

Outline 19: Paleozoic Life

The Evolution of Vertebrates: Fish and Amphibians

Phylum Chordata

- All chordates have a dorsal nerve cord.
- Chordates with vertebrae are the vertebrates. The vertebrae surround the spinal cord.
- Primitive chordates include sea squirts and arrow worms.

Chordate Fossils

- The oldest known chordates are *Pikaia* from the Burgess Shale and the older *Yunnanozoan* from China.
- Both have a dorsal nerve cord, but no vertebrae.

Fossil Fish

- Fish are vertebrates.
- Oldest fish in the Ordovician.
- They are the Agnatha, or jawless fish.
- Teeth on their lips and tongues.

Major Fish Groups

- Agnatha: jawless fish; still living
- Jawed groups:
- Placoderms: extinct armored fish with cartilaginous internal skeleton
- Chondrichthyes: cartilaginous fish (sharks and rays); no float bladder
- Osteichthyes: bony fish; float bladder

Origin of Jaws

- Jaws evolved by modification of the gill arches, tiny bones used to hold open the gill slits.
- Jaws may have evolved to help with respiration by pumping water over the gills when the jaws opened and closed.
- Biting came later.

The Osteichthyes: Bony Fish

- 2 main groups
- Ray-finned fish
- Lobe-finned fish
- 40,000 species of living ray-finned fish - the teleosts, a great evolutionary success!
- 2 kinds of living lobe-finned fish, a great evolutionary failure?

Lobe-Finned Fish

- Include the living lungfish and coelocanth, plus the extinct rhipidistians.
- Bones and muscles of lobe fins could be used to walk on land.
- The rhipidistians walked out of the water in the late Devonian to become the first amphibians.

Amphibians: Fish out of water

- Reproduction: same as fish
- Breathing: same as lungfish
- Fluid retention: mucous glands of fish, later became oil glands in skin.
- Locomotion: lobe fins modified into walking legs.
- Conclusion: not a big evolutionary jump