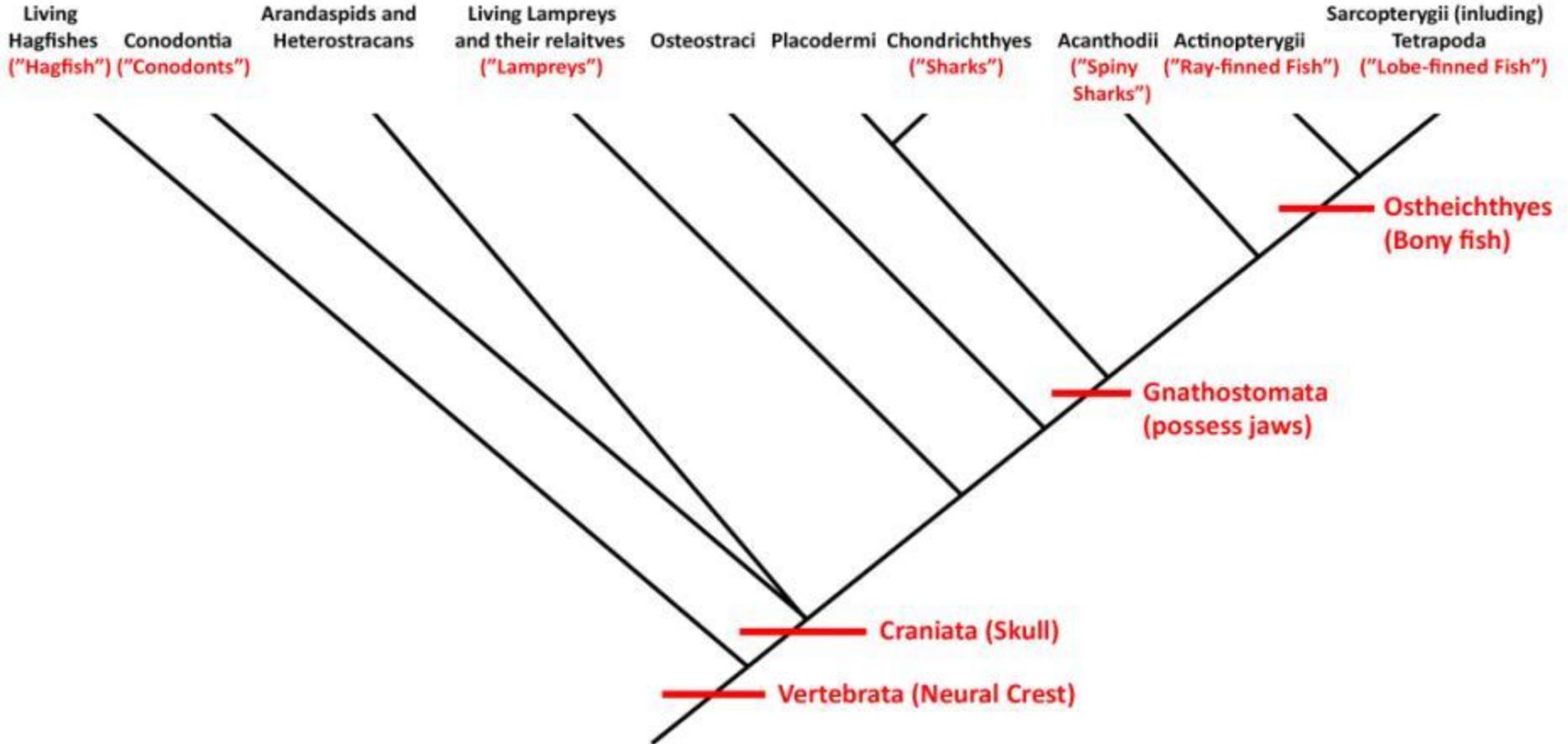


Stuart S. Sumida
Biology 342

(Simplified)Phylogeny of Fishes



HAGFISHES:

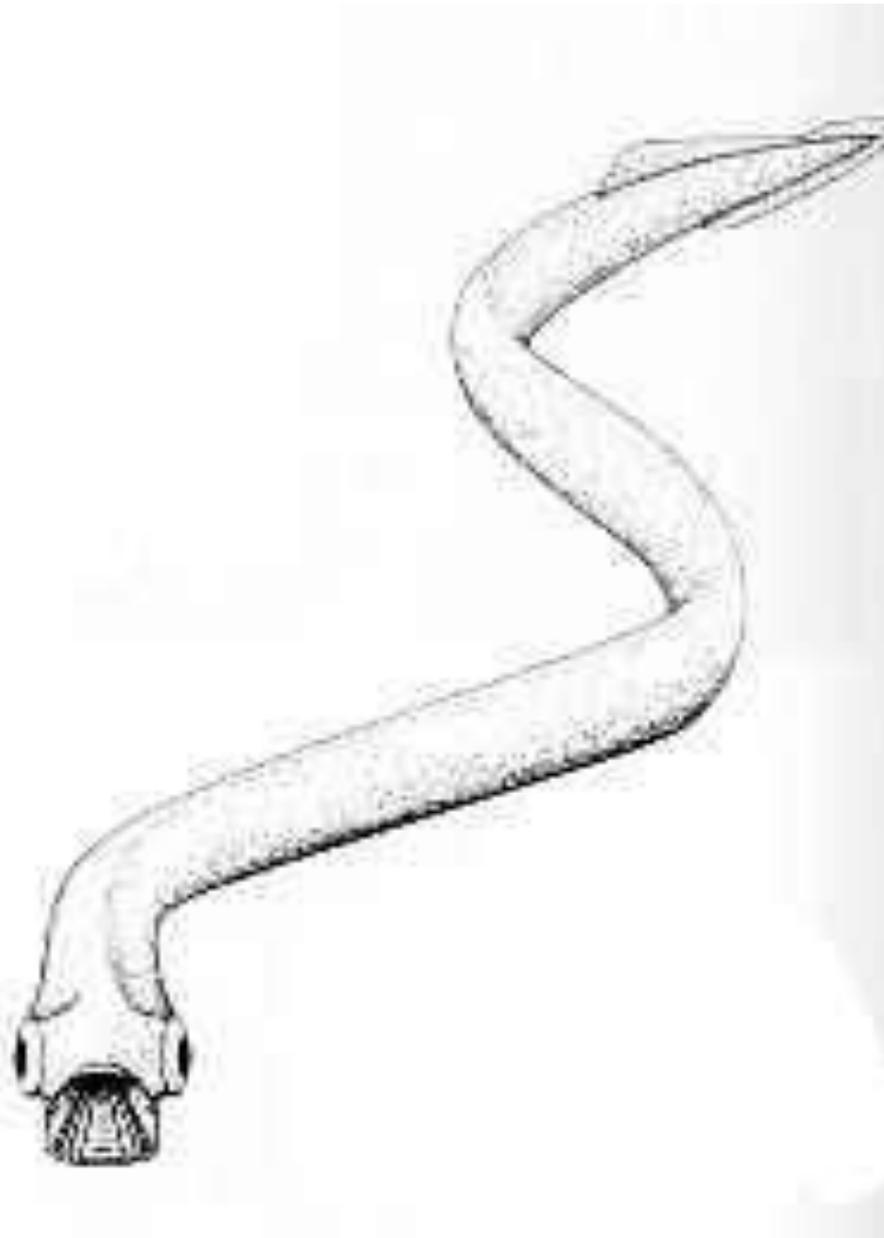
- Living relict group of fishes often considered to be amongst most primitive of vertebrates.
- Jawless, poorly developed cranial structures, no ossified vertebral elements.



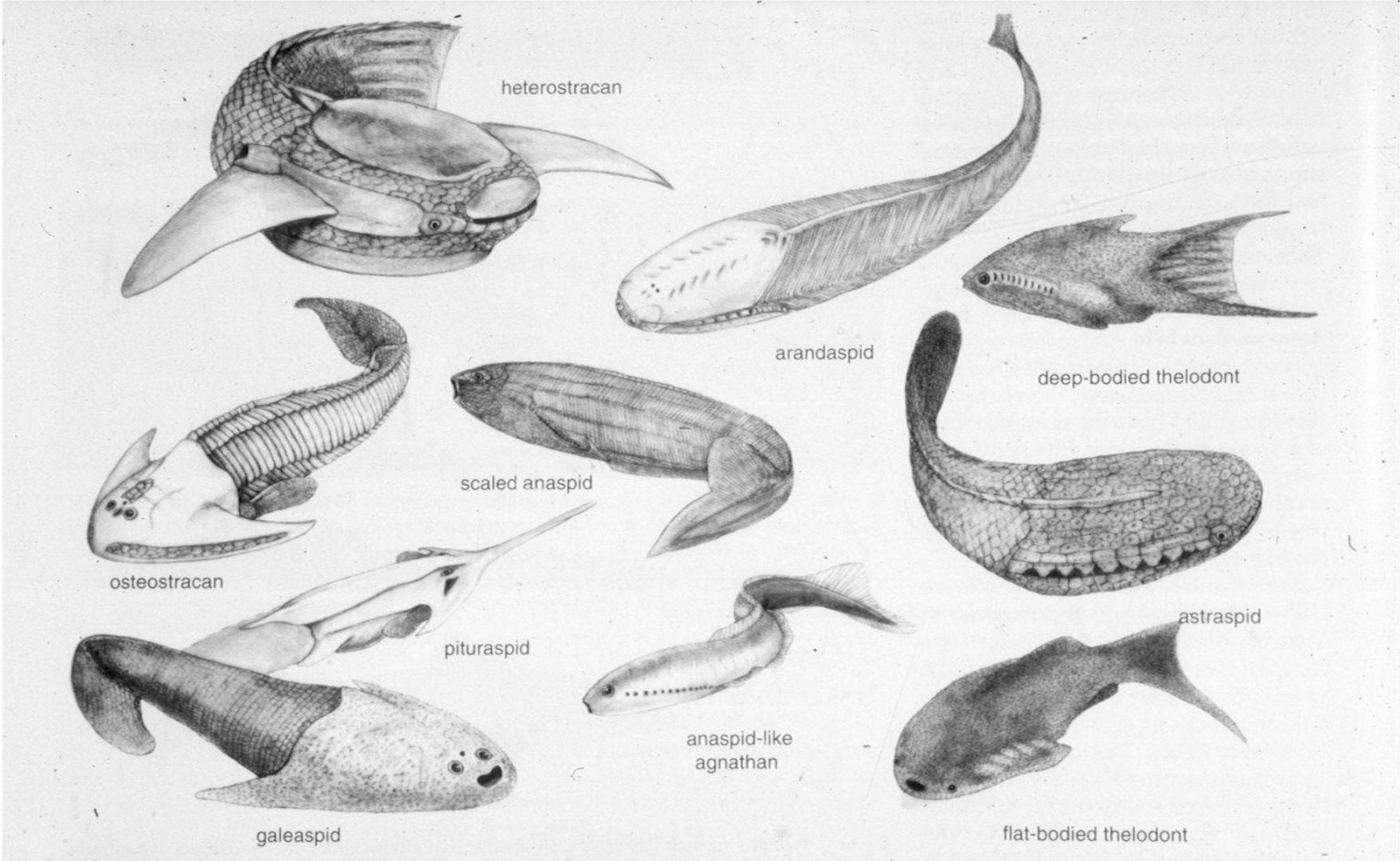
CONDONTS: Originally thought not to be vertebrates, but their best known components made of same material as teeth and bones (therefore probably from neural crest material)

CONDONTS:

Originally thought not to be vertebrates, but their best known components made of same material as teeth and bones (probably from neural crest material)



Diversity of extinct jawless fishes

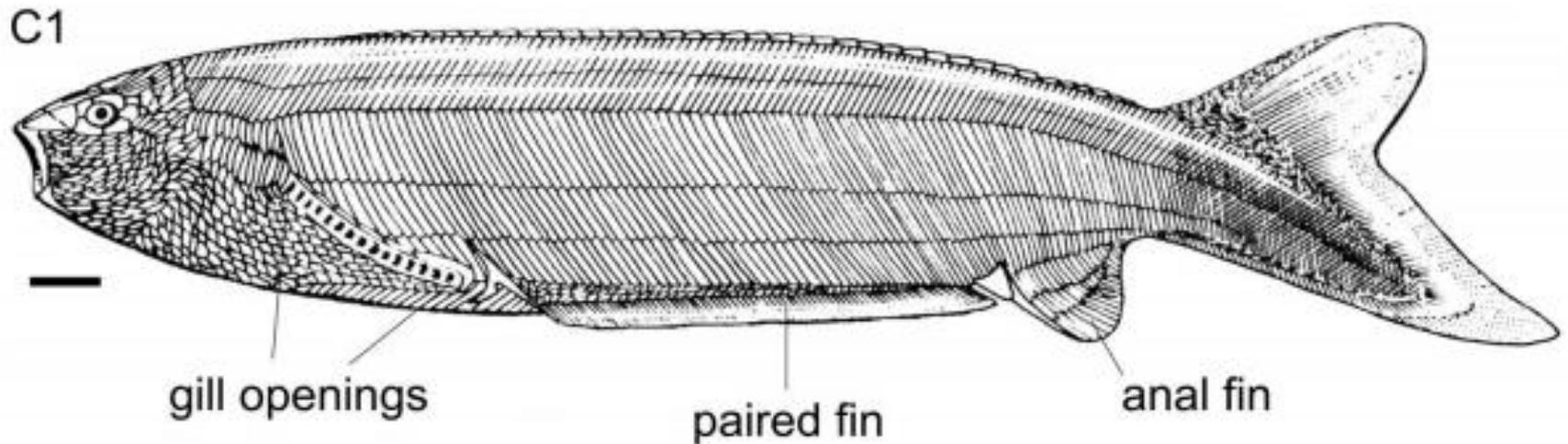


Note: The Conodontia, the lineage including [arandaspids + heterostracans], and all other fishes form a polychotomy. This means we know they are all more closely related to one-another, but we don't have enough data (or the data aren't clear enough) for us to determine exactly which among the groups are more closely related to one another.

Not exactly satisfying, but the most honest thing to say.

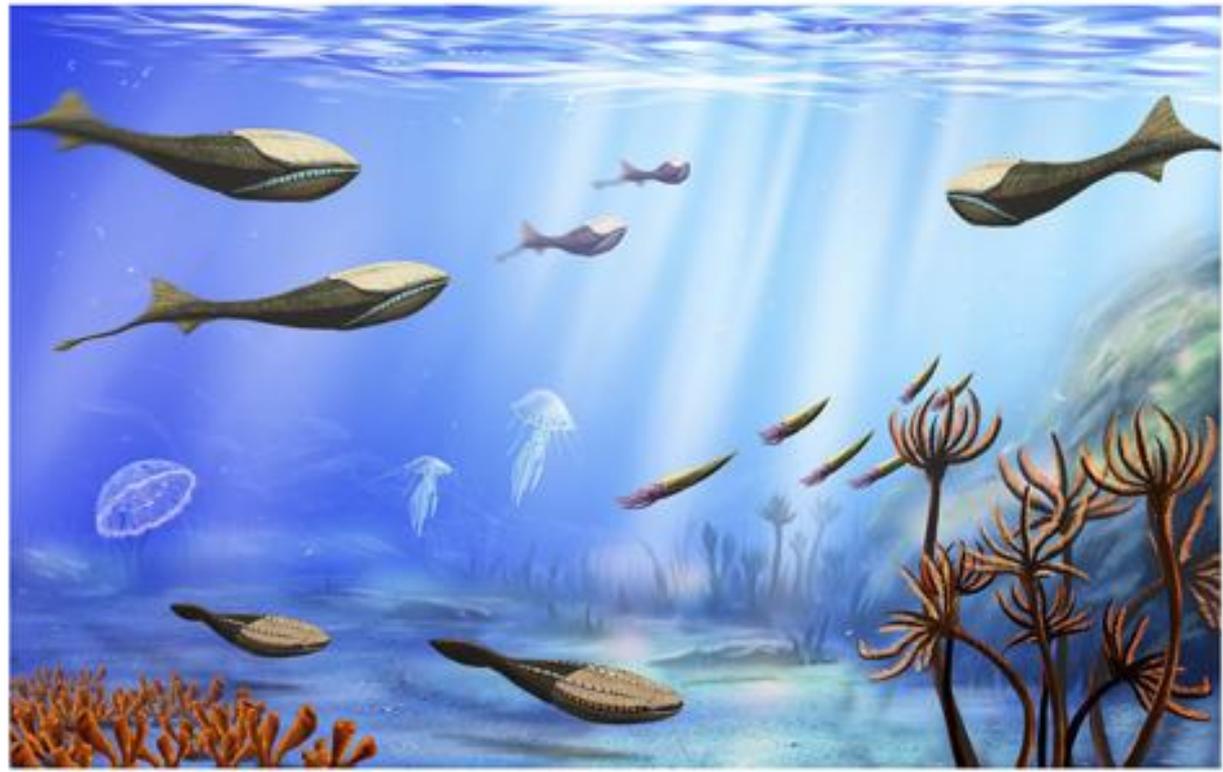
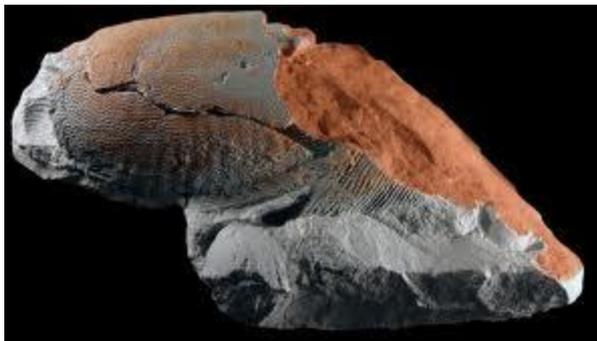
Arandaspid and Heterostracans:

- Jawless fishes with very bony scales/exoskeletal structures.
- Frequently characterized by a tail with a downward turned major lobe (known as a “hypocercal tail”).



Pharyngeolepis, a heterostracan

Arandaspis



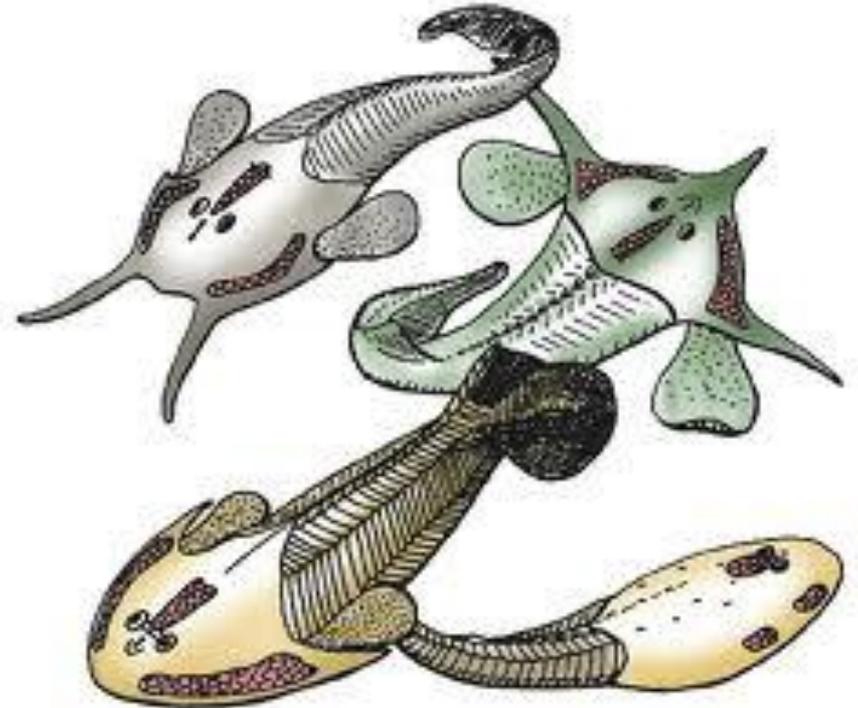
Lampreys and their relatives:

- Lampreys are the last living relicts of a lineage of jawless fishes that stretches as far back as the Devonian.
- Living lampreys probably are not like their Devonian relatives.
- Note that they do not have paired appendages, only midline fins.



Osteostraci:

- A group of heavily armored jawless fishes
- May have been the first to have paired appendages
- Had extensive head shields demonstrating their sensory organs.
- The sensory organs included electroreceptors.







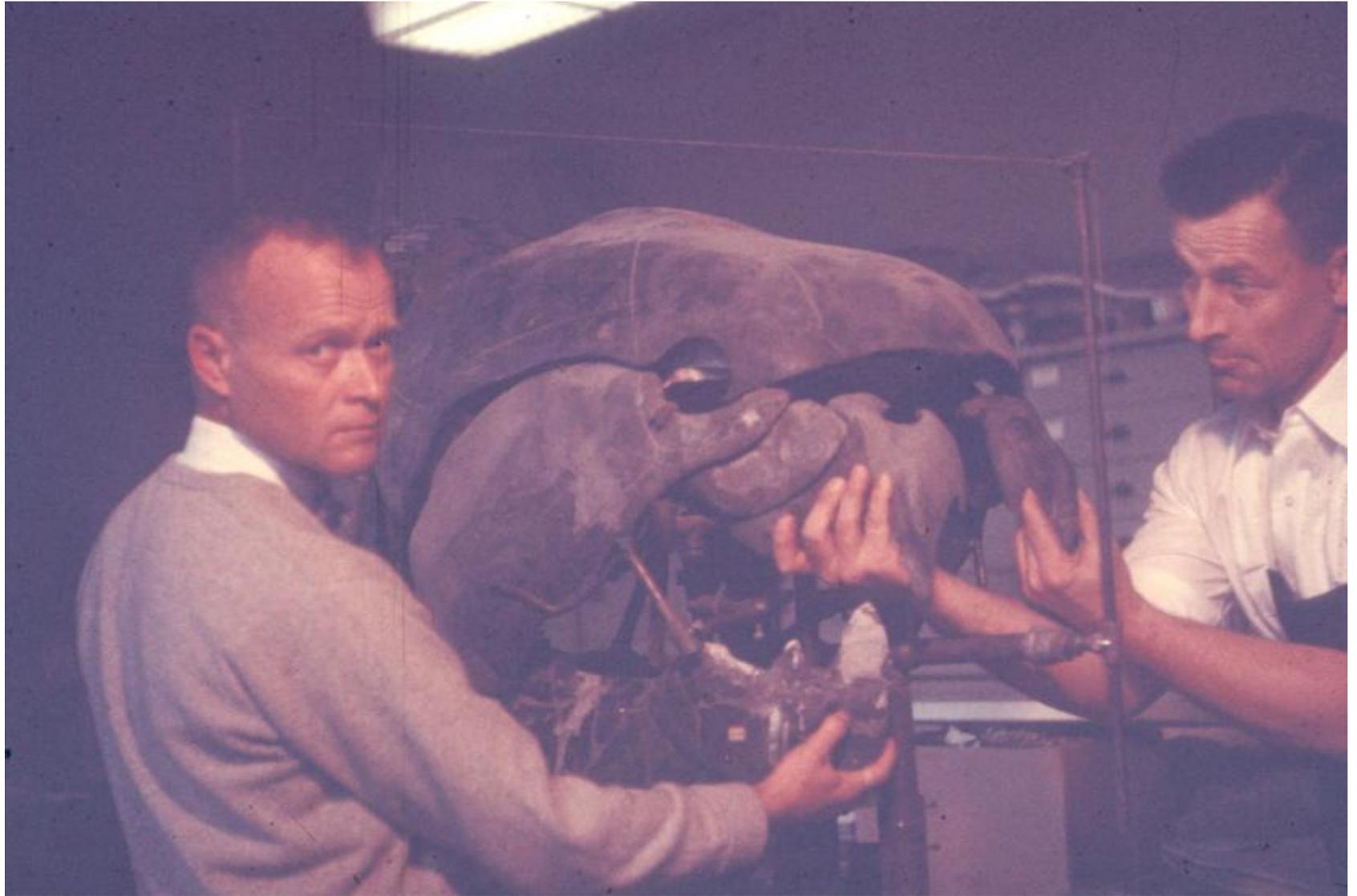
PLACODERMI

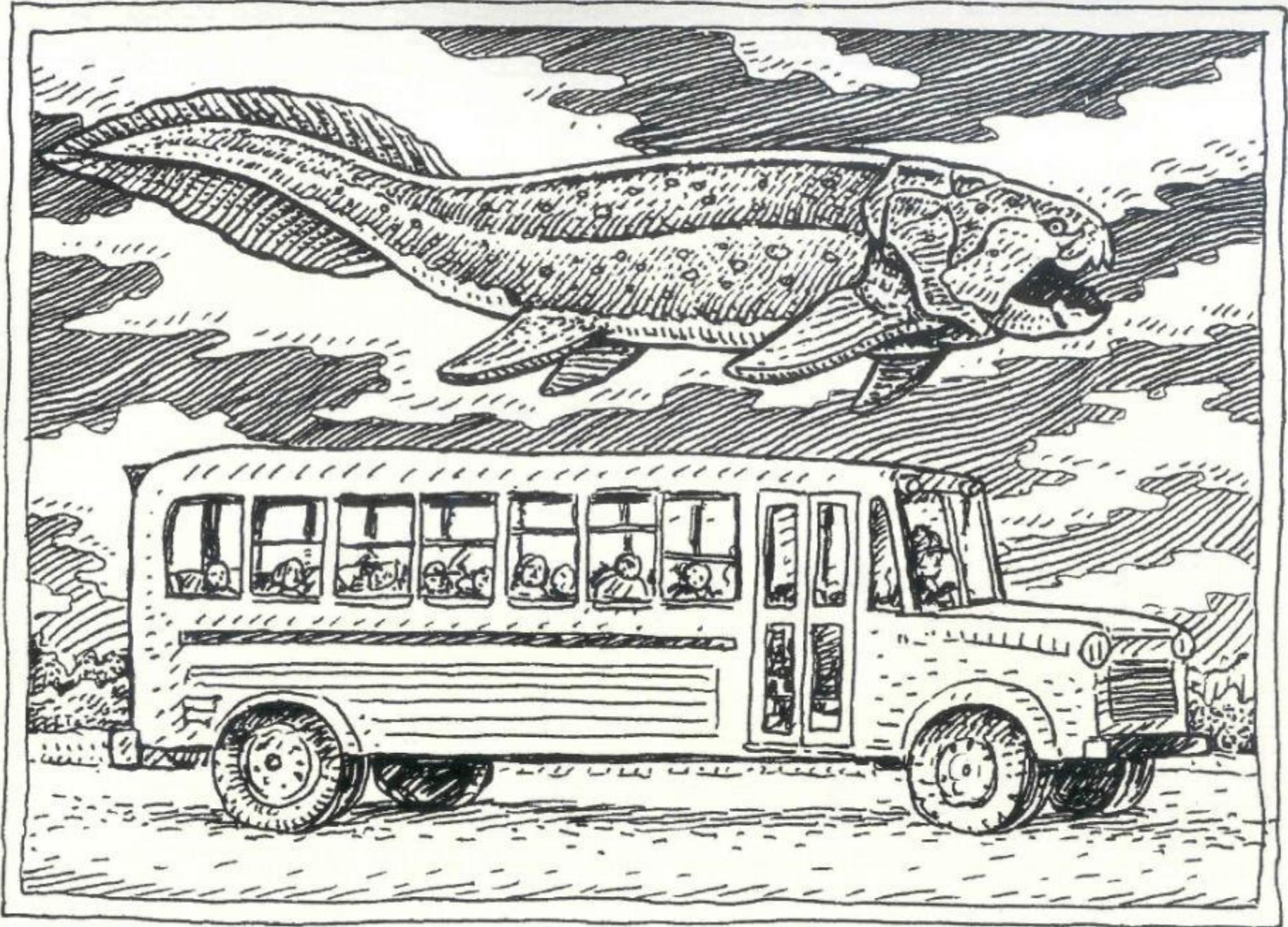
- Closest relatives of living cartilaginous fishes
- Known since Devonian
- Big cutting jaw plates, but not true teeth



PLACODERMI: Closest relatives of living cartilagenous fishes; Known since Devonian;
Big cutting jaw plates, but not true teeth

Dave Dunkle and *Dunkleosteus*



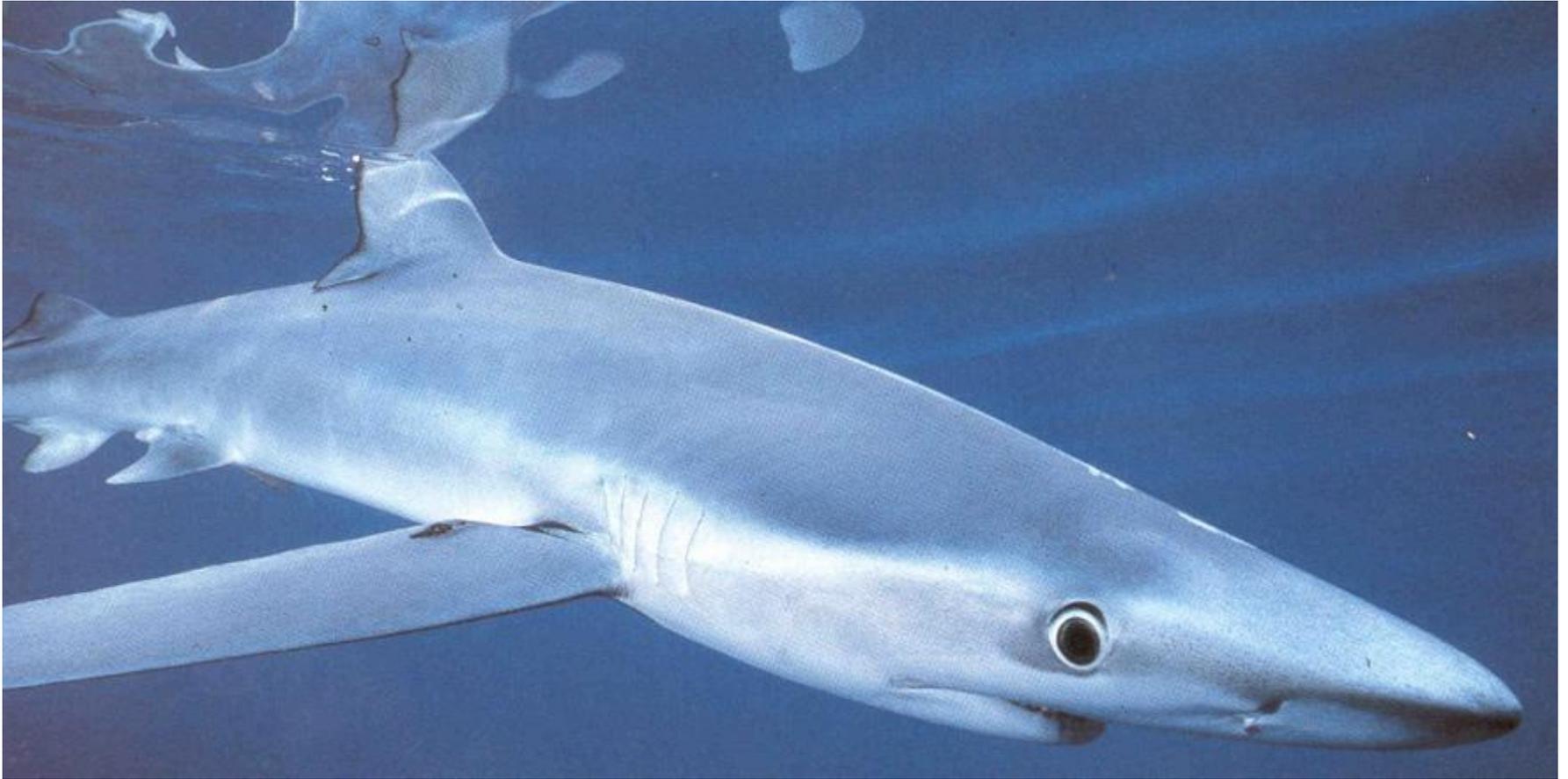


DUNKLEOSTEUS - A DEVONIAN FISH AS BIG AS A SCHOOL BUS



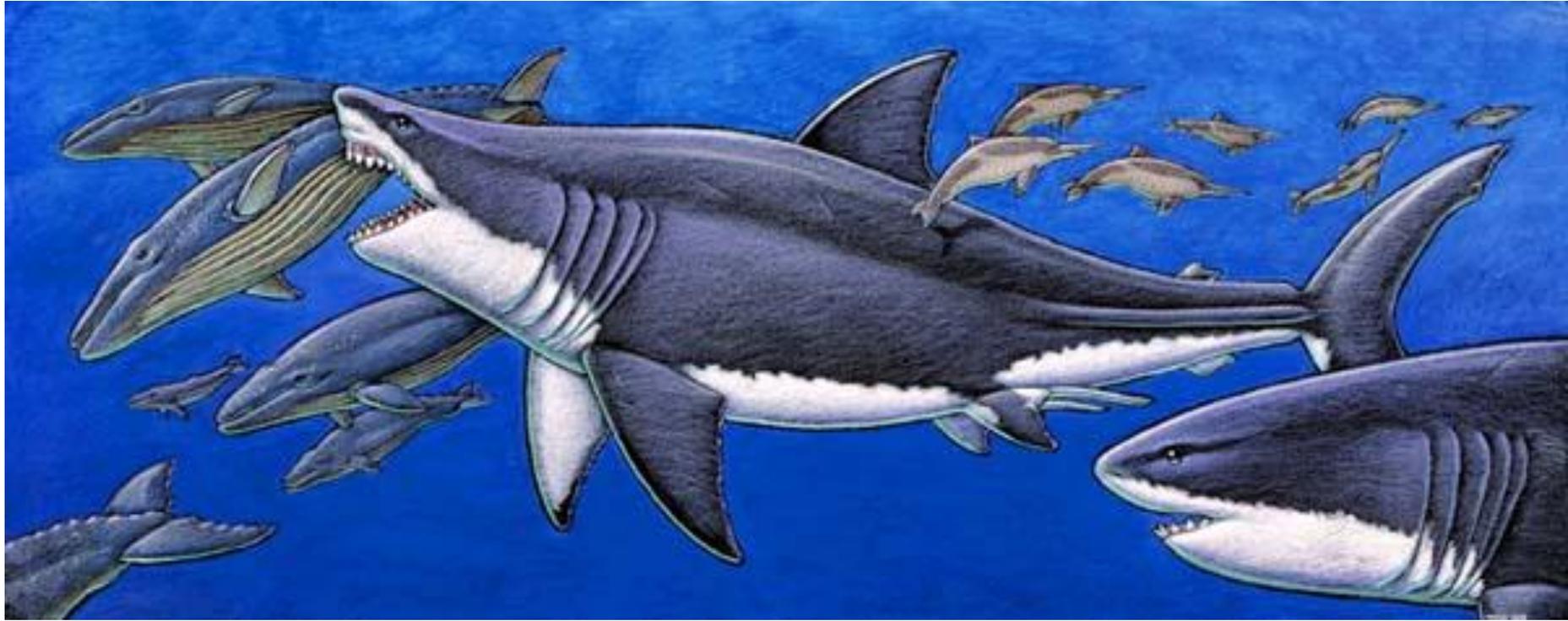
Bothriolepis

CHONDRICHTHYES: The Cartilaginous Fishes



Includes: sharks, skates and rays, holocephalians





Iniopterygians



Helicoprion





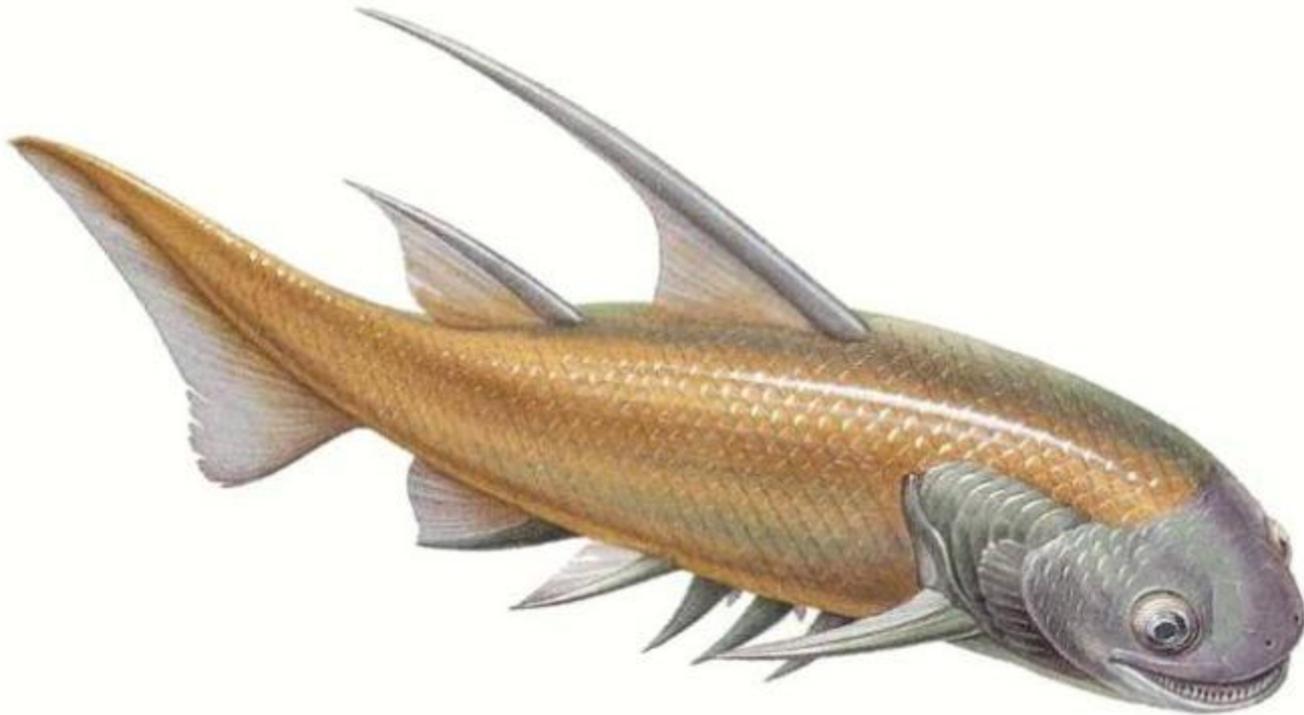
A Chimera (a holocephalian)



ACANTHODII

- Acanthodians are often referred to as “spiny sharks” – but were not real sharks.
- Known as far back as Silurian
- Abundant until Early Permian
- Generally considered to be the sister-group to bony fishes.

Reconstructions of Acanthodians



OSTEICHTHYES (BONY FISH)

Most diverse groups of vertebrates
Enormous diversity of sizes, shapes,
habitats.

Includes:

- Actinopterygii (“Ray-finned fishes”)
- Sarcopterygii (“Lobe-finned fishes”)

(Both groups known as far back as early
Devonian)

Garibaldi: The California State Marine Fish

