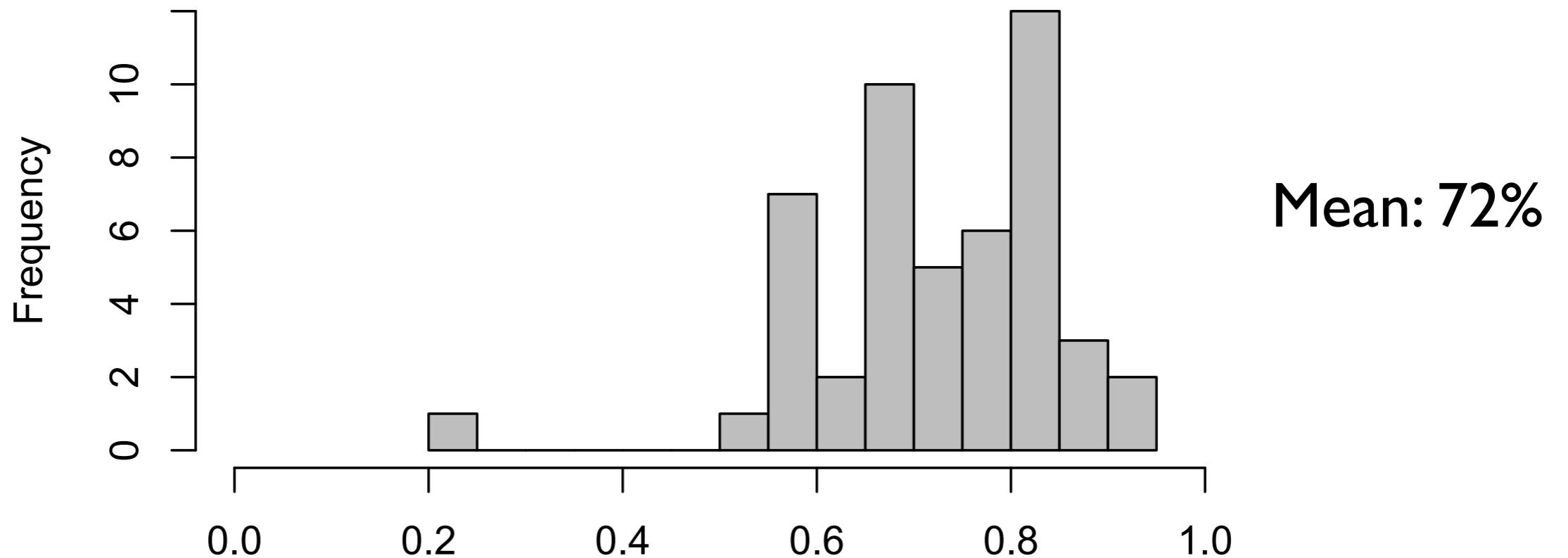


Test Results

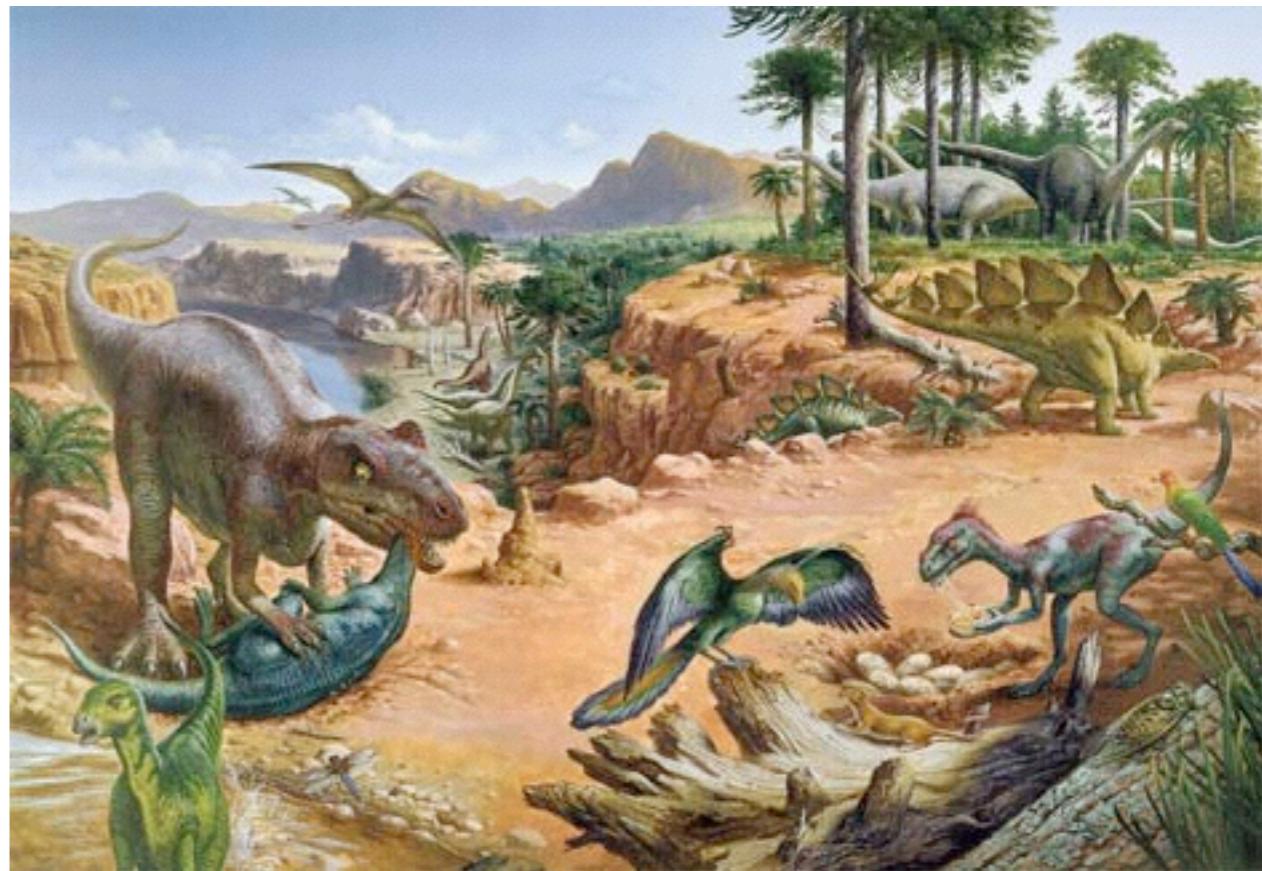
Histogram of x



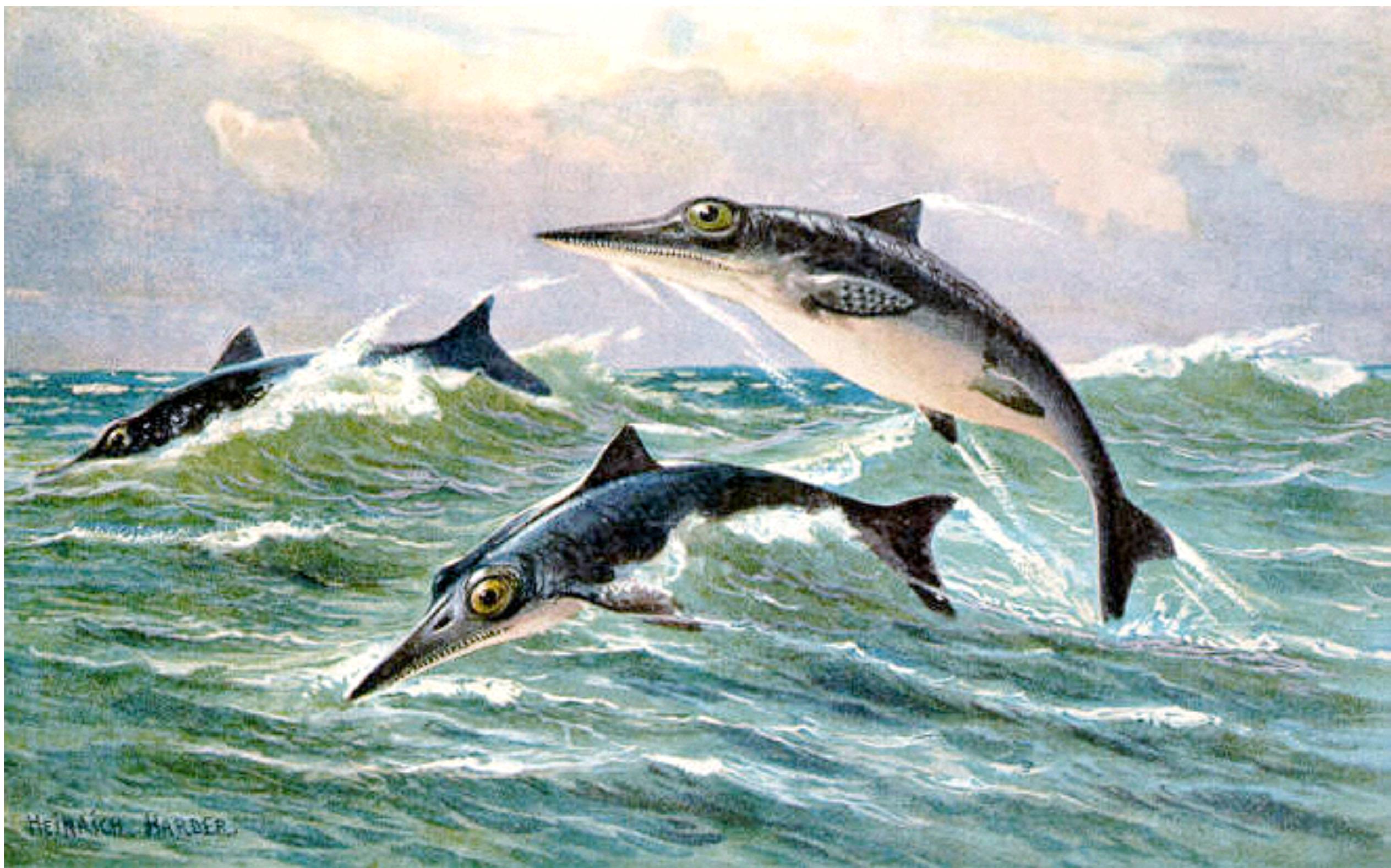
No quiz grades by the way

The Final Days...

- Today: Mesozoic Marine Reptiles
- The Mesozoic WORLD
- Mammals
- Extinctions
- FINAL
 - Not cumulative
 - Monday, May 9th, 2016 3pm - 6pm
 - Exact same format
 - Green Scantron



Aquatic Reptiles of the Mesozoic





Mosasaurus

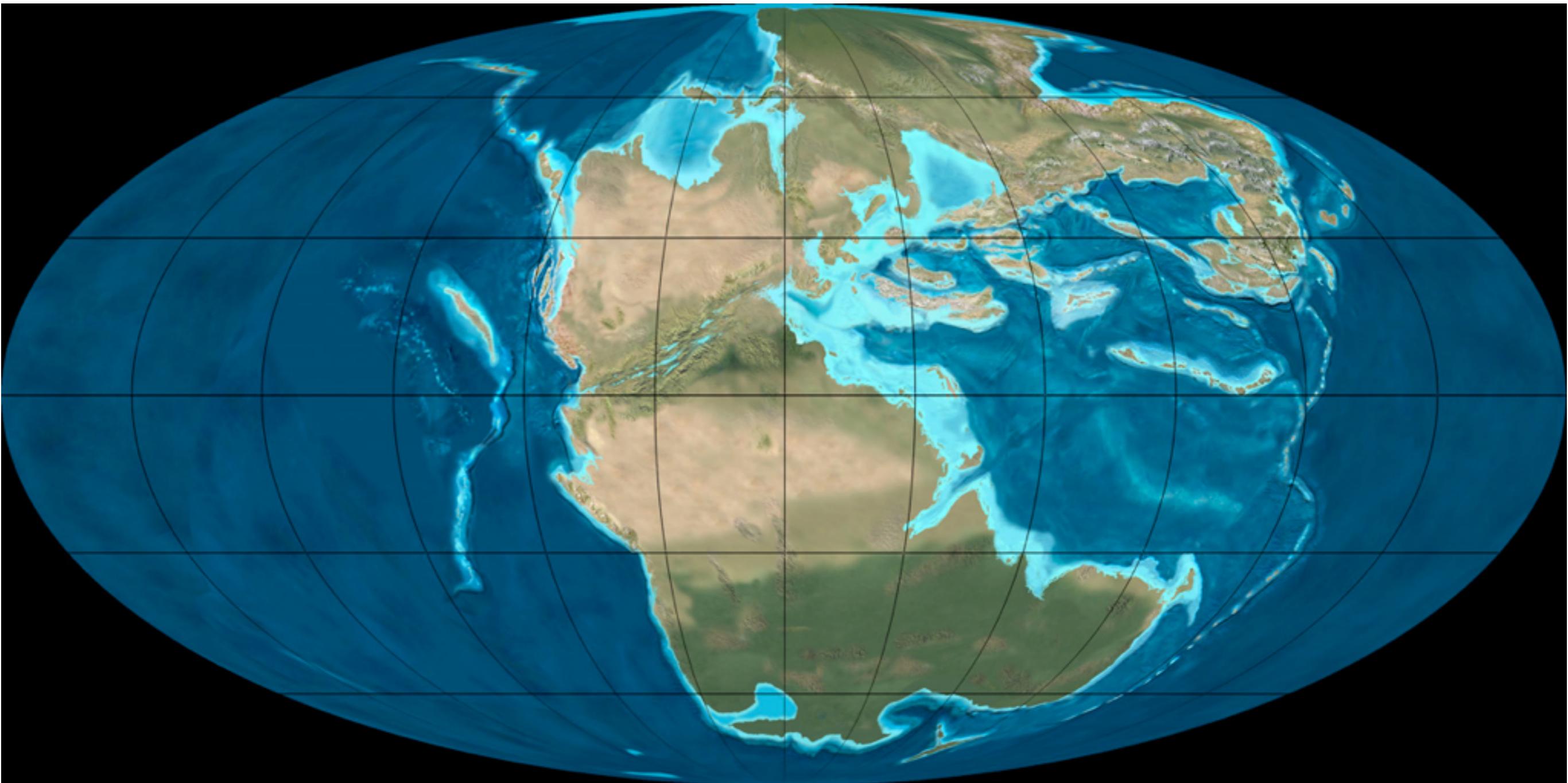
Preceded any dinosaur discoveries: unearthed in 1764 by quarry workers in the Dutch city, Maastrich

French Revolutionary Forces obtained the fossil after paying a 600 bottle of wine reward

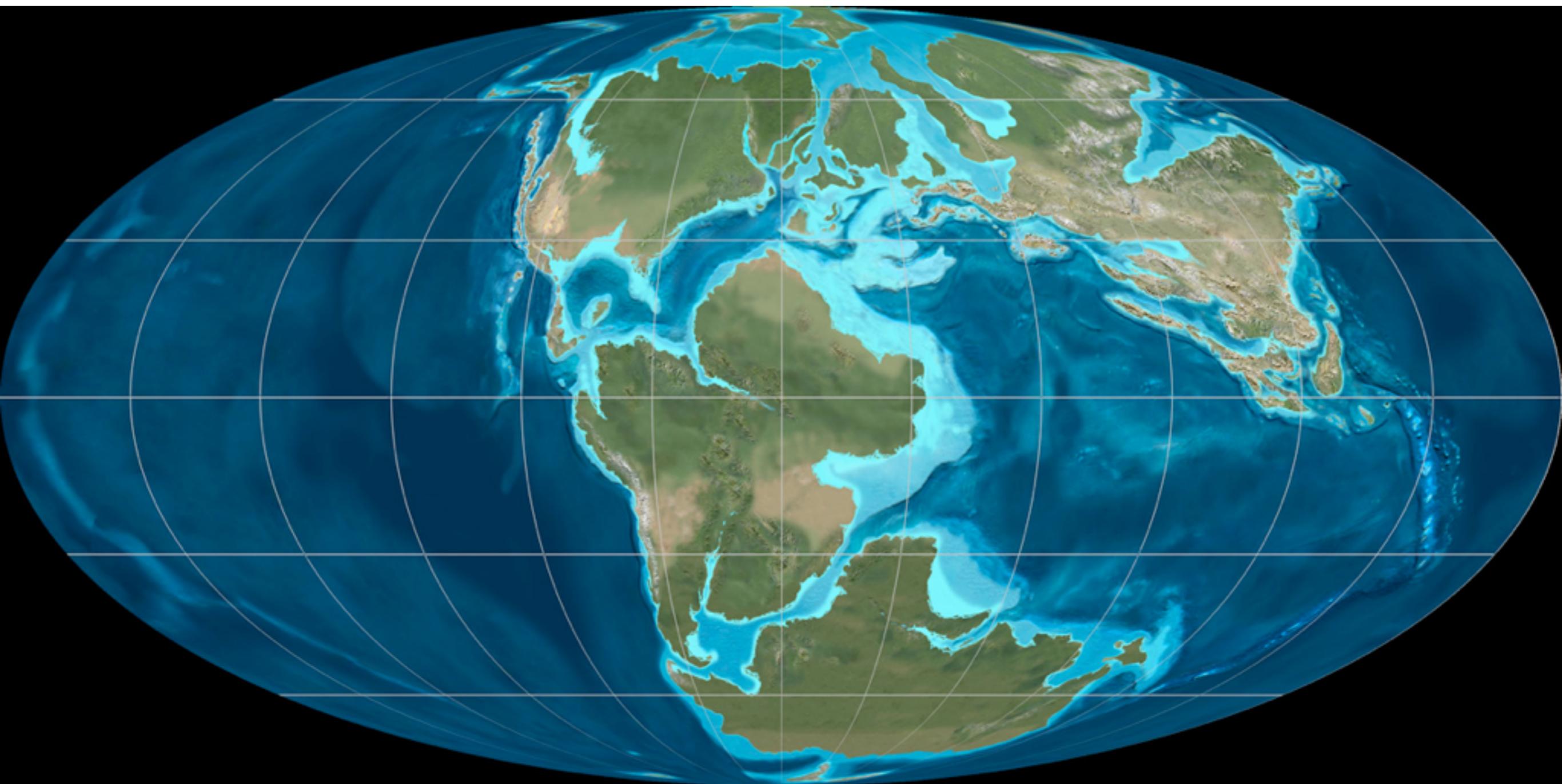
Wasn't recognized as reptilian until 1799



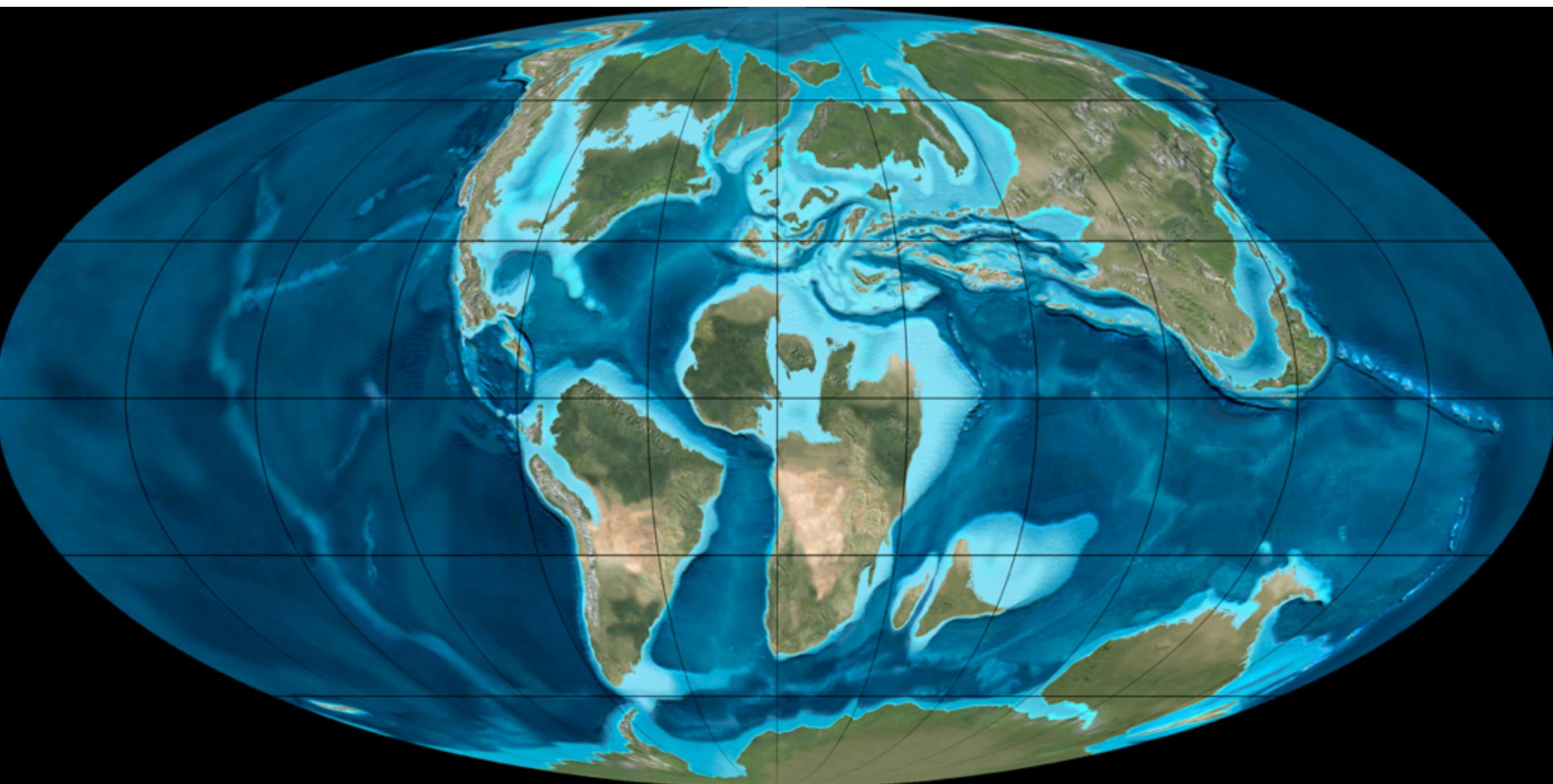
Triassic Oceans

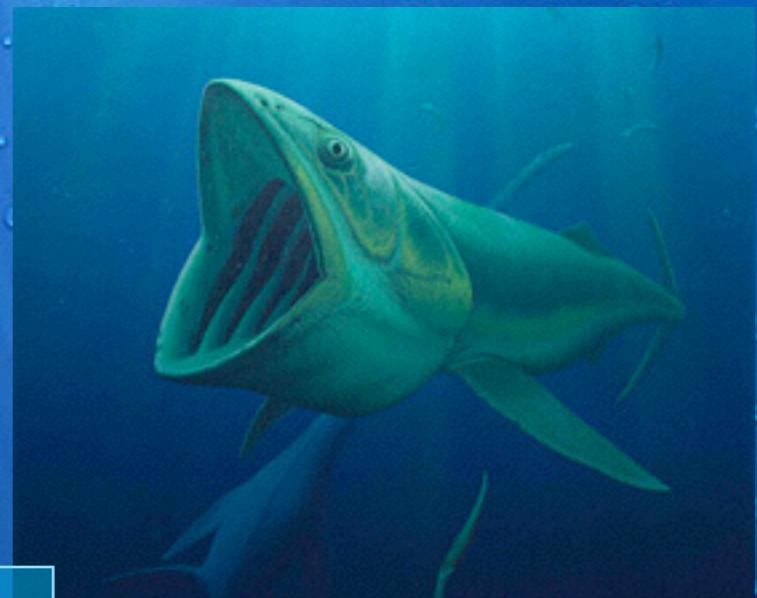
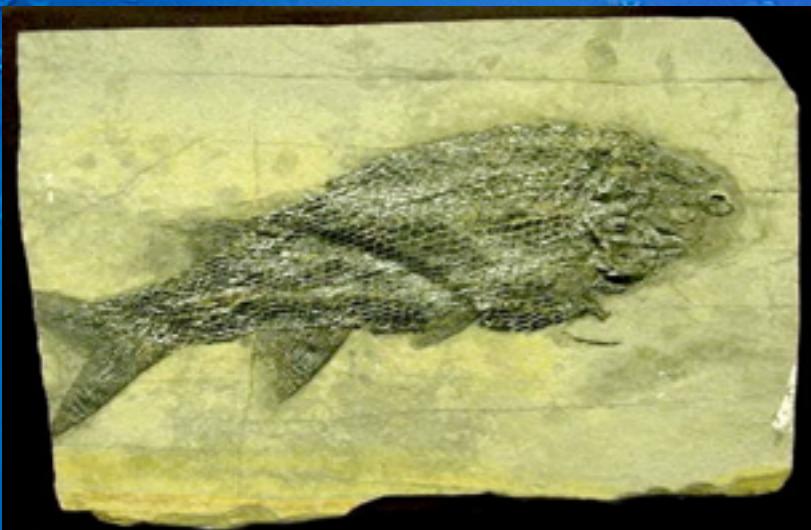


Jurassic Oceans



Cretaceous Oceans

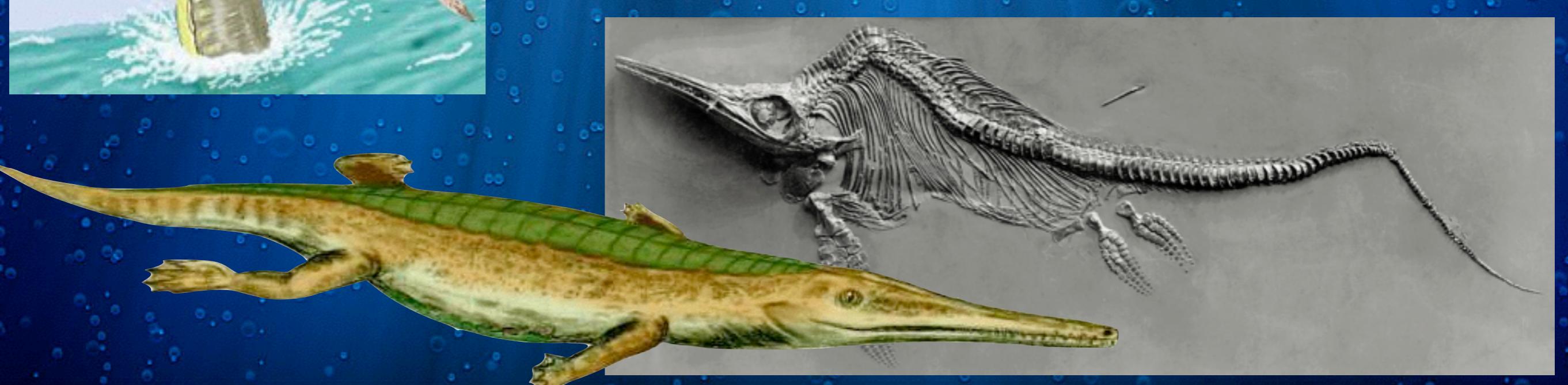
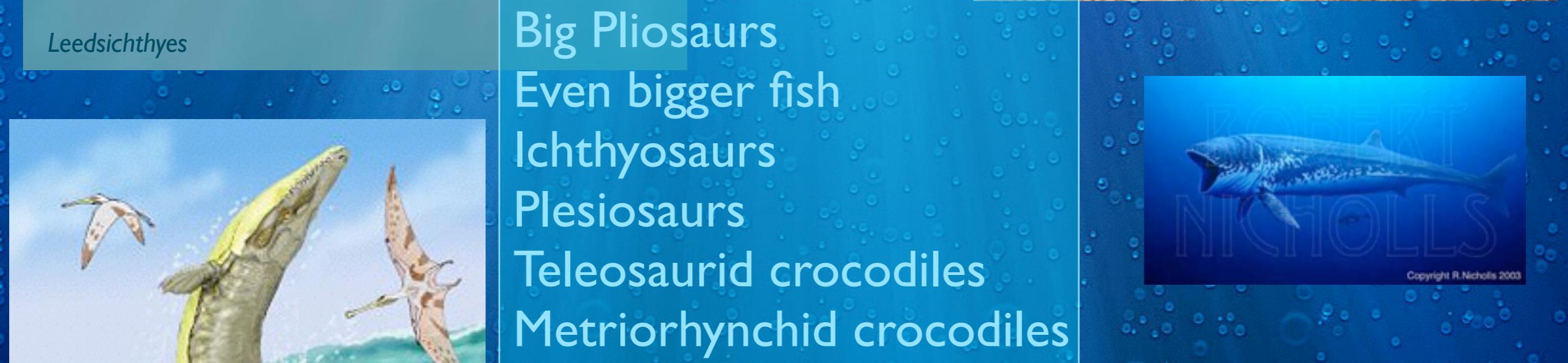




'Seafood Hypothesis'

Fish of various sizes
Enormous filter-feeding fish
Rays
Neoselachian sharks
Ammonites
Squid





Aquatic Reptiles of the Mesozoic

Major Groups:

Sauroptrygians

Nothosaurs and Placodonts

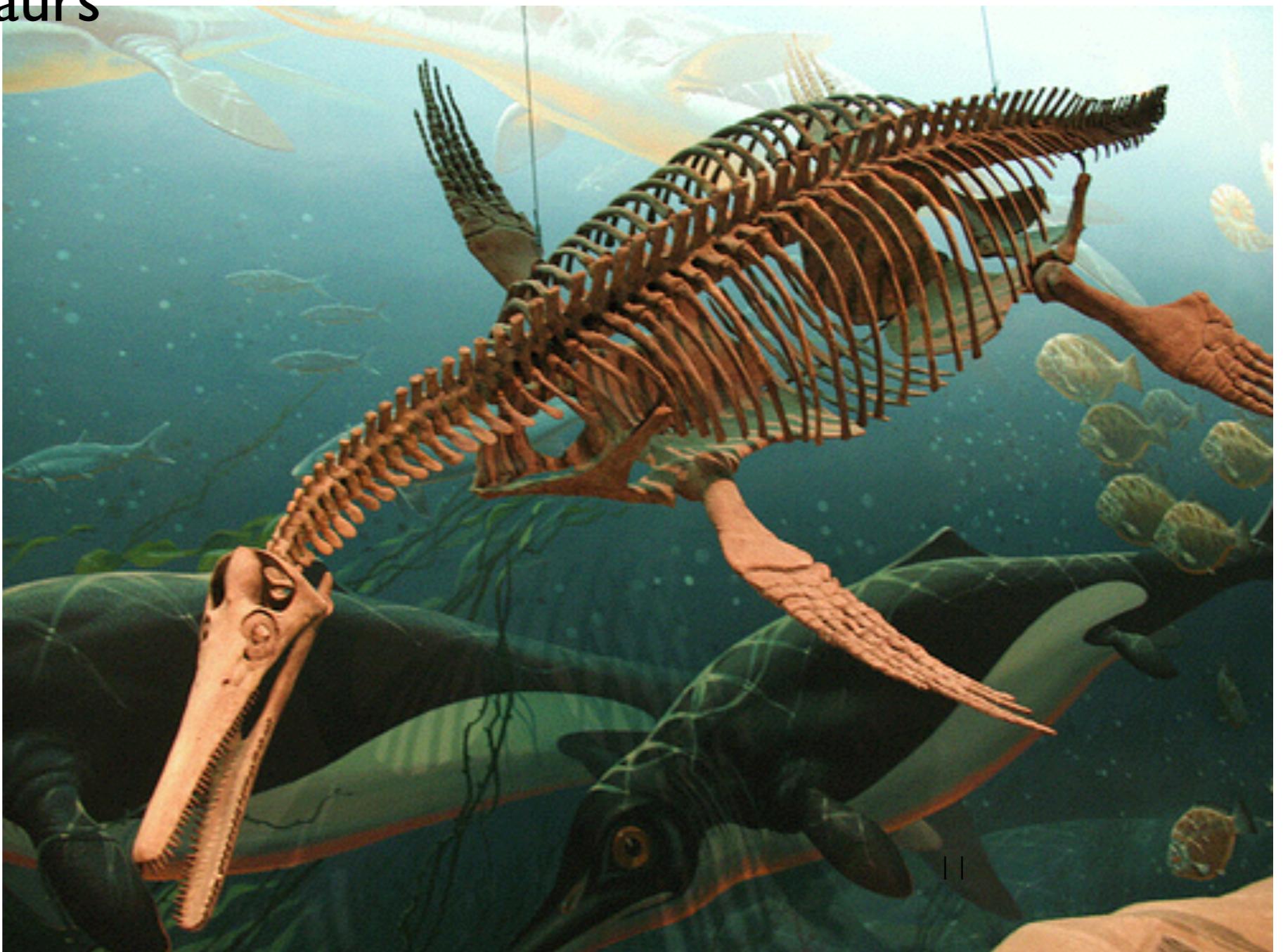
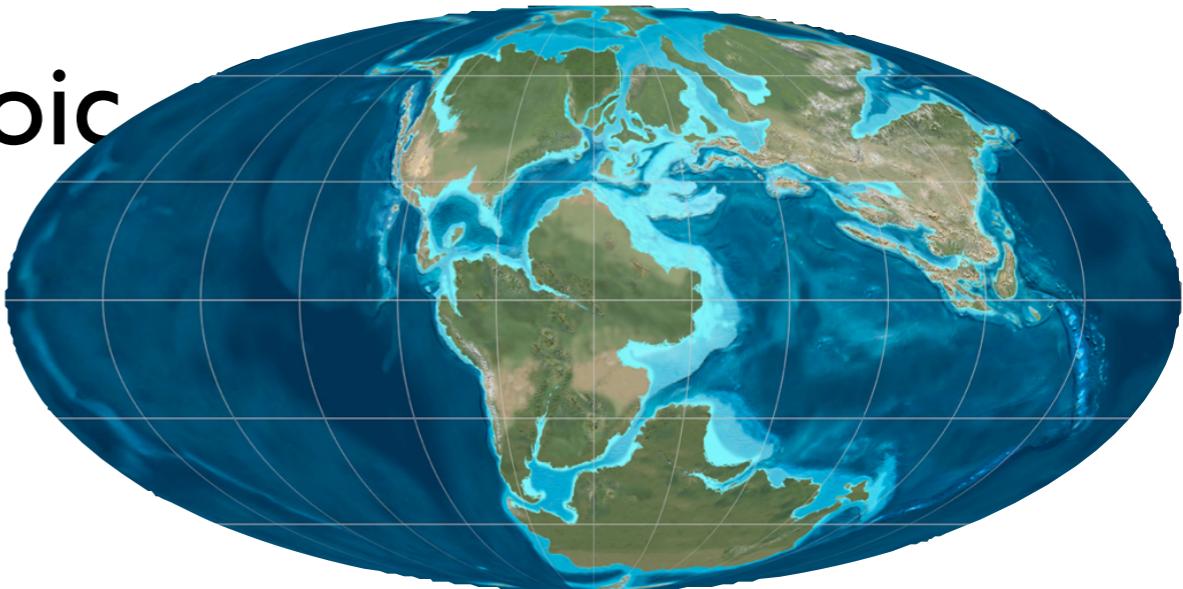
Plesiosaurs and Pliosaurs

Ichthyosaurs

Mosasaurs

Turtles

Crocodiles



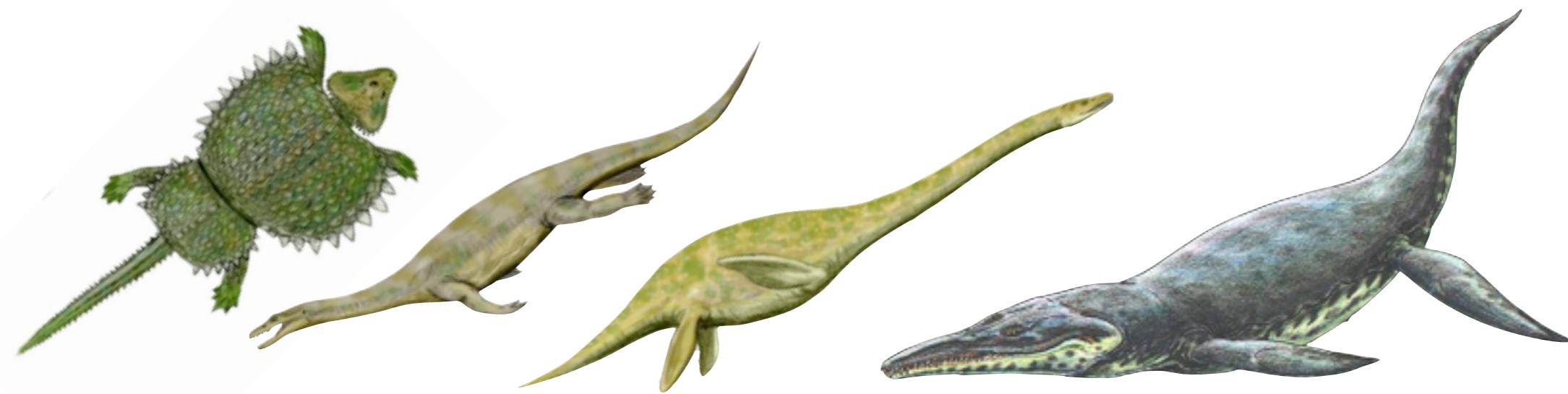
Sauroptrygians: Basal Diapsids

Diversified in the Triassic

Lepidosauria
Sauropterygia



(Basal to Archosaurs)



Placodons

Nothosaurs

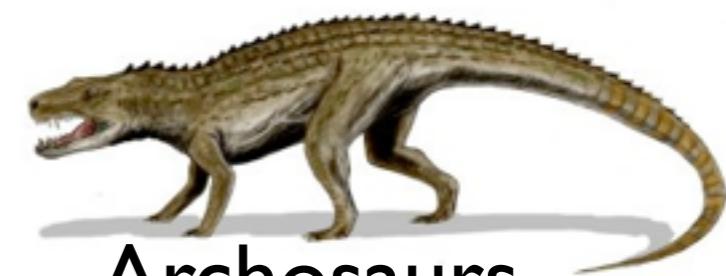
Plesiosaurs

Pliosaurs

Icthyopterygia

Sauroptrygia

Lepidosauramorpha



Archosaurs



Synapsida



Anapsida



Lepidosauria



Eureptilia

Amniotes

Diapsida

Archosauromorpha



Archosauria



Placodonts = “Tablet Teeth”

Mid to late Triassic
Several continents
Shallow, coastal environments
1-3 ft long
Turtle shape, long tail

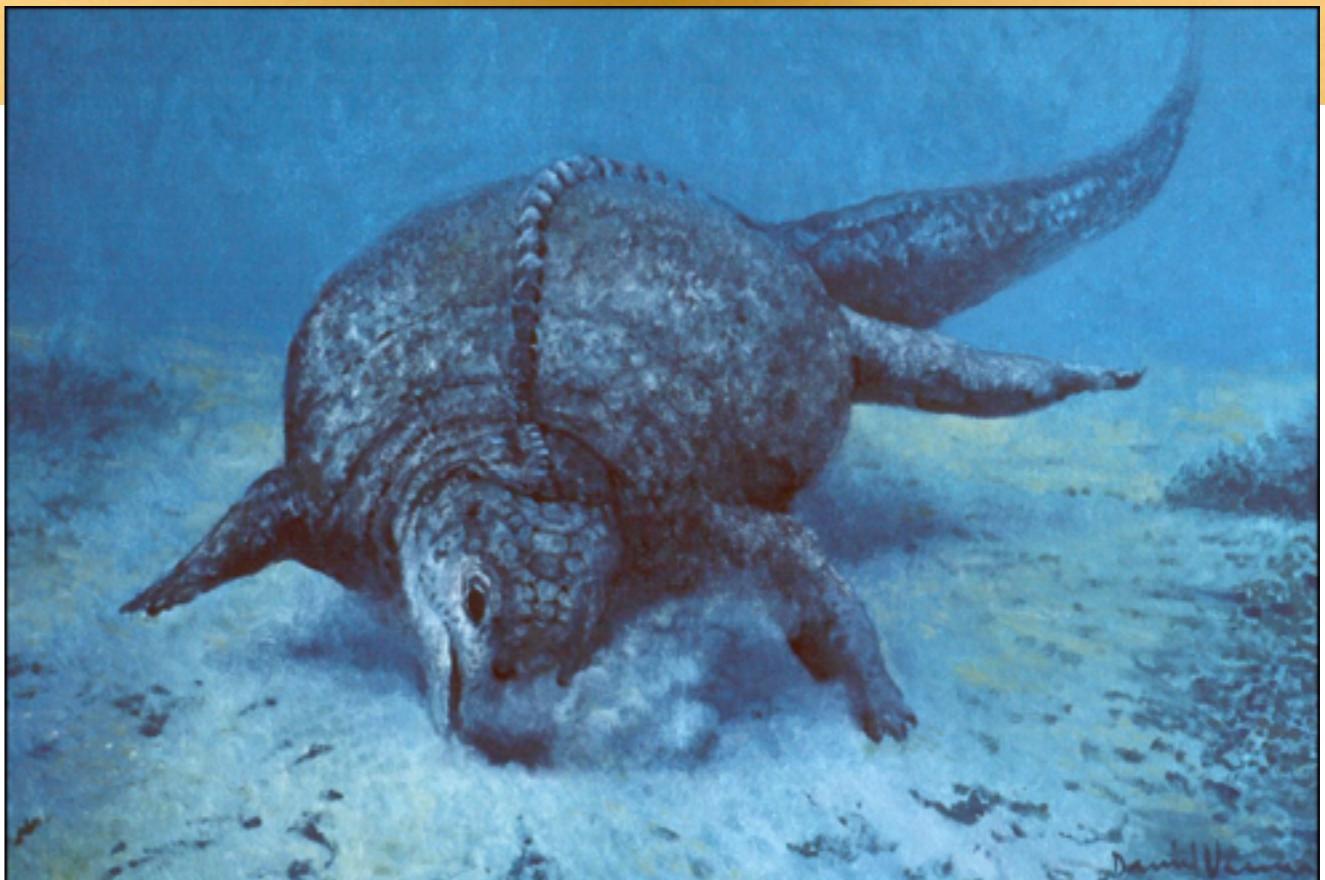
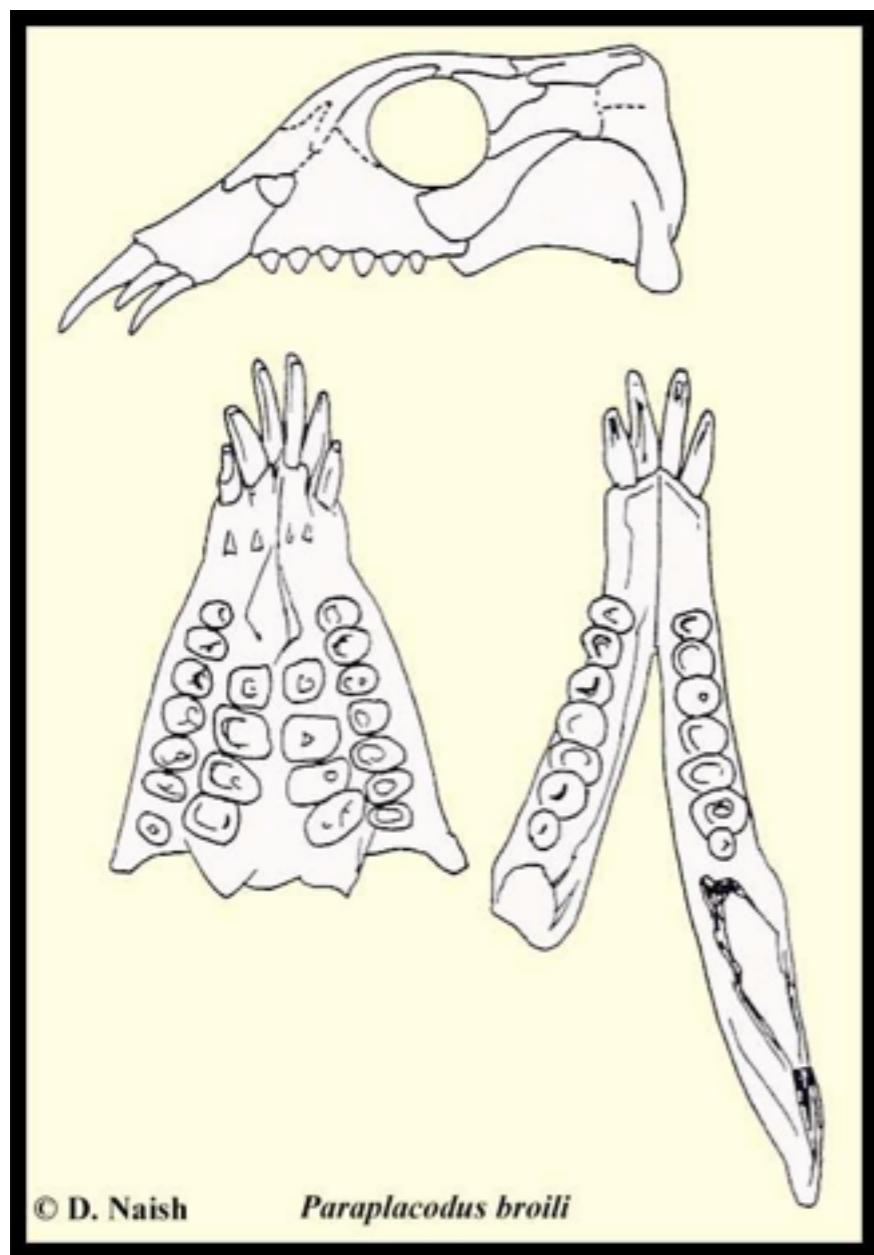


Placodonts

Boxy skull

Tooth comb, crushing teeth

Mollusk-strainer?

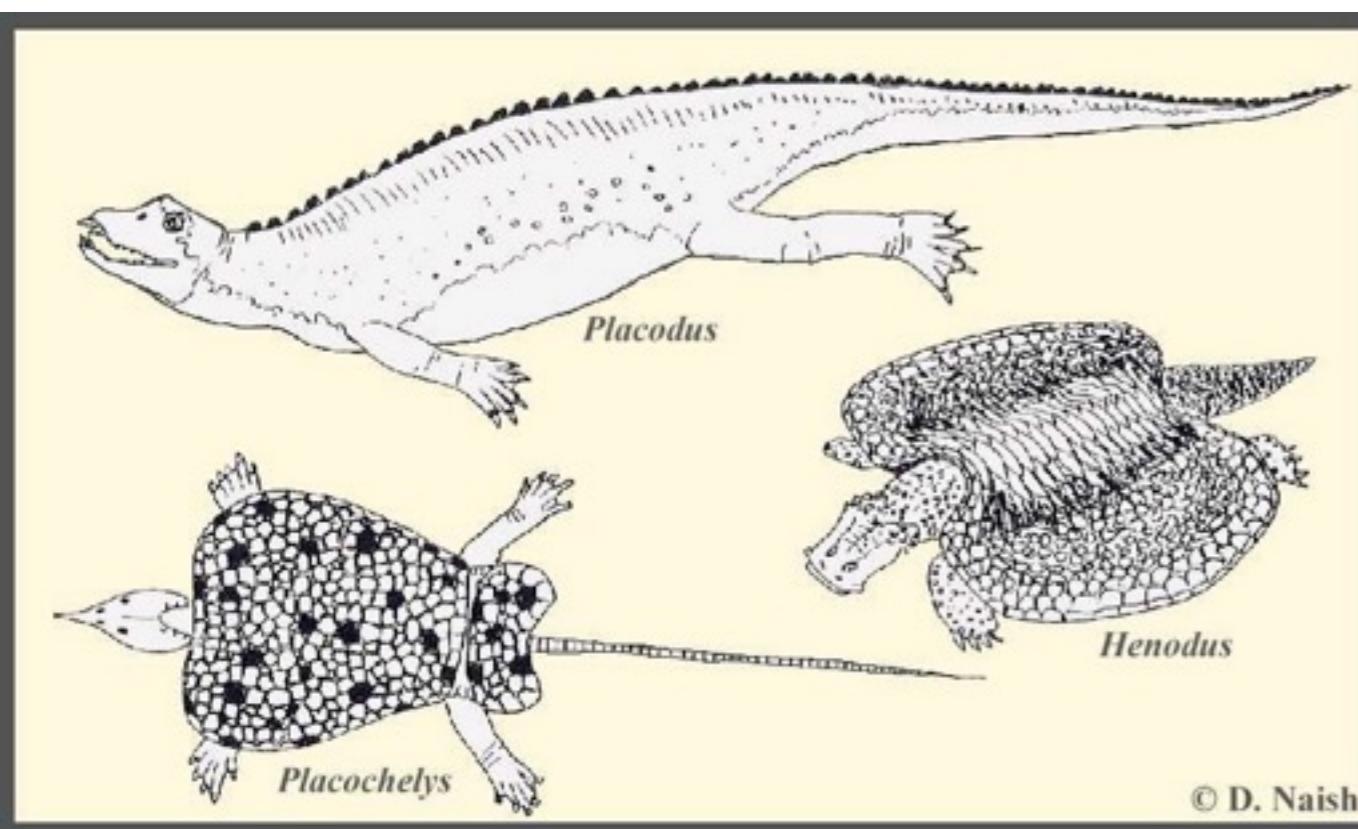


Placodonts

2 Major groups:

Placodontoids: unarmored

Cyamodontoids: armored



Nothosaurs

Triassic SEALS



Attributes:

Mid Triassic of Eurasia

Coastal environments

~ 12 ft long as adults

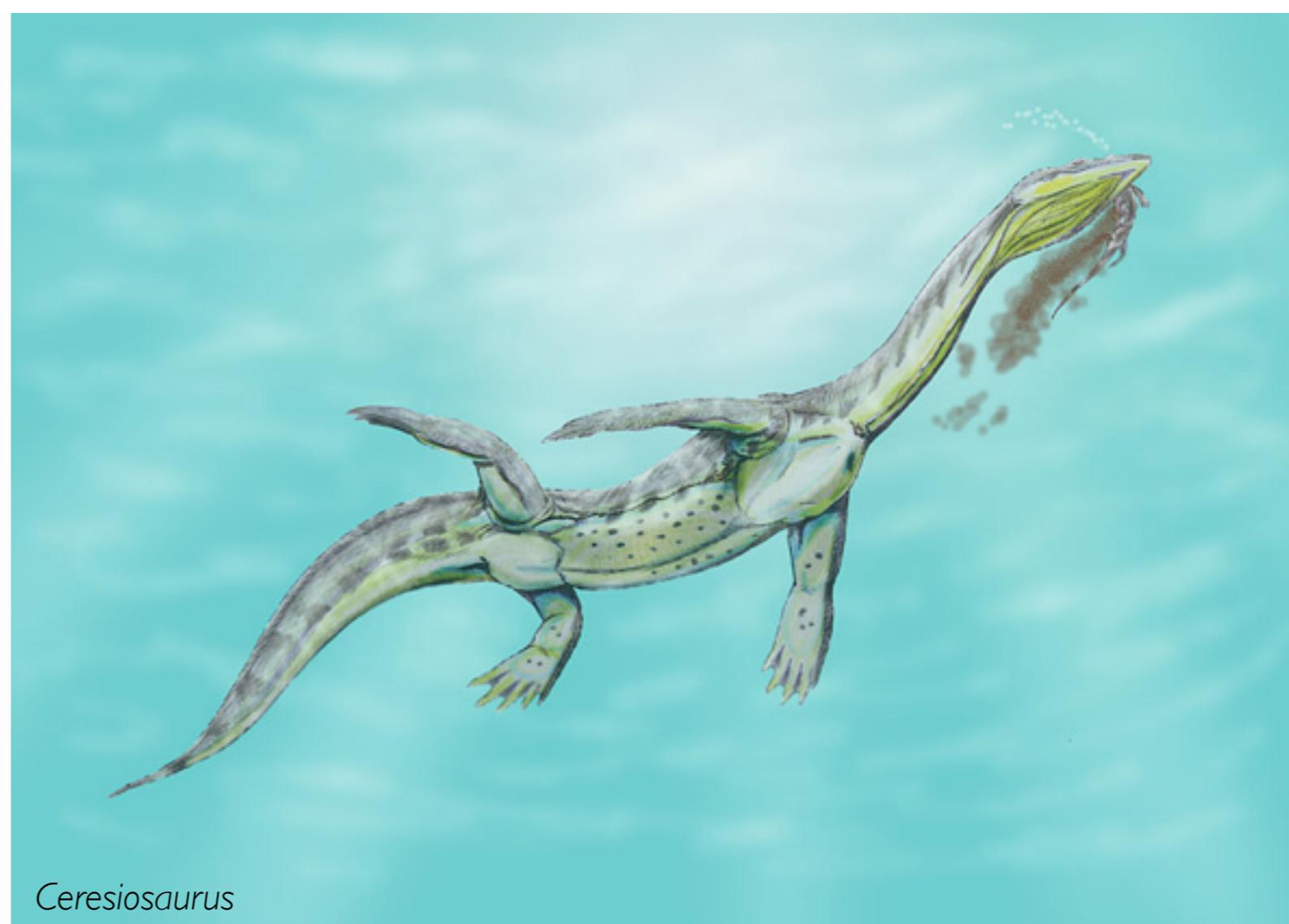
Long neck, streamlined body

Paddlelike forelimbs

Reduced hindlimbs

Webbed feet

Small pointy teeth



Nothosaurs

Triassic SEALS

Ecology:

Fish/squid-specialists

Foraged in water, but were dependent on rocks/beaches



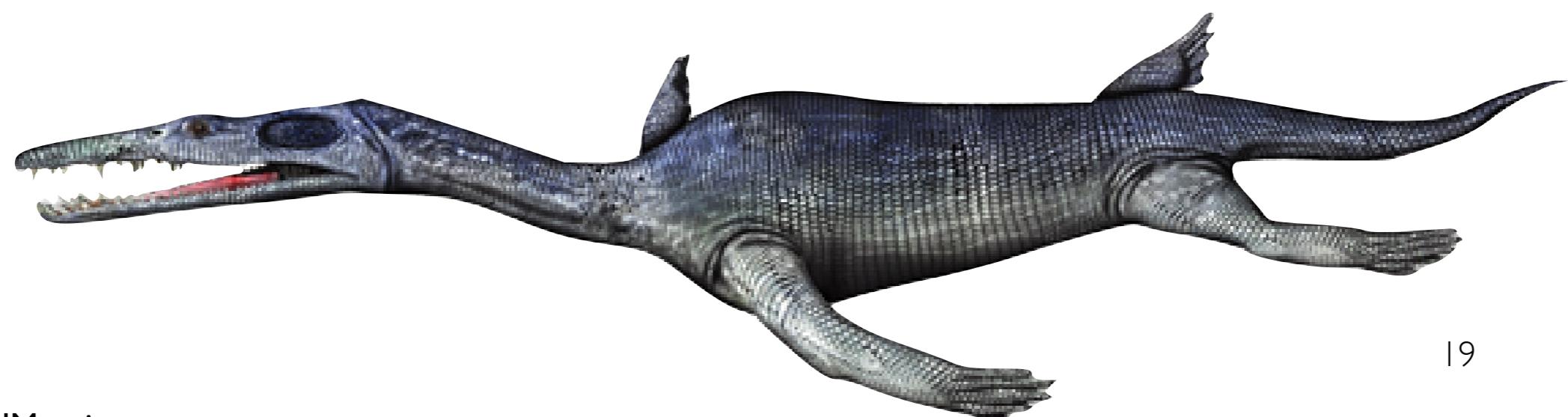
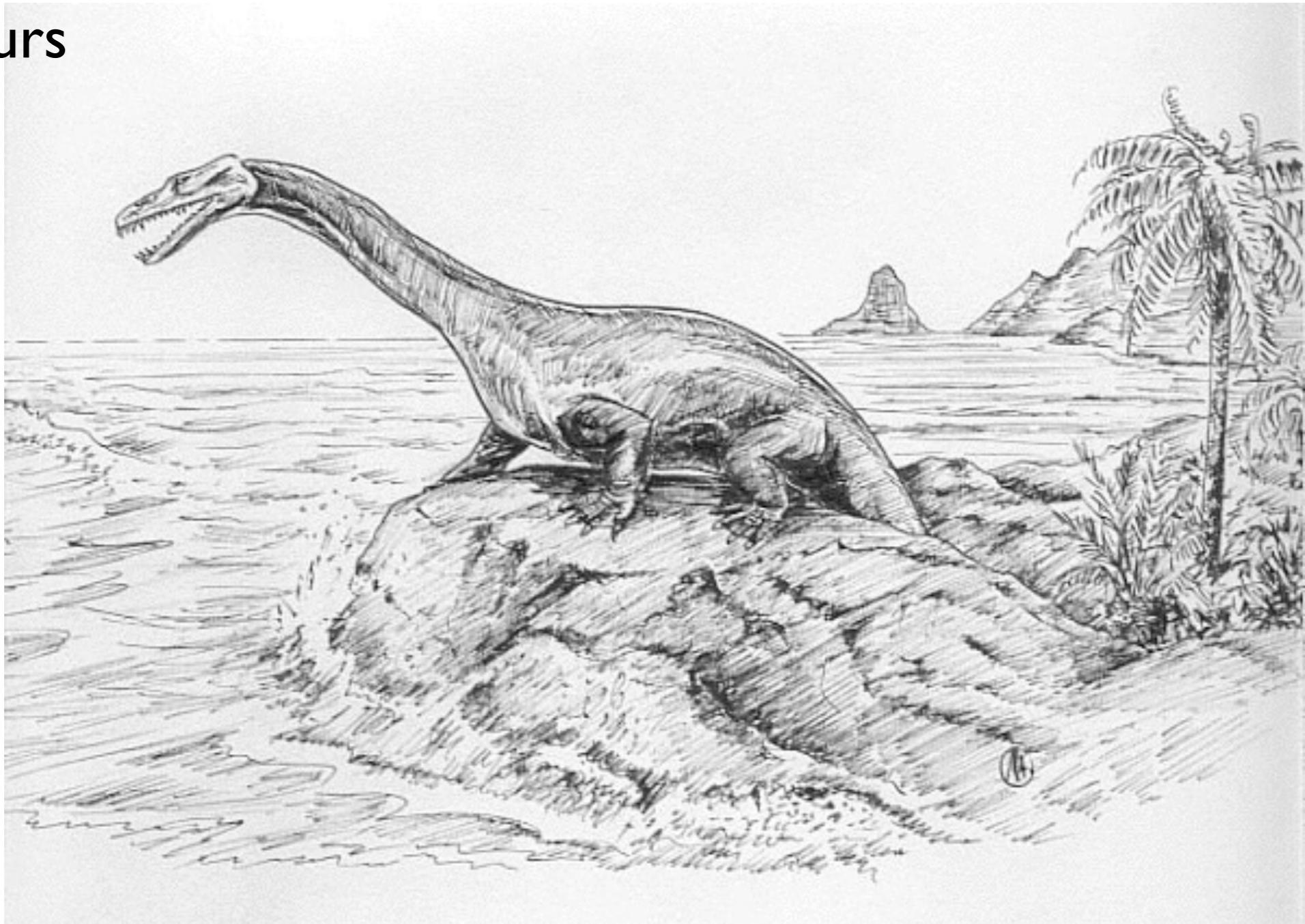
Lariosaurus



Keichousaurus



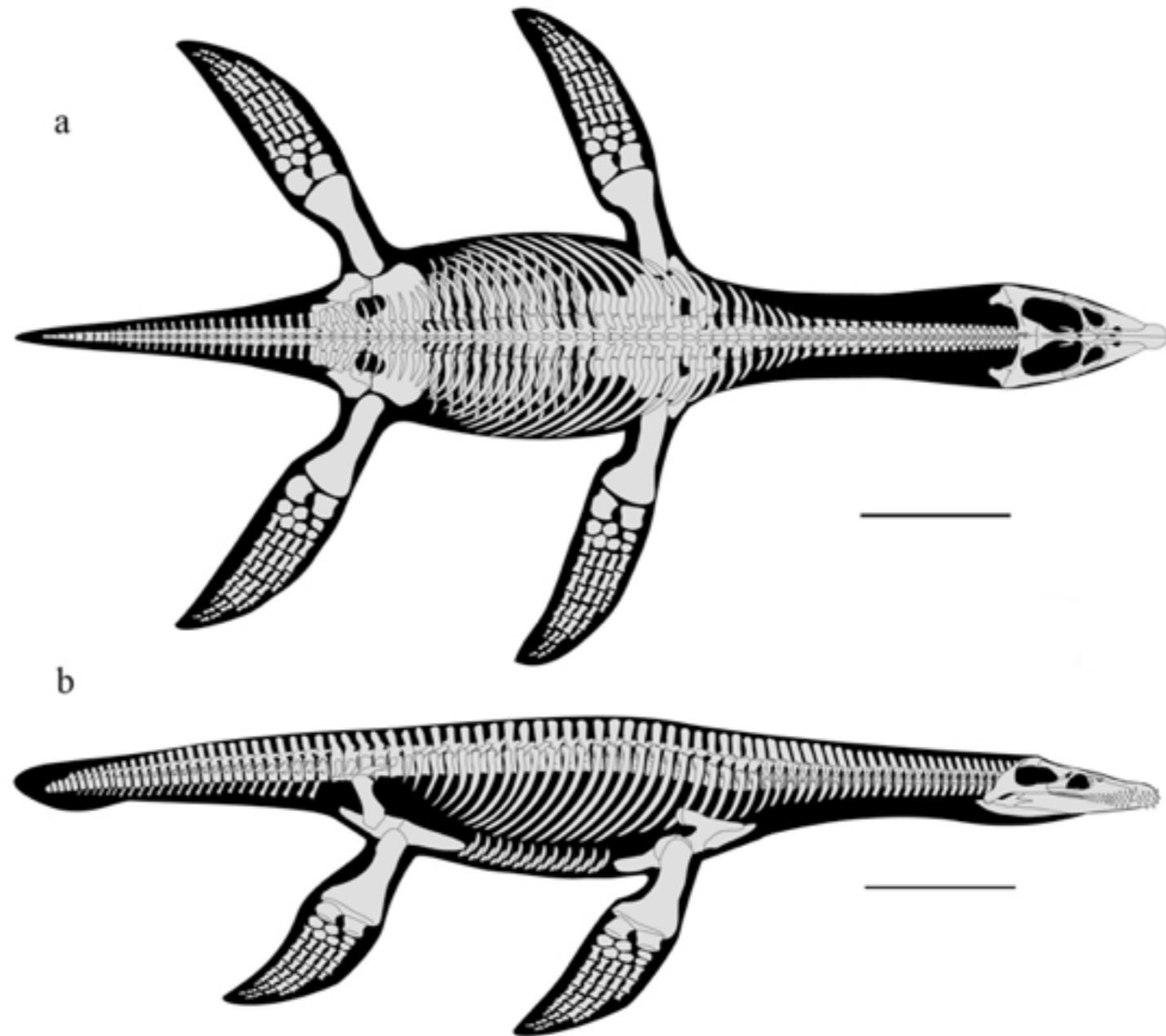
Nothosaurs



19



Plesiosaurs



Attributes:

Early Jurassic to Late Cretaceous

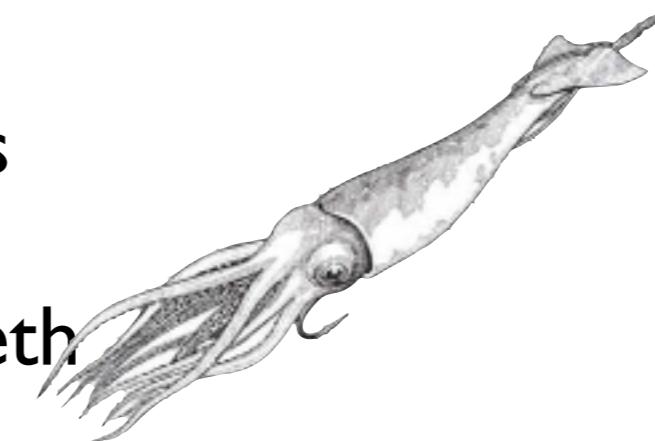
Several Continents

Front and hind limbs modified to flippers

Stiff trunk, strong pectoral and pelvic girdles

Short, boxy body with massive ventral ribs

Long necks, short tails, small head, sharp teeth

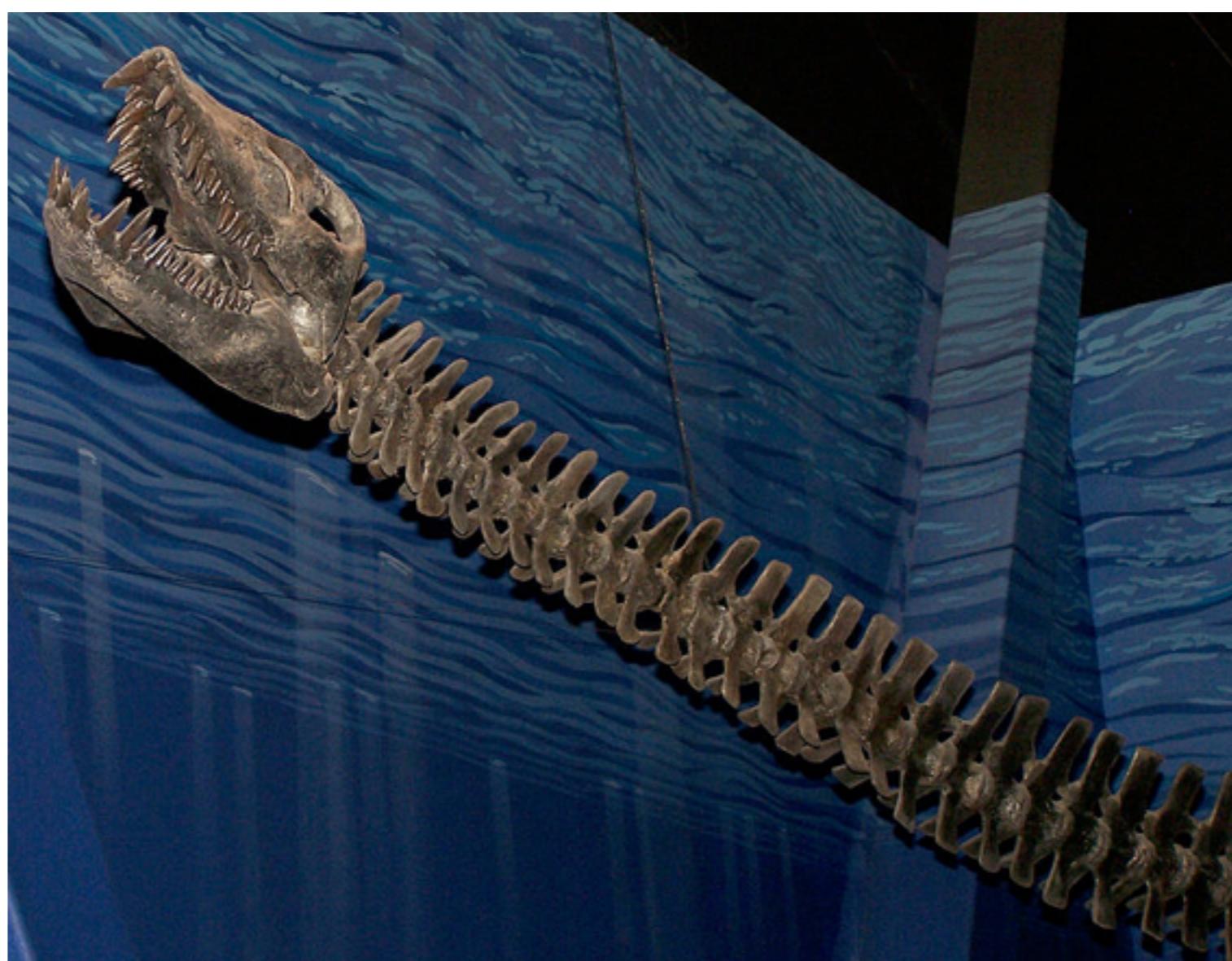


Plesiosaurs

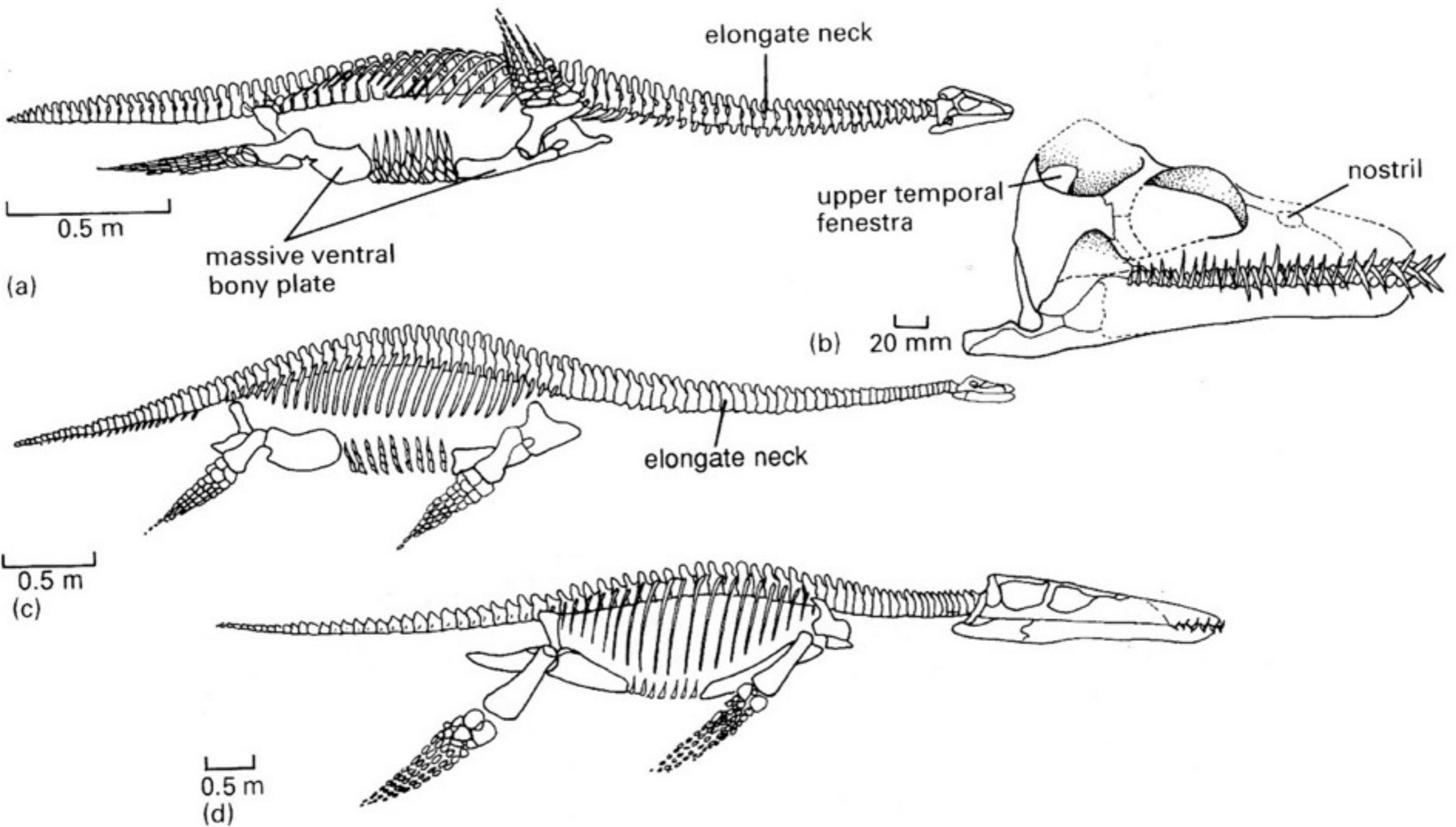
Ecology:

Fully marine and deep water habitats

Fish/cephalopod specialists



Elasmosaurus



Plesiosaurs

Locomotion

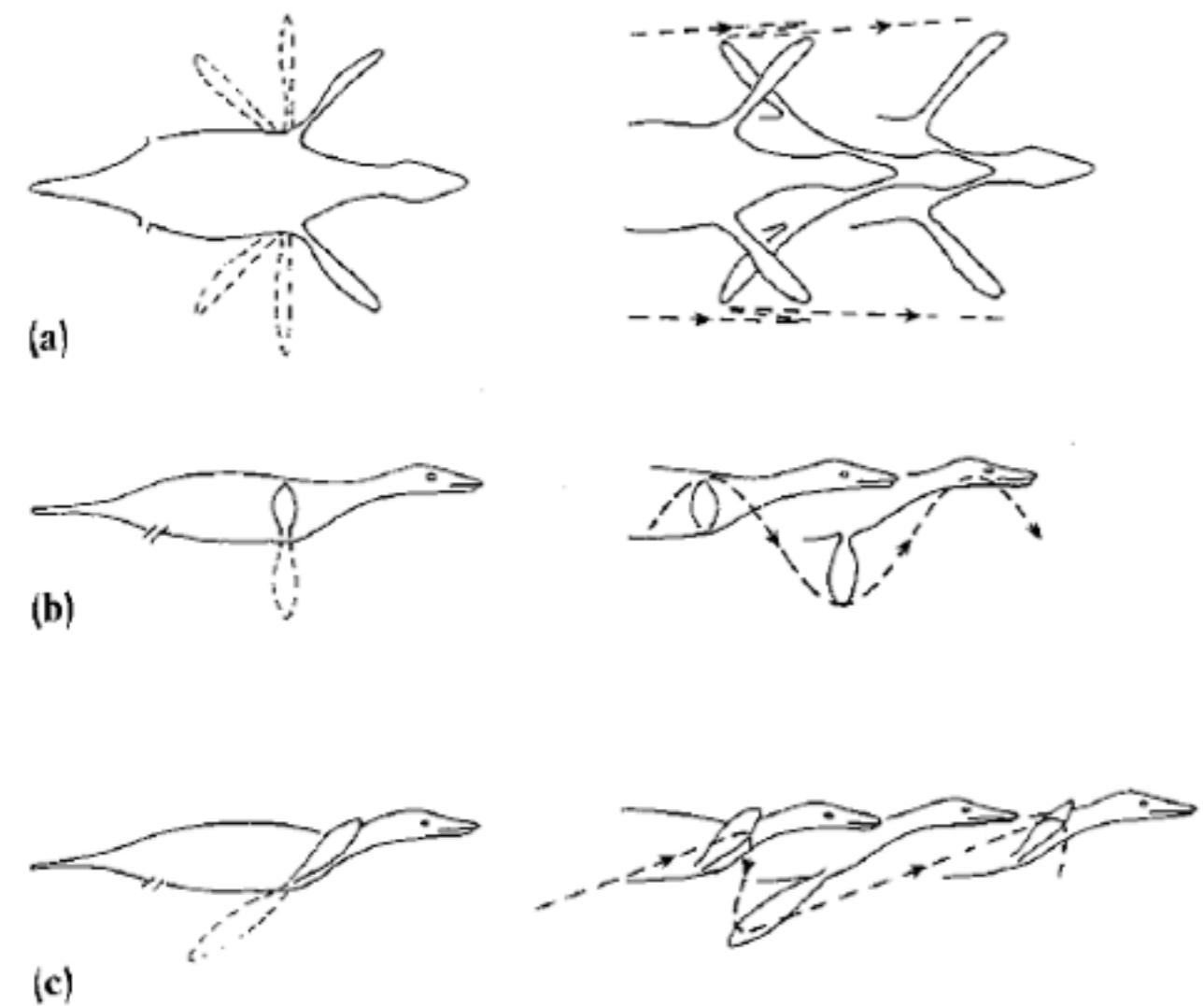


FIGURE 9.6 Three possible swimming techniques for plesiosaurs: (a) rowing; and (b) and (c) underwater flight. The diagrams on the left show how the flippers would have been moved relative to the body and those on the right show successive positions of the animal moving through the water. Only the foreflippers are shown.

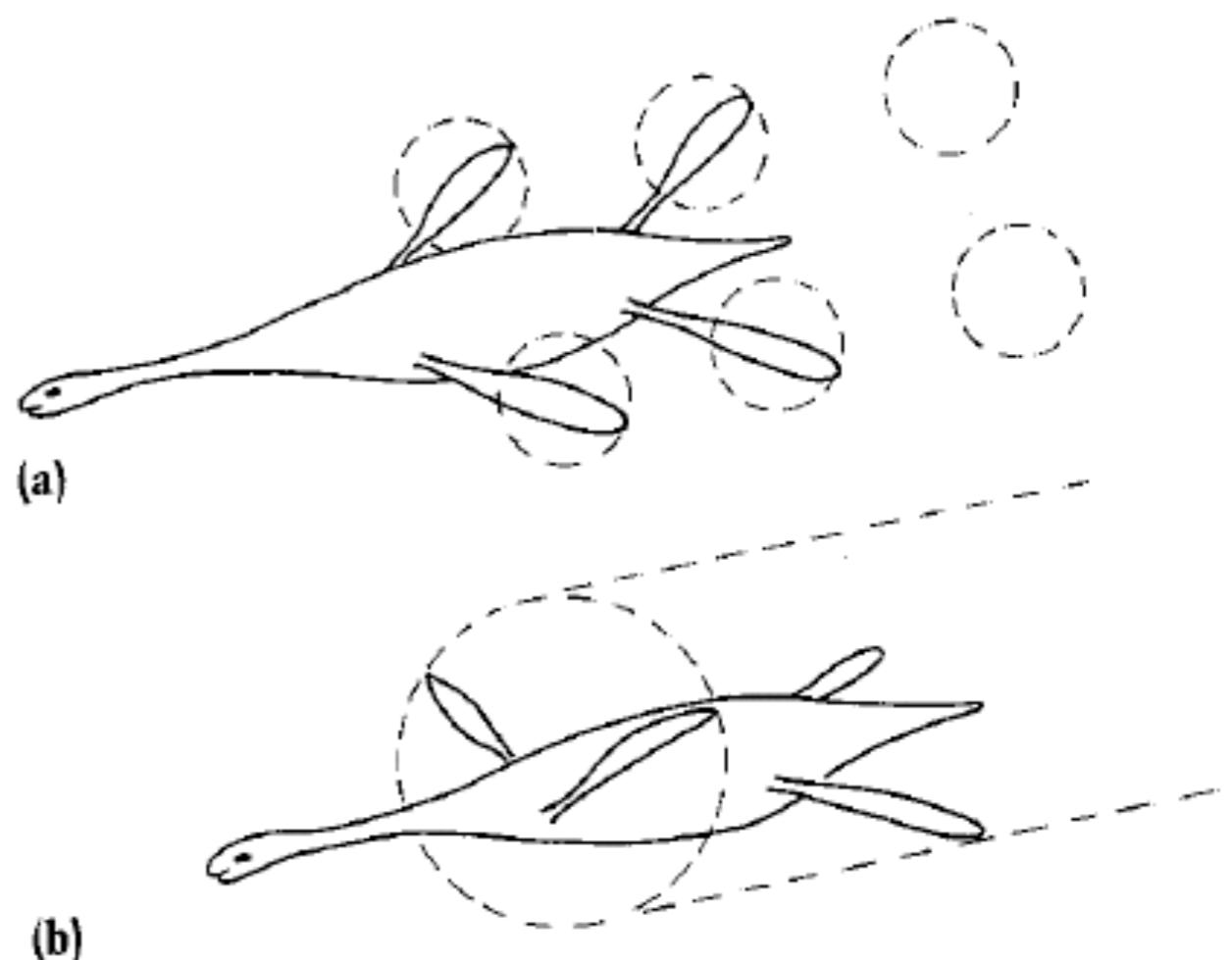
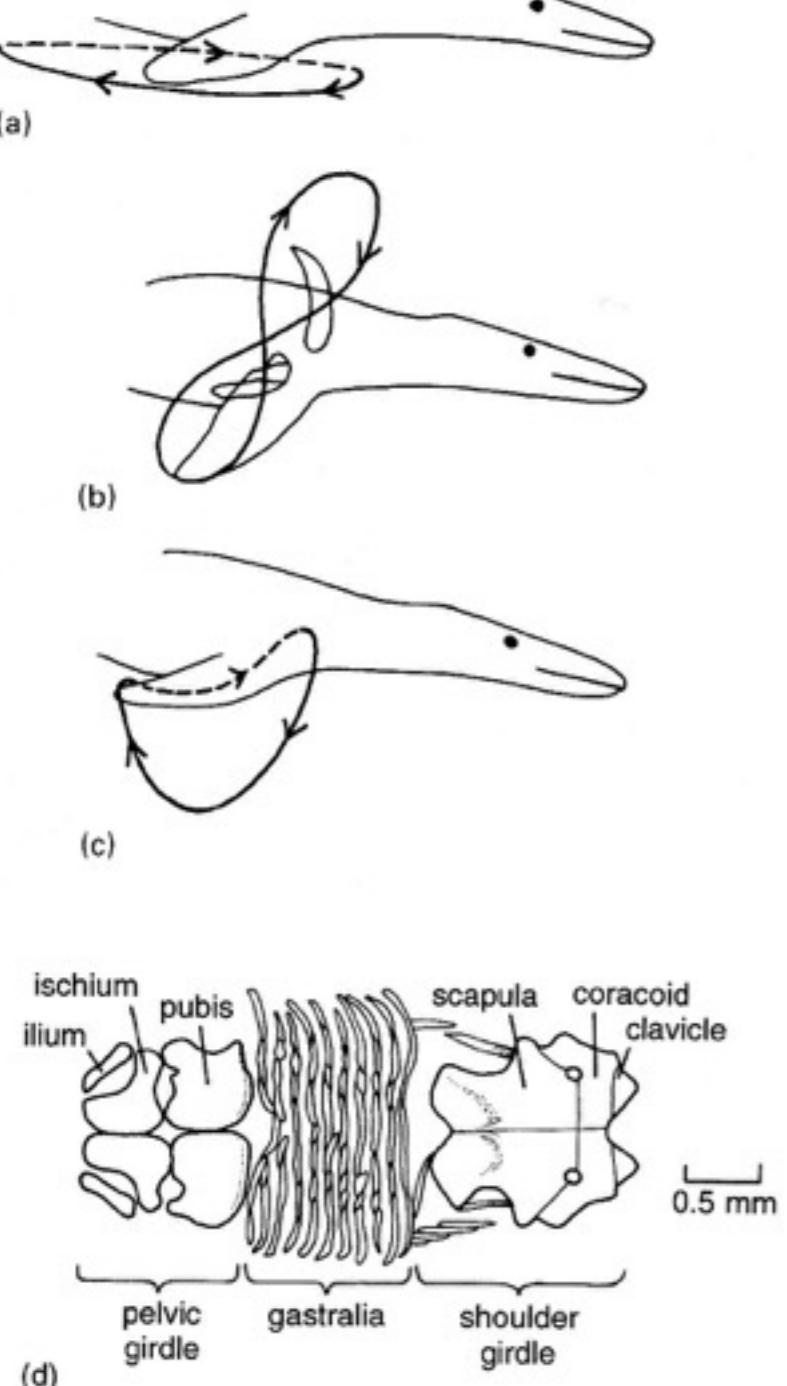
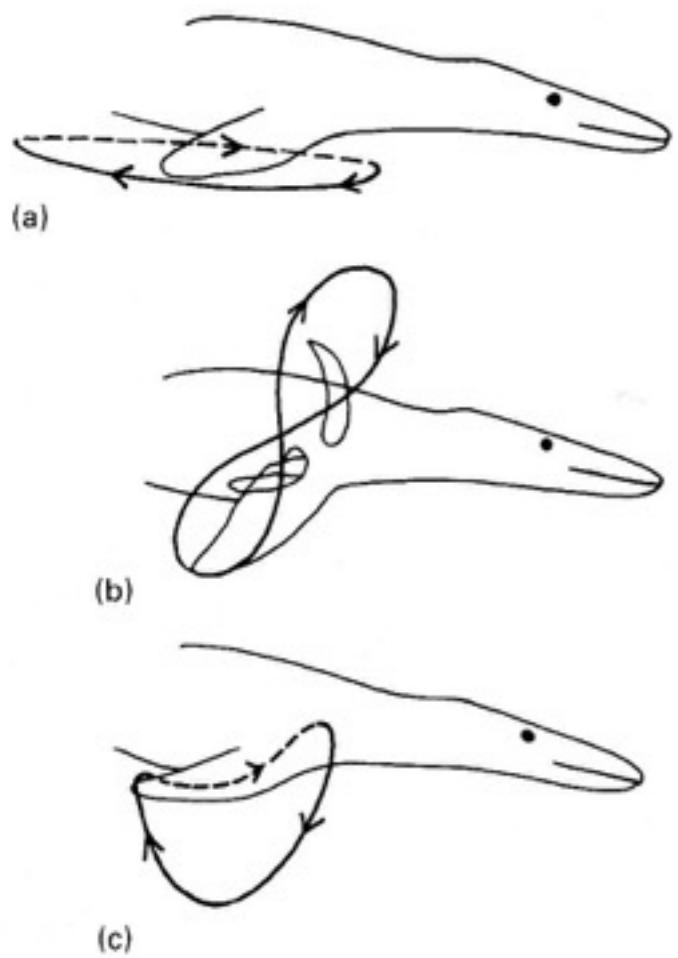


FIGURE 9.8. A plesiosaur (a) rowing and (b) "flying" under water. Broken out lines show the water driven backward by the swimming movements.





Plesiosaur locomotion: (a–c) three hypotheses: (a) rowing underwater like a duck, (b) flying underwater like a penguin, and (c) an intermediate style like a sealion; (d) ventral view of the heavy bony covering of the plesiosaur belly. [Figures (a–c) after Taylor 1986, copyright © 1986 Macmillan Magazines Ltd; (d) after Robinson, 1975.]

Birds

<http://www.youtube.com/watch?v=EahSpvyiFmw&feature=related>

Penguins

<http://www.youtube.com/watch?v=ErIhvelMk0k>

Sea Lions

<http://www.youtube.com/watch?v=br4IPNmfrOY&feature=related>



Plesiosaurs

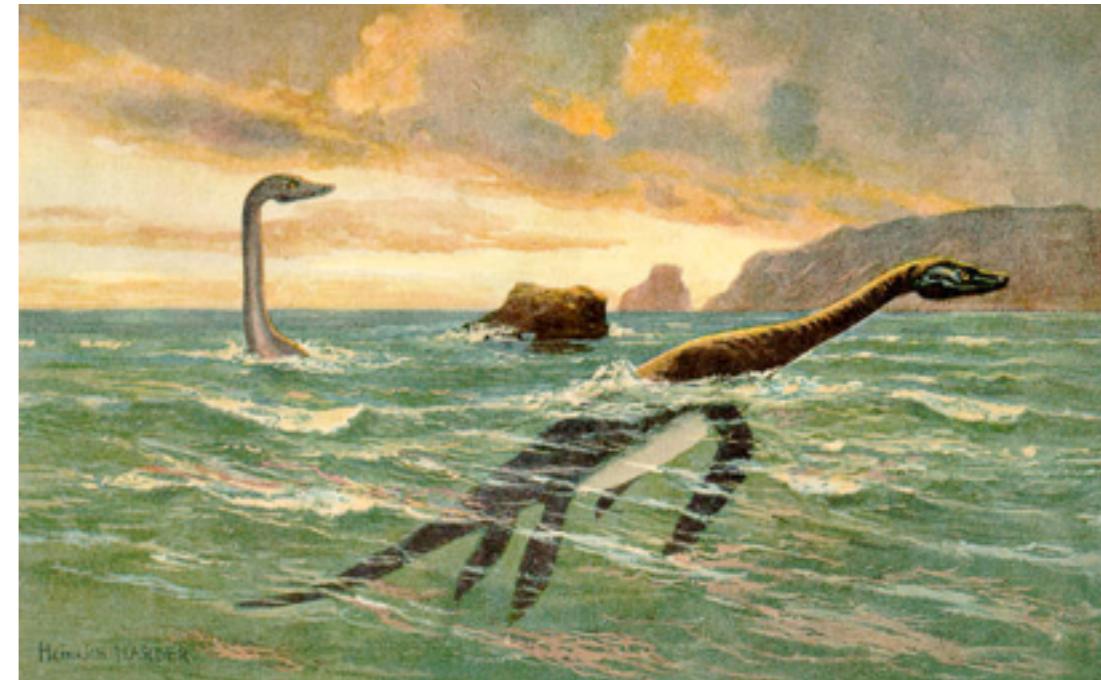
Locomotion

Likely slow swimmers

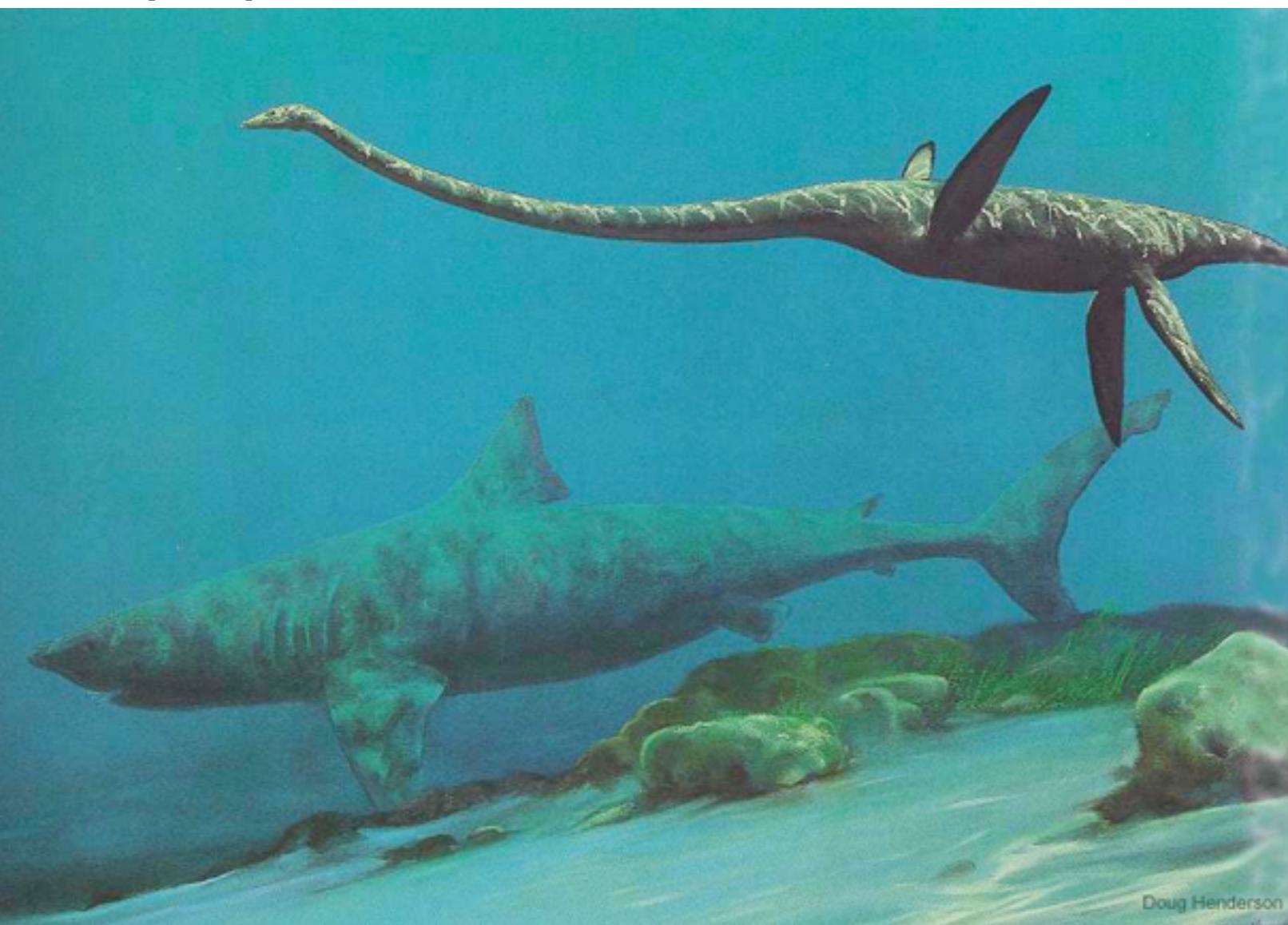
Cruised below the water surface and used long neck to grab prey from below

4-flipper setup would give them an amazing amount of maneuverability

Fins: propulsion



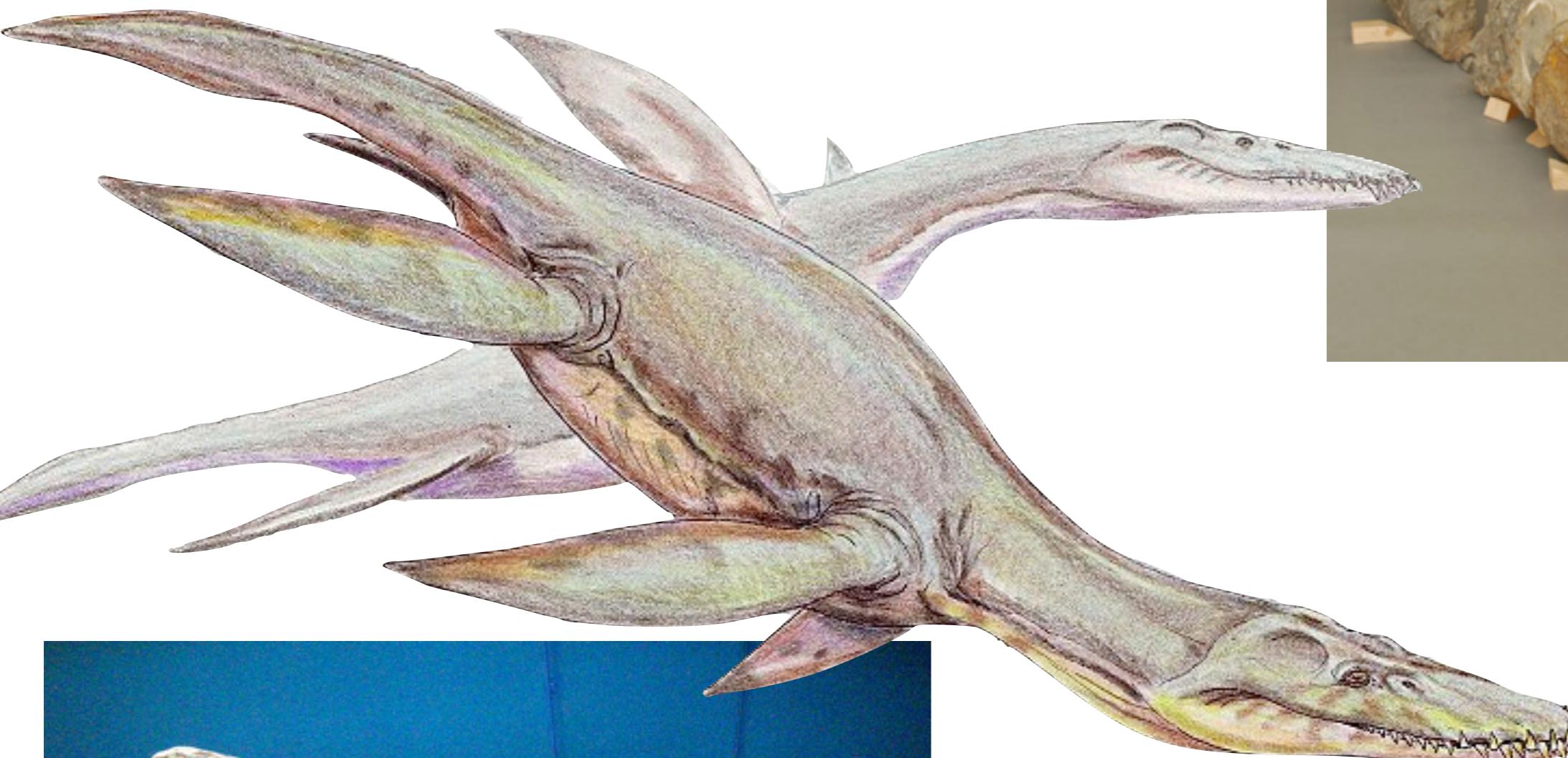
This would have been impossible



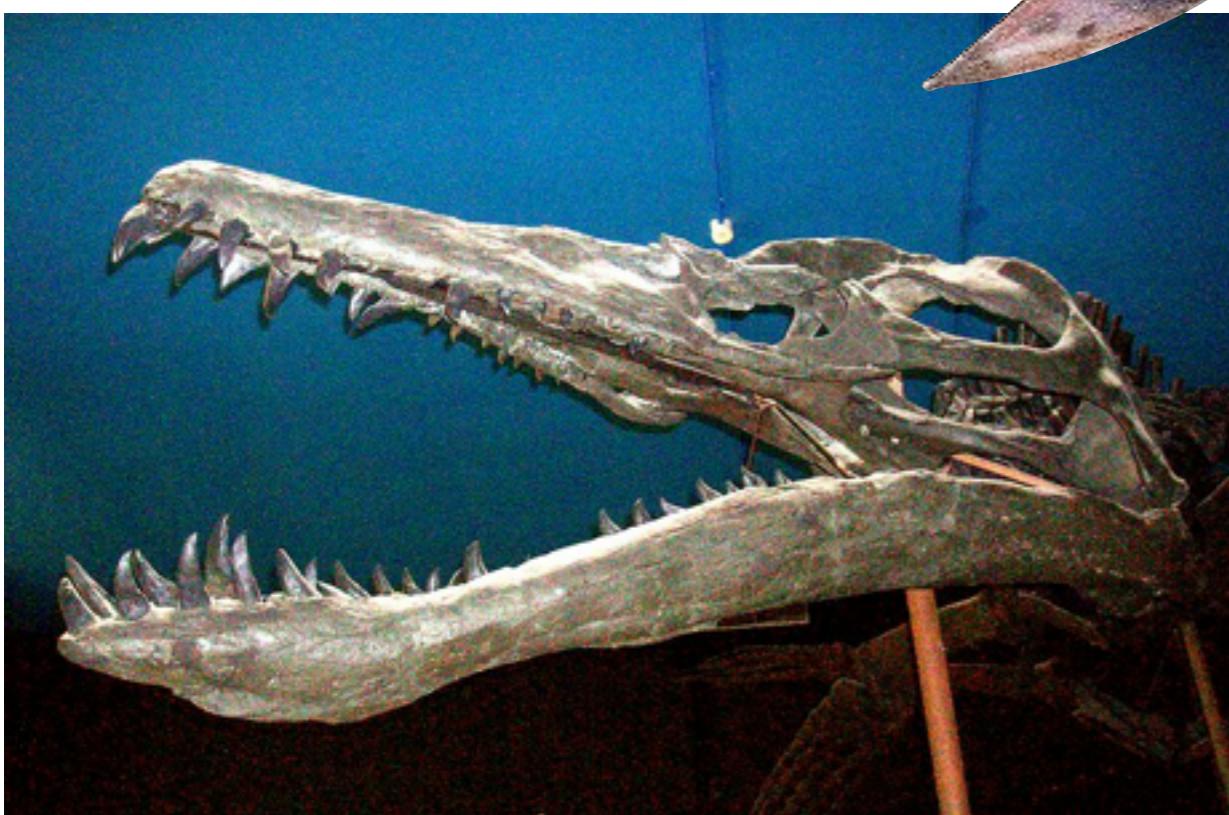
BBC One

Pliosaurs

APEX predators



A Pliosaur jaw



Pliosaurs

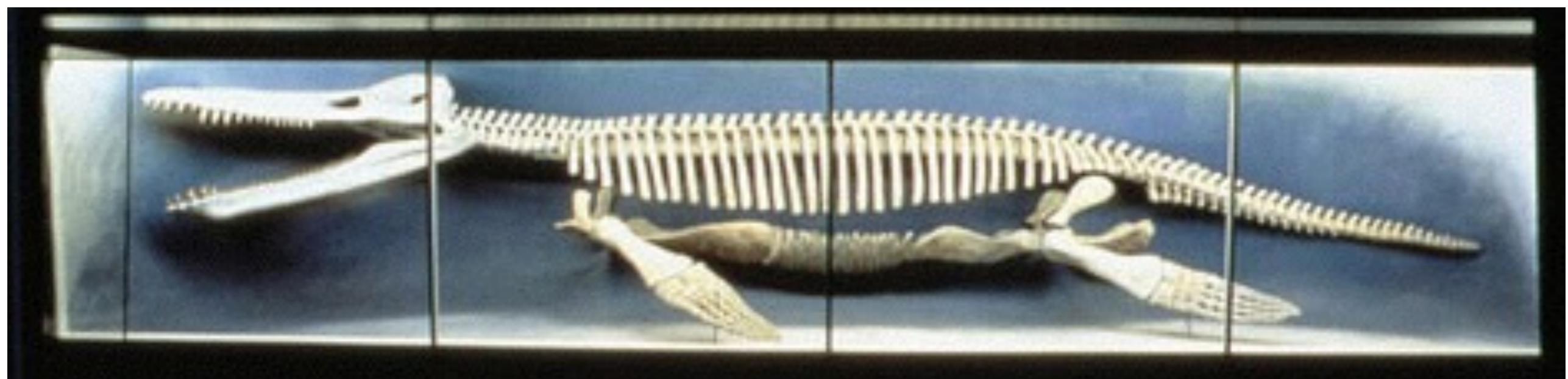
Whales of the Mesozoic!

Up to 40 feet in body length

The skull was 1/3 of this length!

Large and faster than Plesiosaurs

Large, conical teeth

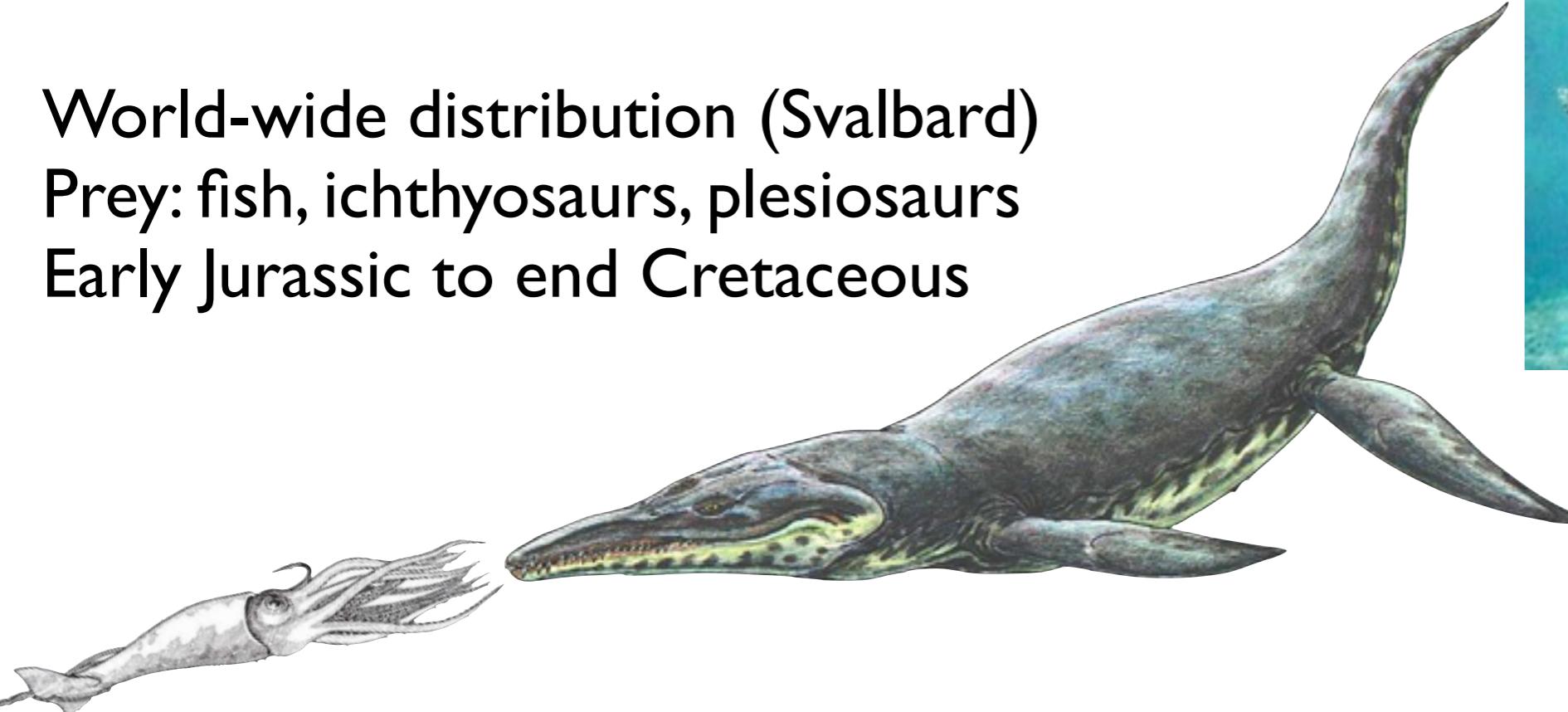
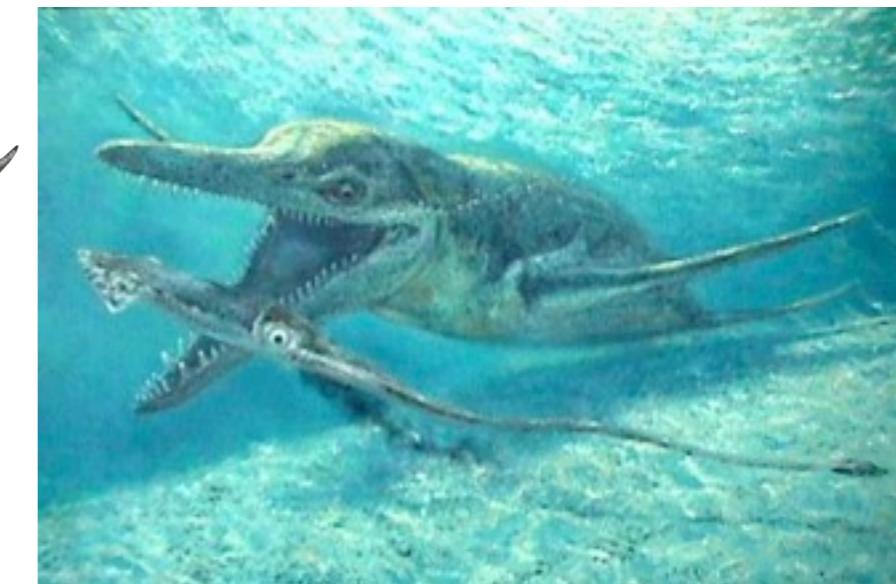


Pliosaurs

World-wide distribution (Svalbard)

Prey: fish, ichthyosaurs, plesiosaurs

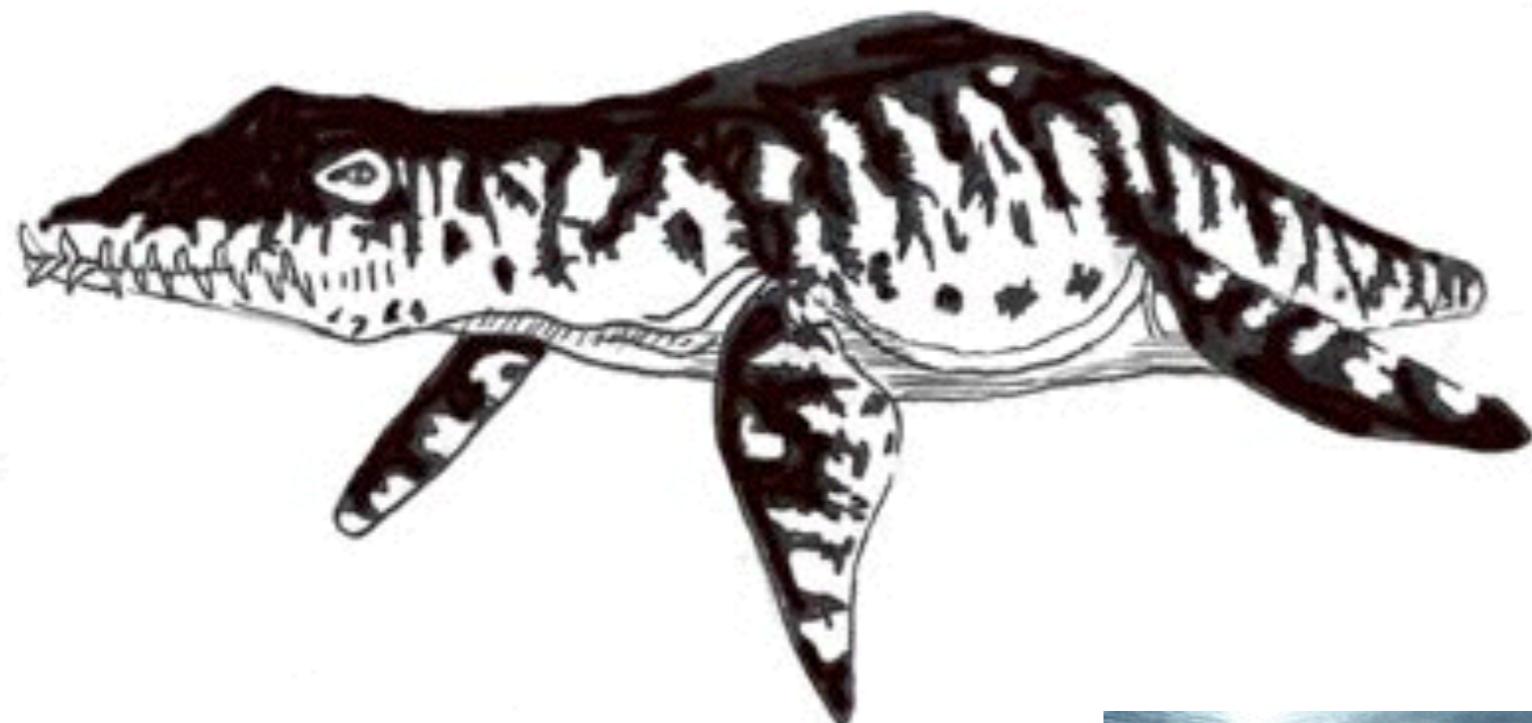
Early Jurassic to end Cretaceous



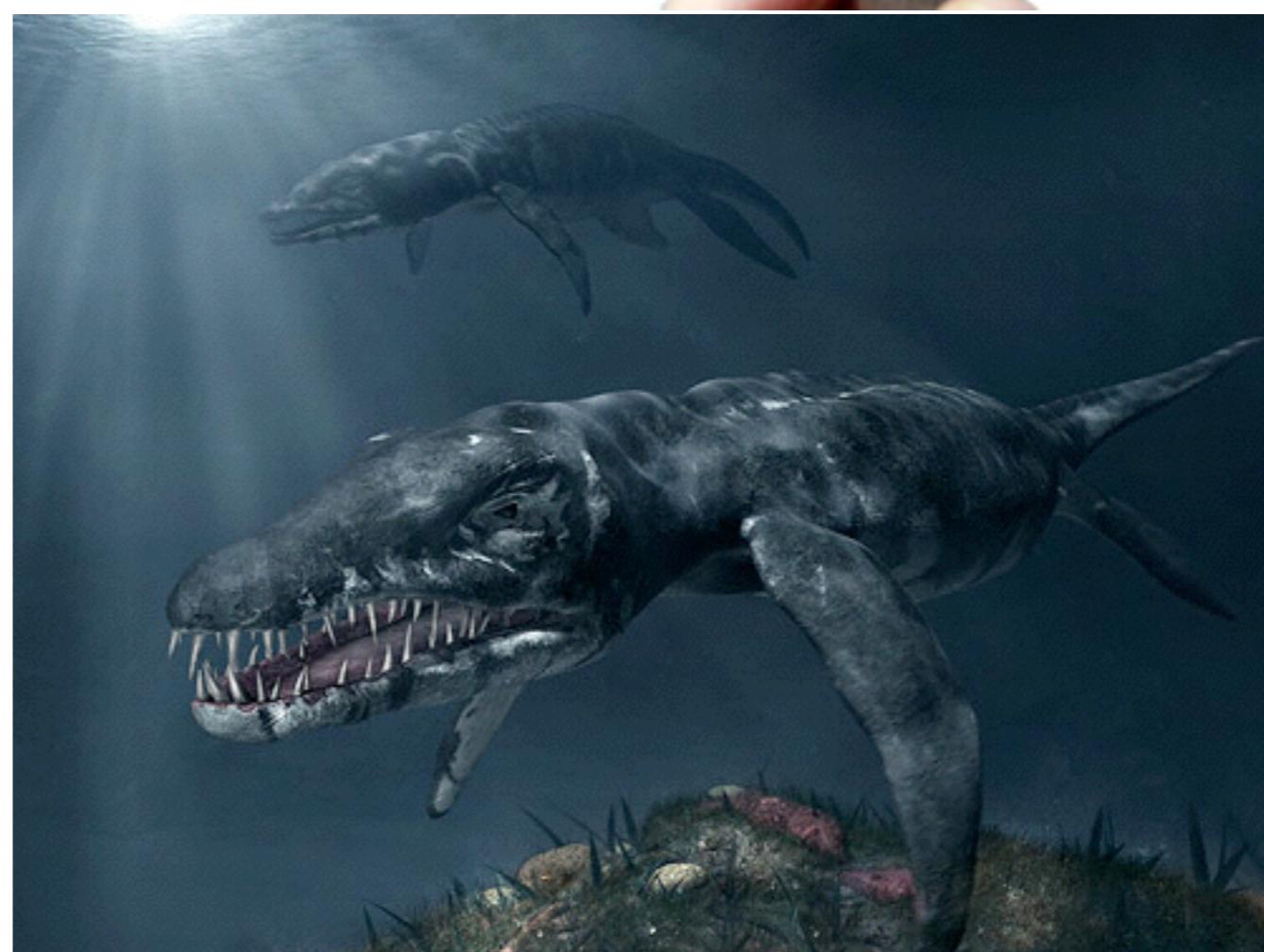
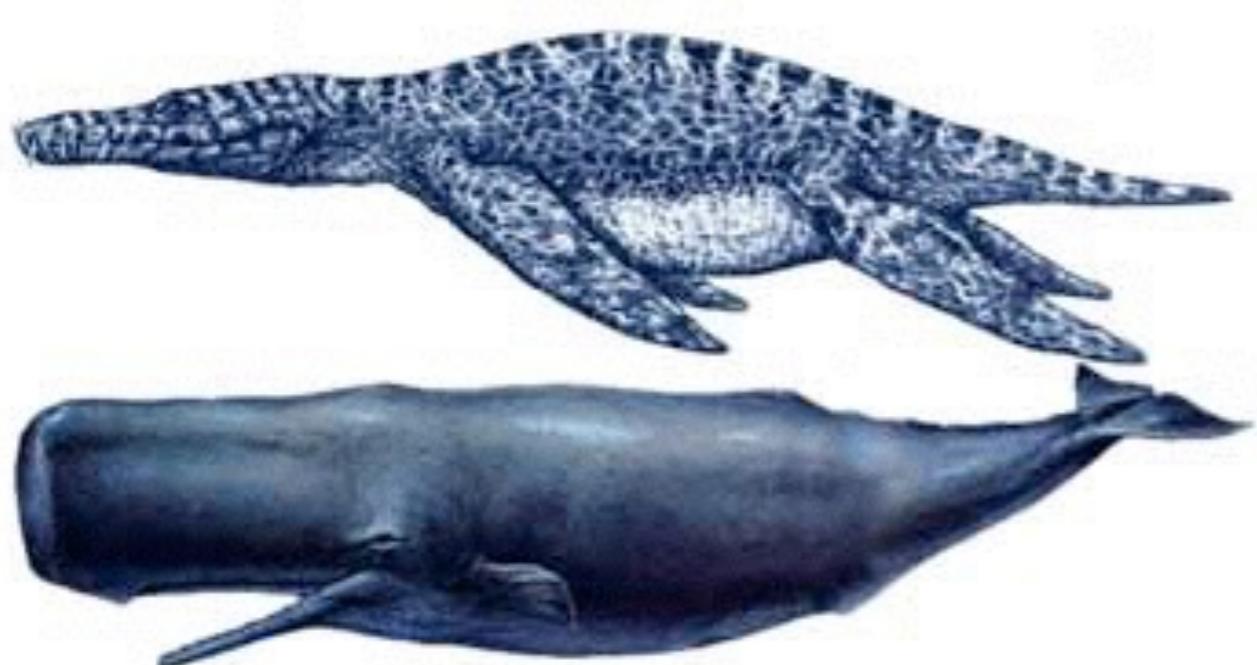
Pliosaurs



Liopleurodon



Serrated Portion.





Art by NGM Art

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Sea Monsters

National Geographic magazine, December 2005

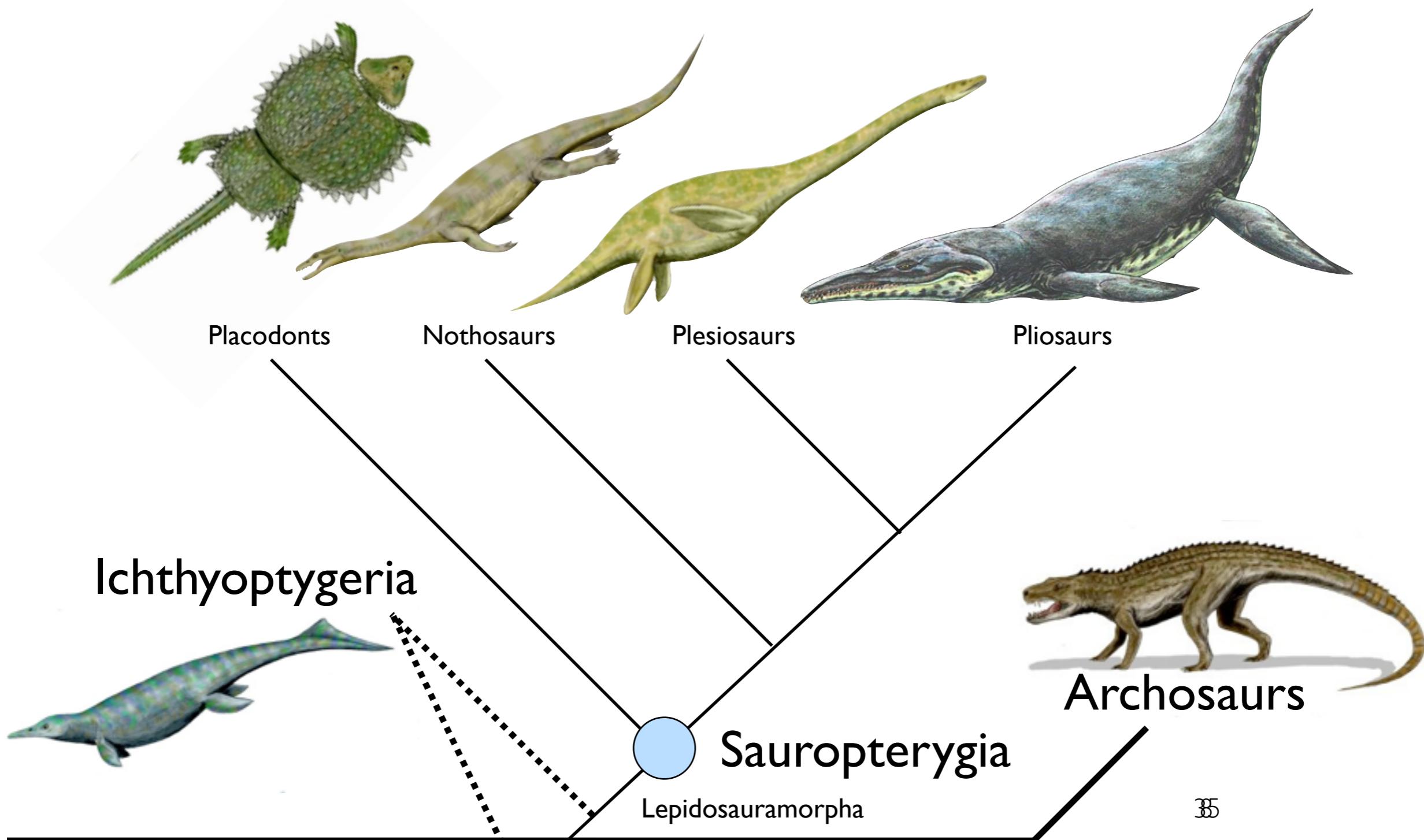


Ichthyosaurs: Basal Lepidosaurs or sister taxa?

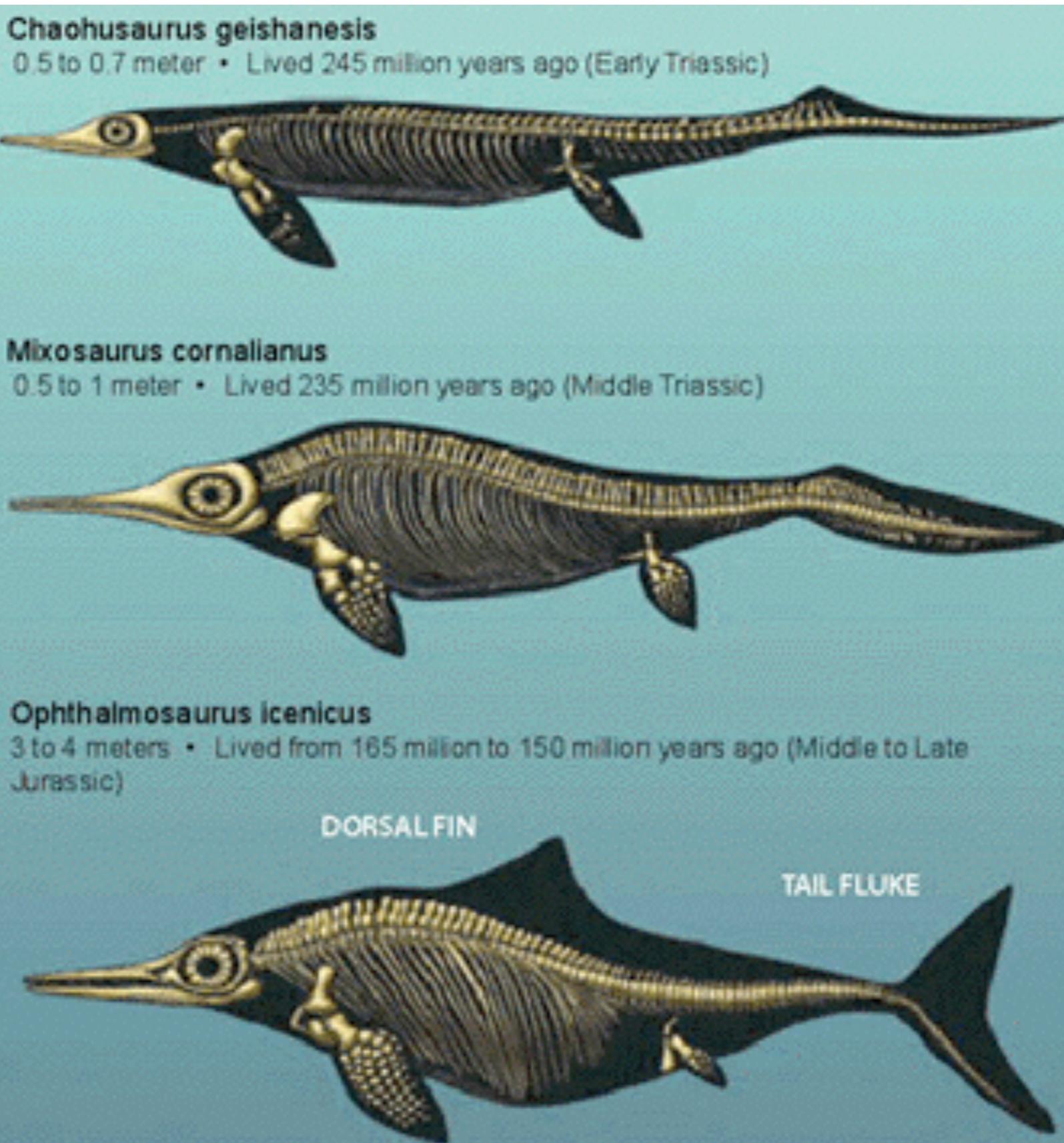
Lepidosaurs

Lepidosauria

Sauroptrygia



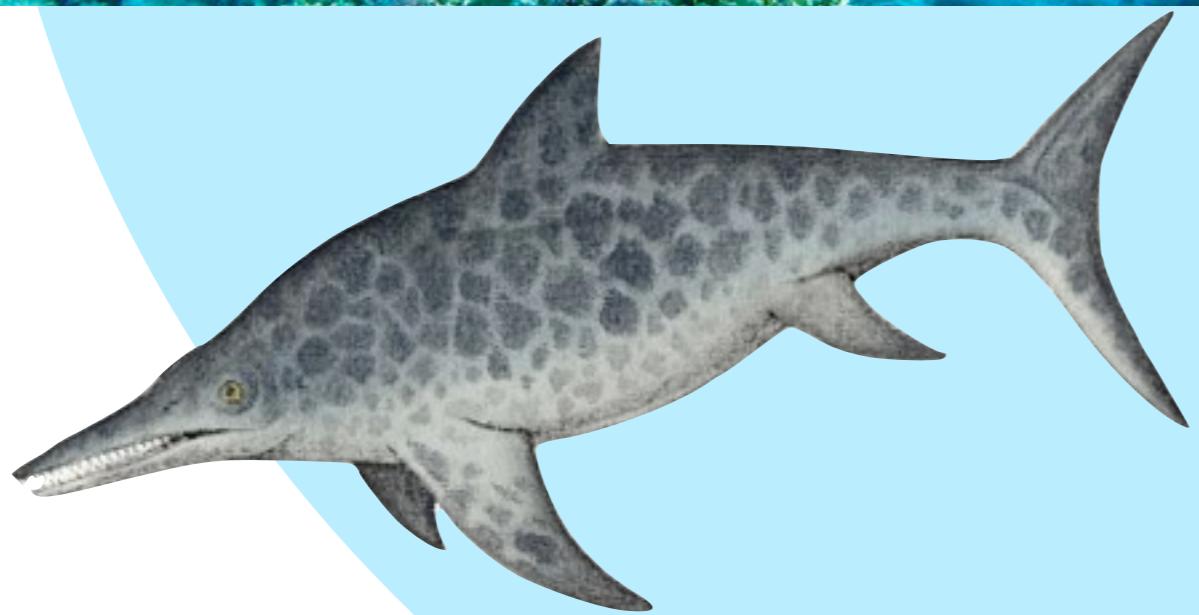
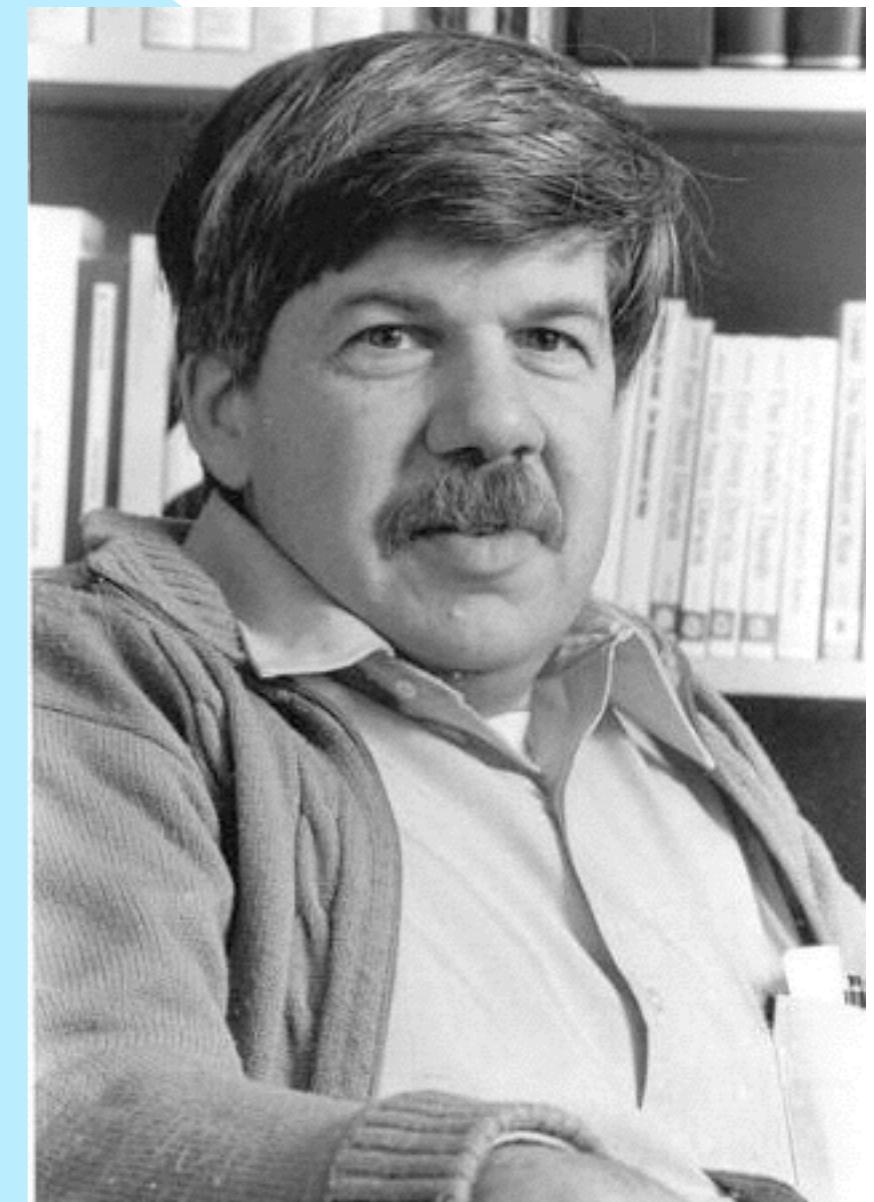
Ichthyosaurs



Early Triassic to Mid Cretaceous



©2009 Tahoe Art on Demand



Convergent Evolution!

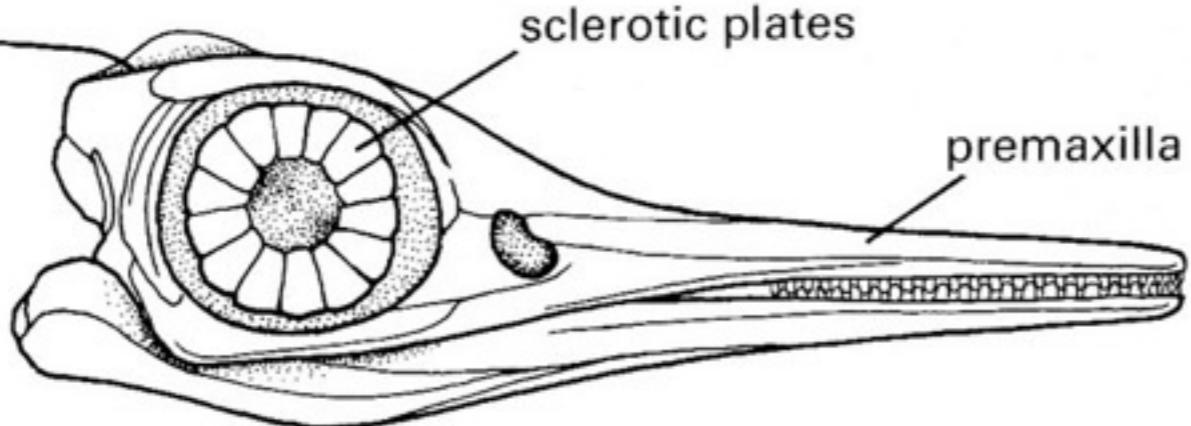
The dorsal fin evolved in exactly the right place for maximal hydrodynamic efficiency in fish, ichthyosaurs, & dolphins... the power of selection

Ichthyosaurs

upper
temporal
opening

100 mm

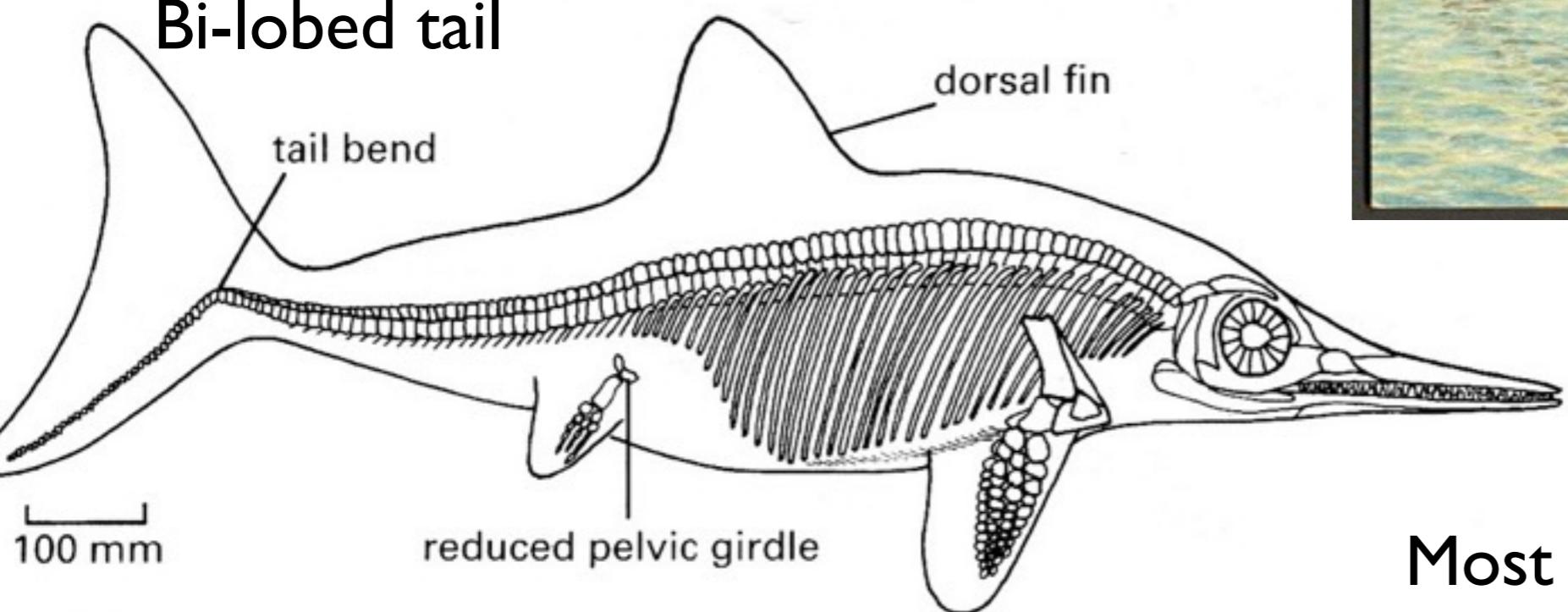
(a)



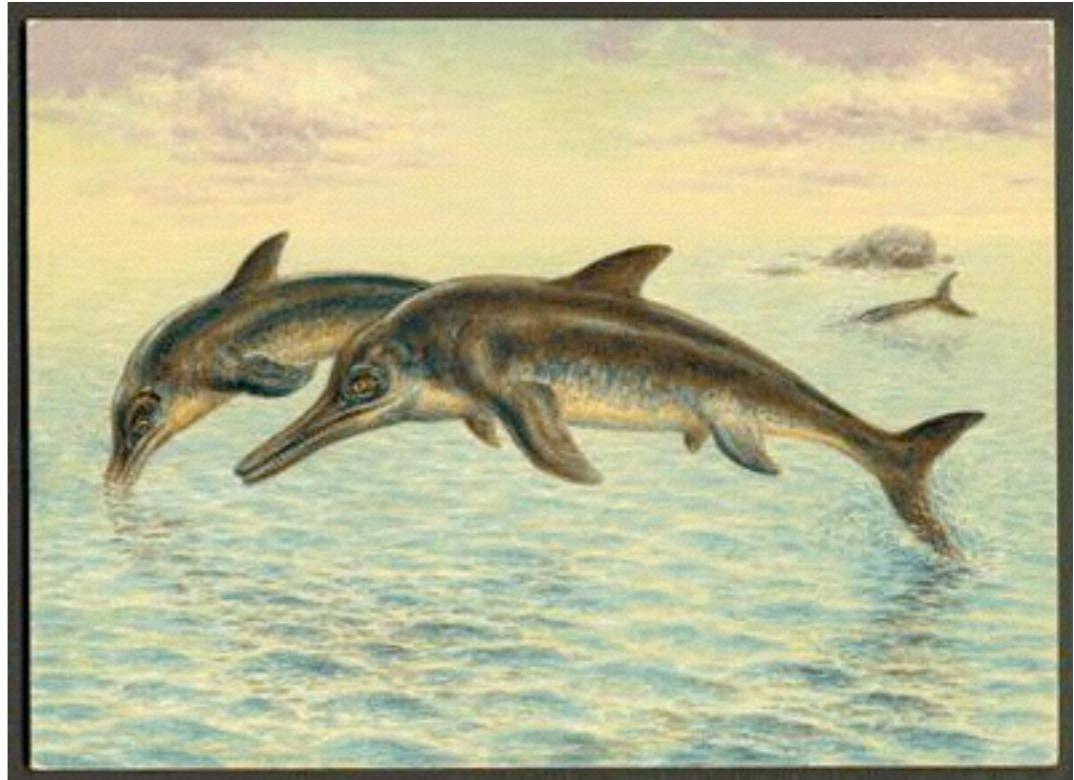
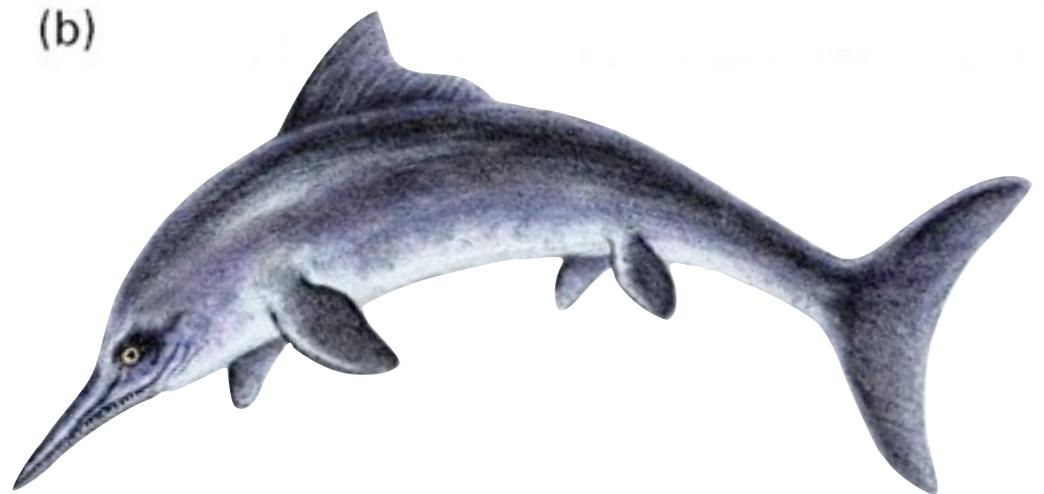
Bi-lobed tail

tail bend

dorsal fin



(b)



Attributes:

Most ‘fish-like’ marine reptile

Earlier forms had longer bodies

Cretaceous forms are more dolphin-like

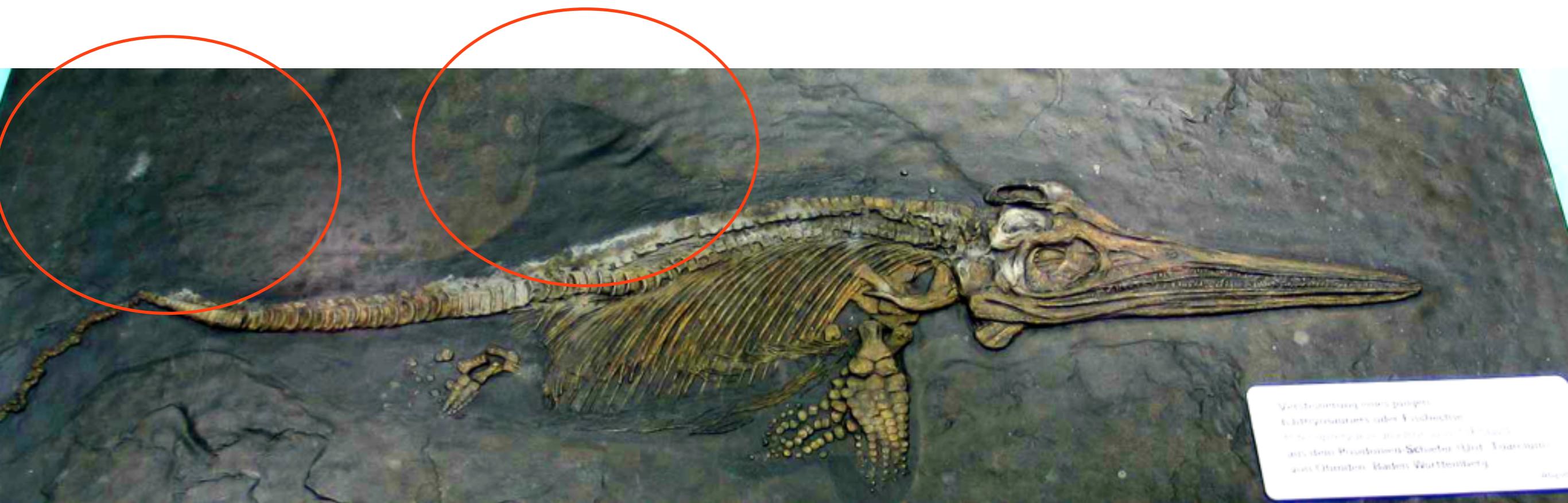
Up to 50 ft in length!

Forelimbs modified into flippers

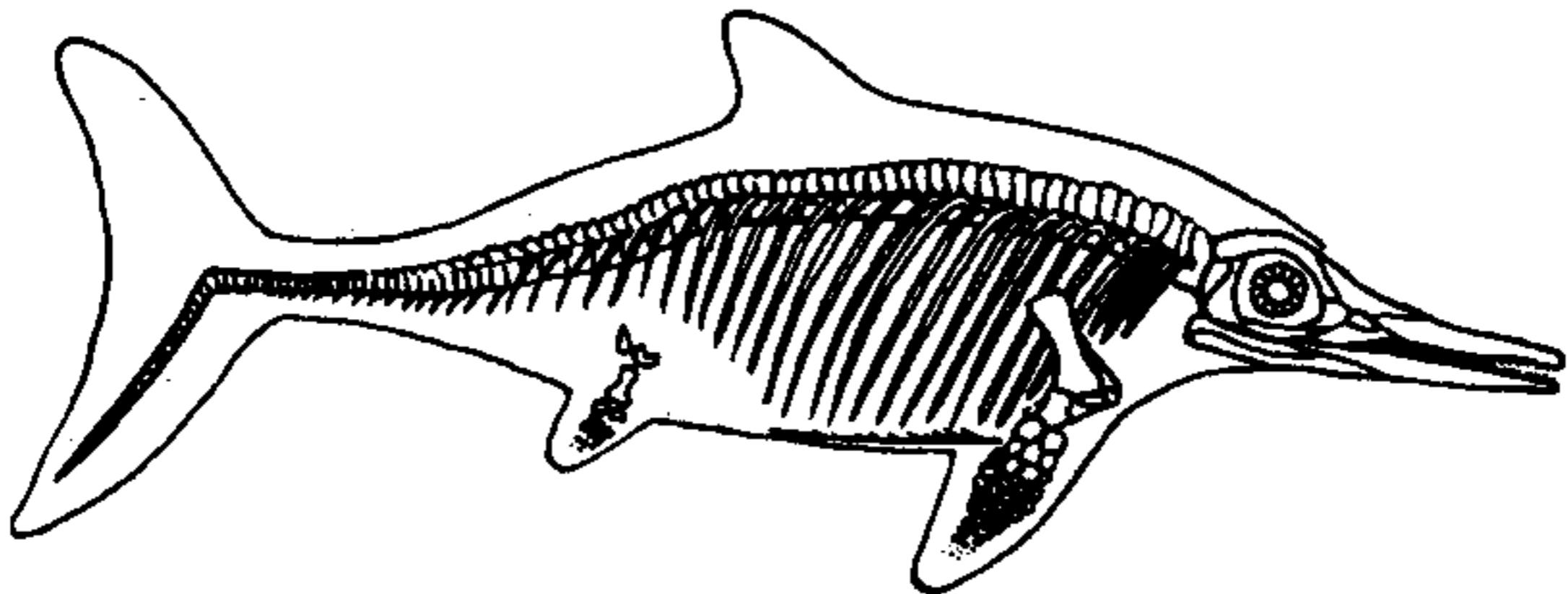
Reduced hindlimbs, reduced pelvic girdle³⁹

Ventrally-tipped tail and dorsal fin

Fossil evidence for soft anatomy: Germany



Mit dem Fund eines plesiosaurierartigen
Kopfrostrum aus einer Kalksteinlage
aus dem Unteren Jura der Stadt Wittenberg
wurde ein neuer Plesiosaurier-Spezies entdeckt.
Foto: Christiane Harten, Naturkundemuseum
Wittenberg



Attributes:

World-wide distribution

Specialized pursuit predators

Likely a very similar ecology as modern dolphins

Fins were not used for propulsion, but for directional control & stability



2 main styles of locomotion:

I. Slow-moving, ambush predators

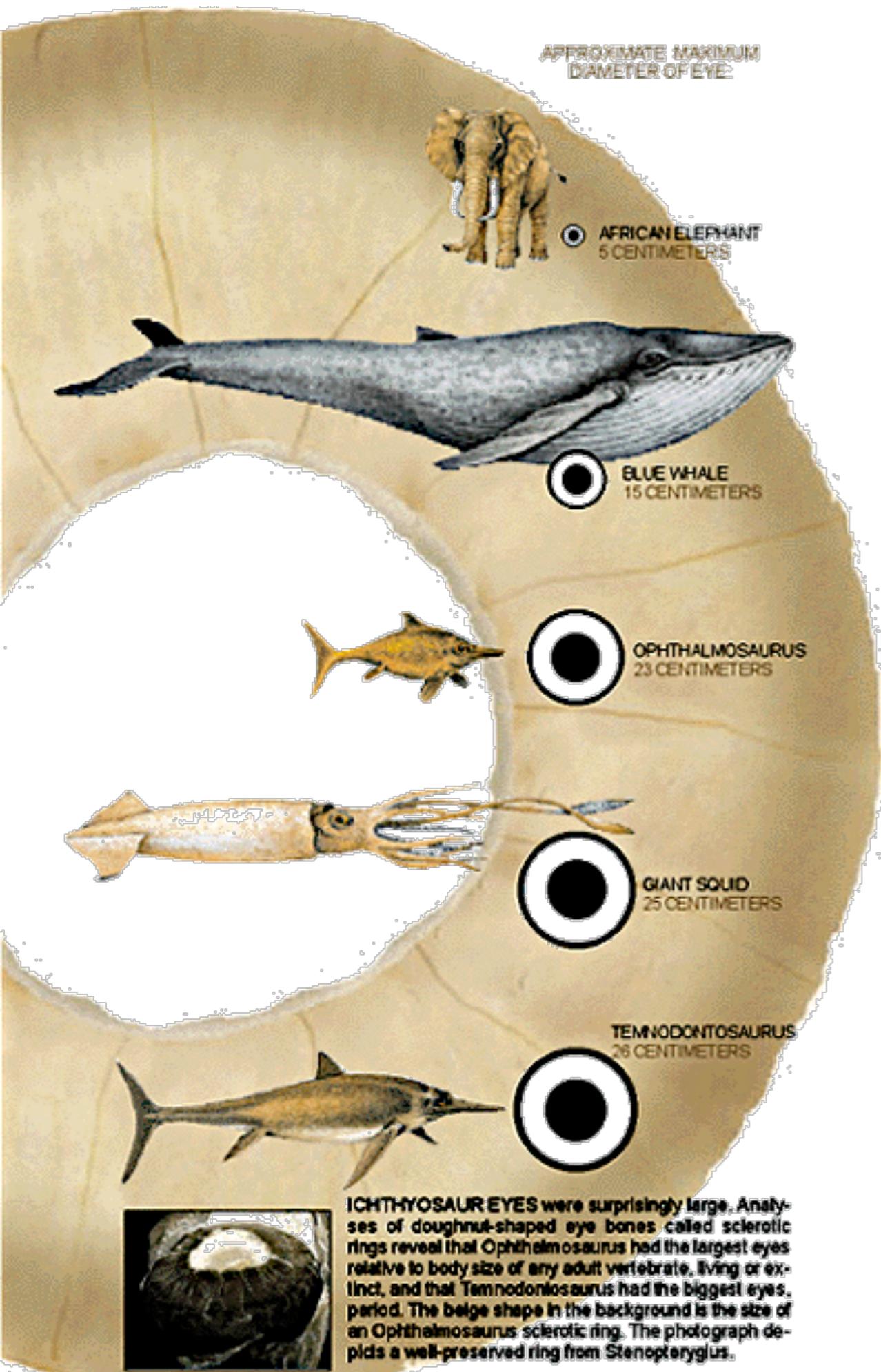


2. Fast-moving pursuit predators
up to 25 mph





Their similarity with tuna, dolphins, suggests that they occupied a similar ecological niche. This has led some people to believe that they could have been endothermic (Tuna are also endothermic)



Ichthyosaur EYES

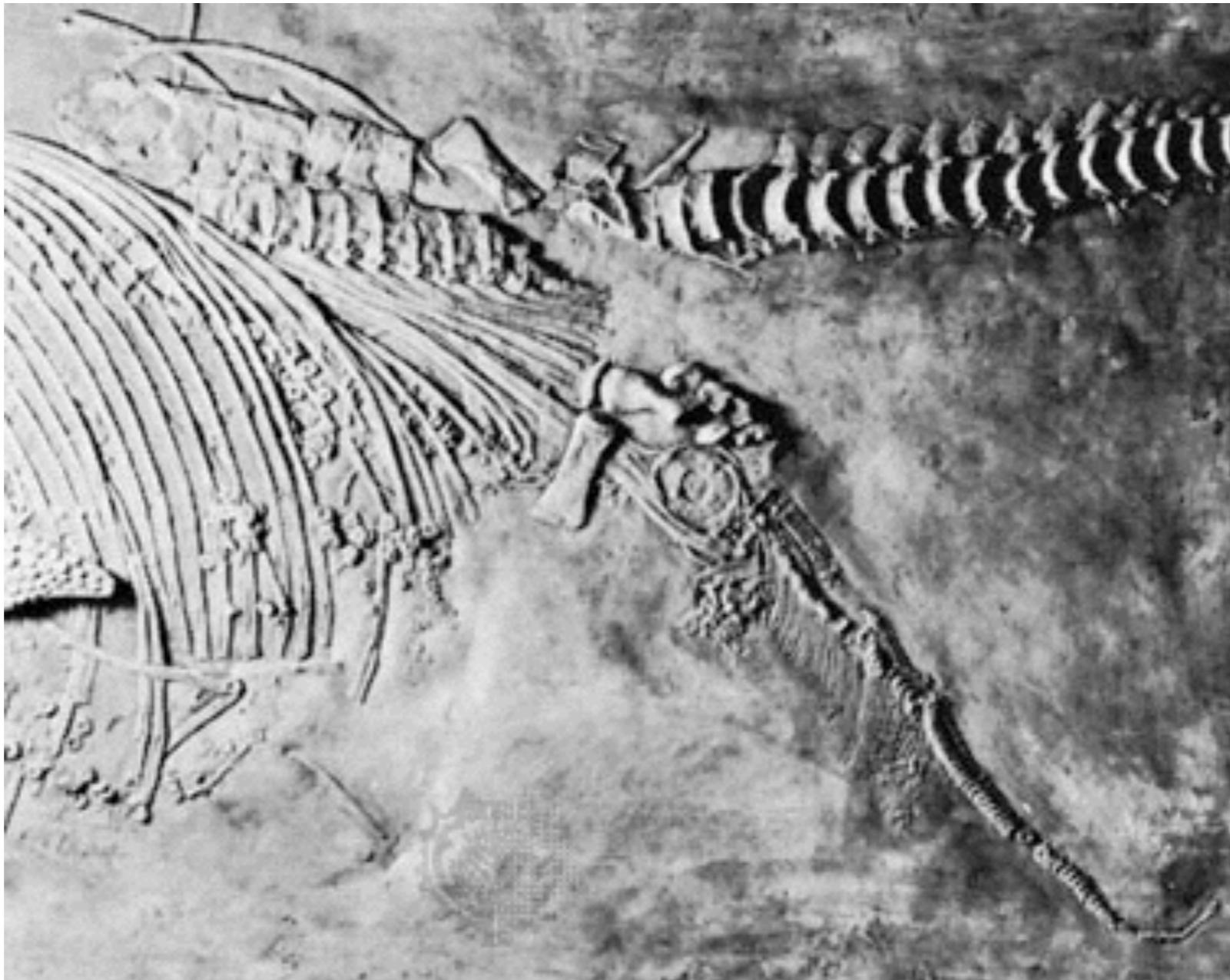
- Largest eyes of any animal
- Eyes are sized by measuring the sclerotic rings
- Large eyes are needed for hunting prey at great depths~ probably similar to elephant seals and sperm whales



Ichthyosaur Reproduction

Although they evolved from egg-laying ancestors, Ichthyosaurs were **Viviporous** (gave birth to live young)

A divorce from the mainland was inevitable, given their marine adaptations



Young were born tail-first, similar to modern whales!

Temnodontosaurus: the largest Ichthyosaur

