

Lecture 20: Class Osteichthyes

Lecture objectives:

1. To be able to discuss the major innovations of body morphology in bony fishes
2. To be able to discuss the concept of neutral buoyancy and how fish achieve this
3. To be able to discuss the characteristics of ray-finned fishes
4. To be able to discuss the characteristics of lobe-finned fishes
5. To be able to compare and contrast locomotion in ray-finned fishes and cartilaginous fishes

Text book: pages 591-603 (7th Ed)
Pages 660-673 (6th Ed)

- bony fishes
 - largest and most diverse taxon of vertebrates
 - originated 410 mya
 - marine & freshwater

Major innovations:

Operculum over gills (Figure 8-19)

- made from bony plates attached to the first gill arch
- allows pumping of water over the gills

Lungs & swim bladders (Figure 27.24)

- many bony fish had and have lungs, accessory breathing organs
- swim bladder
 - neutral buoyancy with minimal muscular effort
 - amount of gas needs to be regulated
 - pneumatic duct
 - gas originate in blood and secreted into bladder

Pectoral and pelvic girdles

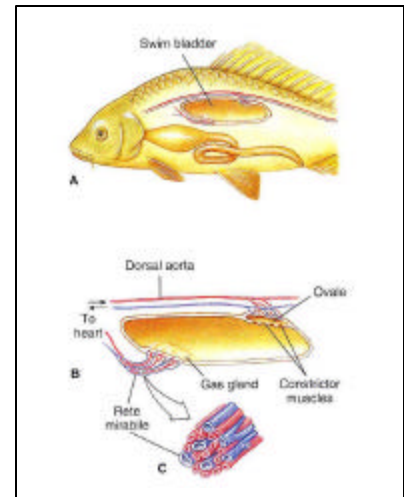
- embedded in body musculature allowing independent movement

Respiration

- good O₂ uptake + high manoeuvrability allows high activity levels
- counter-current system (physiology lectures)

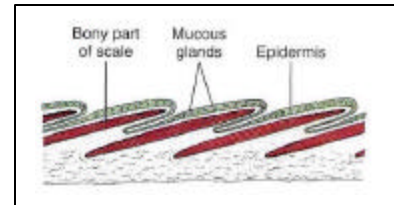
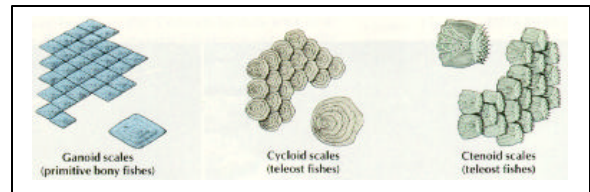
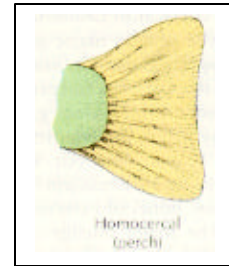
Jaws

- progressive specialisation and modification



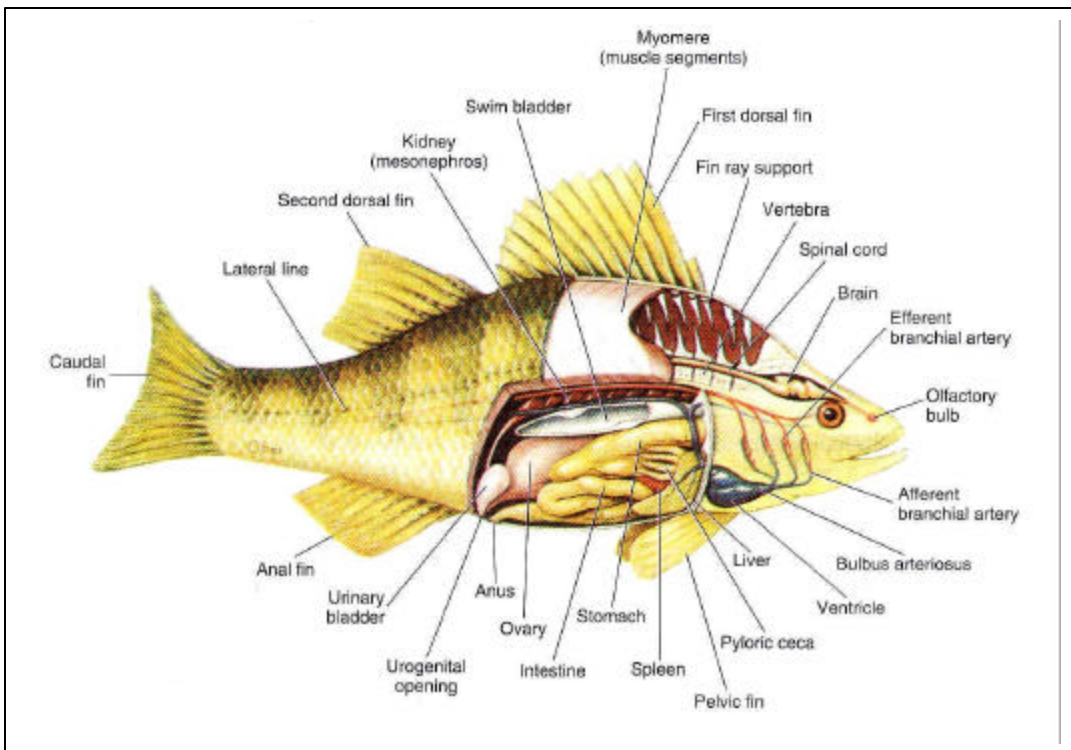
SubClass Actinopterygii - the ray-finned fishes (Figure 27.13)

- Modern bony fishes
- Largest group of all vertebrates
- skeleton more or less bony
- tail usually homocercal
- skin with mucous glands and scales (most)
 - ganoid scales
 - cycloid scales
 - ctenoid scales
 - scales of dermal origin (Figure 27.15)
- single operculum over all gills
- gills used to excrete salts
- swim bladder for buoyancy control
- 2-chambered heart
 - partially separate venous and arterial blood
- mouth terminal (cf sharks) (Figure 27.13)
- stomach & digestive glands (most)
- mesonephric kidneys
 - excrete nitrogenous wastes
- brain - large optic lobes & cerebellum



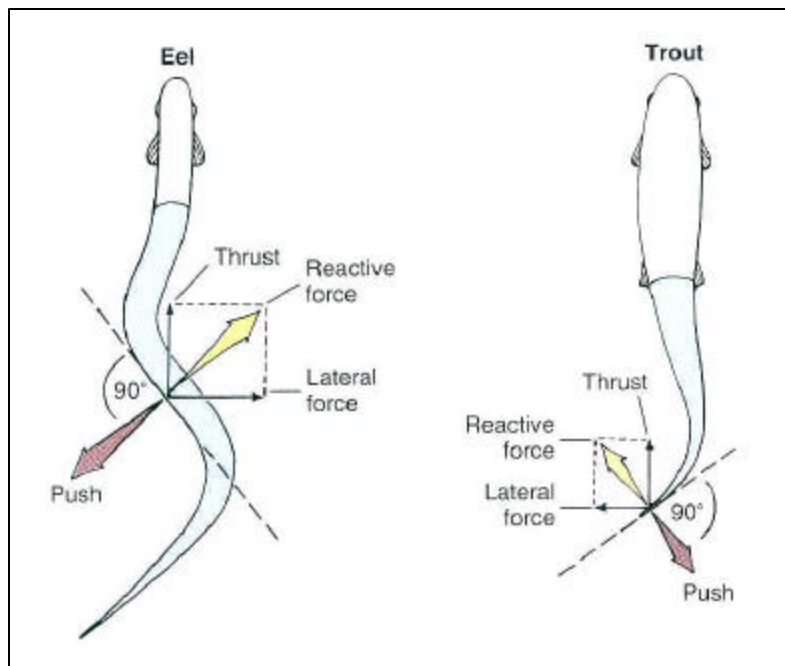
Reproduction:

- sexes separate
- fertilisation external
 - oviparous
 - viviparous



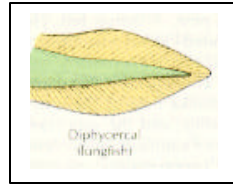
Locomotion:

- Segmented musculature
 - Myomeres
 - Alternate contractions along side of fish
 - Waves of contraction pass anterior → posterior
 - Very obvious in eels
 - Slow swimming fish
 - Fast swimming fish
 - Eg, tuna
 - Body held rigid and contractions directed towards tail
- Swim bladder
 - Gives neutral buoyancy so can hang in water
- Pectoral fins
 - Give manouverability
- Medial fins
 - Give stability
- Swimming most efficient form of locomotion
 - Supported by water



SubClass Sarcopterygii - the lungfish and coelacanth (Figure 27.19)

- 7 species
- marine & freshwater
- lungs and gills present
- strong, fleshy, paired lobed fins
- external scales
- diphyercal tail
- closest living relatives to tetrapods



Lungfish (Figure 27.19)

- once widespread
- generally similar to primitive fishes except fins are bony and muscular
- gulp air from water surface

Coelacanth (Figure 27.20)

- Entire group thought went extinct 70 million years ago
- Specimen dredged up in 1938 off the coast of South Africa

All pictures from
Hickman et al., 1998