

Herpetology Lab

* Lab created by Dr. Cindy Shannon and modified by Tyler Flisik

Objective: To learn the basic characteristics of amphibians, reptiles and mammals to learn how to identify local examples. This will allow us to discuss and identify "herps" on field trips.

AMPHIBIANS & REPTILES

The study of amphibians and reptiles is called **herpetology**. Therefore, the term "herps" is often used to refer to these organisms.

Amphibians are classified in the kingdom system as follows:

Domain Eukarya

Kingdom: Animalia

Phylum: Chordata

Class: Amphibia Order: Anura = frogs and toads, Order: Urodela = newts and salamanders

Examples of amphibians would include frogs, toads, salamanders and newts. Their characteristics include a "double life." Which refers to their 2-phase life style. They are usually aquatic while developing from egg to juvenile, and semi-terrestrial as a juvenile and adult. **Metamorphosis** refers to a change in body form, so that the young form looks different from the adult. Most amphibians undergo metamorphosis from aquatic larvae that breathe using gills, to a terrestrial adult that breathes using lungs. Amphibians have no amniotic layer around their egg (instead the egg is often surrounded by jelly layers), so the egg must be laid in water. Amphibians practice **cutaneous respiration** (skin breathers) to obtain oxygen in addition to gills as larvae and lungs as adults. Some also use **buccal respiration** (respiration through the mouth and pharynx).

Unlike reptiles, amphibians lack scales, so the skin of amphibians is smooth, moist and slippery, and they have mucus glands to keep their skin from drying out. The mucus secreted from the mucus glands also makes them hard to hold onto for predators. Many amphibians also produce toxins that can be secreted from specialized **poison glands** when they are attacked. Amphibians do not have true nails or claws, although some have a modified projection of the epidermis, but it is not a true claw. Their teeth are **homodont** (all the same), except toads, which are toothless. Similar to most reptiles, amphibians have a **three-chambered heart** (2 atria, 1 ventricle), while birds, crocodiles and mammals have a four chambered heart (2 atria, 2 ventricles). Amphibians have a brain with **10 cranial nerves**, which send information received by the sensory receptors to the brain. This differs from reptiles, birds, and mammals which have 12 cranial nerves. Most amphibians have enlarged pelvic and pectoral girdles, which allows them to better support their body weight on land. All amphibians are **ectotherms**, so their body temperature depends on heat derived externally. Furthermore, amphibians are not as good at body temperature regulation as reptiles, so amphibians tend to have body temperatures about 20-22 degrees Celsius (68-72 degrees F) and compared to the reptiles which range from 25-40 degrees Celsius (77-104 degrees F).

Reptiles are classified in the kingdom system as follows:

Domain Eukarya

Kingdom: Animalia

Phylum: Chordata

Class: Reptilia Order: Testudines = turtles and tortoises, Order: Squamata = lizards and snakes,
Order: Crocodylia = crocodiles and alligators

Examples of reptiles include lizards, snakes, turtles, crocodiles and alligators. Reptiles, birds, and mammals have an egg encased within amniotic fluid (**amniotic egg**), which allows them to lay their eggs outside of the water. Some reptiles and most mammals retain the egg and develop the fetus internally, then give birth to live young (viviparity). Another characteristic, which was key to their invasion of land, is the **keratinized scales** that cover the skin of reptiles. These scales are homologous with the hair of mammals and the feathers of birds. The cornified portion (dead cells) of the epidermis is frequently **shed** in healthy reptiles and resulting in new growth. If the reptile is in poor health, it tends to have difficulty shedding due to the amount of energy require to produce new scales. Most reptiles have true claws made of keratin, with some snakes having a single claw or spur on each side of their anal opening, which are the vestigial hind limbs once present in snake ancestors. Unlike amphibians, reptiles do not have an aquatic larval stage, so all reptiles have lungs, although there are some turtles and sea snakes that practice cutaneous respiration to extend the length of their dives. **Most reptiles have a three-chambered heart** (2 atria, 1 ventricle) except the crocodylia, which have a four-chambered heart. While turtles and crocodylia have a single erectile penis, male snakes and lizards have a pair of reproductive organs known as a **hemi-penis**. The hemi-penis is a 2 sac structure which may allow for reproduction to continue once one sac has distributed sperm. Reptiles tend to have more teeth than amphibians, with most reptiles having homodont dentition, although some lizards are **heterodont** and crocodylia are **thecodont** (teeth are in sockets). Similar to amphibians, reptiles are **ectothermic**, relying on the external environment to control their internal body temperature.

REPTILES & AMPHIBIANS

By: CLIPARTIC



HERPETOLOGY LAB SPECIMENS

AMPHIBIANS

Salamanders:

1. California Newt
2. California Slender Salamander

Frogs & Toads:

1. Spadefoot Toad
2. Western Toad
3. Leopard Frog
4. Treefrog (California and Pacific)
5. Bullfrog (introduced)

REPTILES

Turtles & Tortoises:

1. Desert Tortoise

Lizards:

1. Western Whiptail
2. Desert Horned Lizard (NOT a horny toad!)
3. Collared Lizard
4. Desert iguana
5. Alligator Lizard
6. Zebra-tail Lizard
7. Western Fence Lizard
8. Side-blotched Lizard
9. Western Skink
10. Granite Spiny Lizard
11. Chuckwalla

Snakes:

1. Rosy Boa
2. Striped Racer
3. Racer
4. Coachwhip
5. Long-nosed Snake
6. Common Snake
7. Ringneck Snake
8. Spotted Leaf-nosed Snake
9. Gopher Snake
10. Western Rattlesnake
11. Red Diamond Rattlesnake
12. Sidewinder
13. Western Blind Snake

Name: _____

HERPETOLOGY LAB QUESTIONS

1. Why do amphibians need to live near water? _____

2. Describe 5 evolutionary advances that reptiles have over amphibians:

1. _____

2. _____

3. _____

4. _____

5. _____

3. What is the difference between a frog and a toad?

4. How is a salamander different from a lizard? _____

5. What is the spade on a spadefoot toad for?

6. How do you tell a western toad from a spadefoot toad? _____

7. Describe a leopard frog's spots: _____

8. What two characteristics will help you tell a treefrog from any other frog? _____

9. Describe the physical characteristics of a bullfrog: _____

10. Which lizard has a mottled or marbled appearance, and a VERY long tail? _____

11. Which lizard has a row of enlarged or raised scales down the middle of its back? _____

12. Which lizard has distinct blackish cross bands on its back, and a fold down the side of its body with short stubby legs? _____

13. Describe the following lizards:

Side-blotched: _____

Western fence: _____

Horned: _____

14. Describe the rosy boa: _____

15. Which snake is reddish, has a black patch on the neck and looks like a braided whip? What do you notice about the eyes on this snake? _____

16. How can you tell the striped racer, long-nosed snake and common kingsnake apart? _____

17. Which of the snakes in the previous question eats other snakes? _____

18. Which snake hisses and rustles in leaves like a rattlesnake, but is nonvenomous? _____

What do you think this snake eats?

19. What is the difference between a poisonous animal and a venomous animal? _____

19. What 3 traits should you look for to identify a rattlesnake:

1. _____

2. _____

3. _____

20. Describe the following rattlesnakes:

Western: _____

Red Diamond: _____

Sidewinder: _____

21. What is the best course of action for a venomous snake bite?(P. 262 Audubon book) _____

Mammalology Lab

Objective: To learn the basic characteristics of mammals to learn how to identify local examples. This lab will allow for easier discussion of identification of mammals on field trips.

The study of mammals is called **mammalogy**. A wide variety of mammals occur in California including opossums, moles, squirrels, bats, rabbits, beavers, bears, coyotes, deer, seals, dolphins, whales. and many more!

Mammals are classified in the kingdom system as follows:

Domain Eukarya

Kingdom Animalia

Phylum Chordata

Class Mammalia Order: Monotremata = egg laying mammals (platypus, echidna)

 Infraclass: Marsupalia = marsupial mammals (koala, kangaroo, opossum)

 Infraclass: Eutharia = placental mammals (rodents, cetaceans, dogs, cats, ungulates)

Mammals have multiple shared, derived characteristics that define mammals. First, all mammals have **mammary glands** (milk glands), which is where the taxonomic group gets its name. Milk is a lipid rich nutrient source for developing offspring and is one of the reasons for the high survival rates of most mammals. Most mammals have hair or fur, often over the whole body. This insulates them and allows them to have a fairly constant body temperature (**homeotherms**). Some mammals found in warm climates, like elephants, rhinos and hippos, have very little hair covering their bodies, but have very thick skin and other adaptations for cooling. Whales and porpoises are hairless, and instead rely on blubber for insulation. Other mammal characteristics include muscular diaphragm that separates the abdominal cavity from the chest cavity, and single lower jaw bone called a mandible, three inner ear bones and red blood cells without a nucleus. All mammals have a 4-chambered heart (2 atria, 2 ventricles) and a left aortic arch. Mammals have **heterodont** dentition, which means they have different teeth that serve different functions. Most mammals also have dipodont dentition, which means they have a first set of teeth that are later replaced by a second and final set of teeth. Like crocodilians, mammals also have teeth set in sockets, which is known as **thecodont** dentition. Mammals have a hard palate, which is a bony palate separates the mouth from the nasal cavity allowing mammals to breathe while eating. Mammals are **endothermic** homeotherms that generate their own body temperature internally and maintain a relatively constant body temperature. Almost all mammals give **live birth** (viviparity), with the exception of the platypus and echidnas with lay an egg like reptiles (oviparity). Mammals have a large cerebral cortex portion of the brain, which is responsible for interpretation of sensory information and higher reasoning. At the base of the skull where the spinal vertebra articulate with the skull, mammals have two projections known as occipital condyles. This characteristic separates them from bird and reptiles which only have a single occipital condyle.

Mammals are typically divided into three major groups based on their form of reproduction.

Monotremes, which include the platypus and echidna, lay eggs externally like a bird or reptile. Similar to reptiles the mammal eggs have a leathery shell, rather than a hard shell like that of birds. Monotremes lack nipples and instead secrete milk from their mammary glands. All monotremes are limited to Australia and New Guinea. Marsupials give live birth to underdeveloped young that finish their development in a marsupium or pouch. The only marsupial native to North America is the Virginia opossum (*Didelphis virginiana*). Eutherian mammals give birth to live young that a fully developed within a placenta. Eutherian mammals are by far the largest group of mammals, with world wide distribution. Eutherians are divided into numerous taxonomic orders including rodentia (rodents), chiroptera (bats), carnivora (dogs, cats, bears,

weasals, pinnipeds), afrotheria (elephants, manatees, hyrax), lagomorpha (rabbits and hares), perissodactyla (horses, rhinos) and cetartiodactyla (bovine, camels, pigs, deer, cetaceans).

MAMMALOLOGY LAB SPECIMENS

MARSUPIAL

1. Opossum (marsupial)

EUTHERIANS

2. Armadillo
3. California Mole (insectivore)

Rodentia:

4. Pocket Gopher
5. California Ground Squirrel
6. Western Gray Squirrel
7. White-tailed Antelope Ground Squirrel
8. Northern Flying Squirrel
9. Chipmunk
10. Brush Mouse
11. California Mouse
12. Deer Mouse
13. California Pocket Mouse
14. House Mouse
15. Harvest Mouse
16. Meadow Mouse
17. Desert Kangaroo Rat (K-Rat)
18. Pacific Kangaroo Rat (K-Rat)
19. Woodrat
20. Norway Rat

Chiroptera:

21. Western Pipistrelle Bat
22. Pallid Bat
23. Little Brown Bat

Carnivora:

24. River Otter/Sea Otter
25. Beaver
26. Mountain Beaver
27. Long-tailed Weasel
28. Coyote
29. Domestic Dog
30. Mountain Lion
31. Black Bear
32. Grizzly Bear

Lagomorphs:

33. Desert Cottontail
34. Black-tailed Jackrabbit

here)

Cetartiodactyls (Ungulates):

35. Mule deer (Black-tailed deer)
36. White-tailed deer
37. Pronghorn
38. Mountain Goat
39. Dall Sheep (Bighorn Sheep)

35. Mule deer (Black-tailed deer) 36. White-tailed deer 37. Pronghorn 38. Mountain Goat
39. Dall Sheep (Bighorn Sheep here) 40. Thompson Gazelle

Name: _____

MAMMALOGY LAB QUESTIONS

1. Provide four characteristics unique to mammals:

2. Name some mammals that have little or no hair/fur:

3. Compare the size of the eyes and ears on the mole, gopher and deer mouse. Explain why these characteristics may differ between these rodents. _____

4. How can you tell a chipmunk from a squirrel?

5. Which mammal has front feet that are broader than they are long, a naked nose, no external ears and pin size eyes? How might these characteristics reflect the life style of this mammal? _____

6. Which rodent has tiny ears and eyes and very long incisors? How might these characteristics reflect the life style of this mammal?

7. How can you tell a California ground squirrel from a western-gray squirrel? _____

8. Describe the morphology of the white-tailed antelope ground squirrel:

9. What do you notice about the size of the eyes on the northern flying squirrel? How might this characteristic reflect the life style of this mammal?

10. Compare the morphology of the **California mouse** and **deer mouse**:

Which has a tail that is shorter than its body? _____

Which has very large ears? _____

11. Compare the **woodrat**, **Norway rat** and **kangaroo rats**:

Which has a tuft of hair on the end of the tail? _____

Which has a naked tail? _____

Which has a long tail that is lightly furred with no tuft at the end? _____

Which has very large hind legs in comparison to the front legs? _____

Which is also known as a "packrat"? _____

12. Describe the following:

California Pocket Mouse:

House mouse:

Harvest mouse:

13. How can you tell a desert cottontail from a black-tailed jackrabbit?

14. How does the fur of the beaver differ from that of the coyote? Why?

16. How many black bears are in the museum? How do you know?

17. What are some other names for a mountain lion?

18. How is the tragus of the two kinds of bats on display different?

19. Which mammals have "true horns" instead of antlers?

20. Which deer has antlers that branch equally? Which deer's antlers branch from a main beam?

21. Which mammal has armor?

22. Which mammal has grayish fur, a white face, a rat-like tail and a pouch?

23. Which ungulate is from Africa and would only be seen in California in a zoo?

24. What is a "sign" as far as mammals are concerned? How are they useful? (P. 343 Audubon book)
