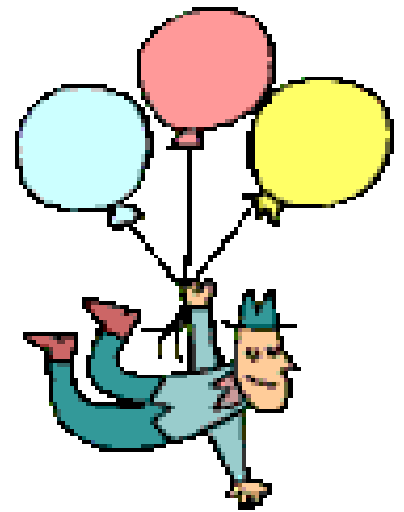
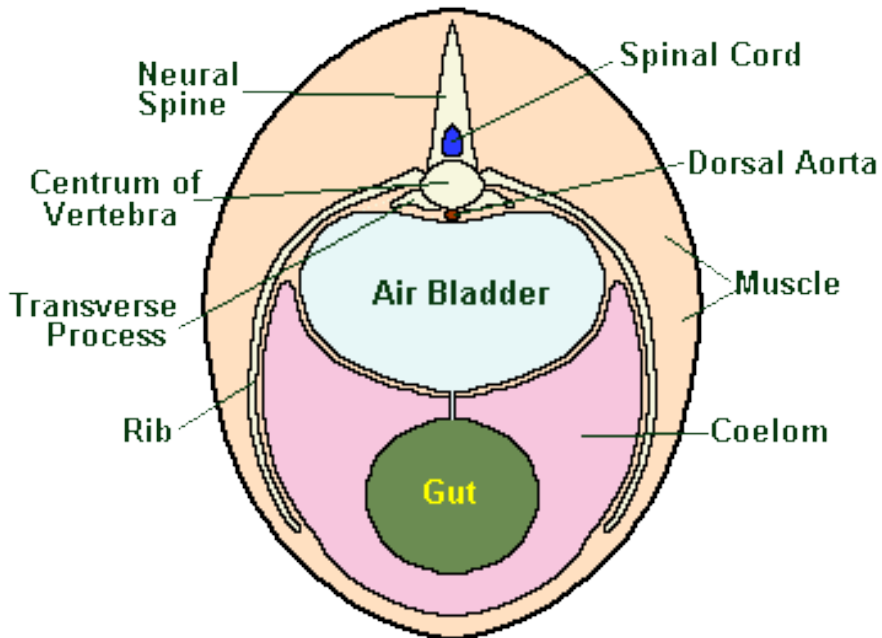


Swim Bladder and its modifications

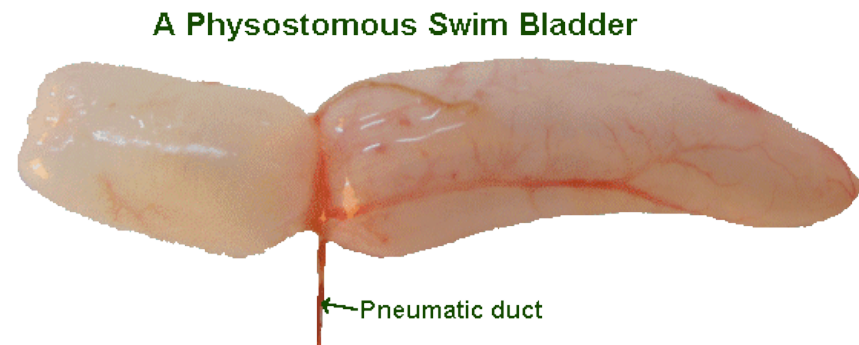


Swim Bladder

- Swim bladder also known as air bladder or gas bladder is a characteristic structure in most of the osteichthyes
- It is situated between the alimentary canal and kidneys and sac like in appearance
- It contains air and develops as a small outgrowth from the wall of the gut



Transverse Section of a Teleost Fish Body



Structural Modification

- In primitive bony fish, *Polypterus* it is in the form of bilobed sac having smooth wall. The right lobe is larger than the left and the two are joined at the proximal ends before opening into the pharynx by an aperture (glottis) provided with muscular sphincter
- In *Lepidosteus* (Holostei) the bladder is single elongated sac which open into gut by glottis. The wall of sac is not smooth but shows alveoli arranged in two rows
- In Dipnoi, *Neoceratodus*, *Protopterus* and *Lepidosiren* the bladder resembles the lung of an amphibian. The wall of bladder is highly vascular and shows numerous alveoli that are further divided into the smaller sacculi. Their bladder is modified for aerial respiration

Structural Modification in teleost

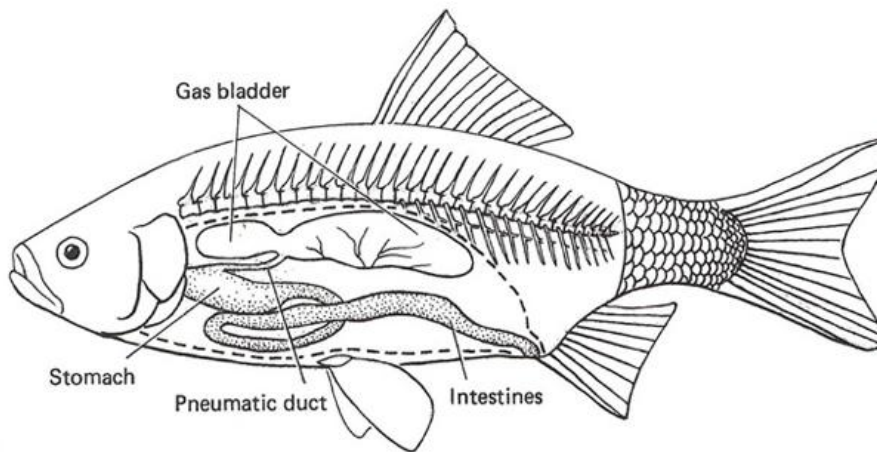
- Gas bladder is present in most teleost but it is absent in several order of fishes such as Pleuronectiformes, Echeneiformes, Giganturiformes, Saccopharyngiformes, Pegasiformes and Symbranchiformes
- Teleost species in which bladder is present , it may be oval, tubular fusiform, heart shaped, horse-shoe shaped or dumb bell shaped
- In Cyprinidae (*Labeo*, *Cirrhinus*, *Catla*) the air bladder is divided into two inter connecting chambers

Structural Modification in teleost

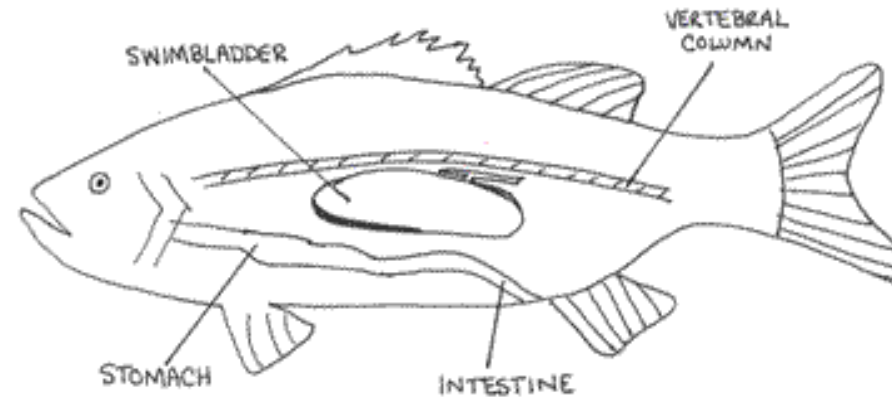
- In several sound producing fishes, the air bladder has finger like caecal outgrowth.
- In *Gadus* a pair of such caeca extend into the head region of the fish.
- In *Otolithus*, pair of short tubular caeca develop from the antero-lateral wall of the bladder and each further divides into two. One of which grows forwards and the other backwards.
- In *Corvina lobata*, several tubular appendages develop from lateral walls of the air bladder

Physostomous and Physoclist bladder in Teleost

- In **physostomi teleost** bladder open into gut by the mean of long pneumatic duct (open type swim bladder) eg: fishes belong to order Cypriniformes, Clupeiformes, Anguilliformes and Esociformes
- In **physoclisti teleost** the pneumatic duct is absent (closed type swim bladder) eg: fishes belongs to order Gasterosteiformes, Mugiliformes, Notacathiformes and Acanthopterygii. Gas reabsorption structure called oval is present in physoclists only



Physostomous Bladder



Physoclist Bladder

Function of Swim Bladder

- **Respiratory:** In primitive bony fishes and Dipnoi, its act as main respiratory organ
- **Sound production:** Act as a resonator for the sound produced by other organ as in Ballistidae and Triglidae
- **Auditory:** In several fishes air bladder is connected with membranous labyrinth and serves to transmit sound waves to the ear
- **Sensory:** Works as a pressure receptor like a barometer
- **Hydrostatic organ:** Volume of gas in bladder increase or decrease to adjust the density of fish when it swim from one depth to another.

In **physostomous** species, excess gas passed out to gut through pneumatic duct. If increase in a volume is desired air can be gulped in at surface and forced into the bladder through pneumatic duct.

In **physoclists**, gas is secreted or absorbed from blood through bladder wall. Gas secreting complex consist of rete mirabile and gas gland and reabsorption of gas is through oval