The Cold Blooded Vertebrates: Fish, Amphibians, and Reptiles

Chapter 13
Vertebrate Characteristics

- Vertebrae
- Skulls
- Living endoskeleton
**ENDOSKELETON CHARACTERISTICS**

- **Made of:**
  - Bone
  - Cartilage
- **All have:**
  - Skull
  - Vertebral column
  - Joints
- **Most have:**
  - Ribs
  - Limbs
What is the difference between endotherms and ectotherms?

- **Endotherms** regulate their body temperature by _______ means.
- **Ectotherms** regulate their body temperature by _______ means.
What is the difference between endotherms and ectotherms?

- **Endotherms** regulate their body temperature by *internal* means.
- **Ectotherms** regulate their body temperature by *external* means.
Mammals and birds are the only endothermic animals. They maintain a relatively constant body temperature. To keep warm, they use fur, feathers, and small ears. To keep cool, they use blood vessels close to the skin, large ears, sweating, and panting.
**ENDOTHERMS**

- **Mammals** and **birds** are the only endothermic animals.
- Maintain a relatively constant body temperature.
- Keep **warm** by:
  - Fur
  - Feathers
  - Small ears
- Keep **cool** by:
  - Blood vessels close to the skin
  - Large ears
  - Sweating
  - Panting
WHAT'S WRONG WITH THIS PICTURE?
ECTOTHERMS
Include fish, amphibians, and reptiles.

The temperature of their bodies is often the same as their surroundings.

Many become sluggish or inactive when their body temperatures get too high or too low.

Regulate body temperature by seeking warmer or cooler environments.
Include **fish**, **amphibians**, and **reptiles**.

The temperature of their bodies is often the same as their surroundings.

Many become sluggish or inactive when their body temperatures get too high or too low.

Regulate body temperature by seeking warmer or cooler environments.
Key systems that all vertebrates have in common:

- Circulatory system
- Respiratory system
- Nervous system
- Digestive system
- Excretory system
CIRCULATORY SYSTEM

- Transports oxygen and nutrients throughout the body.
- Major parts:
  + Blood
  + Blood Vessels
  + Heart
Blood circulates in the body through the pumping action of the heart.

- Carries oxygen, nutrients, carbon dioxide, wastes, and hormones to and from the body’s cells.

**Oxygenated blood:** bright red

**Deoxygenated blood:** dark red
The blood vessels carrying blood away from the heart are called arteries.

The blood vessels carrying blood to the heart are called veins.

Capillaries are microscopic blood vessels in which blood often exchanges gases and other materials.
Vertebrate hearts contain spaces called **chambers**.

The walls of the chamber are made of **muscle**.

How many chambers do vertebrate hearts have?

- Fish: **Two** chambers
- Amphibians/Reptiles: **Three** chambers
- Birds/Mammals: **Four** chambers
- Function: gas exchange
- Major organ: gills or lungs
Mammals and humans have diaphragms to help them breathe.

A diaphragm is a thin layer of muscle that separates the chest chamber from the abdomen.

When the diaphragm contracts, it lowers, causing the chest chamber to become larger.

This draws air into the lungs through the nose and mouth.
NERVOUS SYSTEM

- Central Nervous System
  + Brain
  + Spinal cord

- Peripheral Nervous System
  + Cranial nerves
  + Spinal nerves
  + Sensory receptors
  + Sensory organs
**DIGESTIVE SYSTEM**

- **Mouth**: food enters
- **Esophagus**: tube food passes through
- **Stomach**: digestive enzymes, mixes food
- **Small Intestine**: digestive enzymes, nutrient absorption
- **Liver**: makes bile; fat digestion
- **Gallbladder**: stores bile
- **Pancreas**: digestive enzymes (proteins, starches, fats)
- **Large Intestine**: water absorption
- **Anus**: expels undigested food

13-12 Generalized vertebrate digestive system. The size of the different organs may vary from animal to animal, and sometimes other organs may be present. The digestive systems of most vertebrates follow this general plan.
FORMS OF NUTRITION

OMNIVORES
These are animals able to eat plants AND animals.
Some omnivores are:
- humans
- most bears
- raccoons
- most primates (apes & monkeys)
- seagulls & other birds

HERBIVORES
These are animals that eat mainly plants.
This includes leaves, grass, flowers, seeds, roots, fruits, bark, pollen and much more.
Some herbivores are:
- deer
- horses
- rabbits
- cows
- bees
- sheep
- grasshoppers

CARNIVORES
These are animals that eat mainly meat. This includes insects and all animals.
Some carnivores are:
- Felines (lions, tigers & all cats)
- birds of prey (eagles, hawks, owls, etc.)
- sharks
- frogs
- spiders
**Excretory System**

- **Function**: to filter wastes from the blood
- **Major organ**: kidneys
Fish are ectothermic vertebrates.

A fish’s activity changes with the temperature.

They are designed for life in water.
- Scales
- Lateral lines
- Nostrils
The darker line is the Lateral Line on this Striped Bass.
HOW DOES A FISH MOVE THROUGH WATER?

- Flexing its entire body
- Paired fins
- Streamlined body shape
- Swim bladder
FISH CIRCULATION

- Closed circulatory system
- Two-chambered heart
FISH REPRODUCTION

- Most fish reproduce by spawning.
- Some fish give birth to live young.
Types of Fishes

Three types of fishes:
  - Jawless fishes
  - Cartilaginous fishes
  - Bony fishes
JAWLESS FISH

- No jaws
- No scales
- No paired fins
- Skeleton made of cartilage
CARTILAGINOUS FISH

- Skeletons made of cartilage
- Have jaws, scales, and paired fins

Shark
Skate
Ray
BONY FISH

- Largest group of fish
- Skeleton made of bone
- Have jaws and paired fins
- Most have scales
AMPHIBIANS

- Ectothermic vertebrates.
- Usually live in water when young but can live on land as adults.
- “Amphibian” means double life.
Amphibians are the only vertebrates that undergo metamorphosis.

Young amphibians have gills but adults usually have lungs.

Also use thin, moist skin for respiration.

Two-chambered heart to Three-chambered heart.
**TAILLESS AMPHIBIANS**

**Frogs**
- Smooth, moist skin
- Usually live near water

**Toads**
- Rough, dry, bumpy skin
- Adults can be far from water
Most frogs and toads lay their jelly-coated eggs in water. The eggs are fertilized externally.
Hibernation Vs. Estivation

**Hibernation** helps avoid damage from low temperatures in winter.

**Estivation** helps avoid damage from high temperatures in summer.
HOW DOES A FROG EAT?

- Frogs eat insects, worms, slugs, snails, and other small animals.
- A frog catches food with its tongue, which is short, thick, and attached to the front of its mouth.
- A frog does not use its teeth to chew, but to hold its food.
TAILED AMPHIBIANS - SALAMANDERS AND NEWTS
Salamanders have tails in adulthood.

A few species never develop lungs but keep their gills.

Many species secrete distasteful substances to deter predators.

Some are poisonous and should not be handled.
CAECILIANS

- Have tails but no legs.
- Look like worms or snakes but have a backbone and undergo metamorphosis.
Types of Reptiles

- Turtle
- Skink
- Crocodile
- Tortoise
- Snake
- Lizard
- Chameleon
- Gecko

REPTILEFACT.com
Reptiles
- Dry, scaly skin
- Both wet and dry environments
- Lungs
- Internal fertilization
- Leathery eggshell
- Babies look like adults

Amphibians
- Moist, smooth skin
- Most live in or near water
- Gills or lungs
- External fertilization
- Jelly-coated eggs
- Undergo metamorphosis

Both
- Ectothermic
- Vertebrates
- Three-chambered heart
REPTILE GROUPS

1. Snakes and lizards
2. Alligators and crocodiles
3. Turtles
4. Tuataras
SNAKES AND LIZARDS

- No legs
- No ear openings
- Immovable eyelids
- Found in almost every environment

- Four legs
- Ear openings
- Movable eyelids
- Live in warm or hot, often dry, places
Molting

- Reptile scales do not grow as the animal grows.
- Snakes and lizards shed their skin periodically in a process called molting.
Snakes lack hearing, but can detect vibrations.

They usually have poor vision.

Snakes can detect food or danger with their tongue.

Some snakes can detect the body heat of their prey using pit organs.
Snakes are carnivores.
Most are nonvenomous.
Nonvenomous snakes kill their prey by constriction or eat it alive.
Venomous snakes inject venom with fangs or grooved teeth to kill prey.
HOW DO SNAKES SWALLOW PREY MUCH WIDER THAN THEMSELVES?

1. Jaws are double-hinged
2. Two halves of lower jaw can separate.
3. Throat is elastic and can stretch.

There is a common misconception that snakes ‘unhinge’ or ‘dislocate’ their jaws in order to swallow large prey. In reality, snake jaws have two major adaptations that allow them to open abnormally wide: A mobile quadrate bone and a split lower jaw.

The **quadrate bone** is a small piece of the rear skull in most vertebrates. In snakes, the quadrate bone has become a mobile hinge between the skull and lower jaw. This gives the lower jaw a greater degree of motion than traditional jaws, where the jaw pivots directly at the skull.

The bones of a snake’s lower jaw are **not fused** in the front. Instead, they are connected by an elastic ligament. This allows each side of the jaw to stretch outward and move independently.

VENOMOUS SNAKES IN FLORIDA

- 45 species of snakes are found in Florida
- Only six are listed as venomous.....
FLORIDA VENOMOUS SNAKES

Southern Copperhead

Florida Cottonmouth

Timber Rattlesnake

Dusky Pygmy Rattlesnake

Eastern Coral Snake

Eastern Diamondback Rattlesnake
LIZARDS

Jackson's chameleon
(Chamaeleo jacksonii)

plumed basilisk
(Basiliscus plumifrons)

Texas horned lizard
(Phrynosoma cornutum)

Tokay gecko
(Gekko gekko)

Gila monster
(Heloderma suspectum)

Flying lizard
(Draco volans)

Red worm lizard
(Amphibia alba)

Common wall lizard
(Podarcis muralis)

Eastern glass lizard
(Ophisaurus ventralis)

Algerian cylindrical skink
(Chalcides chalcides)

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CROCODILES AND ALLIGATORS
CROCODILES AND ALLIGATORS

- Most prefer shallow, fresh waters.
- Usually found in tropical or subtropical climates.
- Use large tails to propel themselves through water.
- Raised nostrils and eyes allow them to stay above water while the rest of the body is submerged.
- Have a four-chambered heart.
CROCODILES AND ALLIGATORS

- Alligators
  - Broad, rounded snouts.

- Crocodiles
  - Narrow, pointed snouts.
  - Some teeth stick out when mouth is closed.
Submit at least 4 sources for your research.

Read – *Science Project Research* – pg 6

You are to submit a list of your resources (you will be submitting this in Works Cited format later). Remember - you will need to start with at least four sources – and not all from the internet. Wikipedia is not a valid source.
Wikipedia is the best thing ever. Anyone in the world can write anything they want about any subject. So you know you are getting the best possible information.