

Lecture 5 – The Origin of tetrapods

# Biology 145

# EVOLUTION

## Time frame

Four Extant Groups of Vertebrates: **Agnatha** - jawless fish.  
**Chondrichthyes** - cartilaginous fishes (sharks and rays).  
**Osteichthyes** - bony fish.  
**Tetrapods** - amphibians, reptiles, birds, mammals.

## Early fish - Agnathans

- First fish lacked jaws.
- a. Belong to the class, **Agnatha**.
- c. Living species (hagfish, lamprey) belong to the group called **cyclostomes**.
- d. Cyclostomes lack bony skeletons, in which regard, they are probably degenerate.
- b. Principal fossil representatives belonged to the group called **ostracoderms** - heavily armored with bone.

## Origin of jaws

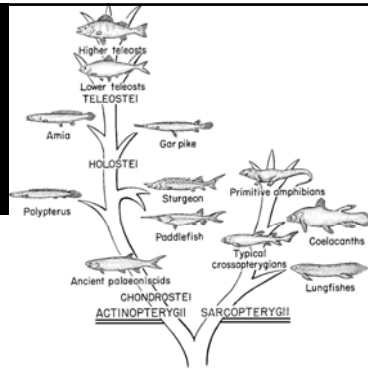
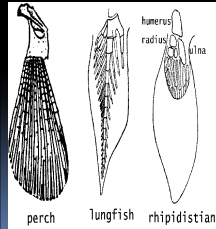
## Early Jawed fish - Placoderms

- Jaws first appear in an extinct group called **placoderms**.

- Modern fish derive from placoderms: Two modern lineages:
  - a. **Chondrichthyes** (cartilaginous fishes) - sharks and rays.
  - b. **Osteichthyes** (bony fishes) -

If Chondrichthyes evolved from (bony) Placoderms, then cartilaginous skeletons must be secondary!

Among bony fish the basic split is between actinopterygians (ray-fin fishes) and sarcopterygians (lobe-fin fishes).



•Sarcopterygians include

a. Crossopterygians.

- i. Rhipidistians, the ancestors of all tetrapods.
- ii. Coelacanth, a marine offshoot of the basal stock, of which a single genus, *Latimeria*, survives as a much-modified deep sea form.

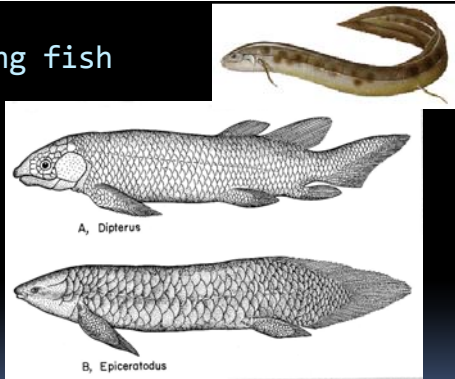


b. African and Australian lungfish.



Lepidosiren – S. America

### Lung fish



Dipterus (Devonina); Epiceratodus (Australian, living)

### Amphibians – the first tetrapods

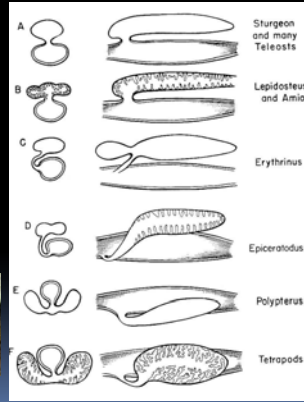
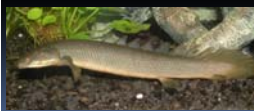
- 1: Lungs
- 2: Limbs
- 3: Hearing



*Pederpes* – Lower Carboniferous – 345-359 ma

### Origin of Lungs

E: Polypterus; African lungfish



### History of the hyomandibular

