

# Unit 2

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## Biodiversity

- Chordata, the vertebrates

# Phylum Chordata

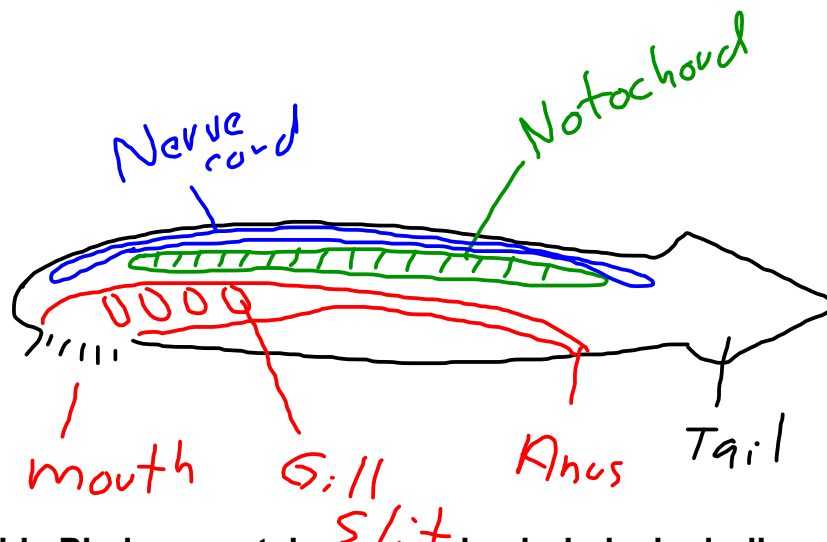
Examples: Sea squirts, fish, birds, dinosaurs, humans.

General characteristics:

1. Bilaterally symmetrical
2. Coelomate
3. One way digestive tract
4. Sexual reproduction with separate sexes

Unique characteristics:

1. **Notochord** – Flexible dorsal skeletal rod. It is replaced by the **vertebral column** in some.
2. **Gill slits** – Slits in the digestive system used for filtering food. They are replaced by **gill arches** in some.
3. **Dorsal hollow nerve cord** – Often called the spinal cord.
4. **Post anal tail**



This Phylum contains several subphyla, including:

1. **Urochordata** – These have a motile larva and sessile adult. Only the larva exhibit all the Chordata characteristics (eg. Sea squirts).
2. **Vertebrata** – Most exhibit Chordata characteristics only in the embryo stage.
  - Most adults do have a tail (e.g. monkeys).

# Vertebrata

We will examine several characteristics to distinguish between Classes within the subphylum Vertebrates:

1. Endoskeleton and appendages - cartilage, bones
2. Respiration - gills, operculum, lungs
3. Circulation - 2, 3 or 4 chambered heart
4. Reproduction - fertilization, development (internal/external)

# Agnatha

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- The Jawless Fish
- Examples: Hagfishes and Lampreys

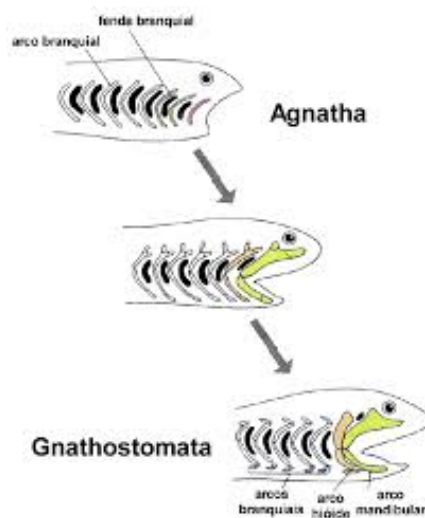


# Class Agnatha

## Endoskeleton & Appendages

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- There is limited skeleton made of cartilage.
- No appendages. No paired fins.

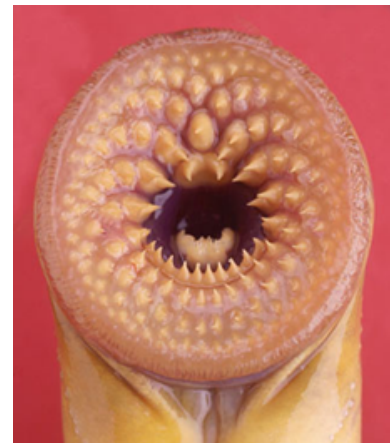


# Agnatha

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## Feeding

- There is no jaw. A sucker-like mouth with teeth (lampreys) or horny plates (hagfish) is present.
- They are external parasites (lamprey) or scavengers (hagfish).

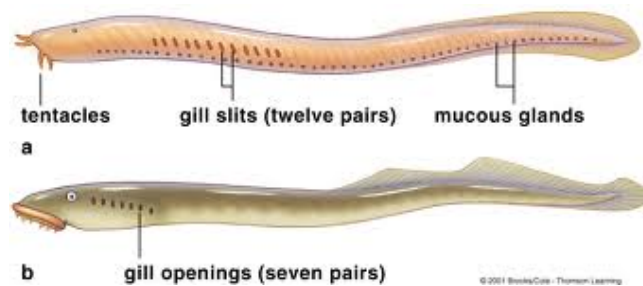


# Agnatha

## Respiration

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- Have gills.
- Water enters through the mouth and out circular gill slits.

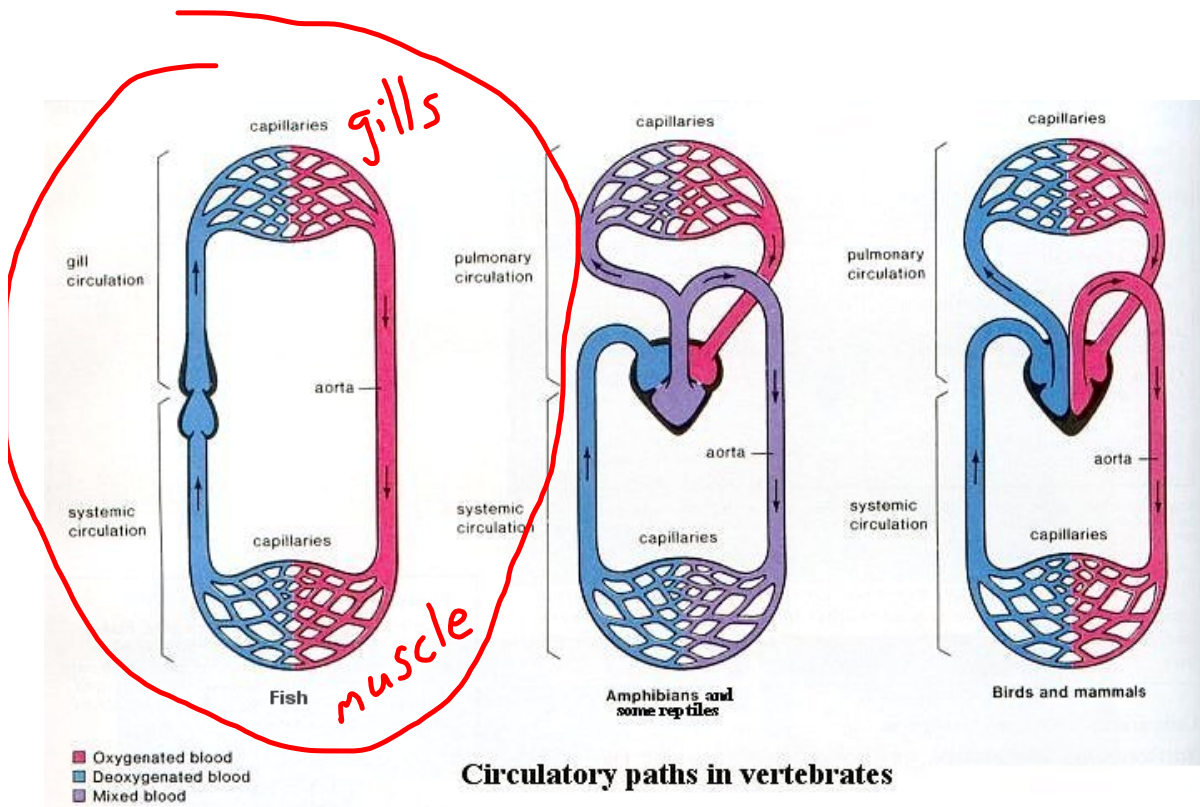


# Agnatha

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## Circulation

- Two chambered heart.





# Agnatha

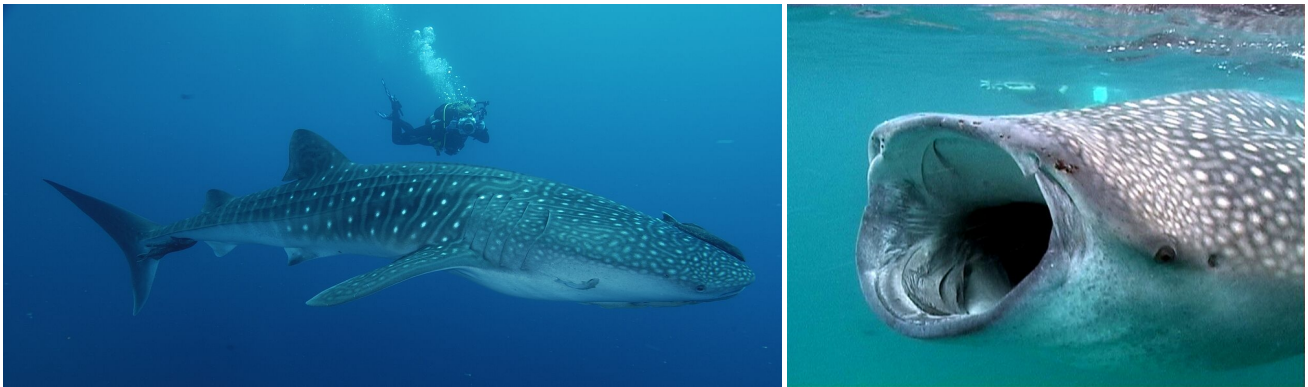
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## Reproduction

- Produce an egg.
- External fertilization.
- Embryo develops inside the egg, outside of the mother.

# Class Chondrichthyes

- The cartilaginous fish.
- Examples: sharks, rays and skates



# Class Chondrichthyes

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## Endoskeleton & Appendages



- Notochord is replaced by **cartilaginous vertebrae** during embryo development.
- There is an extensive skeleton of cartilage.
- Have paired fins.

# Class Chondrichthyes

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## Feeding

- Are active predators, scavengers, and filter feeders.
- There is a jaw which may have many hard teeth.
- Have a short digestive tract.



# Class Chondrichthyes

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## Respiration



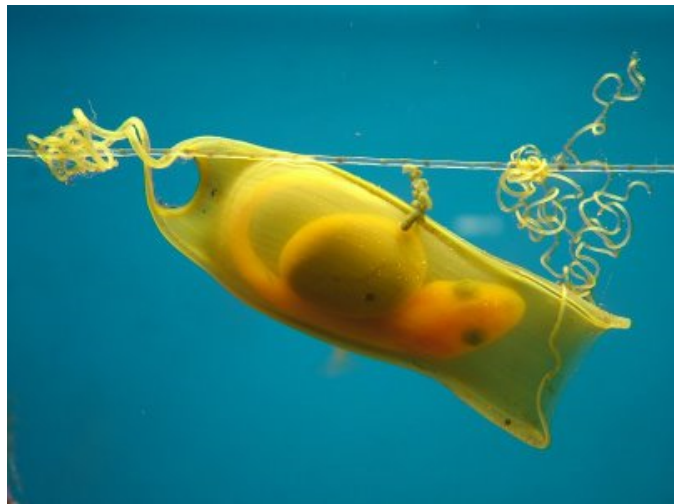
- Have gills.
- Water enters through the mouth or special holes in the head and out vertical gill slits.
- **Ram ventilation**- Have to force water over their gills by swimming.

# Class Chondrichthyes

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## Reproduction / circulation

- Internal fertilization.
- May produce an egg or keep the embryo inside the body.



- Two chambered heart.

# Class Osteichthyes

- The **bony** Fish
- Examples: Trout, cod, goldfish, eel

Atlantic Cod

# Class Osteichthyes

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## Endoskeleton & Appendages

- The notochord is completely replaced by vertebrae made of bone during embryo development.
- There is an extensive skeleton of bone with some cartilage.
- Paired fins.

Atlantic Halibut - 200 kg (444 lbs)



# Class Osteichthyes

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## Feeding and Digestion

- Are active predators (trout), scavengers (catfish), and herbivores (algae eaters).

- There is a jaw which may have many hard teeth.



Arctic Char

# Class Osteichthyes

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## Respiration

- Most have gills (one gill opening), some have a lung.
- Gills are covered by operculum
- Water enters through the mouth and out past the gills.

Clown Fish

Seahorse

# Class Osteichthyes

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## Circulation

- Two chambered heart.

# Class Osteichthyes

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## Reproduction

- Most have external fertilization (cod) but some have internal fertilization (guppy).
- Development may be internal (guppy) or external (cod).
- Some are capable of changing their sex or are briefly hermaphrodites.

Sunfish or Mola Mola

# Class Amphibia

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## Endoskeleton & Appendages

- Notochord is completely replaced by vertebrae made of bone during embryo development.
- There is an extensive skeleton of bone with some cartilage.
- Paired limbs (an adaptation for land). Legs may be modified for swimming (frog).

# Class Amphibia

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## Feeding and Digestion

- Are active predators (frog) and herbivores (newt).
- There is a jaw which may have hard teeth (frog) or none (toad).

# Class Amphibia

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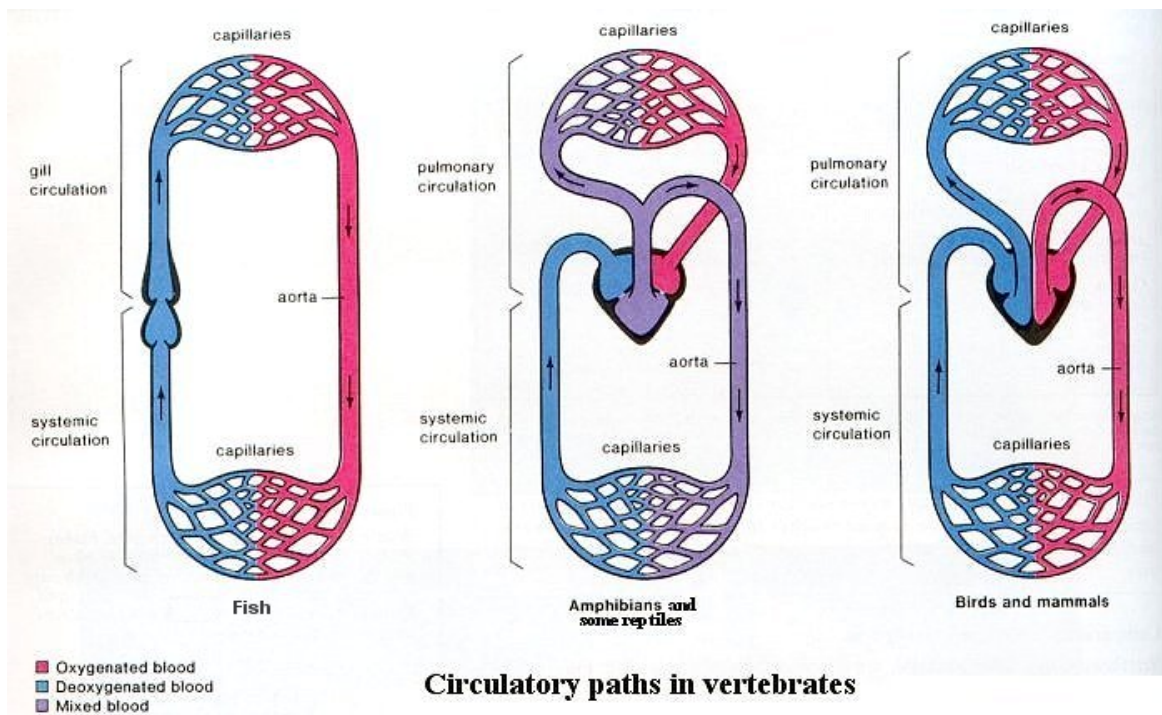
## Respiration

- Most have gills as larva and use lungs and skin for respiration as adult.
- Using lungs is an adaptation for life on land.

# Class Amphibia

## Circulation

- Three chambered heart.
- More efficient than a two chambered heart but oxygenated and deoxygenated blood mix.





# Class Amphibia

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## Reproduction

- Most species have external fertilization (e.g. frog), but some have internal (e.g. some salamanders).
- Most species have external development (e.g. frogs), but some have internal (e.g. some salamanders and frogs).

# Class Reptilia p. 194-195

- Examples: lizards, snakes, turtles, crocodiles

Komodo Dragon

# Class Reptilia

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## Endoskeleton & Appendages

- Notochord is completely replaced by vertebrae made of bone during embryo development.
- There is an extensive skeleton of bone with some cartilage.
- Paired limbs, but some have no limbs.



# Class Reptilia

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## Feeding

- Are active predators and herbivores.
- There is a jaw which may have hard teeth (lizard) or none (turtle).

# Class Reptilia

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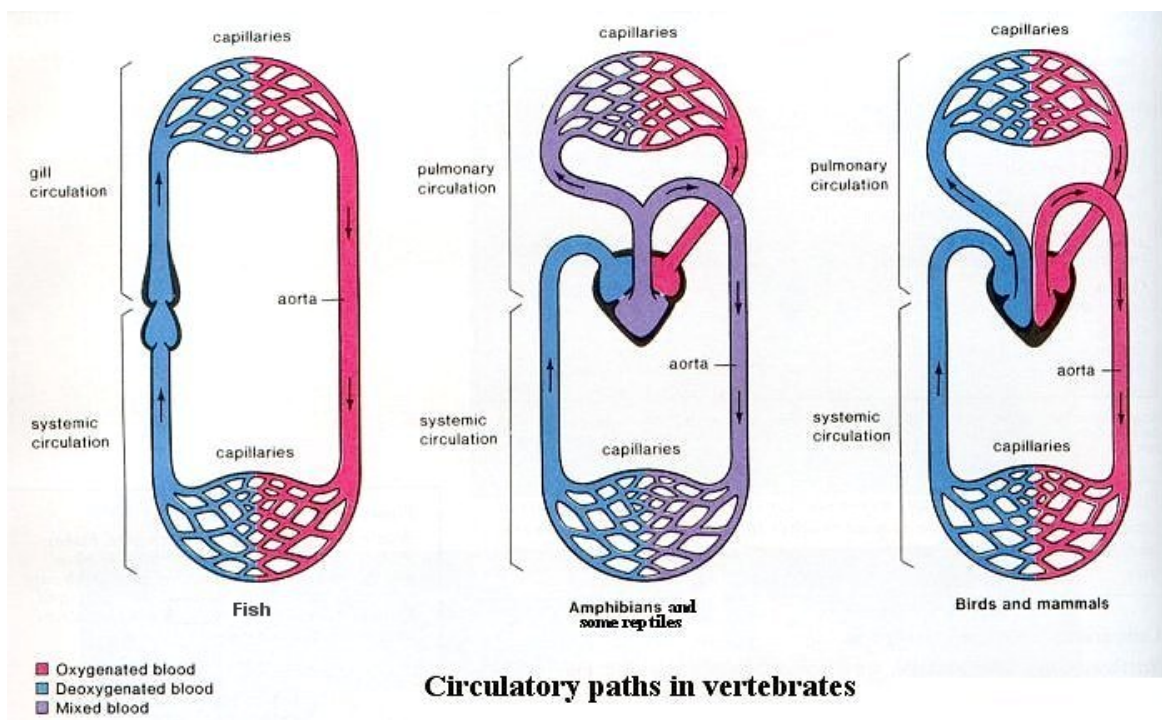
## Respiration

- All have lungs (land adaptation).
- Can't breath through skin because of the dry waterproof layer.

# Class Reptilia

## Circulation

- Three chambered heart.



# Class Reptilia

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## Reproduction

- All have internal fertilization.
- Most species have external development, but some snakes and lizards have internal development.
- Most species have some parental care of eggs (snakes) or larvae (crocodiles).