

Phylum Chordata - vertebrates

- Vertebrates have a jointed internal skeleton of bone or cartilage
- The central feature of vertebrates is the brain case or cranium
- Most vertebrates have bilateral symmetry in their skeletons.
- First appeared in the Cambrian, but marine vertebrates (fish) exploded onto the scene in the Devonian (The age of fish)
- Development of jaws very important, once paired with lungs and limbs, land habitation was possible.

Fish - The first vertebrates

There are basically **four** classes of aquatic vertebrates and you are responsible for classes and genus for each of them.

Superclass Agnatha (Jawless Fish) -- "*Ostracoderms*"

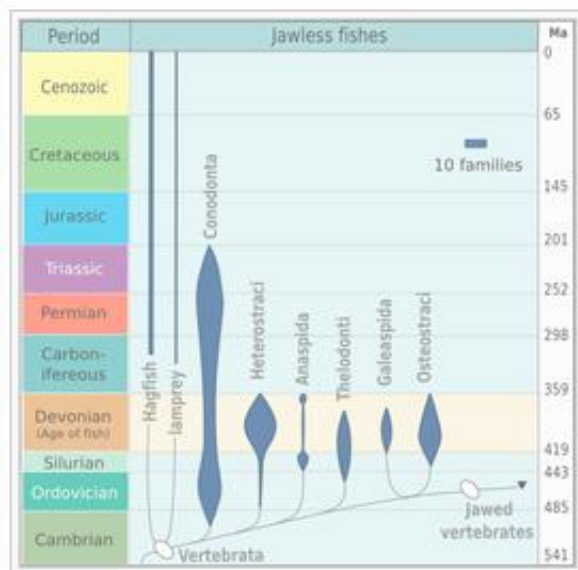
Class Placodermi (Armored Fish) (*you have 2 Genus*)

Class Chondrichthyes (Cartilagenous Fish) (*2 SuperOrders, 2 Genus*)

Superclass Osteichthyes (Bony Fish) (*2 Classes, 5 Genus*)

Superclass Agnatha (Jawless Fish)

First fish to evolve in Cambrian and Ordovician
Most genus are extinct, but the lamprey of today is an eel-like jawless fish





Ancient agnatha with cartilage plates



A lamprey attached to a fish

Fish (continued)

Class Placodermi (Armored Fish)
Genus *Bothriolepis*



Class Placodermi (Armored Fish) 
Genus *Dunkleosteus*

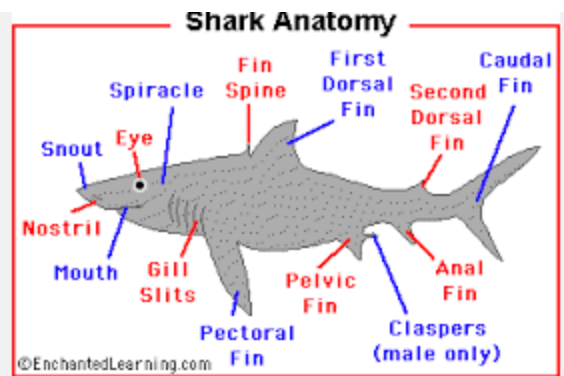


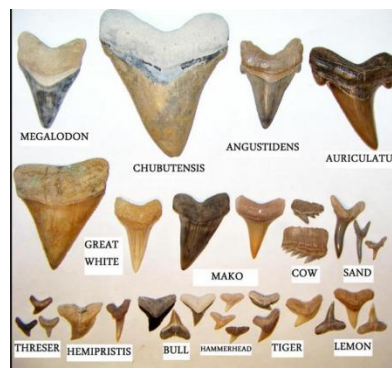
Silurian-Devonian only

Huge, up to 10m long



Class Chondrichthyes (Cartilaginous Fish)
Superorder Selachimorpha
(Sharks, Shark Teeth)



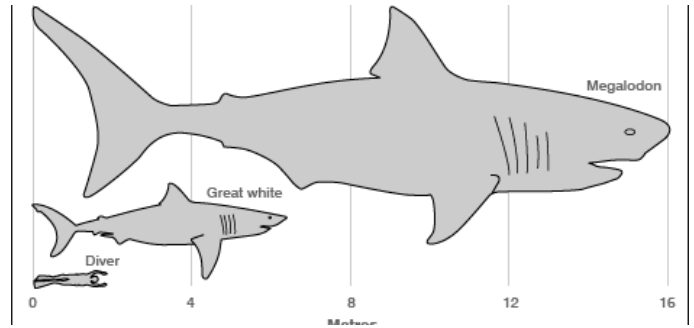


Fish (continued)

Suborder Selachimorpha (Sharks)

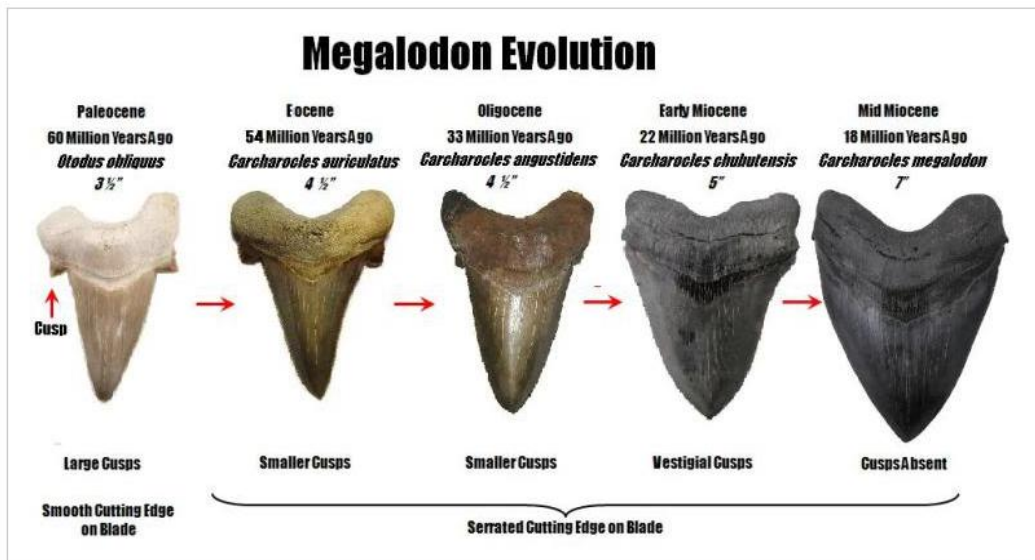
Genus *Otodus*

Extinct (Paleocene to Miocene)
(known as “mackerel” shark
-- now believed this genus evolved into *Carcharocles* --



Genus *Carcharocles*

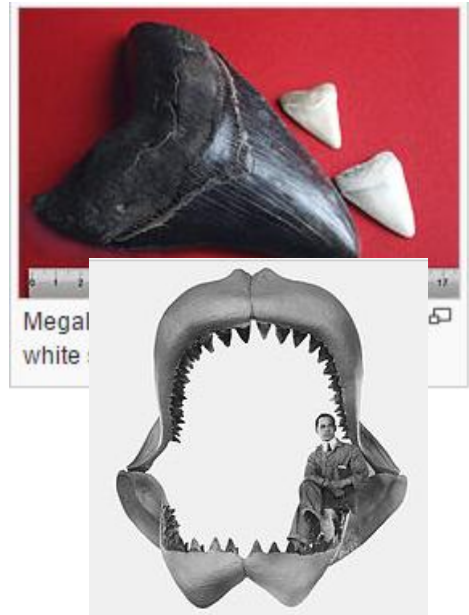
Extinct (Late Eocene to Late Pliocene)



Species *Carcharocles megalodon*

- Extinct – lived from 16 to 2.6 million years ago
- megalodon means “big tooth” in Greek
- At 18m, perhaps most powerful predator ever

Current debate: Do large sharks of today (Genus-*Carcharodon*) evolve form a distinct genus or did they evolve from megalodons (i.e. *Carcharocles*)



Fish (continued)

Class Chondrichthyes (Cartilagenous Fish) Suborder Batoidea (Rays)

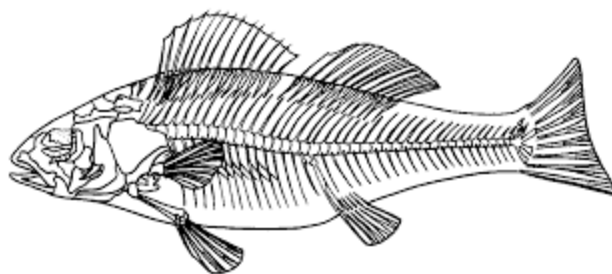


Superclass Osteichthyes (Bony Fish)

45 orders, and over 435 families and > 28,000 species

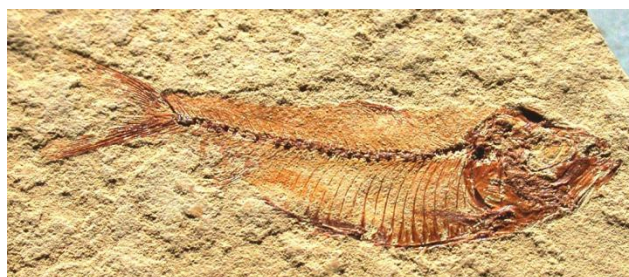
Class Actinoptertgai (Ray-finned)

Late Silurian to present
dominant class of current marine
vertebrates (~30,000 species)



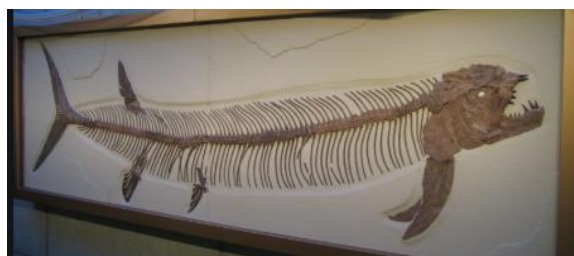
Genus Knightia

Eocene – fresh water bony fish



Genus Xiphactinus *

Extinct - Late Cretaceous bony fish

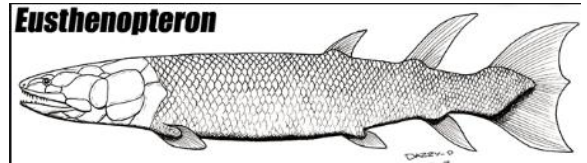


Fish (continued)

Class Sarcopterygii (lobe-finned) -- *limb-like fins*

Genus Eusthenopteron

Late Devonian



Class Sarcopterygii (lobe-finned)

Genus Latimeria (Coelacanth)

Thought to be extinct, 2 species discovered in 1938 off South Africa



Class Sarcopterygii (lobe-finned)

Genus *Tiktaalik*

Tiktaalik is a monospecific genus of extinct sarcopterygian from the late Devonian period, about 360 Mya, with many features akin to those of tetrapods. Tiktaalik may be representative of the evolutionary transition from fish to amphibians. [Wikipedia](#)