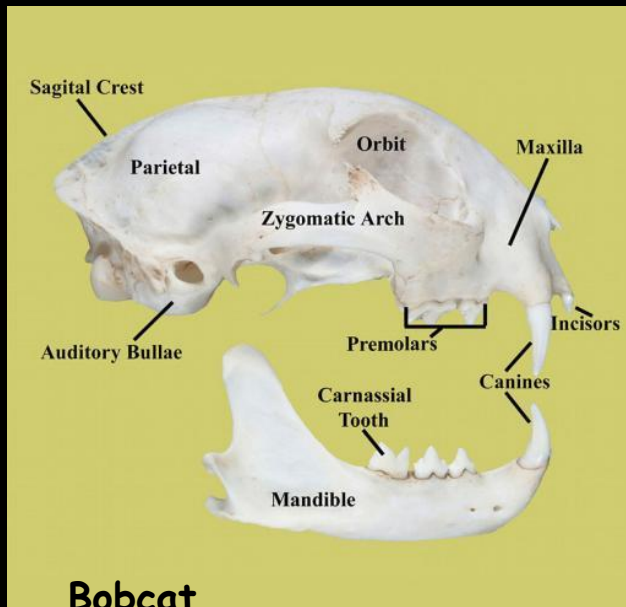
White-nose syndrome disease;

Discovered in NY in 2006; fungal infection (?) causes bats to be active in winter when they should be hibernating.

In 4 years has killed million of bats from NH to VA.

There is a movement to close caves to people to prevent spread of fungus (on shoes, gear and clothing)

The Carnivores



- Many are specialized hunters
- Keen senses of smell, hearing and eyesight
- Many walk on digits
- Specialized teeth: canines and carnassial
- Bear, raccoon, canine, feline, mustelid
- Paws with claws

Photo from Skulls Unlimited website

Order:
Carnivora

Family:
Ursidae

Black Bear

(Ursus americanus)

- Growing population: Hunting Debate
- Up to 660 lbs., crepuscular
- Semi-Hibernator - a resting sleep often called "denning"
- Gives birth in winter while denning



Black Bear Management History

- 1600's Black Bear Plentiful in Colonial MD
- 1850 Due to large scale habitat degradation and other factors bears remain only in remote mountains of western Maryland
- 1949 Bear hunting prohibited statewide
- 1972 Black Bear Listed as State Endangered Species
- 2000 Black Bear Population Estimated to be 227 adult and sub-adult Bears in Garrett and Western Allegany Counties.
- 2004 DNR establishes bear hunting season in Garrett and Allegany Counties.



Order:
Carnivora

Family:
Procyonidae

Raccoon

(*Procyon lotor*)




- Easy to identify: black-mask, ring-tail
- Nocturnal, omnivore - eats anything
- Very dexterous hands
- Food washing - not really "washing"
- Mates in late winter
- May stay in dens during cold weather
- Rabies data (85% of reported cases)

Order:
Carnivora



Family:
Canidae

Red Fox

(Vulpes vulpes)



- Omnivorous
- Black-tipped feet, white-tipped tail, resembles small dog
- Crepuscular, solitary hunter, well adapted to suburbs
- Thick fur will help insulate from the snow.



Only 5% of reported rabies cases are from fox.

Fox stay in their den during severe weathers. They curl tightly into a ball with their bushy tail wrapped around its head and body. Thick fur will help insulate from the snow.

Vocalizations: sound like a woman screaming

Order:
Carnivora

Family:
Mustelidae

Striped Skunk

(Mephitis mephitis)

- Omnivore, opportunistic feeder
- Crepuscular and nocturnal
- Sprays for defense from two independent anal glands
- Assumes U-shaped posture, can spray >10'



The Insectivores



- 3rd Largest order of mammals
- All are small
- Moles, shrews, hedgehogs, tenrecs
- Most are nocturnal and secretive
- Keen senses of smell and hearing

Photo from WildlifeofNorthAmerica.com

Order:
Insectivora

Family:
Scoricidae

Northern Short-tailed Shrew

(Blarina brevicauda)

- Only poisonous mammal in Maryland (salivary gland)
- Mouse- and mole-like with pointed nose
- Only lives a year, very high metabolism, lots of heat loss
- Must eat constantly (1.5x weight daily)
- Most primitive of placental mammals; 3 litters per year
- Crude ability to echolocate



Human-Shrew Comparison: From Ranger Rick

Human

70 lbs

Color vision

20 breaths/min.

Can starve in 20-30 days

80-120 heart beats/min.

Lives 70+ years

Eat 1/14 weight per day

Shrew

< penny

colorblind

850/min.

in 6 hours

600-800/min.

Lives 1 year

Eat 1.5 x weight per day


Order:
Insectivora

Family:
Talpidae

Star-nosed Mole

(Condylura cristata)

- Subterranean, moist meadows, semi-aquatic, swims
- Enlarged forefeet; aerates soil but damages lawns
- 44 teeth - second only to opossum's 50
- Earthworm lover
- Unique shaped nose can detect electric fields of worms



Some Interesting Facts:

22 (11-pair) finger-like projections surround nose with 25,000 minute sensory receptors known as Eimer's Organ.

Fur was used for moleskin caps, purses.

Semi-aquatic - swims; active year-round.

Fastest eater: locates, decides and eats food in $\frac{1}{4}$ second.

Can smell underwater by exhaling bubbles on object and then inhaling them.

The Hoofed Mammals



- Artiodactyla mammals have two functional toes
- They walk on "tiptoes" with elongated bones of hands and feet
- Deer, Goat, Sheep, Antelope, pig




Deer footprint

Order:
Ariodactyla

Family:
Cervidae

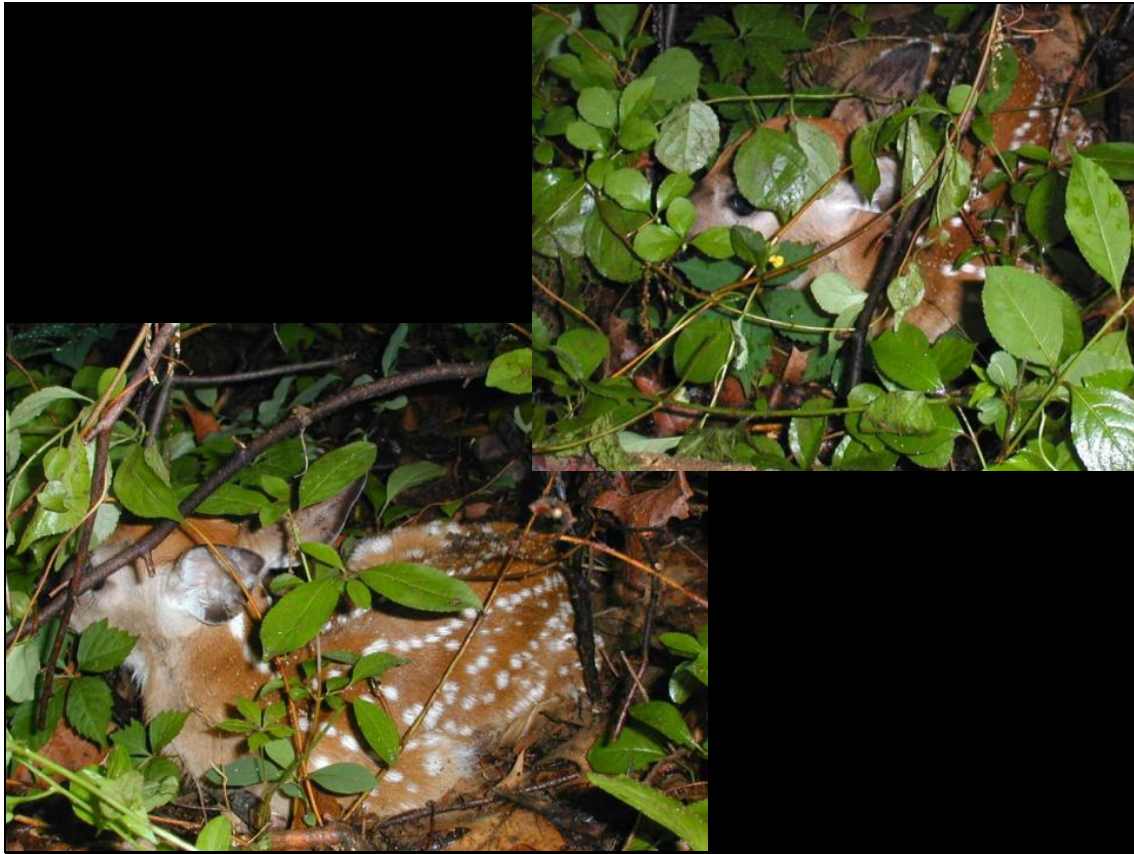
White-tail Deer

(Odocoileus virginianus)



- No upper incisors, lower incisors press against hardened tissue
- Regurgitate cud - later when away from predators
- Horns vs. antlers
- Natural predators: wolves, mountain lions are missing
- Over-population - management controversy
- Winter coat vs. summer coat

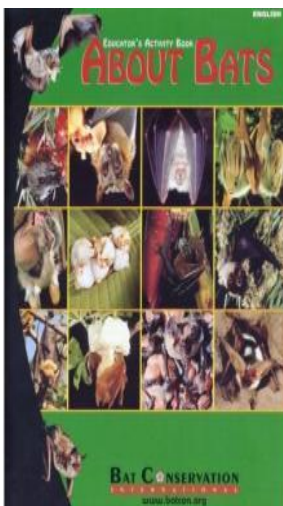
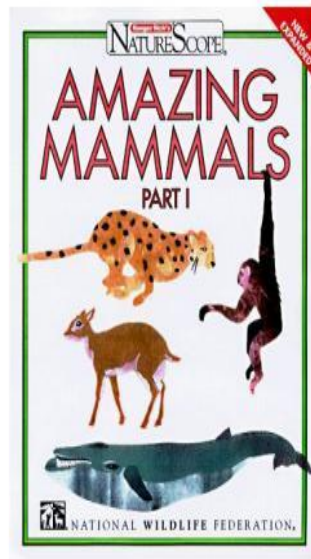
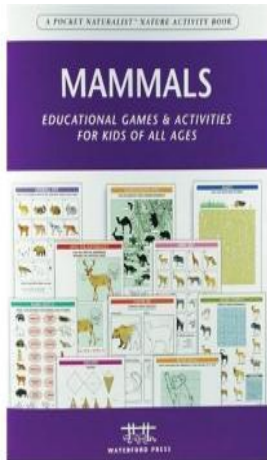
Deer flash their white under-tail as a warning when startled.



- Young have no scent
- Young have spotted fur

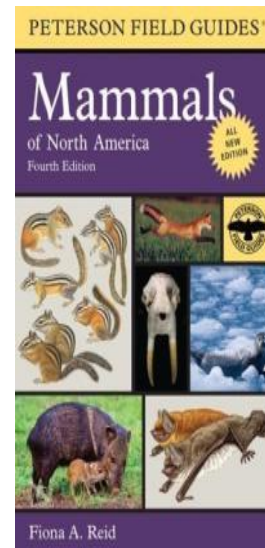
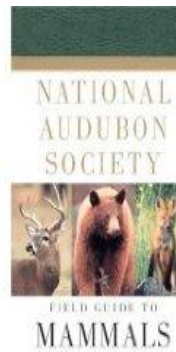
Mammal Resources 1

Activity Guides



Mammal Resources 2

Field Guides



Mammal Resources 3

www.dnr.state.md.us/wildlife/bbcp/bbtrunk.asp



Maryland DNR Black Bear Education Trunk

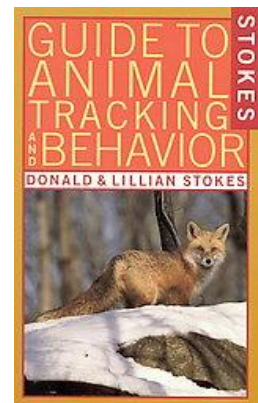
www.bobpickett.org/MammalHome.htm



Done



Audubon Mammals - iPod



Mammal Resources 4

Activities

Track Activities:

Make plaster casts, put powder around animal holes,
Make or interpret track stories

Mammal-Related Nature Games:

Project WILD Activities: e.g., Oh Deer, How Many Bears?
Find Your Partner (by type of movement)

Skulls and Teeth:

Identification, Owl Pellet Dissection

Quiz-Type Activities:

Mammal Jeopardy, Who am I? (yes/no questions),
Concentration, etc.