Module 3: Animal Features are Bone Deep
By the Archbold Biological Station Education Department, 2013
with support from the Southwest Florida Water Management District

At a Glance
In this lesson, students learn about how scientists classify animals and how animal skulls reveal clues about how animals live. Students watch a video, then work in groups to complete a skull matching activity.

Directions
1. Introduce the lesson.
2. Students watch “Animal Features are Bone Deep” video and (optional) complete accompanying worksheet.
3. Divide students into small groups and hand out supplies. Each group needs a full set of skull illustration cards and mammal skull photo cards. Show the first slide of the Skull ID PowerPoint and leave it up during the matching activity.
4. Students work together in groups to match their skull photos with the proper skull illustrations.
5. As a class, use the Skull ID PowerPoint presentation to review the answers. Read the species facts aloud from the skull illustration cards.

Learning Goals
• Emphasize the importance of observation and comparison in learning and in the practice of science.

• Introduce basic concepts of comparative vertebrate anatomy.

• Show that specific skull features such as eye placement, tooth type and size, and brain size are related to function and these features are adaptations, or adjustments in the animal’s body and behavior that make it better fit for survival in its environment.

• Show that skulls from different kinds of animals can share similar features and skulls can be grouped according to these similarities. (Herbivores, carnivores, omnivores, insectivores)

• Demonstrate how a combination of certain skull features can help identify specific animal species.

• Highlight natural history information about 8 animals that live in Florida; the Black Bear, Bobcat, White-tailed Deer, Virginia Opossum, Nine-banded Armadillo, Coyote, Raccoon, and Cottontail Rabbit.

Key Vocabulary
Vertebrate
Invertebrate
Mammals
Adaptations
Carnivore
Herbivore
Omnivore
Insectivore
Predator
Prey
Molar
Canine
Incisor

GOING FURTHER
Students draw or sculpt skulls from real or imagined creatures

Compare skulls of other animals

NEXT GENERATION FLORIDA SUNSHINE STATE STANDARDS
SC.3.N.1.1
SC.3.N.1.6
SC.3.L.15.1
SC.4.N.1.1
SC.4.L.16.3
SC.5. E.5.3
SC.5.L.17.1
### Comparing Skull Features

<table>
<thead>
<tr>
<th>Position of the Eyes</th>
<th>Size of Brain Cavity</th>
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</thead>
</table>
| - Herbivores, like rabbits and deer, have eyes on the side of the head, giving them a wide field of view and making it easier to see predators.  
  - Carnivores, such as bobcats, have eyes that aim forward (binocular vision) because they need to determine exact distance for pursuing prey.  
  - “Eyes up front, likes to hunt. Eyes on the side, like to hide” can be a helpful tool in most cases.  
  - The larger the eye sockets in relation to the skull, the better the eyesight. | - Large brain size compared to the skull size (raccoon) means the animal is more adaptable and has a greater ability to learn.  
  - Small brain size compared to the skull size (opossum) means the animal is less adaptable and has less ability to learn. |

<table>
<thead>
<tr>
<th>Skull Features of Herbivores</th>
<th>Skull Features of Carnivores</th>
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</thead>
</table>
| - Sharp from teeth for cutting and ripping off vegetation.  
  - Teeth in front for grooming and biting off parts of plants.  
  - Huge gap between front teeth and grinding teeth so the tongue can move food around when they chew.  
  - Big rear molars to grind up tough plant material.  
  - Eyes on the sides of their head to look out for predators. This creates a blind spot in front, but a well-developed sense of smell helps overcome this handicap. | - Very long/sharp upper and lower fangs (canine teeth) for killing prey.  
  - Sharp cutting side teeth that carve off chunks of meat to be swallowed whole.  
  - Small grooming teeth in front.  
  - Eyes face forward, giving it accurate distance perception (binocular vision) for seeing and pursuing active prey.  
  - Large brain relative to skull and contained in the round back part of the skull. |

<table>
<thead>
<tr>
<th>Skull Features of Omnivores</th>
<th>Skull Features of Insectivores</th>
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</table>
| - Combination of both herbivore and carnivore characteristics give them a wider choice of food selection.  
  - Long pointed teeth for catching prey.  
  - Sharp, scissor-like teeth for shearing meat.  
  - Rounded teeth for grinding and crushing plant material (fruits, berries, and soft plant tissue) | - Narrow snout, long skull.  
  - Tiny peg-like molars.  
  - Small eye sockets (rely on smell, hearing and touch). |

### Additional Resources
- Florida Mammals Guide: [www.wildflorida.com](http://www.wildflorida.com)
- Smithsonian National Museum of Natural History (mammal section): [http://www.mnh.si.edu/mna/main.cfm](http://www.mnh.si.edu/mna/main.cfm)
# Evaluation

School/Date: 

Teacher/Grade: # of Students:

## VIDEO WORKSHEET SCORES

Write the number of students that achieved each score.

<table>
<thead>
<tr>
<th>Score (Questions Answered Correctly)</th>
<th>Number of Students</th>
<th>Score (Questions Answered Correctly)</th>
<th>Number of Students</th>
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## SKULL MATCHING ACTIVITY

Checkmark for correct answers and “X” for mismatches

<table>
<thead>
<tr>
<th>Student Groups</th>
<th>Skull 1</th>
<th>Skull 2</th>
<th>Skull 3</th>
<th>Skull 4</th>
<th>Skull 5</th>
<th>Skull 6</th>
<th>Skull 7</th>
<th>Skull 8</th>
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<td>Group 3</td>
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<td>Group 5</td>
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If your class is visiting Archbold Biological Station, please bring us this evaluation. Thank you.
Animal Features are Bone Deep
Student Video Worksheet
Find the answers while watching the video.

EARTH (Finish the sentence)
1. The Earth is a great place for life. Overall, it’s not too hot or cold and has plenty of ….

DOGS AND CATS (Finish the sentence)
2. Every animal is like its parents and siblings but it is also ...

VERTEBRATES AND INVERTEBRATES (Finish the sentence)
3. Animals are classified as vertebrates if they have a ...

ANIMAL GROUPS (Finish the sentence)
4. Each animal group shares certain traits. Humans and manatees are mammals, so both produce ...

PREDATOR (Circle the answer)
5. Most predators have eyes on the (front) (side) of their face.

PREY (Circle the answer)
6. Most prey animals have eyes on the (front) (side) of their face.

Match The Animal Types With Their Diet

7. Herbivore ________  A: Eats plants and meat

8. Omnivore ________  B: Eats plants

9. Insectivore ________  C: Eats meat

10. Carnivore ________  D: Eats insects
Animal Features are Bone Deep
Teacher Answers to Video Worksheet
Find the answers while watching the video.

EARTH (Finish the sentence)
1. The Earth is a great place for life. Overall, it’s not too hot or cold and has plenty of ... water.

DOGS AND CATS (Finish the sentence)
2. Every animal is like its parents and siblings but it is also ... unique or different.

VERTEBRATES AND INVERTEBRATES (Finish the sentence)
3. Animals are classified as vertebrates if they have a ... back bone or spine

ANIMAL GROUPS (Finish the sentence)
4. Each animal group shares certain traits. Humans and manatees are mammals, so both produce ... milk.

PREDATOR (Circle the answer)
5. Most predators have eyes on the (front) (side) of their face.

PREY (Circle the answer)
6. Most prey animals have eyes on the (front) (side) of their face.

Match The Animal Types With Their Diet

7. Herbivore ___B_____
A: Eats plants and meat

8. Omnivore ___A_____
B: Eats plants

9. Insectivore ___D_____
C: Eats meat

10. Carnivore ___C_____
D: Eats insects
Mammal Skull Teacher Answer Sheet

Skull 1: Black Bear
Skull 2: Bobcat
Skull 3: White-tailed Deer
Skull 4: Virginia Opossum
Skull 5: Nine-banded Armadillo
Skull 6: Coyote
Skull 7: Raccoon
Skull 8: Cottontail Rabbit

Keep in Mind: These are photographs of real skulls found in the wild. Skulls found in the wild are often missing jaws, teeth, and other parts.
**Black Bear**  
*Ursus americanus*

- Omnivore that eats insects (including honey bee larvae), berries, acorns, armadillos, grasses, etc.
- Excellent sense of smell
- Sharp claws good for climbing trees and digging
- Florida’s largest land mammal
- Cars are its #1 killer

**Bobcat**  
*Lynx rufus*

- Strict carnivore, eating mainly small mammals (rabbits, rats, and mice)
- Will eat deer, birds, or hogs if they can catch them
- Travels long distances to hunt for food
- Both males and females tend to be solitary
- Has large auditory bullae that holds the middle and inner ear, indicating an acute sense of hearing
White-tailed Deer
*Odocoileus virginianus*

- Herbivore that eats mostly plant material such as flowers, leaves, shoots, and grasses
- Will sometimes eat acorns, corn, and cacti
- Uses scent marking to communicate with other deer, signaling presence of predators and to mark territories
- Less well-developed sense of hearing, but has large ears
- Predators that hunt deer in Florida include panthers and alligators

**Photo by Rebehak D. Wallace**

Virginia Opossum
*Didelphis virginiana*

- Omnivore that eats insects, frogs, birds, fruits, seeds, snakes, grasses, earthworms, and road kills
- A marsupial, meaning it has a pouch where young opossums stay until old enough to survive outside
- Will “play dead” when threatened or harmed
- Small braincase indicates it is less adaptable and has less ability to learn.

**Photo by William Krause**
**Nine-banded Armadillo**  
*Dasypus novemcinctus*
- Eats large amounts of ants, beetle larvae, termites, and other insects
- Spends much of its time digging for insects buried in leaf litter and soil
- Poor eyesight, relies mostly on hearing
- Long narrow snout suggests keen sense of smell
- Is hunted by predators such as coyotes, bobcats, and panthers
- Boney body plates provide protection

**Coyote**  
*Canis latrans*
- Omnivore that eats mostly small mammals such as rabbits, squirrels, rats, and mice, but will also eat birds, reptiles, insects, fruits, and vegetables.
- Live in small packs of several adults and young
- Mostly nocturnal
- Hunts for mice by slowly walking through grass with nose to the ground, smelling for prey
**Raccoon**  
*Procyon lotor*

- Omnivore that eats just about anything it can find; road kills, garbage, frogs, turtles, eggs, birds, insects, and mice
- Have a very well developed sense of touch
- Is nocturnal and hides during the day in a den such as a hollow log, pile of brush, or in trees
- Predators can be bobcats, coyotes, panthers, and Great Horned Owls
- Large brain case means it has a greater ability to learn.

**Cottontail Rabbit**  
*Sylvilagus floridanus*

- Herbivore that feeds mostly on grasses, plant buds, leaves, and bark
- Has very good eyesight and hearing
- Freezes when danger approaches, but will run quickly and erratically if a predator gets too close
- Is nocturnal and mostly hides during the day
- Predators include coyotes, foxes, owls, hawks, and snakes
Mammal Skull Photo Cards

Skull 1

Skull 2

Skull 3

Skull 4

Archbold Biological Station

Skull 1: 12”

Skull 2: 4 ½”

Skull 3: 9 ¼”

Skull 4: 4 ¾”