

17 - Paleozoic Vertebrates

Phylum Chordata

- Bilateral symmetry
- Spine or cartilage notochord
- Spinal cord
- Linear digestive tract
- Post-anal tail

Pharyngeal Slits (Gills)

- All chordates begin as an embryo with gills, a tail, and no arms or legs
- For reptiles, mammals, and birds, these gills (gill arches) become part of our inner ear, jaw, and neck

Invertebrates

- Tunicates

Subphylum Vertebrata

- Animals with backbones and spinal columns
- 5% of all animal species

Animals

Fish

- First true vertebrates on Earth
- Began when early chordates began to exhibit organic mineralization
 - Bones, shells, teeth, scales, etc.

Classification

- Lack or presence of a jaw
- shape of fin
- bony or cartilaginous

Ostracoderm

- Jawless

- Class Agnatha
- Late Cambrian to end of Devonian
- Armored plates
- Bottom-feeders, freshwater
- Gills only for breathing, not feeding

Teeth

- Cone tooth
- Conodont

Conodonts

- Teeth initial thought to be from worms, arthropods, mollusks, etc
- Eel-like jawless fish
- Up to 16 inches in length
- Teeth but no jaw (like a sieve)
- Maybe filter-feeding?

Jaws

- Early jawed fish
 - Placoderm
 - Plate-skinned
 - Silurian-Permian
 - Up to 12 m, various types
 - No teeth, bony plates instead

Lobe-Finned Fish

- One of these is a "living fossil"
- Crossopterygians
 - Most likely direct ancestors to amphibians

Tiktaalik

- "Large river fish"
- Neck
 - Could turn head left and right
- Well developed pectoral fins, with wrist, elbow, and shoulder
- Eyes towards top of head
- Could leave the water, but mostly stayed in the water

Ichthyostega

- First amphibian

Labyrinthodonts

Temnospondyls

Reptiliomorphs

- Develops amniotic egg (shelled egg that could be put on land)
 - Waste sac (allantois)
 - Yolk sac provides nutrients
- Lead to reptiles

Reptiles

- Earliest agreed-upon reptile was Hylonomus
- Late Mississippian
- Considered a protorothyrid
 - Earliest reptile
 - Diversified and replaced many amphibians
 - More mobile
 - More advanced jaws and teeth
 - Amniotic egg
 - Tougher skin
 - More efficient lungs
 - Protorothyrids evolved into Pelycosaurs
 - Dominant predator
 - Mostly went extinct by end of Permian
 - Fin-backed
 - Blood temperature regulation
 - Example
 - Dimetrodon
 - More like mammal-like reptiles, not reptiles or mammals
 - Therapsids evolved from Carnivorous Pelycosaurs
 - Official mammal-like reptiles (but not mammals or reptiles)
 - Sphenacodontia (new word for "mammal-like reptiles")
 - Synapsids
 - One opening (fenestra) in the skull behind each eye
 - Cheek bone
 - Diapsids
 - Reptiles and most birds
 - Two openings in the skull behind each eye

- Cheek bone to help with jaw muscle attachment
- Warm Blooded
- Larger jaw, complex and varied teeth
- Legs more vertical (instead of splayed out)

Mammals

Birds

The Earliest Chordates

- Early-Middle Cambrian Period
- Notochords only, the earliest Chordates had not yet developed a backbone at this point
- We are not yet sure which earlier organisms they evolved from
 - May have evolved from echinoderms

Mylokunmingia

- One specimen known
- Early chordate
- Only one fossil exists
- History not well known (~518 Mya)

Pikaia

- Common primitive chordate from the Burgess Shale (515-505 Mya)
- Bilateral, has a ...
- ...

Haikouichthys

- May be first known vertebrate (~515 Mya)

Class Veticul