

THE FISHES

Subphylum Vertebrata

- 7 Current Classes:
 - Agnatha – jawless fish
 - Chondrichthyes – Cartilaginous fish
 - Osteichthyes – Bony fish
 - Amphibia – Amphibians
 - Reptilia – Reptiles
 - Aves – Birds
 - Mammalia - Mammals

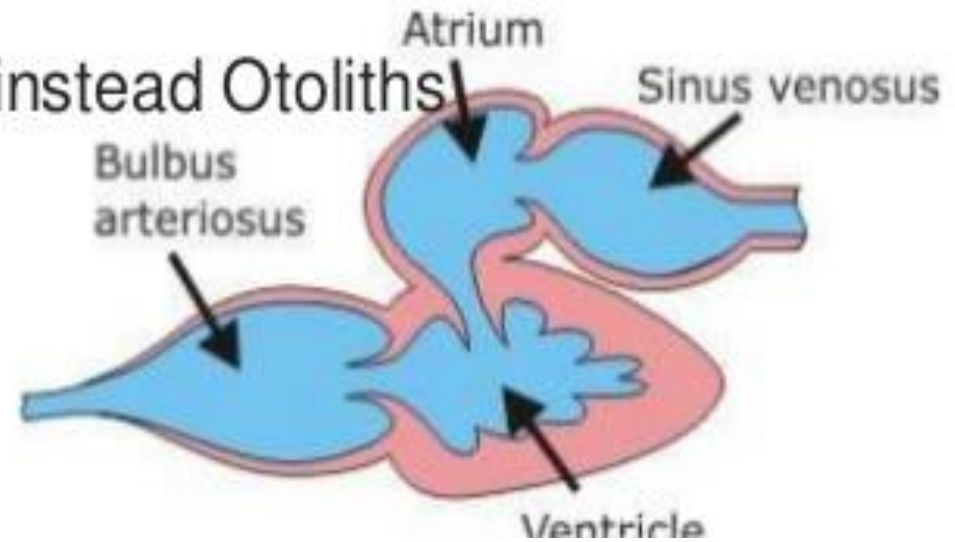
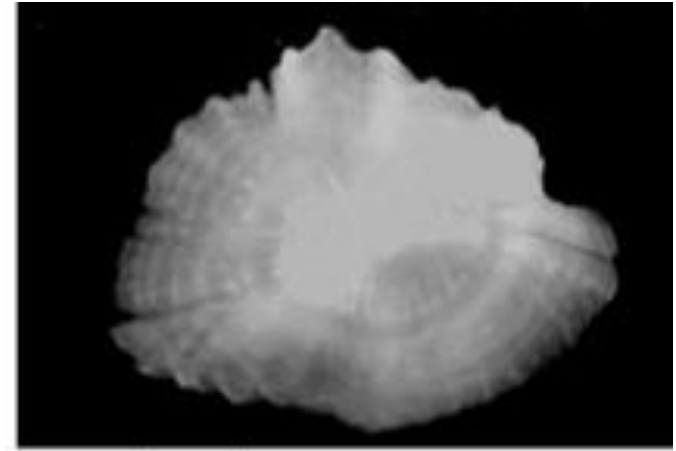
Class Agnatha

- “Jawless Fishes”
- Most primitive fish
- Lacks jaws and feed by suction
- Cylindrical and elongated body



Characteristics

- Soft skin devoid of scales
- Lack swim bladders and gill covers (Operculum)
- Two chambered heart
- Lateral lines
- No external ears and eyelids instead Otoliths
- External Fertilization
- Oviparous



Examples

Hagfish & Lampreys



- Hagfish

- Feed mostly on dead or dying fish



- Lampreys

- Mostly freshwater
- Attach to other fish and suck their blood

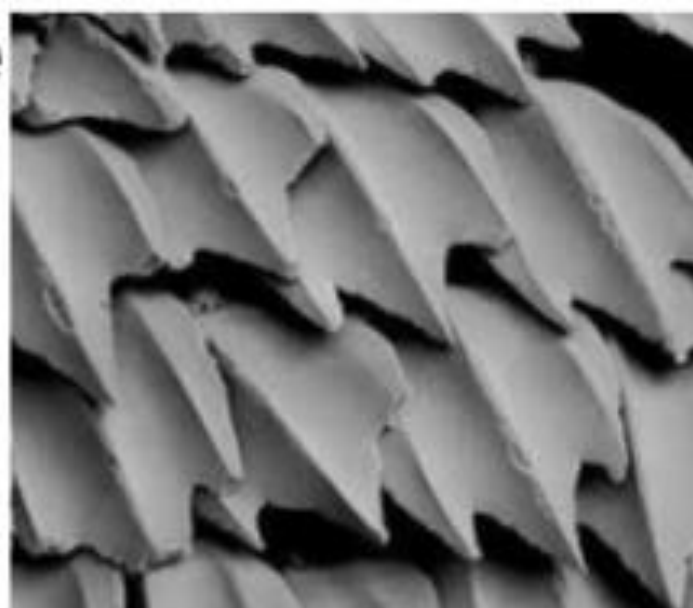
Class Chondrichthyes

- “Cartilaginous Fish”
- Skeleton made of cartilage
- Movable jaws with well-developed teeth
- Rough sand paper like scales made of the same composition of the teeth



Characteristics

- Skeleton made of cartilage
- Body covered with triangular placoid scales
- Ventral subterminal mouth with several rows of triangular teeth.



Characteristics

- Internal fertilization
- Ovoviviparous
- Two chambered heart
- No external ears and eyelids

Examples

Sharks & Ratfish



- **Sharks**

- Adapted for fast swimming and to be predators



- **Ratfish or Chimeras**

- Bottom dwellers
- Have long “rat-like” tails

Rays and Skates

- **Rays**
 - Flattened bodies with gills on the bottom of their bodies
 - Whip-like tail with stinging spines (venomous)
- **Skates**
 - Very similar to rays but with out the long tail or stinging spines



Class Osteichthyes



- “Bony Fish”
- Make of 98% of all fish and over half the vertebrates
- Skeleton at least made partially of bone
- Thin, flexible, overlapping scales
- Mouth located at end of body
- Presence of gas-filled sac called a swim bladder

Characteristics

- Skeleton made of bones
- Lateral lines
- Two chambered heart
- Operculum covering the gills
- Swim bladder

Characteristics

- Paired fins made of rays and spines or lobed fins lacking the rays and spines.
- Various types of scales (ctenoid, ganoid, cycloid)
- External fertilization
- Spawning and oviparous
- No external ears and eyelids

Examples



Salmon



Carp

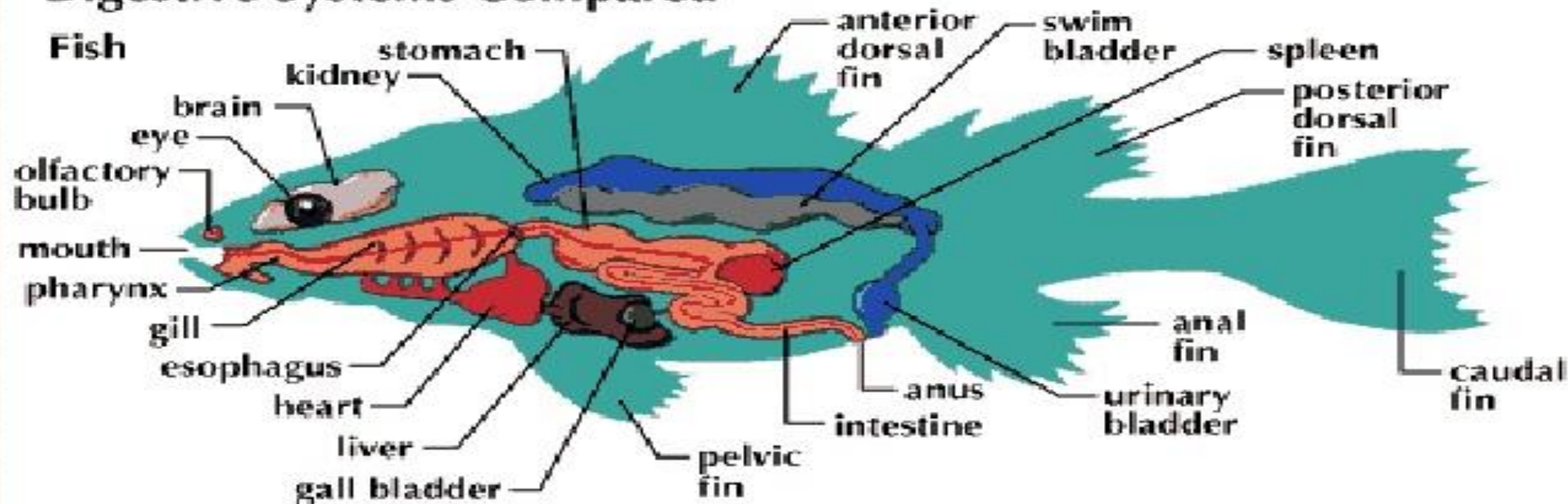


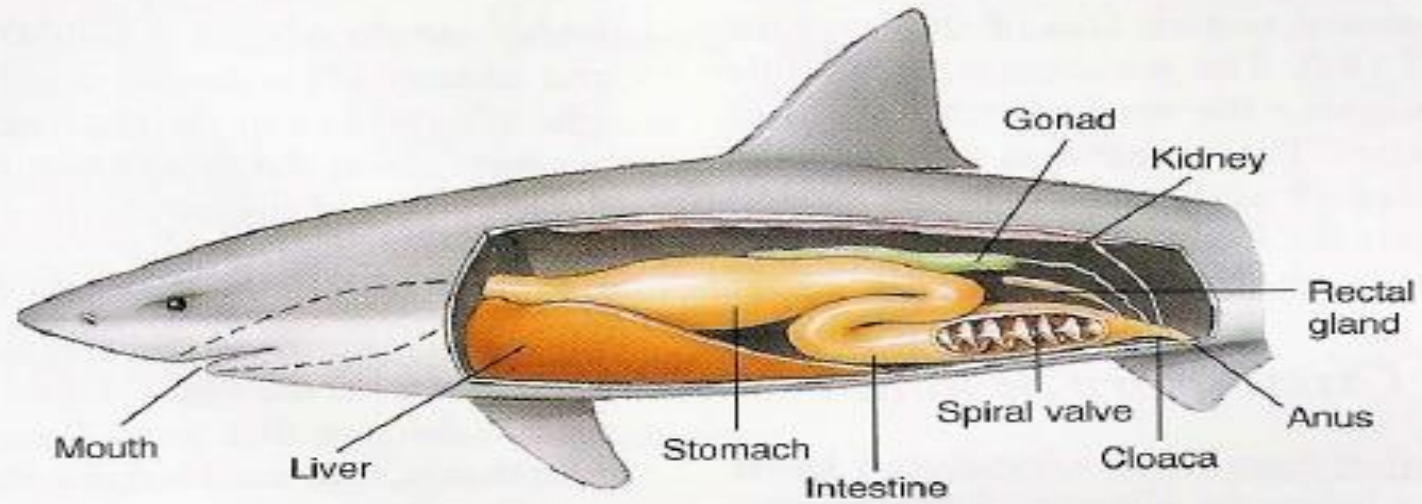
Yellow Fin Tuna

Digestion

- Food passed through esophagus into the stomach for digestion and on into an intestine

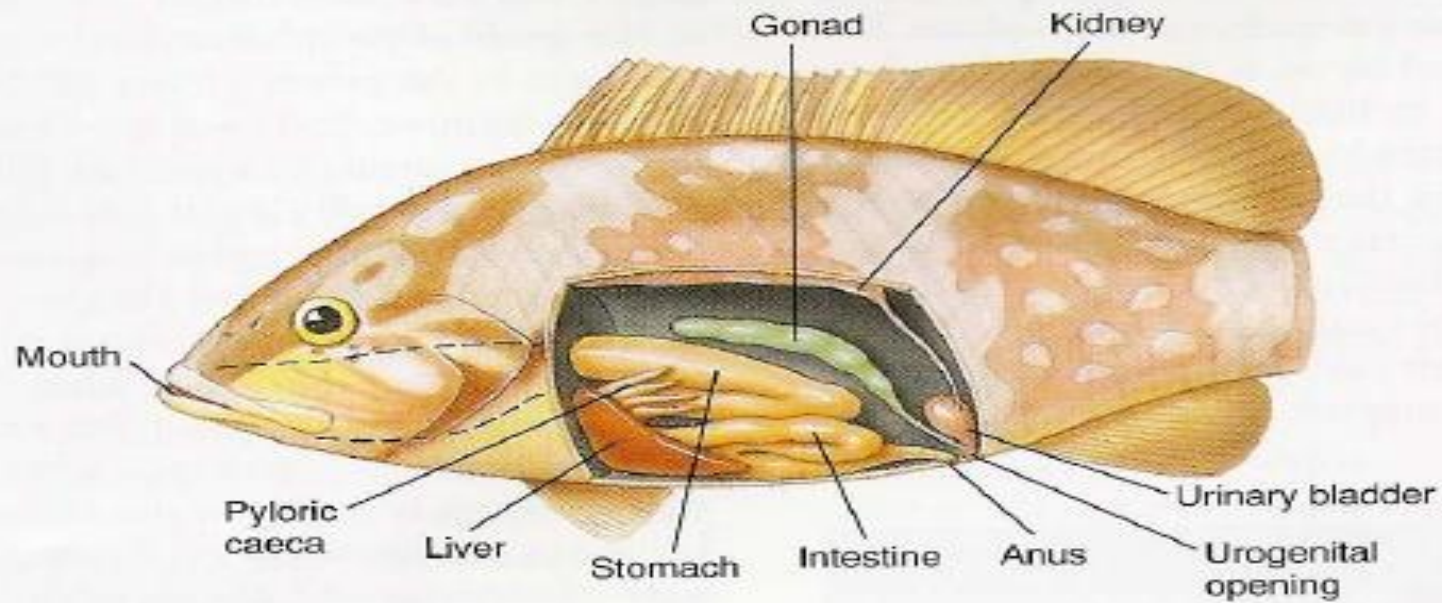
Digestive Systems Compared





(a)

Cartilaginous fishes

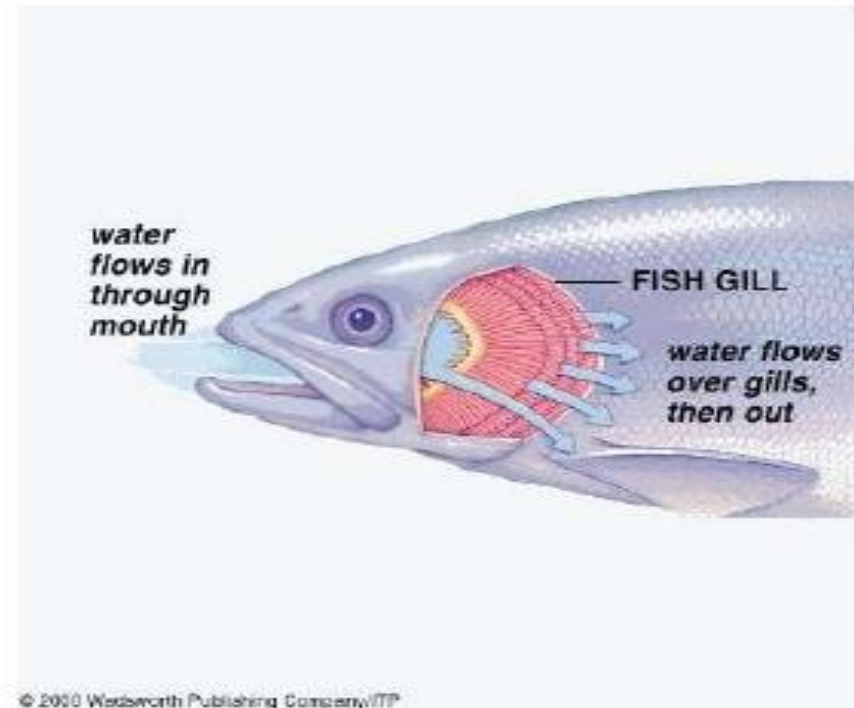


(b)

Bony fishes

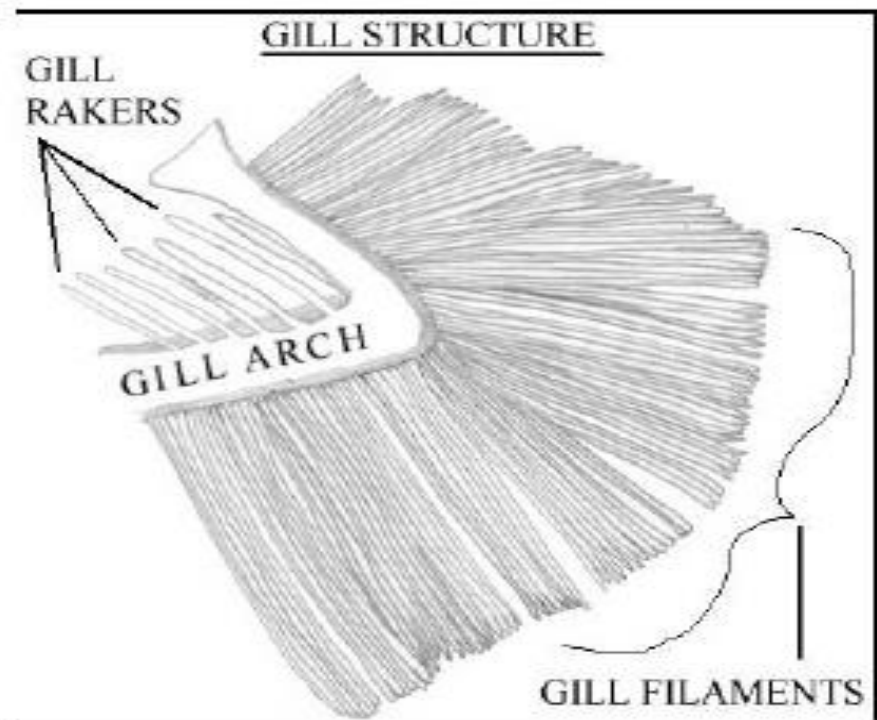
Respiratory System

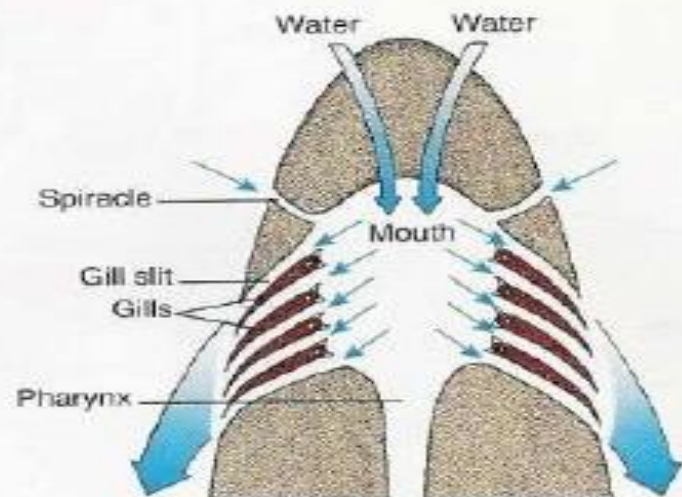
- Fish get oxygen that is dissolved in the water
- They must get water to flow over gills to do this, called irrigation



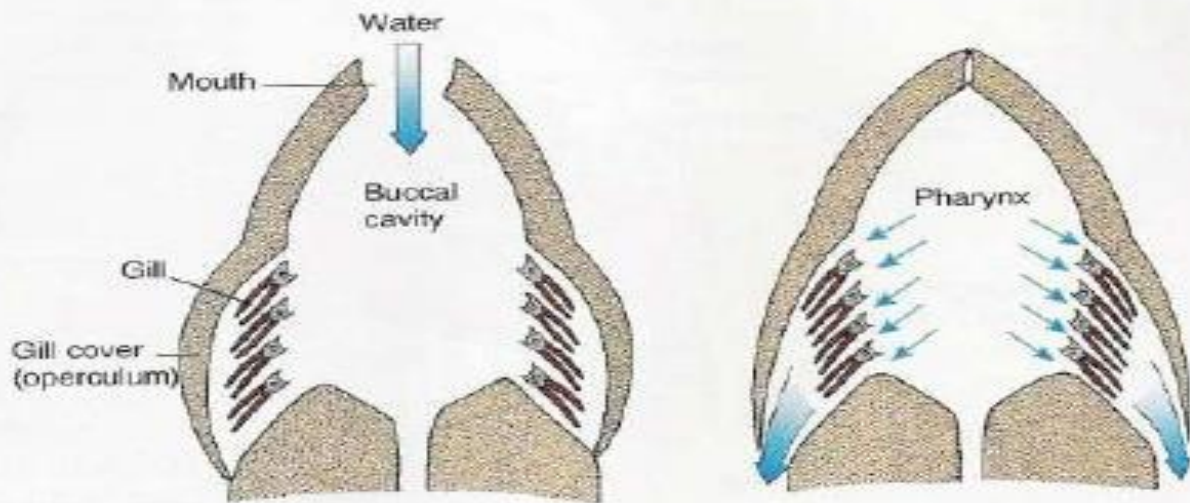
Gill Structure

- The gill is supported by cartilaginous or bony structure called gill arch
- Gill rakers are used as filters to stop food from entering gills
- Gill filaments contain the capillaries





(a)



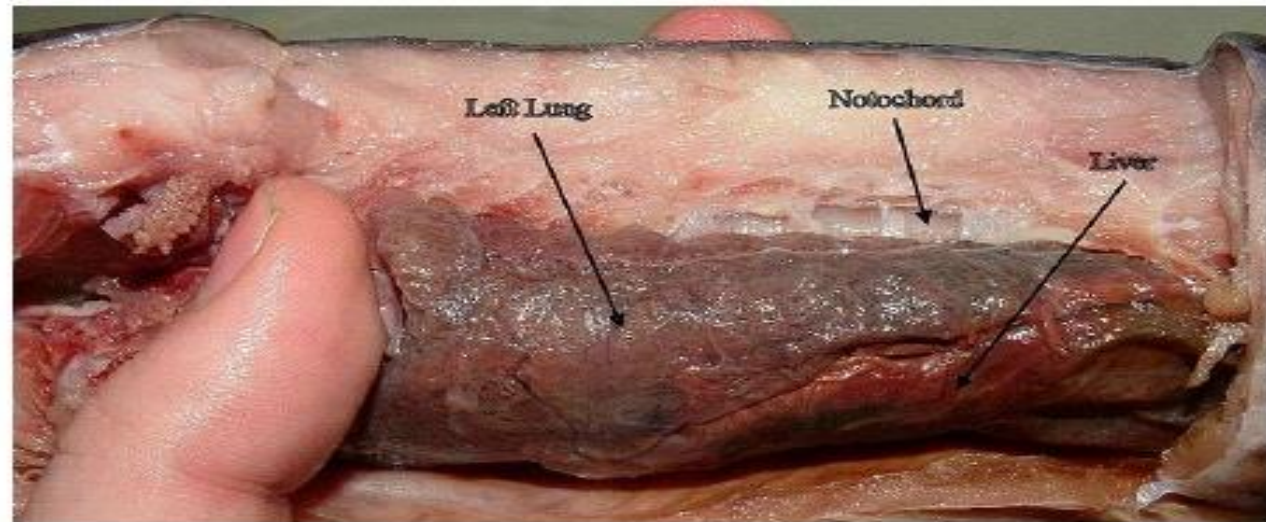
(b)

Inhalation

Exhalation

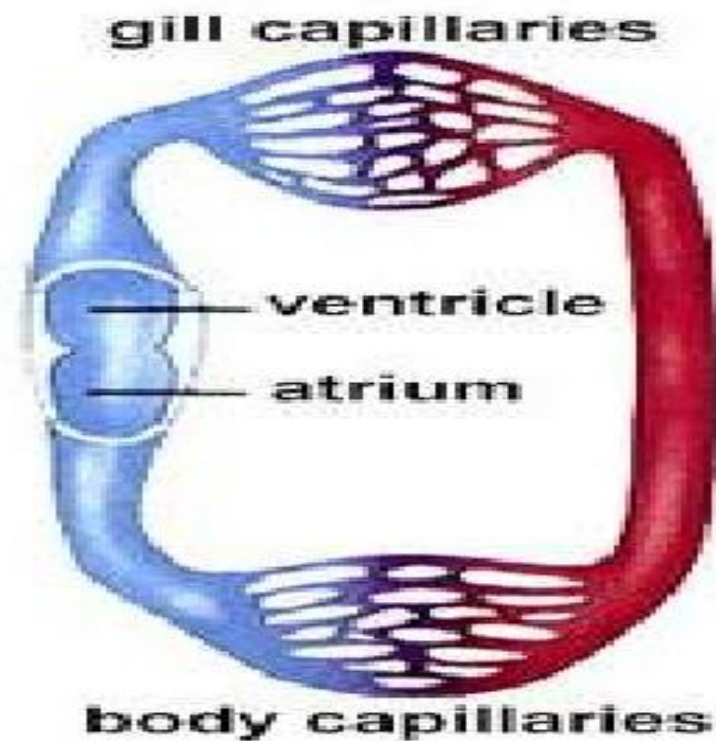
Lungfish

- Uses actual lungs to breathe and has reduced gills

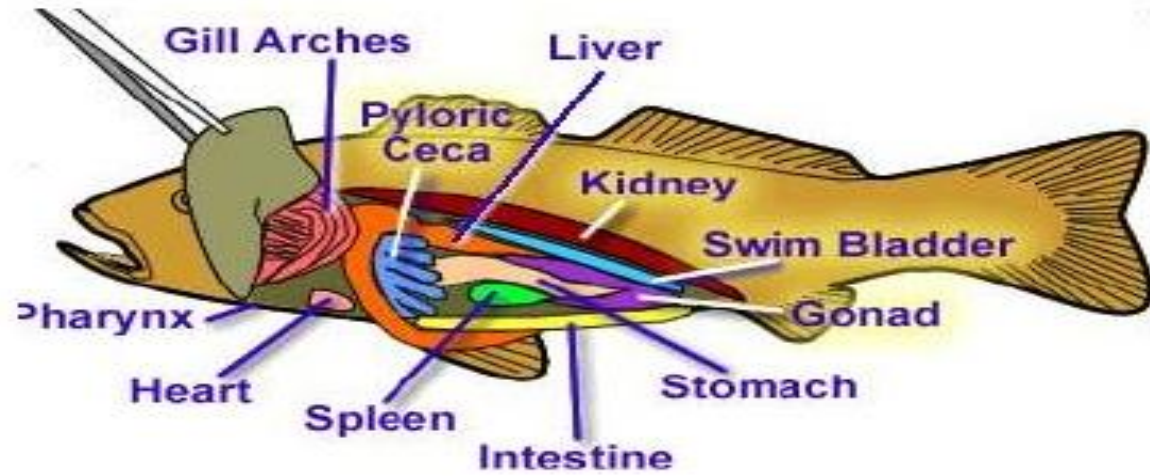


Circulatory System

- Closed circulatory system
- Two chambered heart
- Gas exchange happens in the gills



Locomotion



- Swim bladder – specialized organ filled with gas that assists in floating due to a heavier bone structure (found in bony fish)

Pectoral Fins

- Oversized in sharks to provide lift due to no swim bladder, provide tight maneuverability in bony fish

Dorsal & Anal Fins

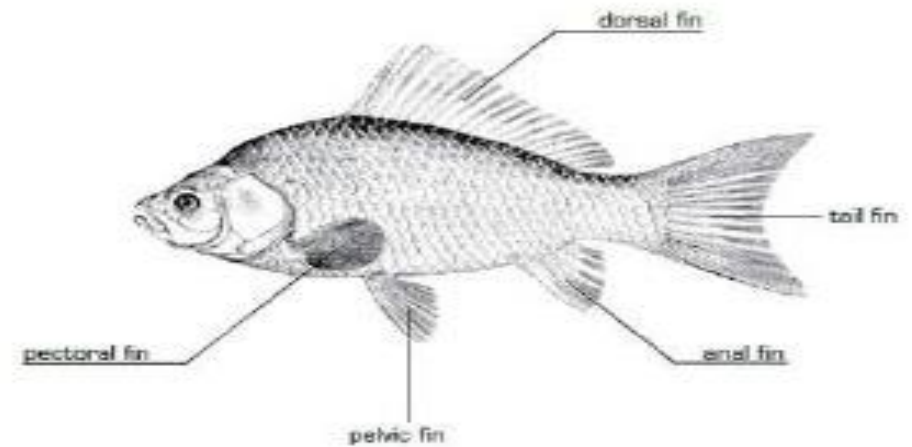
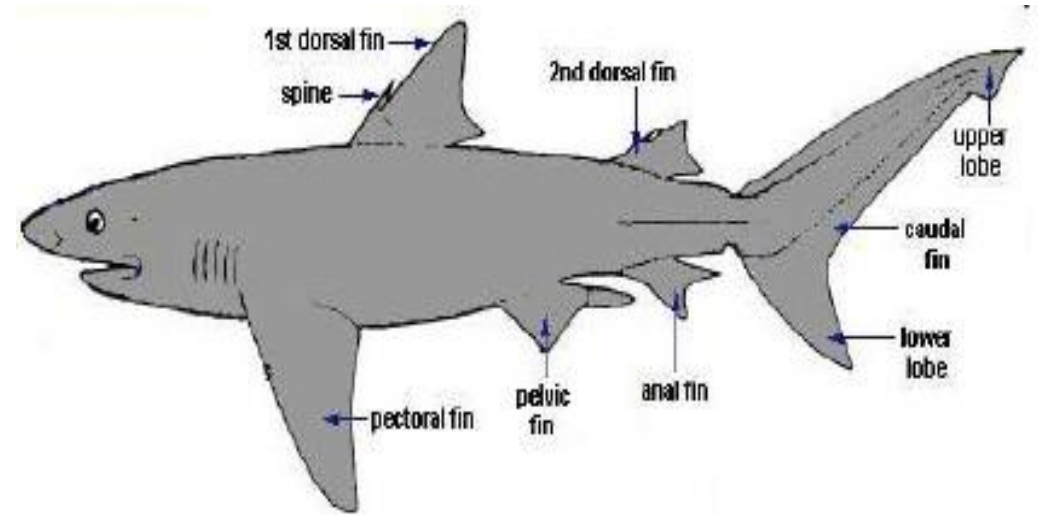
- Employed as rudders used to steer and provide stability

Caudal (tail) fin

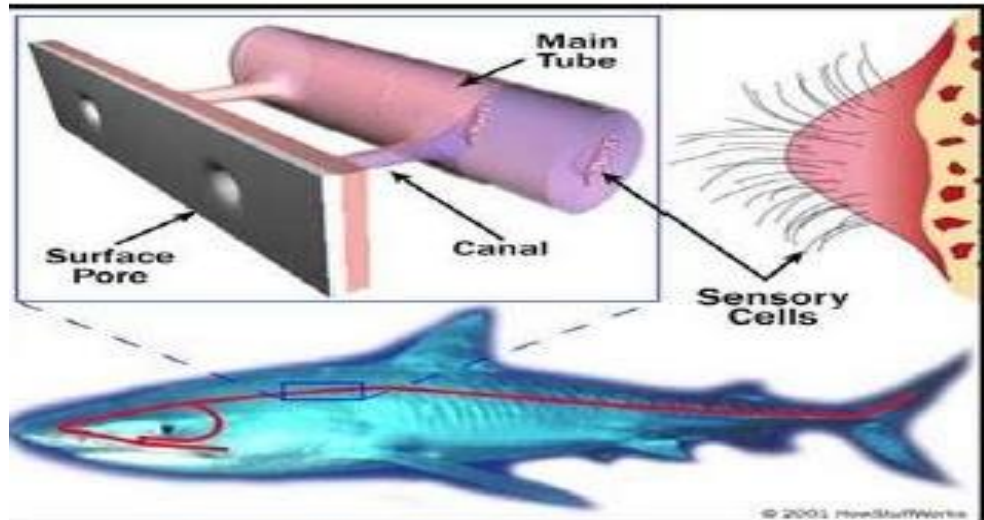
- Used in steering and force production

Pelvic fin

- Help the fish turn, balance, and brake



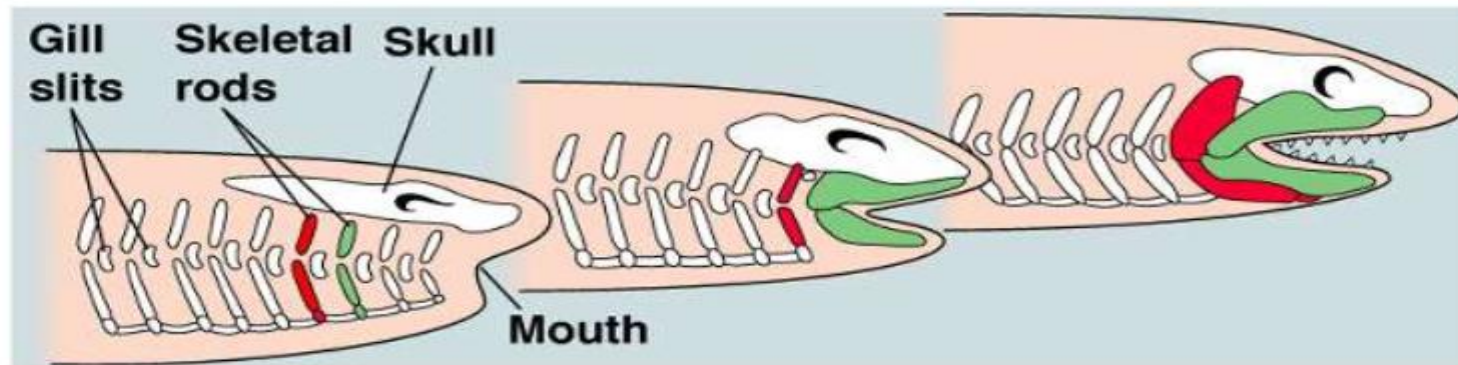
Lateral Line



- Unique sense organ that enables them to detect vibrations in the water
- Canals inside the body connected to surface by pores

Other Evolutionary Advancements

- Expansion of species began with the evolution of a jaw developed from the structure supporting the gill slits
- This led to the ability to hunt other animals and thus led to advances in the nervous system and other body system processes



Other Evolutionary Advancements

- Development of fleshy and skeleton fins that became the starting point for arms, legs, and wings
- Evolution of gills allowed for better diffusion of oxygen
- Gills developed into pouches then developed into lungs

