

# Mesozoic



## Conodonts — end Triassic **extinction**.

### Actinopterygii

In **Triassic Holostei** domination. In **Jurassic** expansion of **Teleostei** which become the dominant Fish group. Other groups of actinopterygii retreat. In Cretaceous e.g. Paleoniscida become extinct.

#### Actinopterygii

Chondrostei — dominant late Paleozoic fish group

Holostei- dominant in Triassic

Teleostei- dominant since Jurassic

**Sharks** — In Triassic important hybodonts, button-like teeth, crushing of bivalve test. In Jurassic expansion. And modern families appear. In Cretaceous 12 of 16 recent families. *Cretoxyrhina* was one the largest sharks of its time, reaching lengths of up to 7 metres (23 ft)<sup>[4]</sup> and was a chief predator in its ecosystem, preying on a variety of marine animals, including marine reptiles like mosasaurs and plesiosaurs, and other large fish

Tertiary — *Carcharodon megalodon* — 20m.

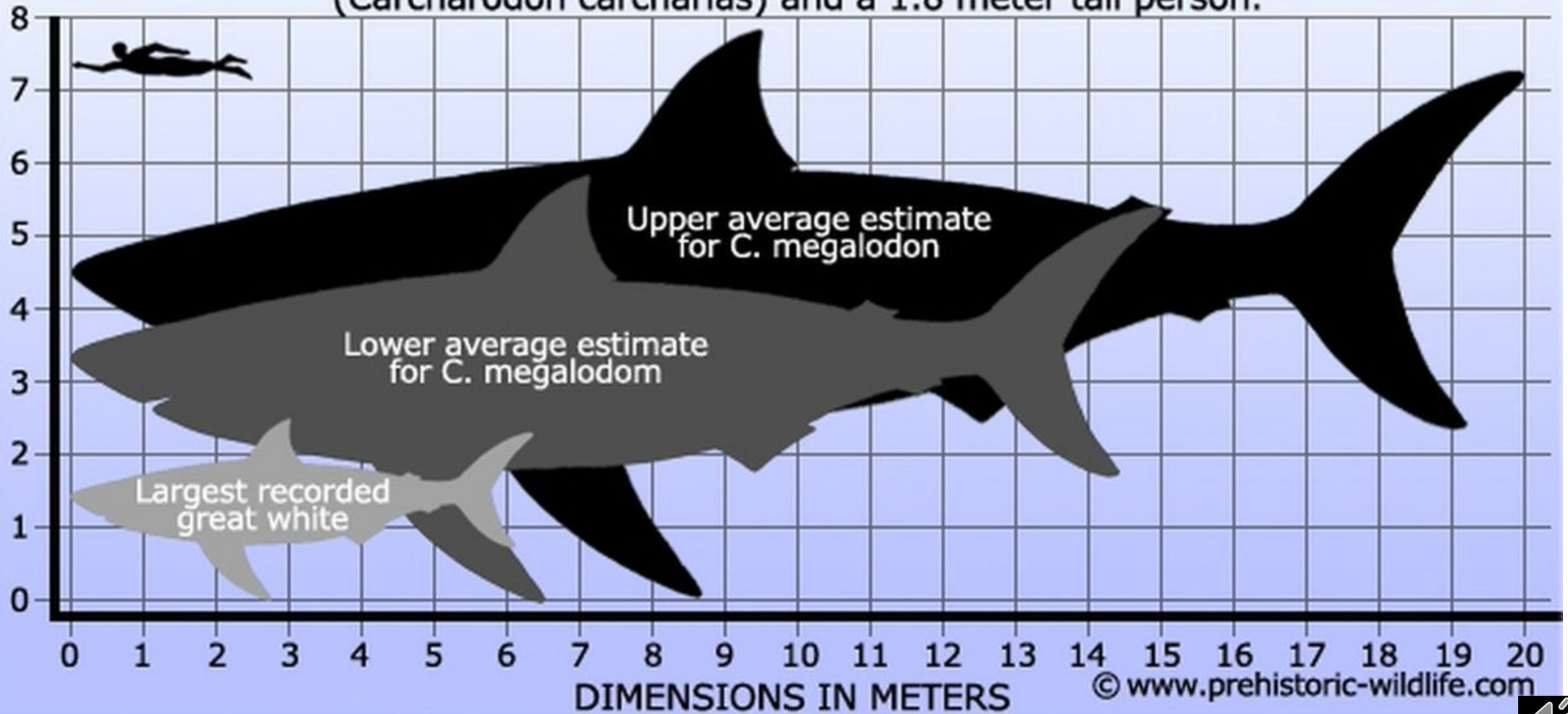
Megalodon byl v kompetičním vztahu s kytovci lovcími jiné velryby, kteří možná přispěli k jeho vyhynutí. Vzhledem k tomu, že žil primárně v teplých vodách, za jeho vyhynutí mohl i nástup ledové doby či ochlazení oceánů.

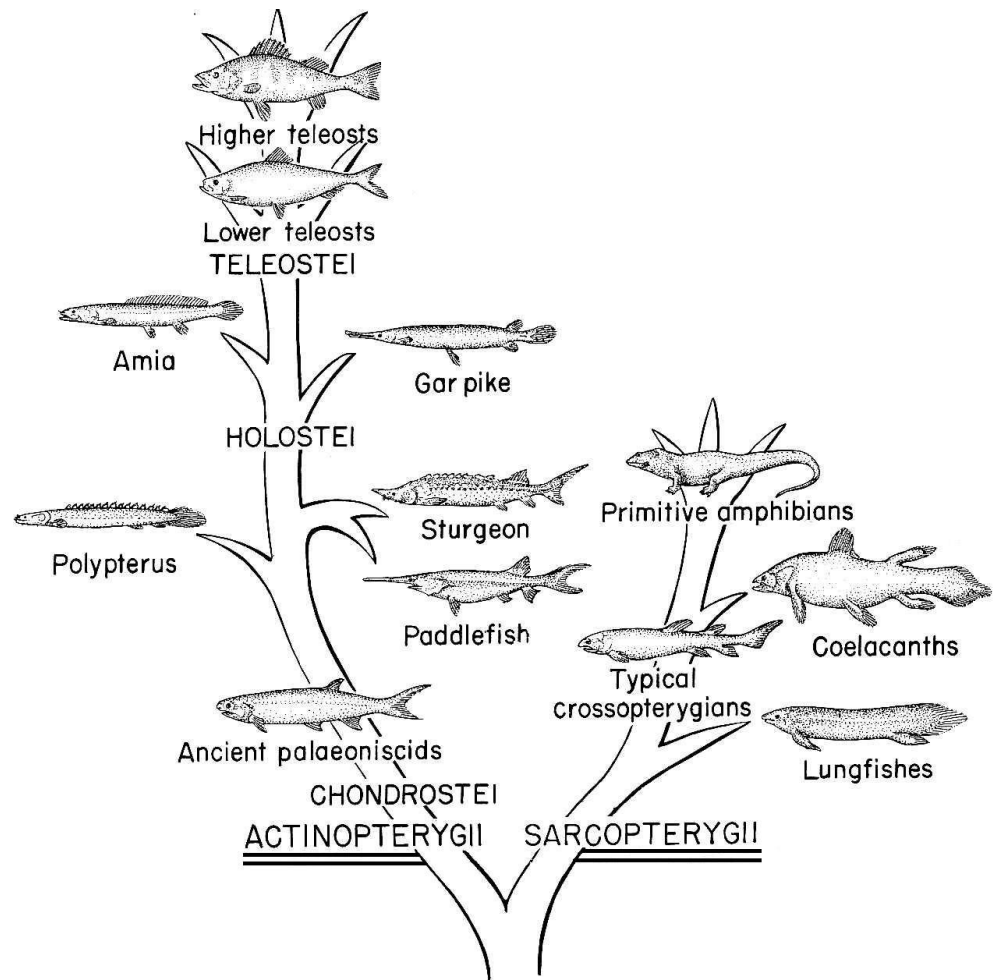
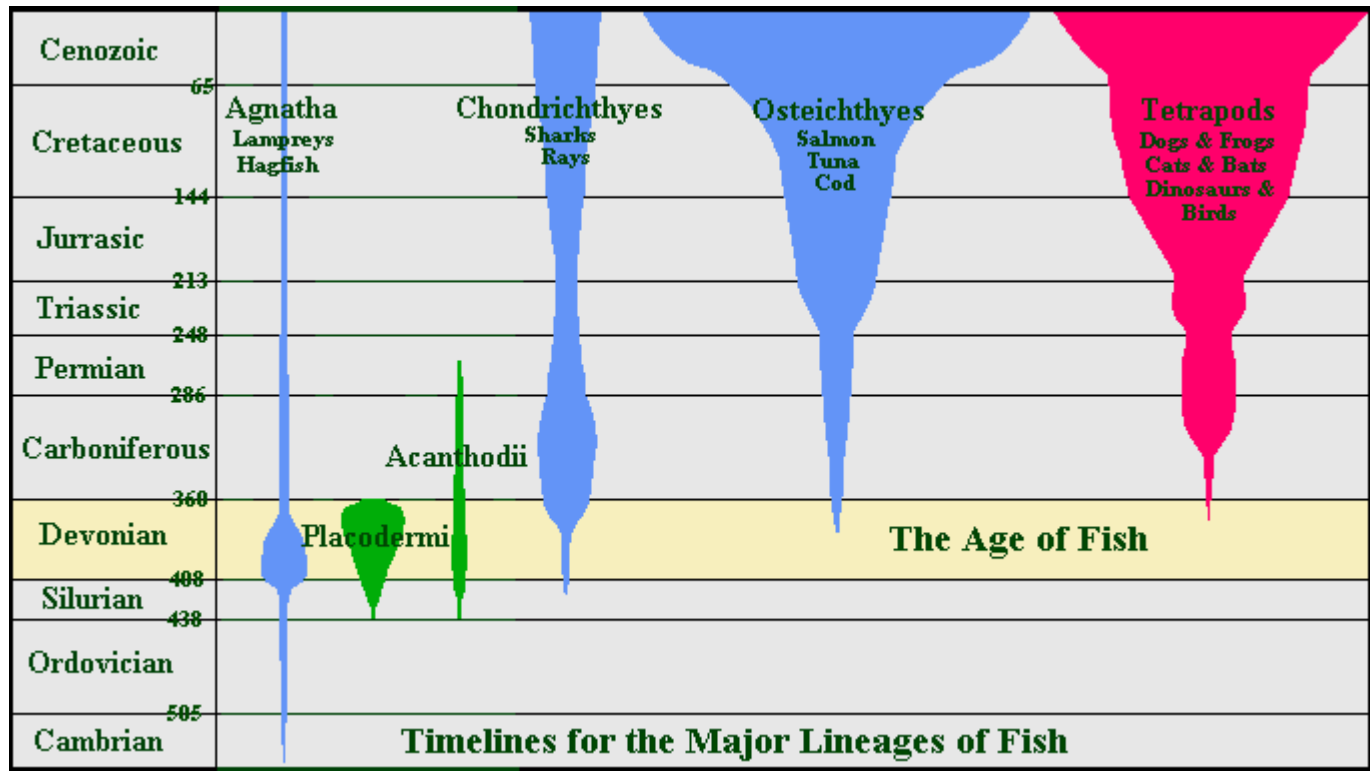
**Crossopterygii, Dipnoi** — Triassic last system in which higher representation

Today — „living fossils“



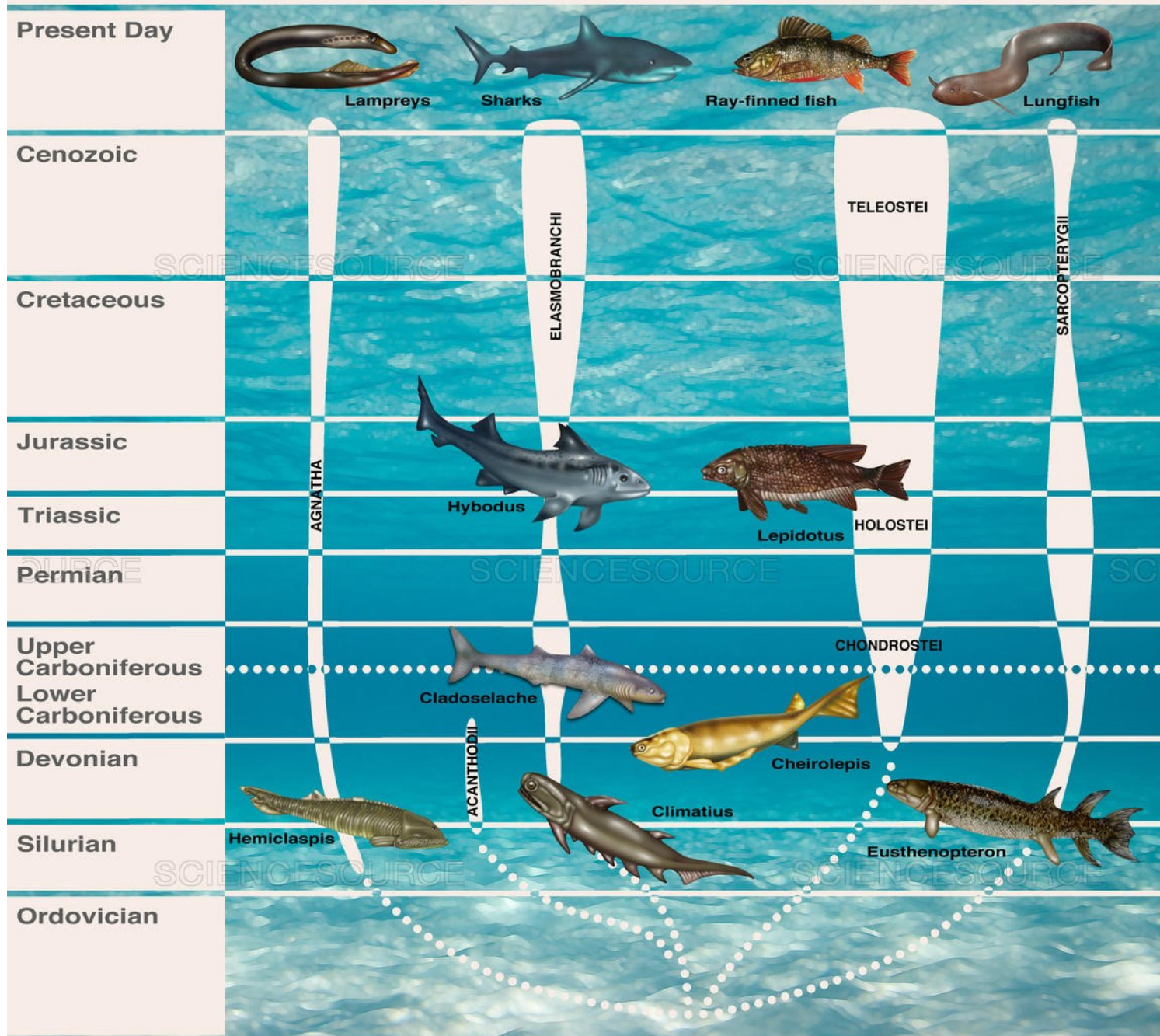
Estimates for *C. megalodon* compared with the largest recorded great white shark (*Carcharodon carcharias*) and a 1.8 meter tall person.

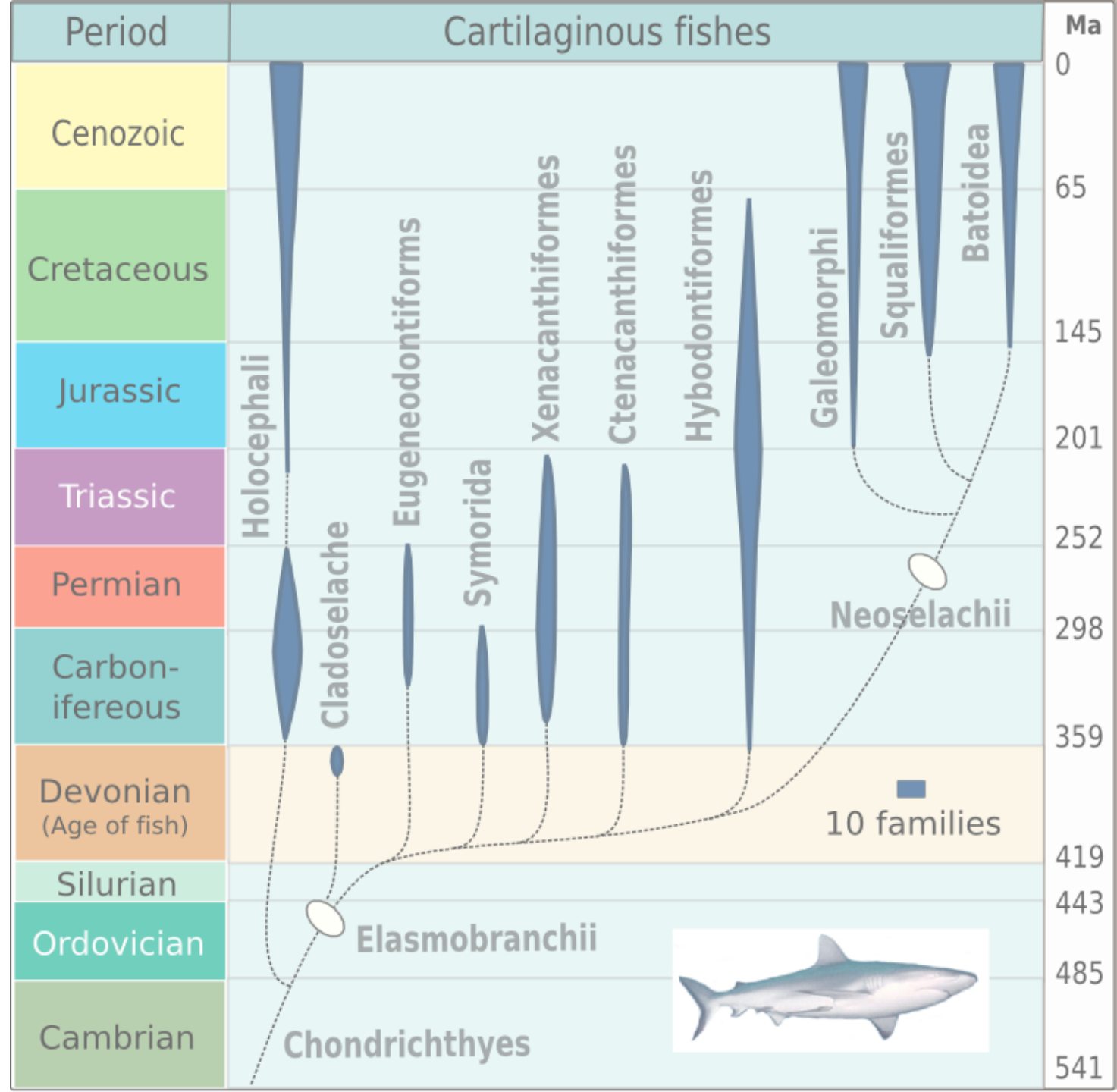


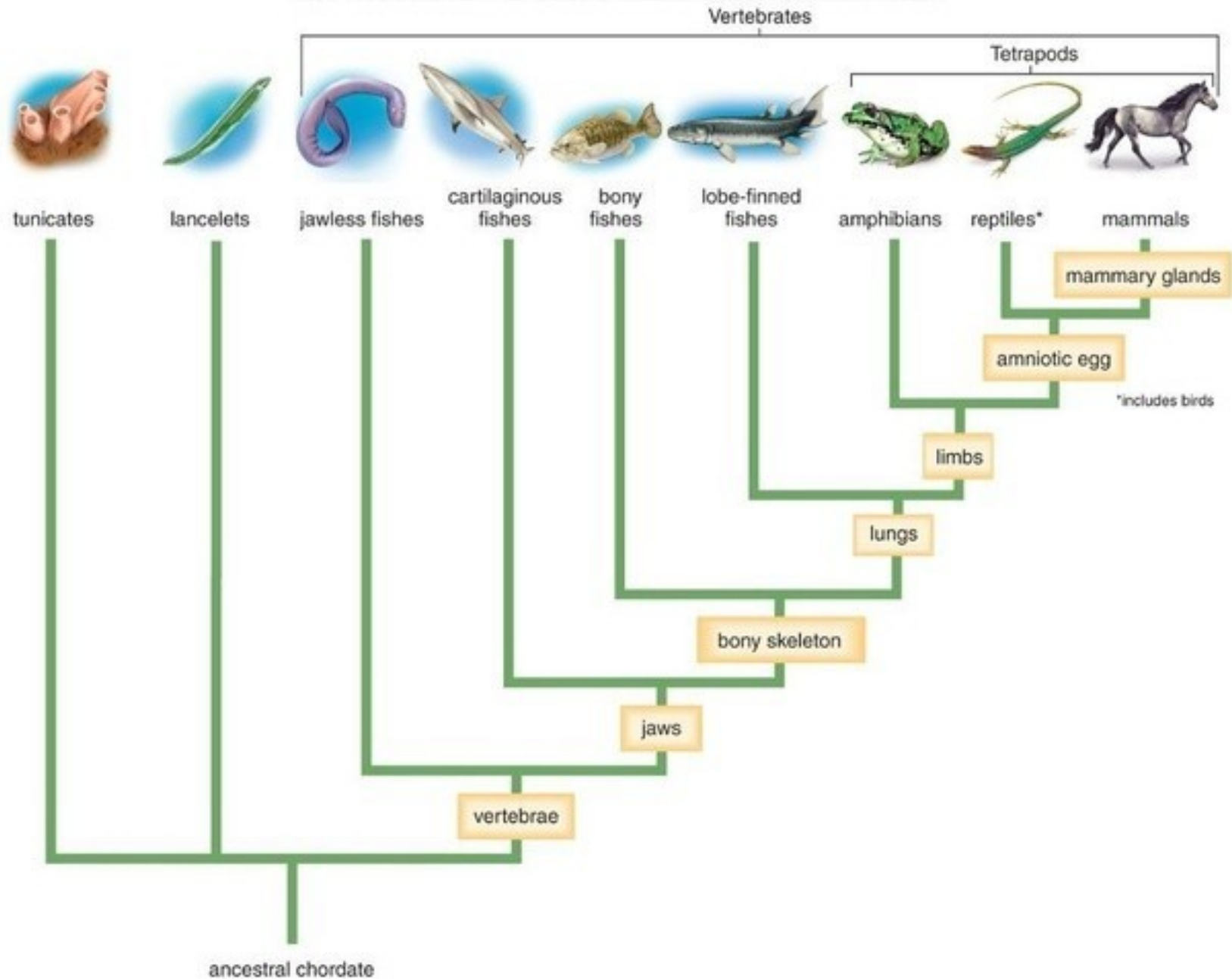




# EVOLUTION OF FISHES







**Amphibians** – in Triassic still Paleozoic group **Temnospondyli**, retreat and end Triassic extinction, reduced survival till mid Jurassic. New **modern groups** appear in **Triassic**.

First **frogs** (Anura)– *Triadobatrachus massinoti* Gradual entry of **other modern groups** in **Jurassic** and **Cretaceous**.

Further groups of modern amphibians –Caudata- salamanders (mloci), Gymnophiona (červovní)





červoiři                      mloci                      žáby



Gymnophiona



Caudata



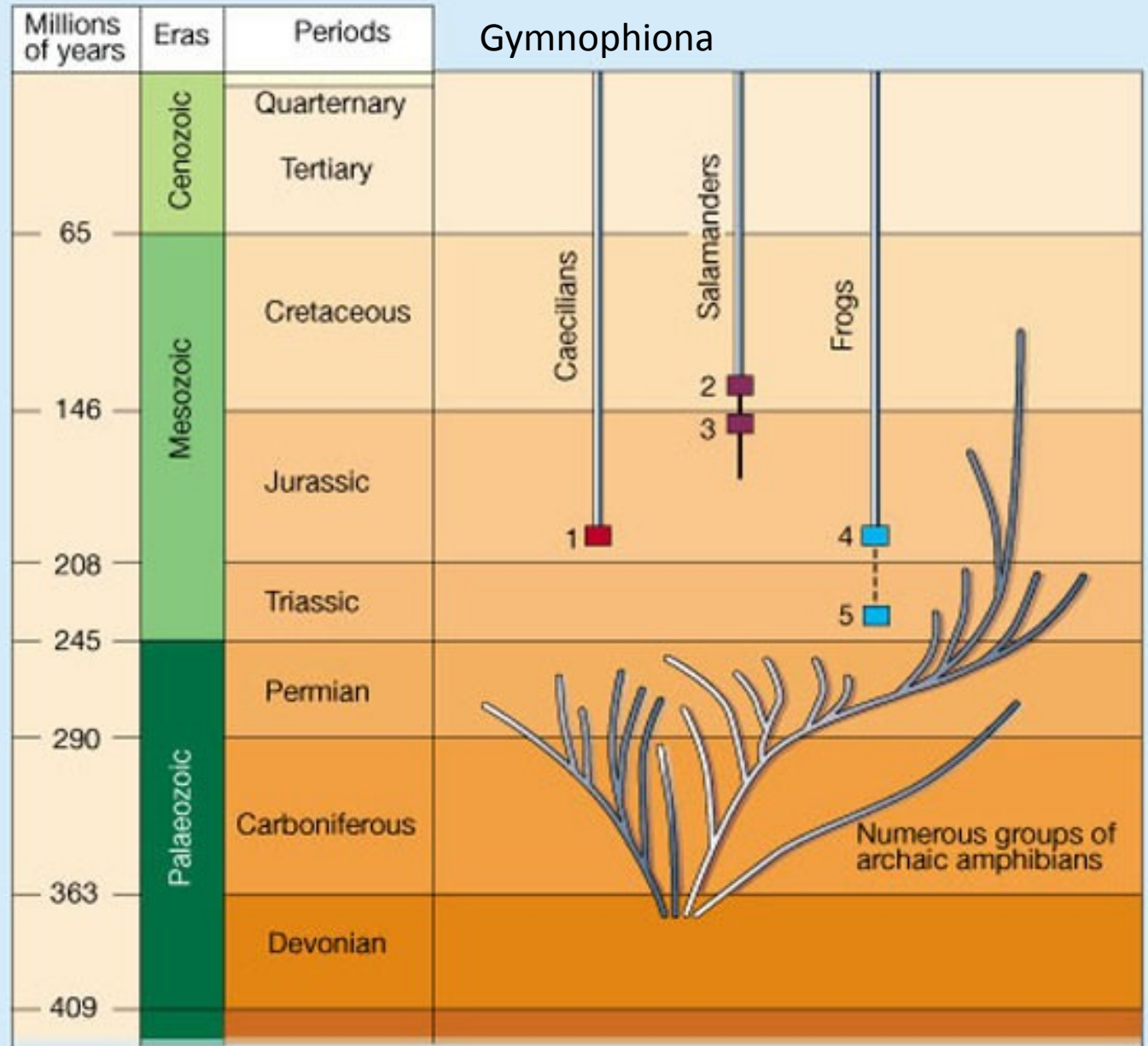
Salientia

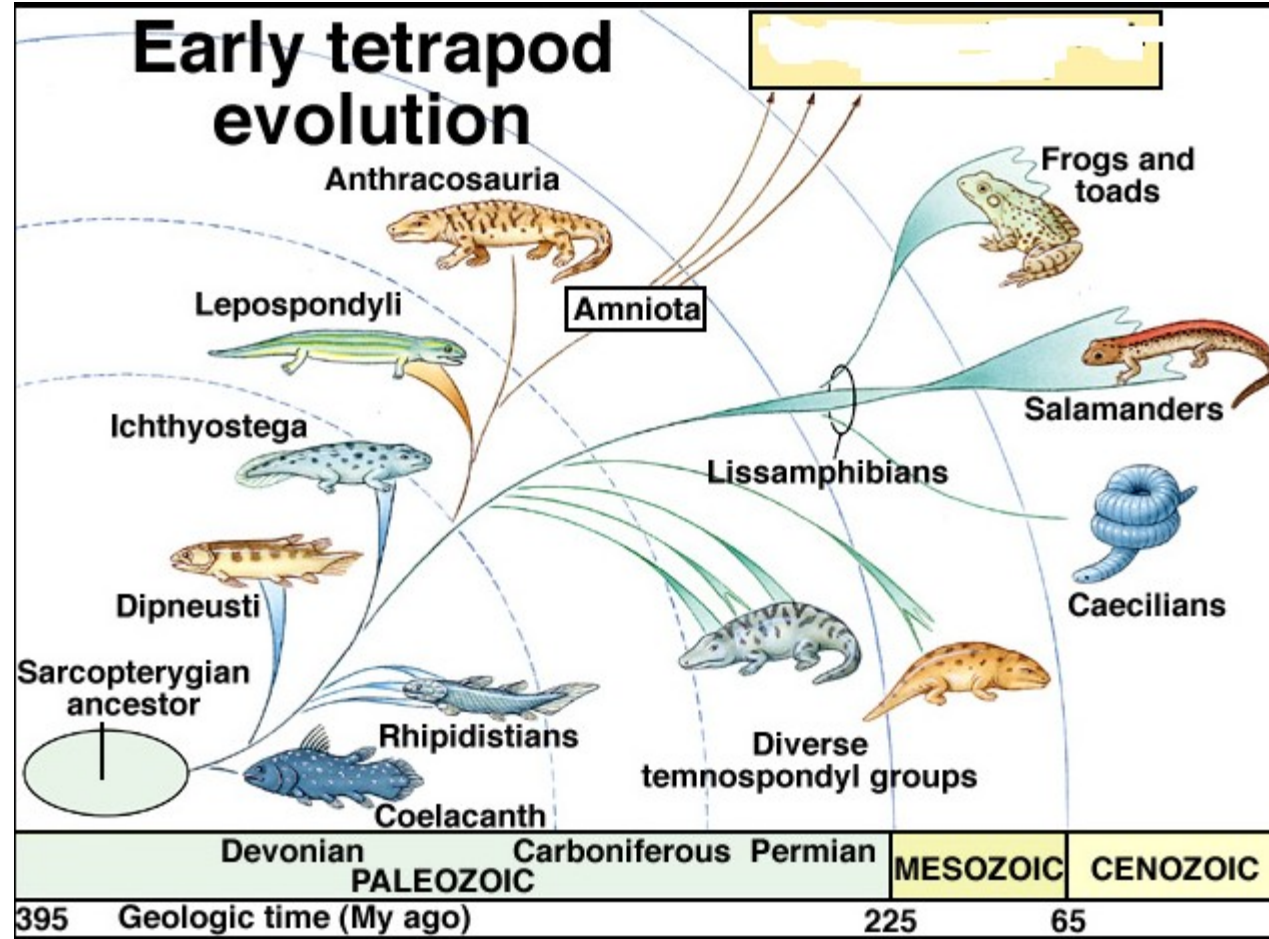
Lepospondyli

Temnospondyli

3







Gymnophiona

# Anapsids, diapsids, euryapsids

## Reptile Subclasses:

### 1 – Anapsida

O. **Cotylosauria**- stem reptiles

O. **Chelonia** - turtles & tortoises

- unchanged for about 175 million years

- identified by bony dermal plates to which ribs & trunk vertebrae are fused

### 2 - Lepidosauria

O. Rhynchocephalia (Sphenodonta) - only living representative is the Tuatara(hatérie)

O. Squamata - lizards, geckos, & snakes

### 3 -Archosauria

O. **Thecodontia** – stem archosaurs

O. **Pterosauria**

O. **Saurischia**- 2 major groups: sauropods & theropods

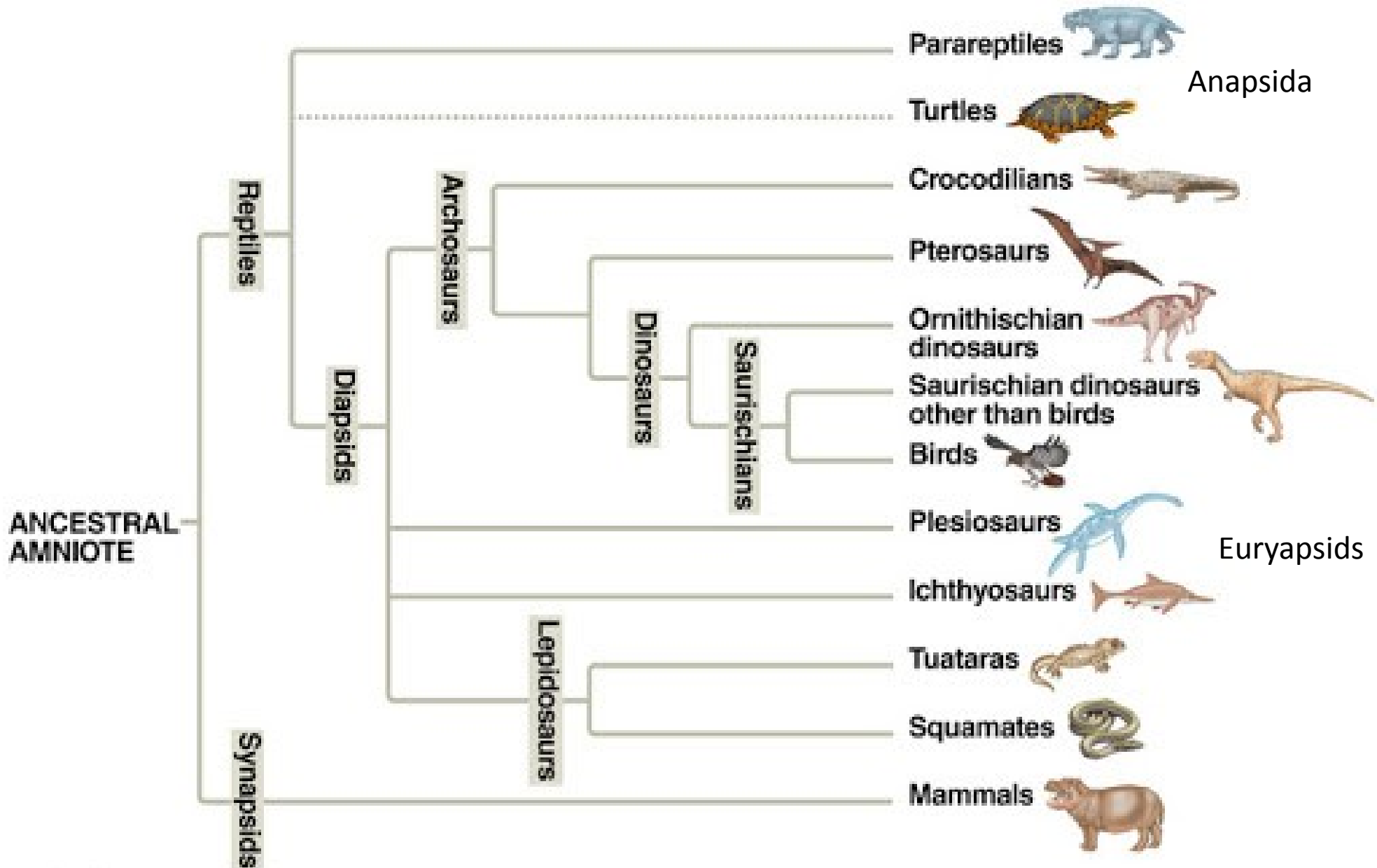
O. **Ornithischia**

O. **Crocodylia**

4 - **Euryapsida** - marine reptiles, includes the plesiosaurs & ichthyosaurs

**Dinosauria**







## 2 - **Lepidosauria**

O. Rhynchocephalia (Sphenodonta) - only living representative is the Tuatara

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O. **Crocodylia**

4 - Euryapsida - marine reptiles, includes the plesiosaurs & ichthyosaurs

**Lepidosaur**s – radiation at the beginning of Triassic, Small lizard-like reptiles. Predecessors of thecodonts (Permian) and **Squamata** (Triassic)

**Thecodonts** – wide expansion in early and middle Triassic. End Triassic extinction (dinosaurs?)  
*Postosuchus* was one of the largest carnivorous reptiles during the late Triassic

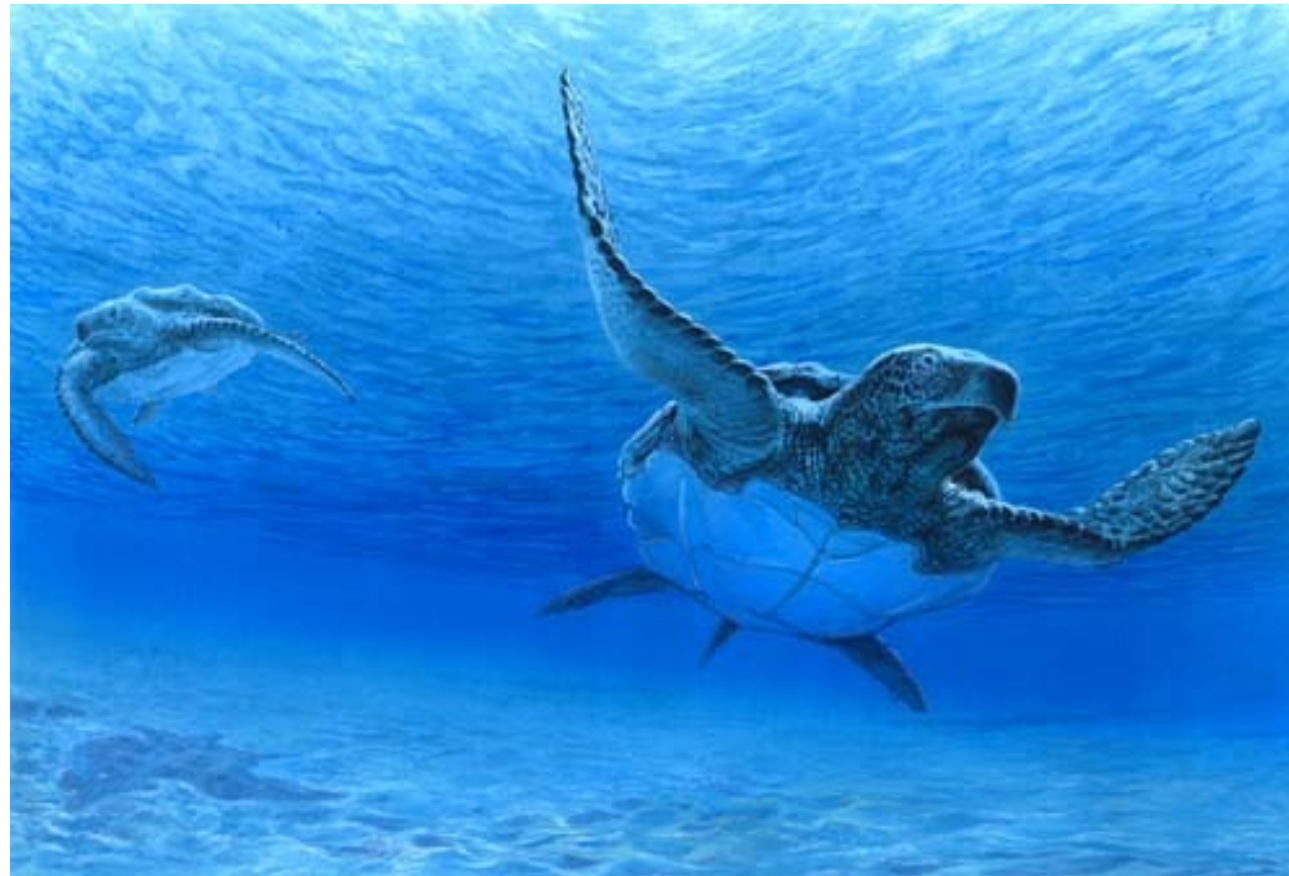
**Crocodyles** – Triassic, thecodont predecessors. **Originally land animals**, secondary to water environment. Great **expansion** in **Jurassic**, mostly in **seas**. In **Cretaceous gigantic forms** as 15m Phobosuchus.

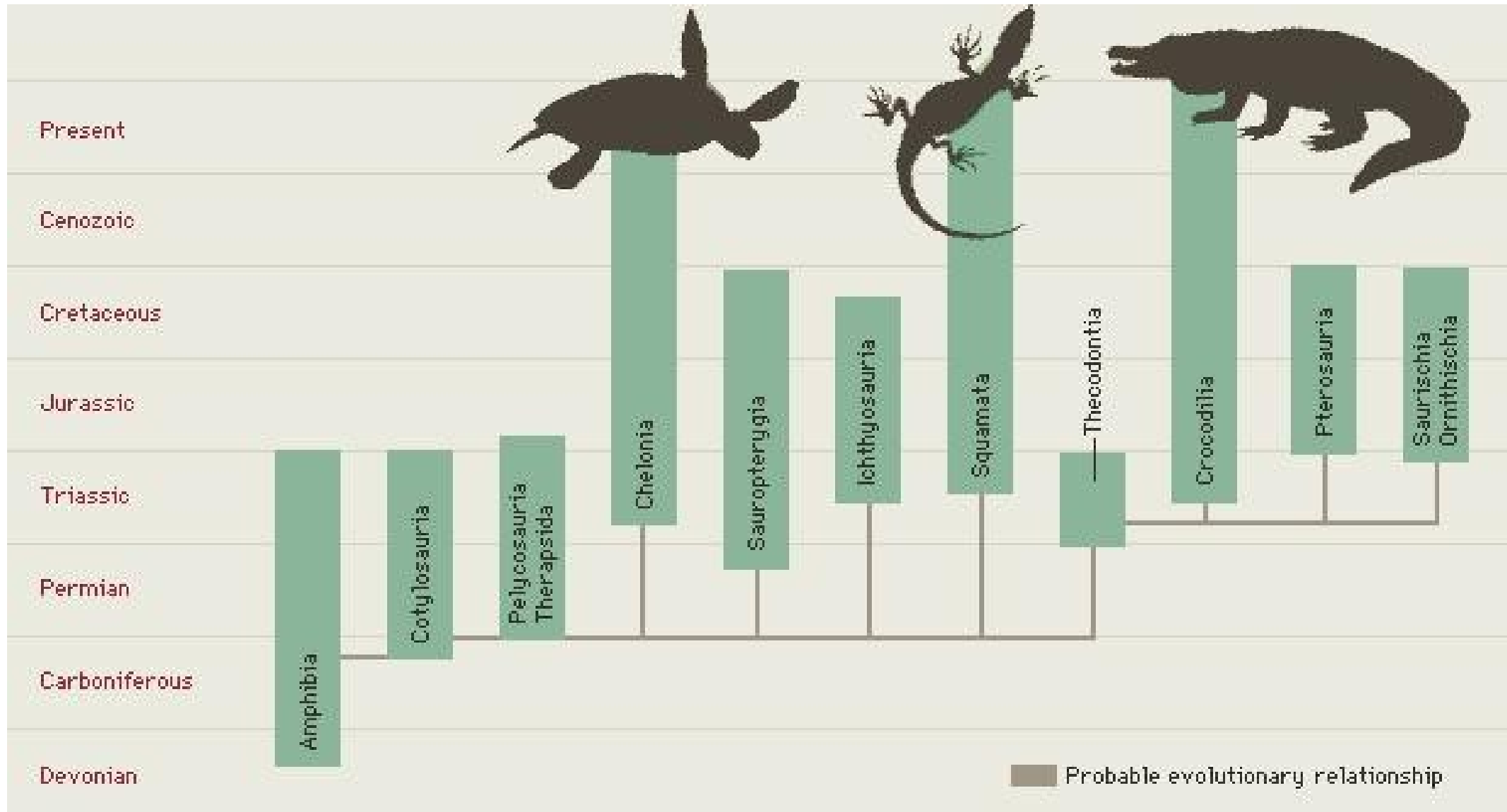


# Land Reptiles

**Cotylosaurs** – end Triassic extinction

**Chelonia** – originally terrestrial animals, late Jurassic transition to marine environment.  
Cretaceous – 4m Archelon





# Squamata(šupinatí) - lizards, geckos, & snakes

## Snakes

Snakes are thought to have evolved from either burrowing or aquatic lizards, perhaps during the Jurassic period, with the earliest known fossils dating to between 143 and 167 Ma ago.[10] The diversity of modern snakes appeared during the Paleocene epoch (c 66 to 56 Ma ago, after the Cretaceous–Paleogene extinction event).





# Evolution of Snakes

Ball python



- Snakes are tetrapods with no legs.
- Evolution predicted primitive fossil snakes with evidence of limbs.

*Pachyrhachis*



*Eupodophis*



*Najash*



- Evolution also predicted intermediate forms between lizards and snakes.
- *Adriosaurus*, a fossil lizard with hindlimbs, reduced forelimbs, and an elongated body.





# Lizards

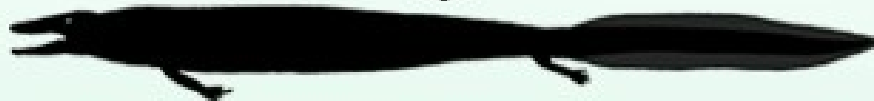
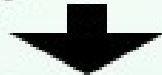
The earliest known fossil remains of a lizard date to the Late Triassic. Mosasaurs probably evolved from an extinct group of aquatic lizards known as aigialosaurs in the Early Cretaceous. During the last 20 million years of the Cretaceous period (Turonian–Maastrichtian ages), with the extinction of the ichthyosaurs and pliosaurs, mosasaurs became the dominant marine predators. They became extinct as a result of the K-Pg event at the end of the Cretaceous period, about 66 million years ago



## How the Mosasaurs Evolved



By the early Cretaceous diapsid lizards that would give rise to the monitor lizards were already roaming about.



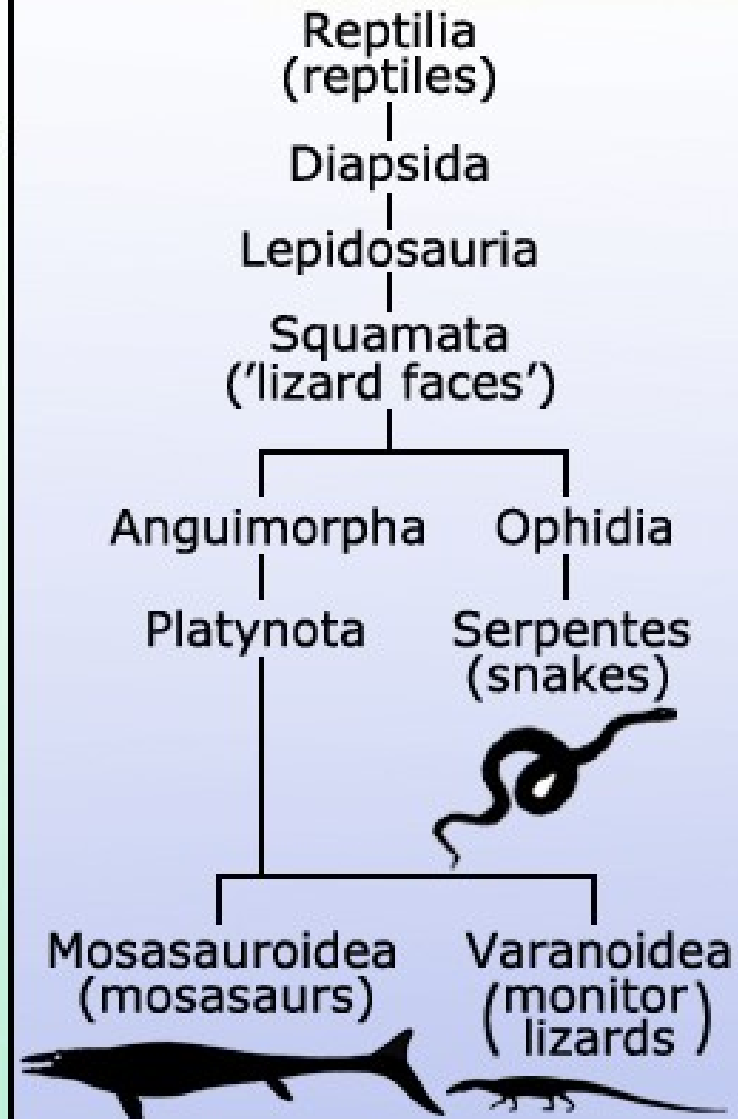
During the Cenomanian/Turonian of the Late Cretaceous some 100.5-89.9 million years ago the first primitive mosasaurs were hunting in coastal waters.



In the final stages of the Cretaceous the mosasaurs had become fully aquatic and dominated the oceans all the way to the end of the Cretaceous.

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## How Mosasaurs and Monitor Lizards are Related.



## Mosasurs - Cretaceous

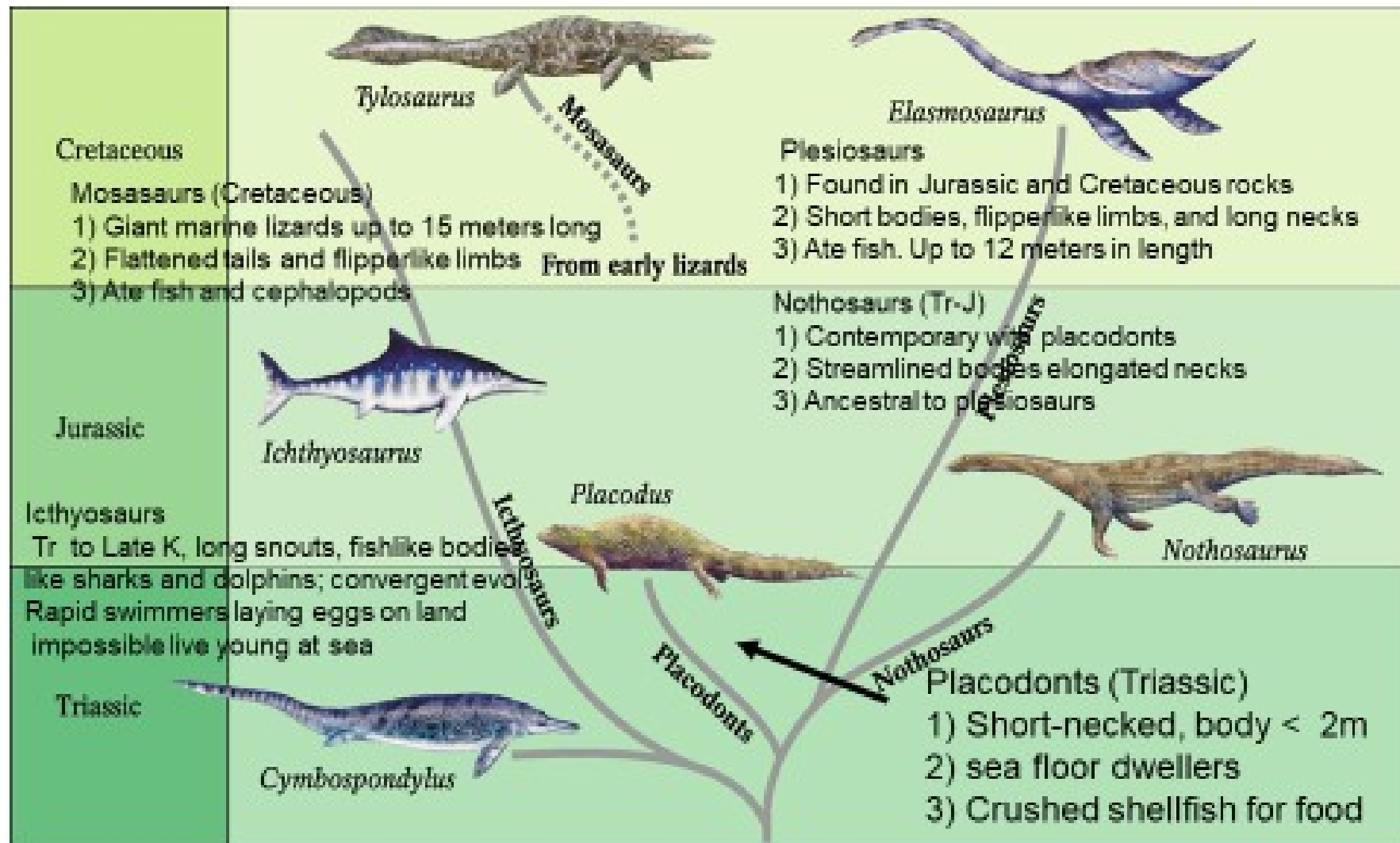
The early ancestors of mosasaurs probably fed in the ocean and returned to land much like the marine iguanas that are found today in the Galapagos Islands. Over a relatively short period of time, however, these ancestral mosasaurs became larger and more specialized, evolving rapidly into several genera of highly successful predators. By the beginning of Coniacian time (about 90 million years ago - mya), there were three major genera (*Tylosaurus*, *Platecarpus* and *Clidastes*) living in the Western Interior Seaway. **Tylosaurs** - by the Campanian, Tylosaurs were even larger (**13-14 meters**) and many more species were making their appearance. Within the space of a few more million years, by Maastrichtian time (70 mya), mosasaurs were truly huge, with several lineages (*Mosasaurus* and *Hainosaurus* – a close relative of *Tylosaurus*) reaching nearly **15 meters** (50 feet). One giant specimen (*Hainosaurus bernardi*) found in Europe was **17 meters** (almost 55 feet) in length. There was no doubt who were the **biggest and baddest predators in the oceans 70 million years ago.**



Sea Dragons



# Euryapsid Marine reptiles



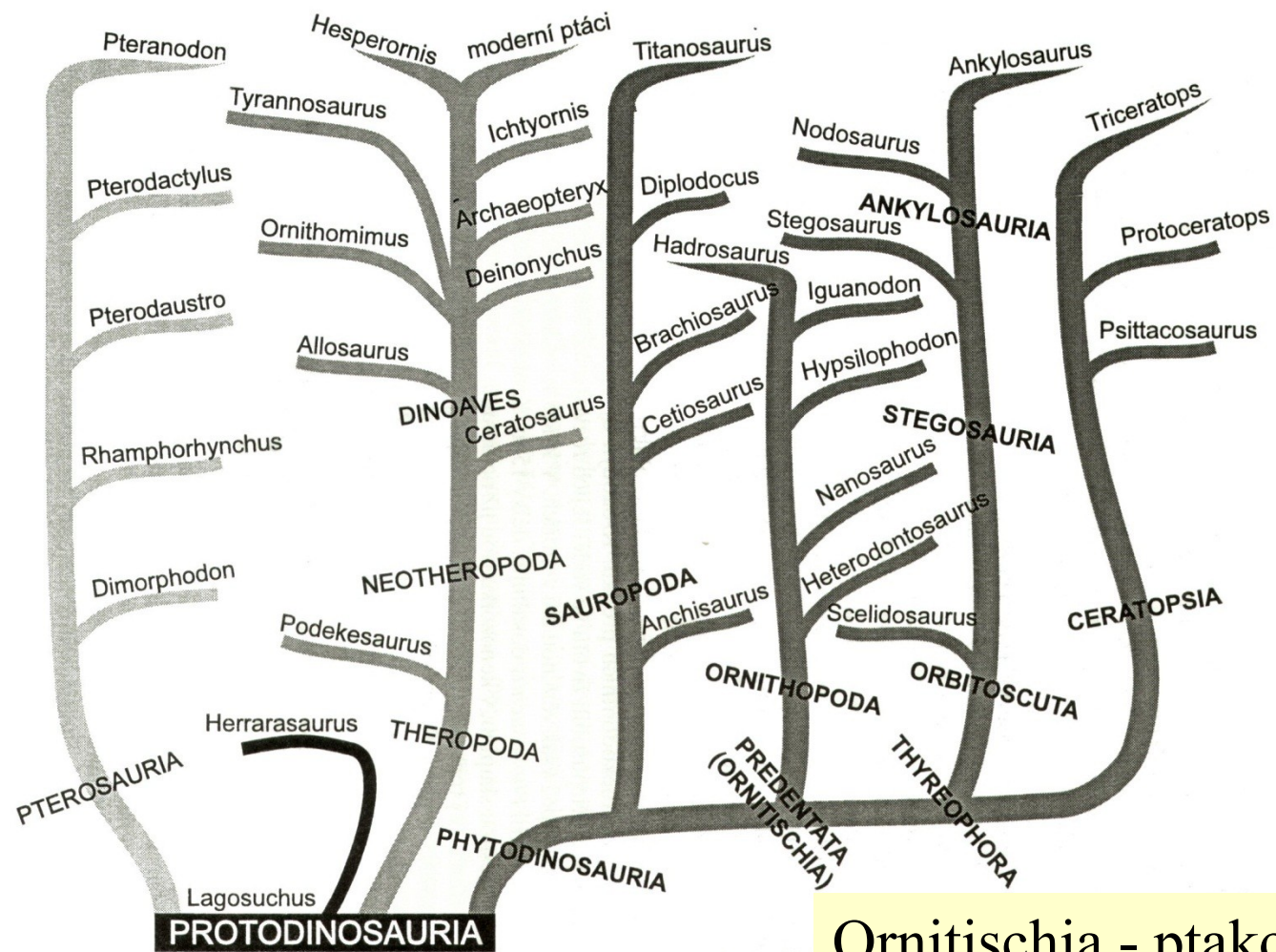
Plus Marine Crocodiles

From early diapsids



# Dinosauria

## Saurischia-plazopánví



## Ornithischia - ptakopánví

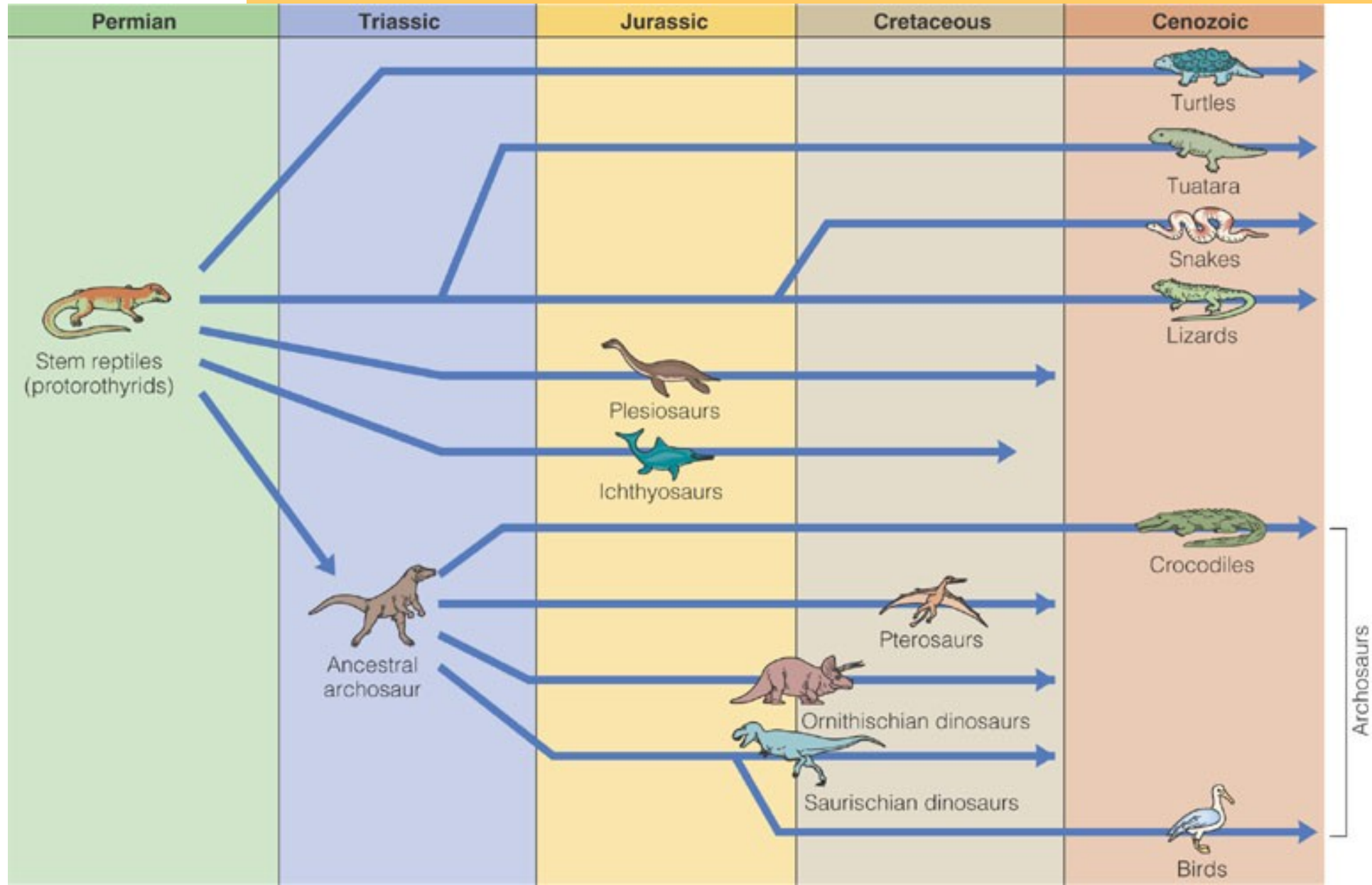
Obr. 71. Schematické znázornění evoluce dinosaurů (zjednodušeno podle Bakker, 1986).





*Aves*

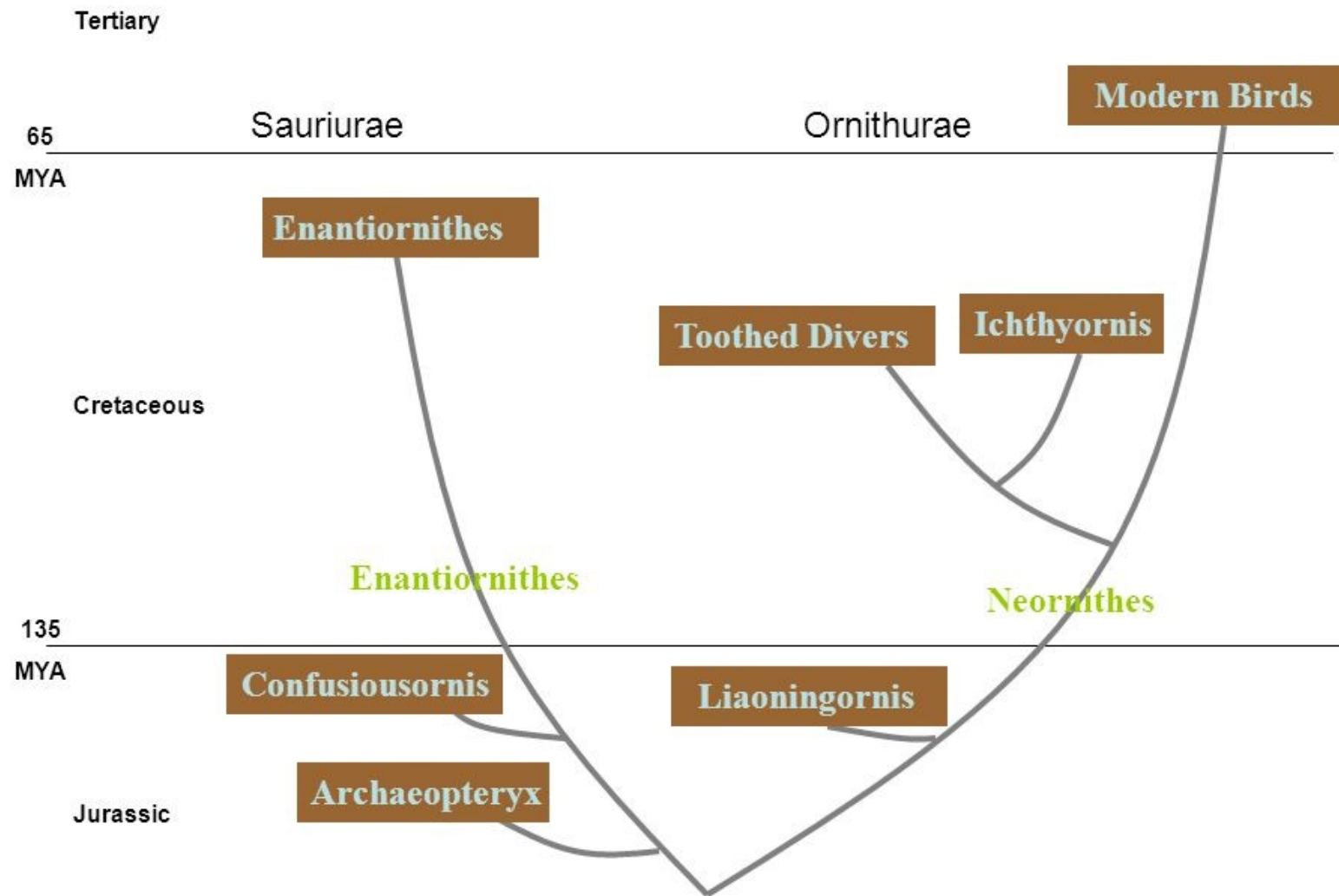
# Reptiles and Birds



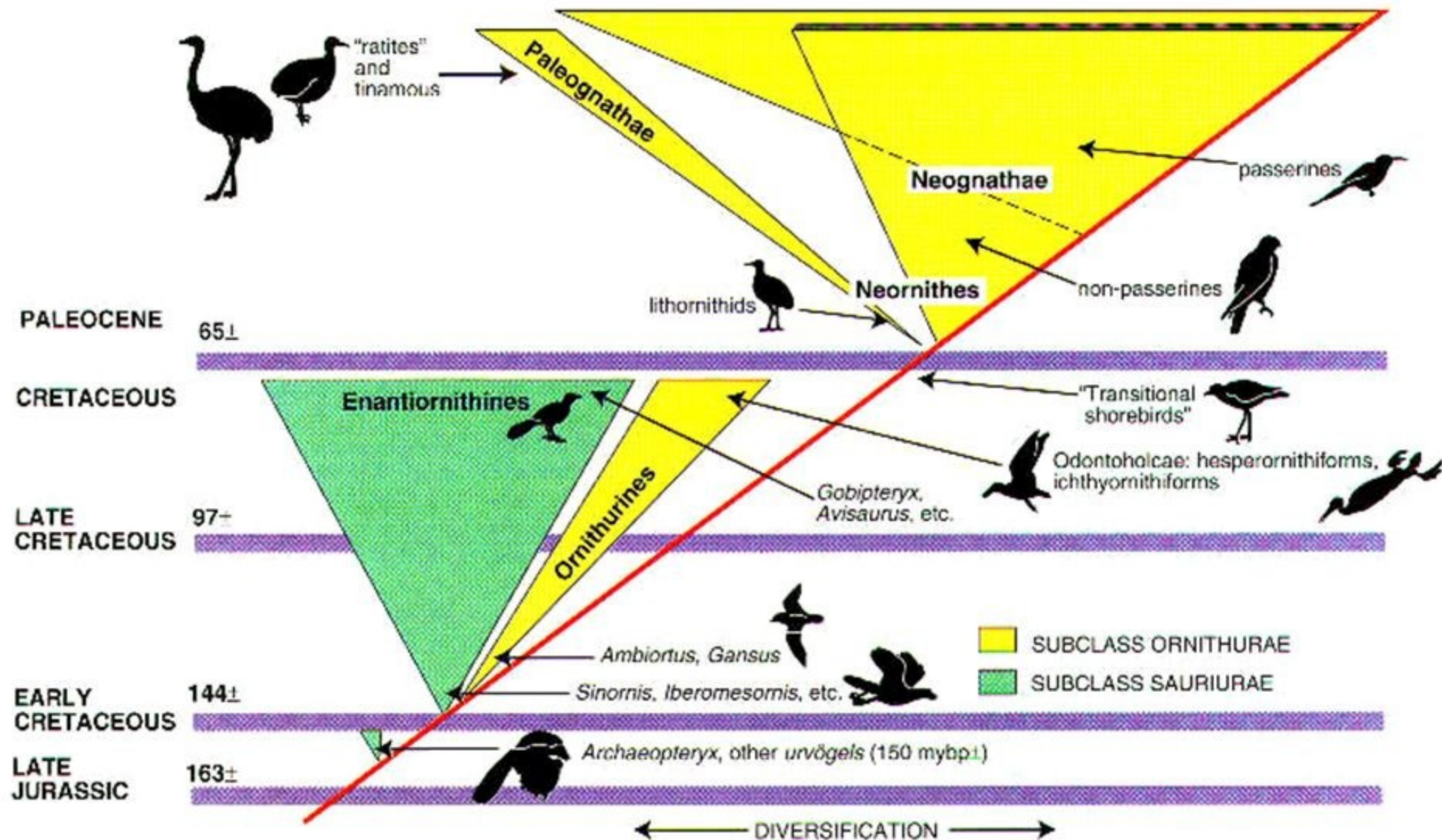
Sauriurae (opposite birds) - ? Archeopteryx(Jurassic), Confuciusornis  
(Jurassic-Cretaceous)

Ornithurae (modern birds) — Hesperornis, Ichthyornis (Cretaceous)





# Neornithines = Paleognathae + Neognathae



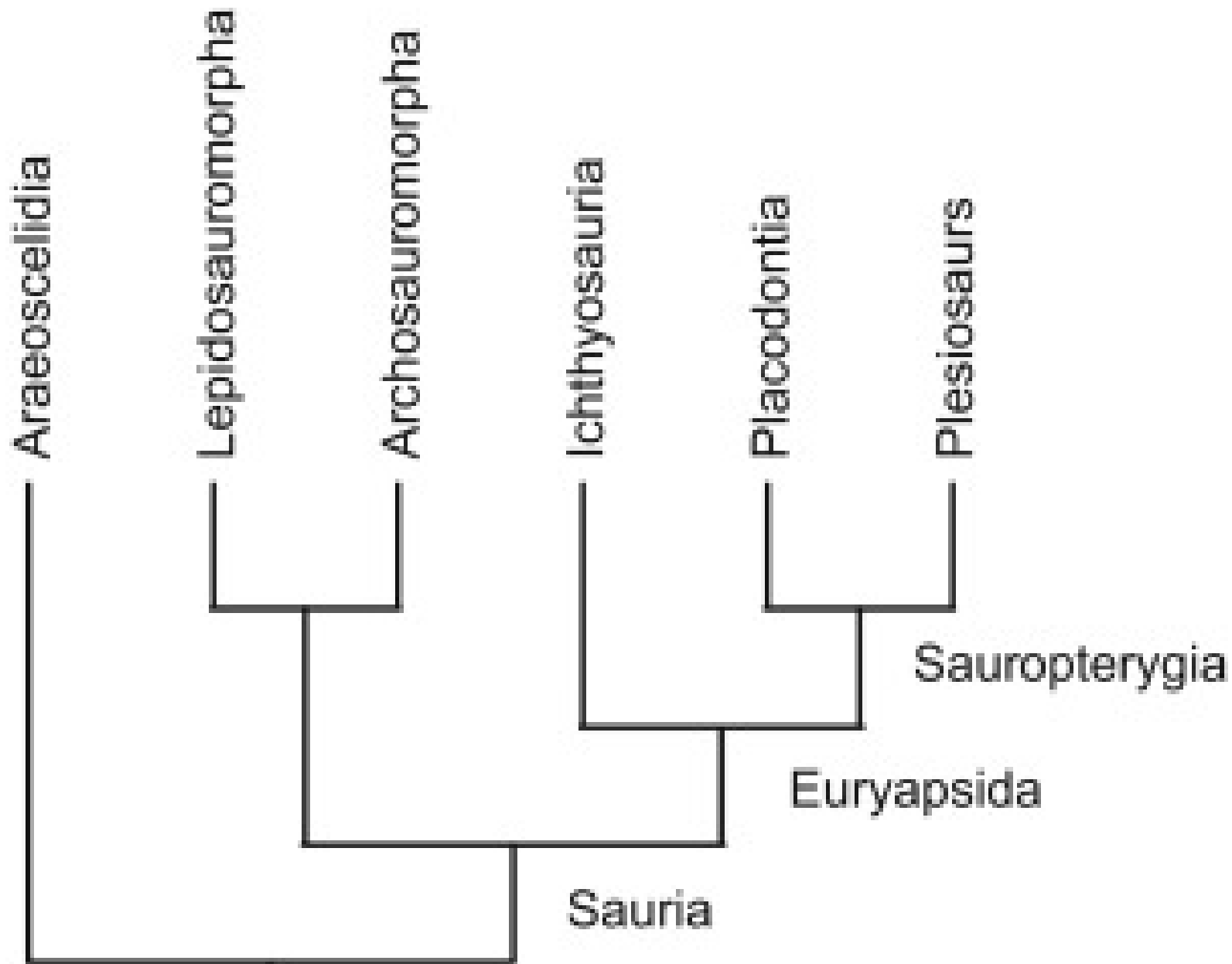
# Euryapsids

**Euryapsid** Include *Ichthyopterygia* and *Sauropterygia* (nothosaurs and plesiosaurs). convergence, not common ancestry; derived from diapsid.]

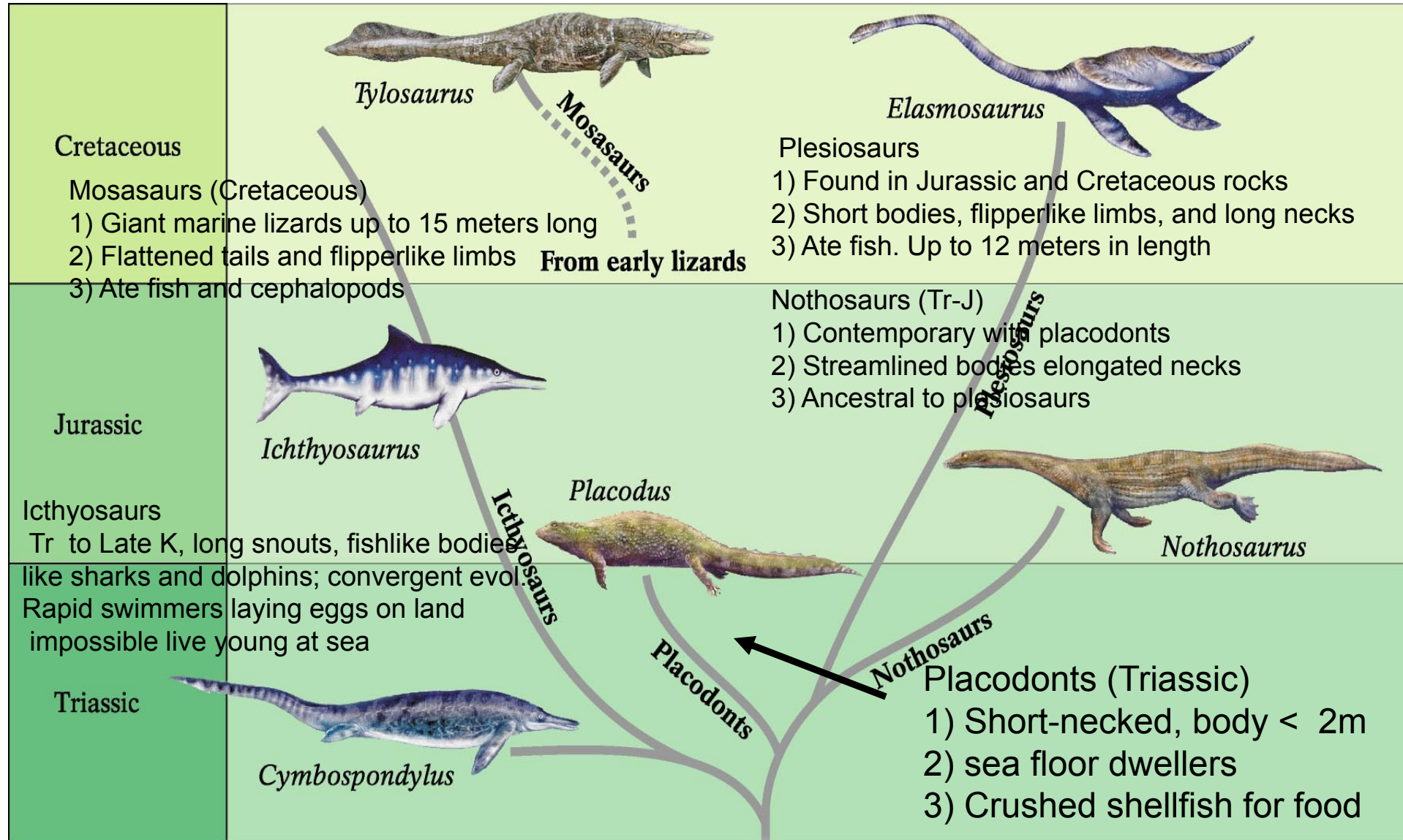
**Sauropterygia** – Placodontia  
Notosauria  
Plesiosauria







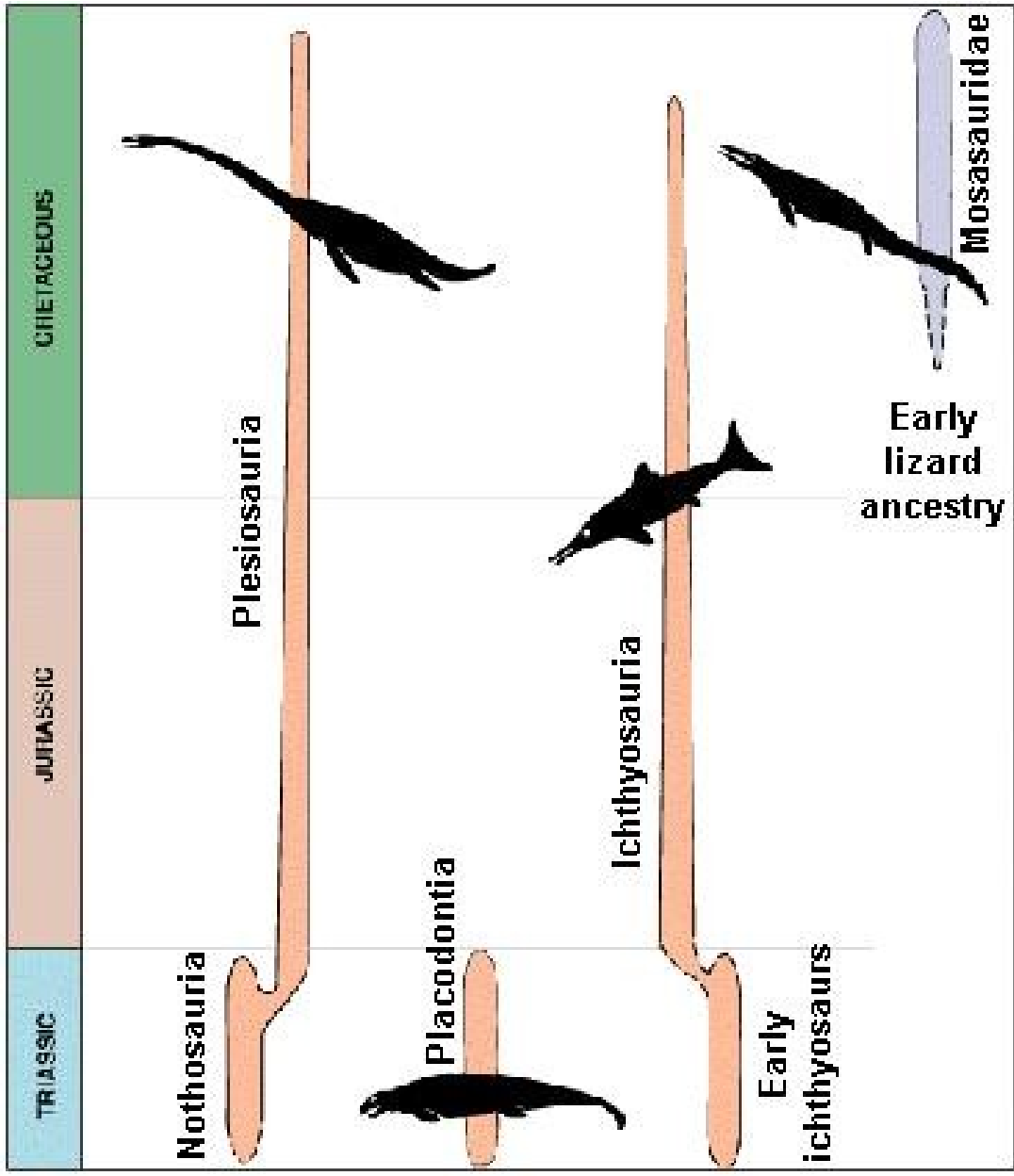
# Euryapsid Marine reptiles

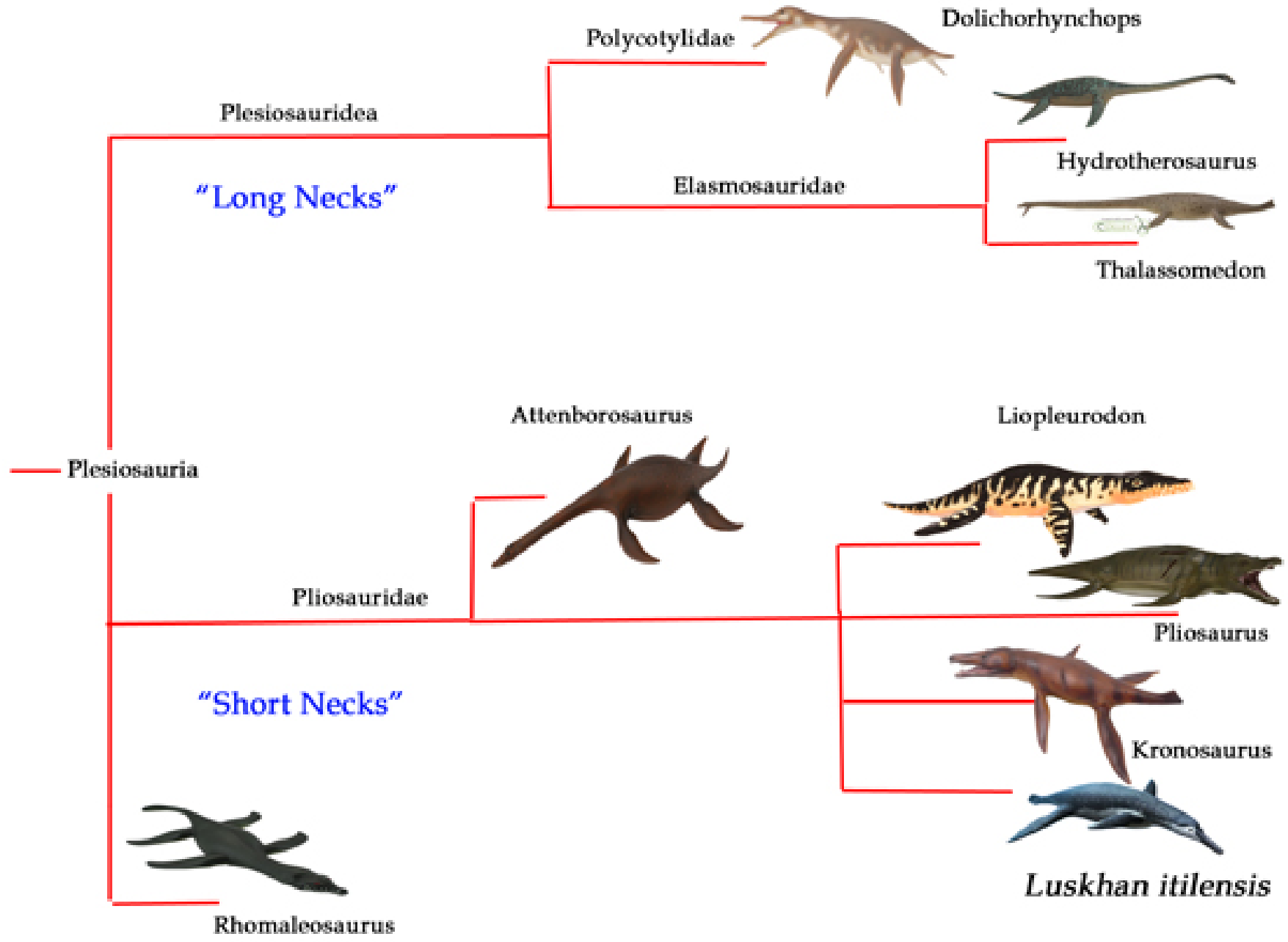


Plus Marine Crocodiles

From early diapsids

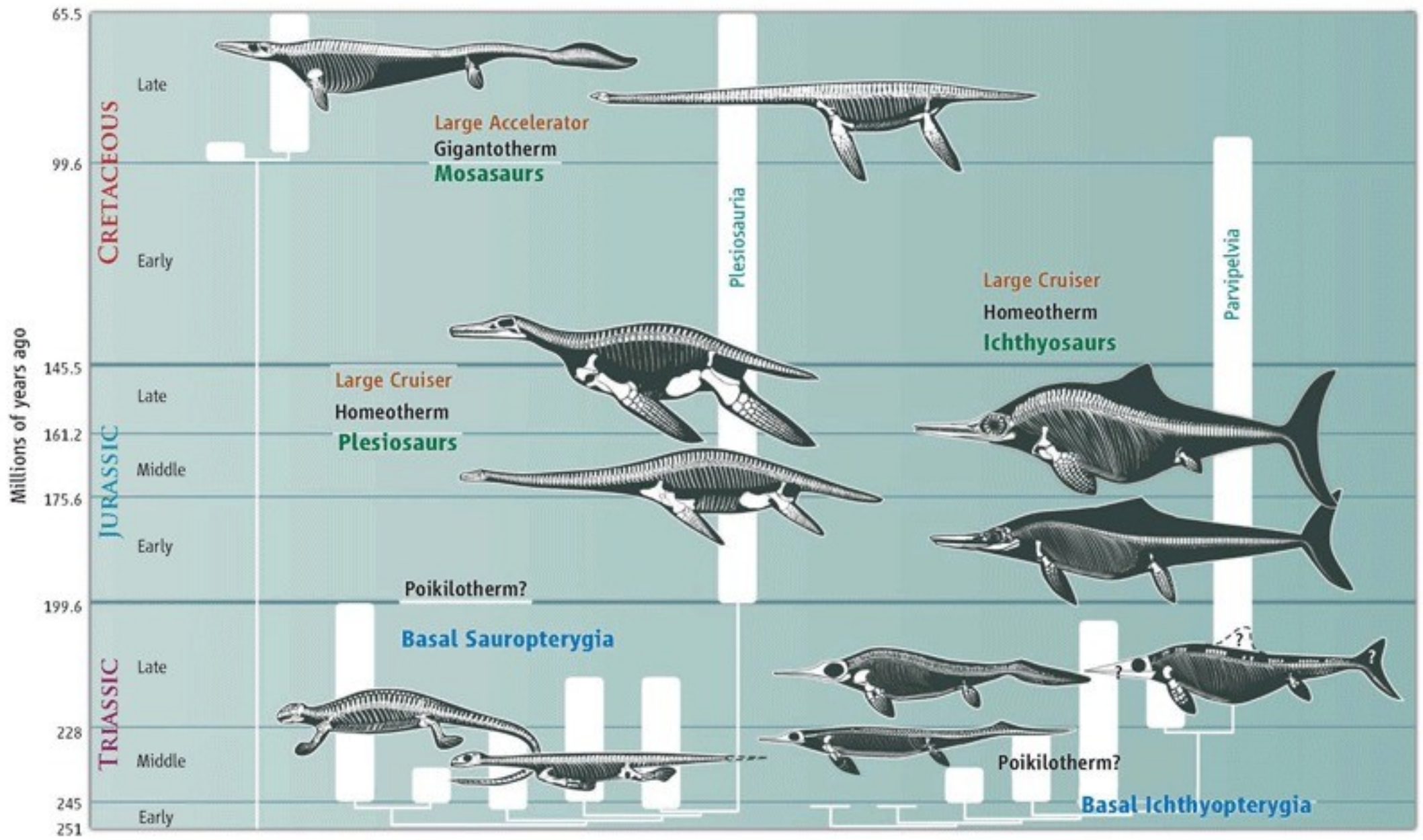






**Ichthyosaurs and plesiosaurs** had inhabited the oceans since the **Triassic**, evolving into many diverse forms and surviving several major extinction events. For unknown reasons, **ichthyosaurs declined significantly in early Cretaceous** and are thought to have been extinct by the time that the earliest mosasaurs re-entered the water. **Plesiosaurs were also less numerous in the late Cretaceous than during the Jurassic**, and had evolved into some very specialized forms like the long-necked **Elasmosaurus** (13.7 meters). Even the **short-necked plesiosaurs (pliosaurs)** were much smaller than their Jurassic cousin, *Liopleurodon*, and an early Cretaceous relative, **Kronosaurus** (10m). It is possible that both the ichthyosaurs and the plesiosaurs were losing the evolutionary battle of "who eats who" to faster, giant Ginsu sharks (*Cretoxyrhina mantelli*). The world-wide domination that mosasaurs in the late Cretaceous.







# Synapsids

**Therapsida**  
**Mammalia**



Geological Time  
and the  
Evolution of  
Mammals:  
Pelycosaurs  
Therapsids  
Cynodontia:  
the transitional  
Infraorder

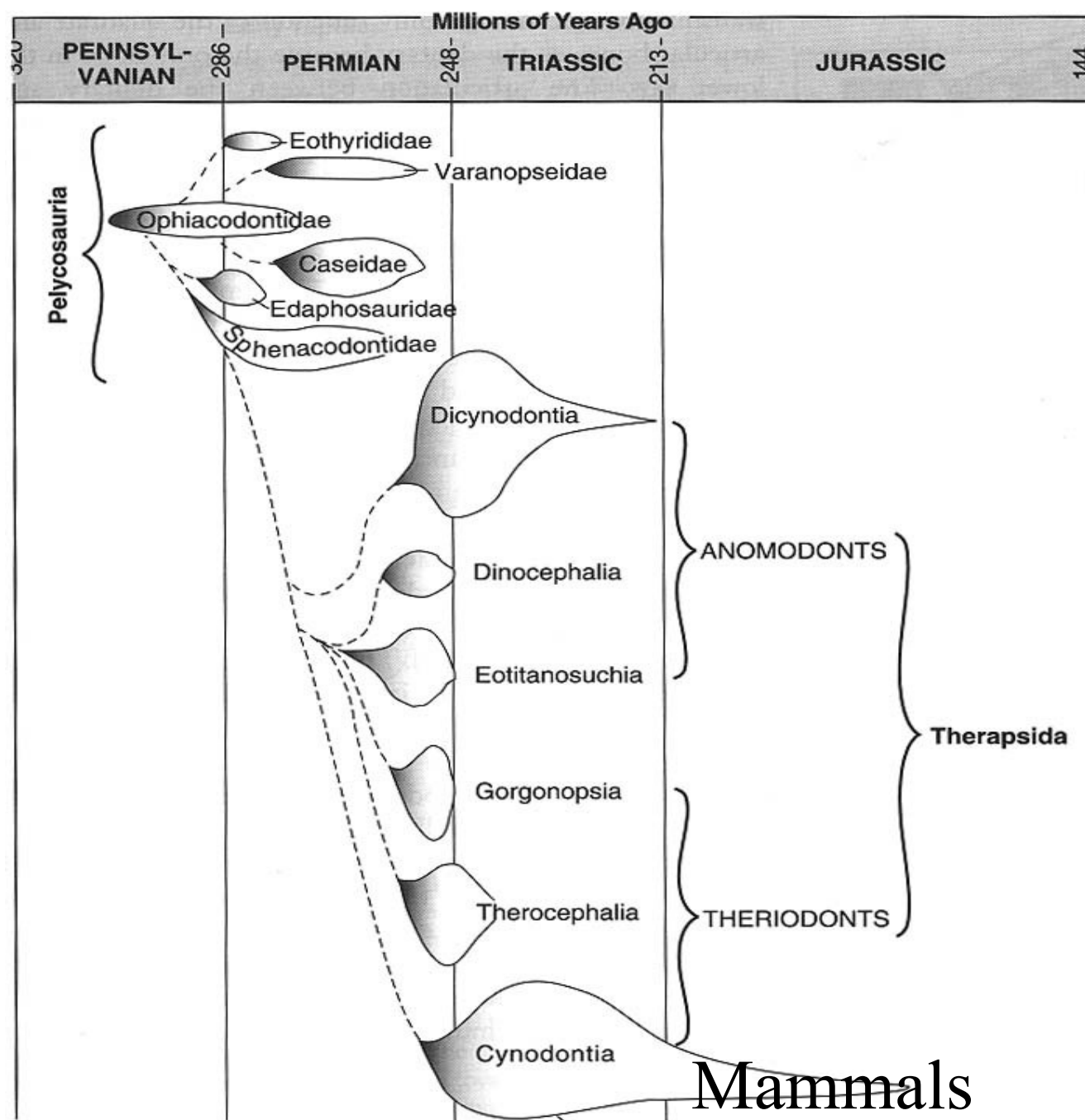


Fig 4.2, Feldhamer



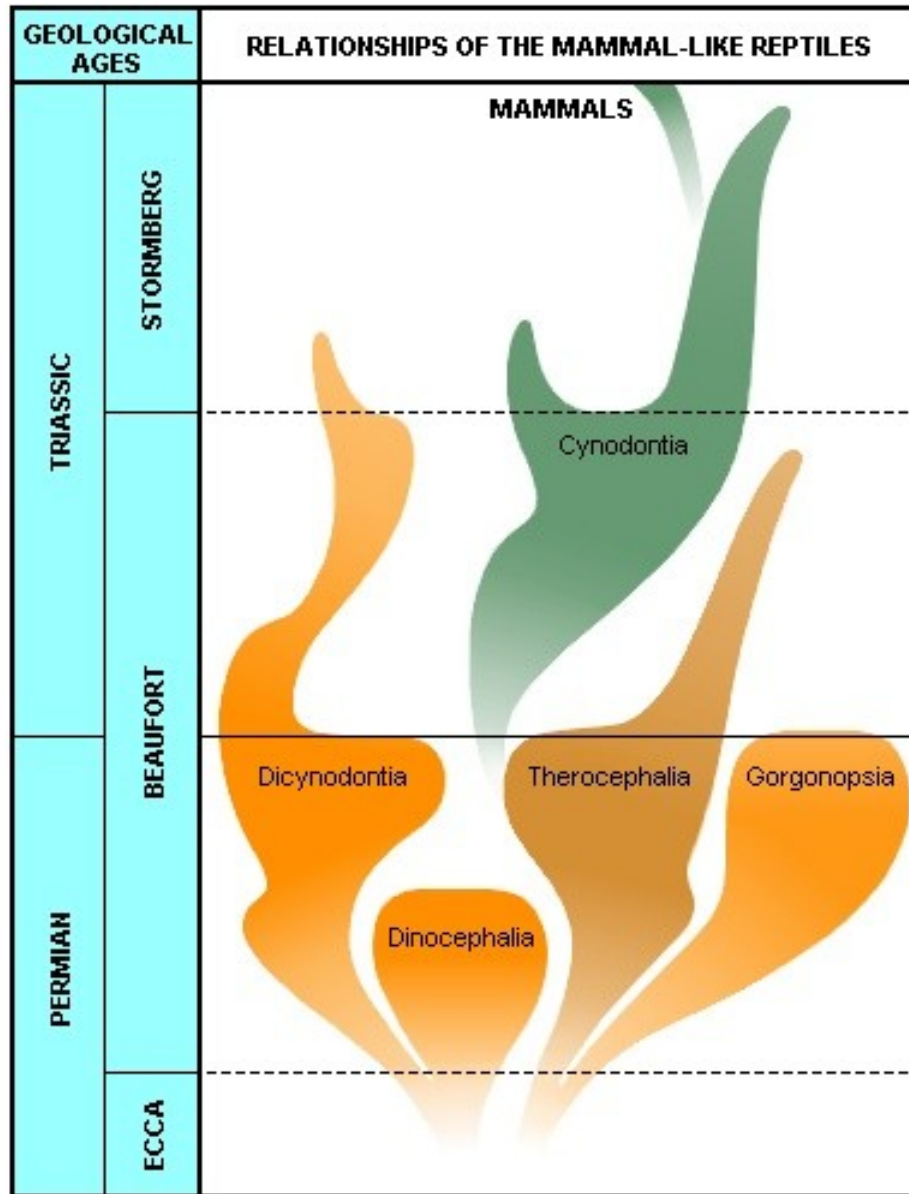


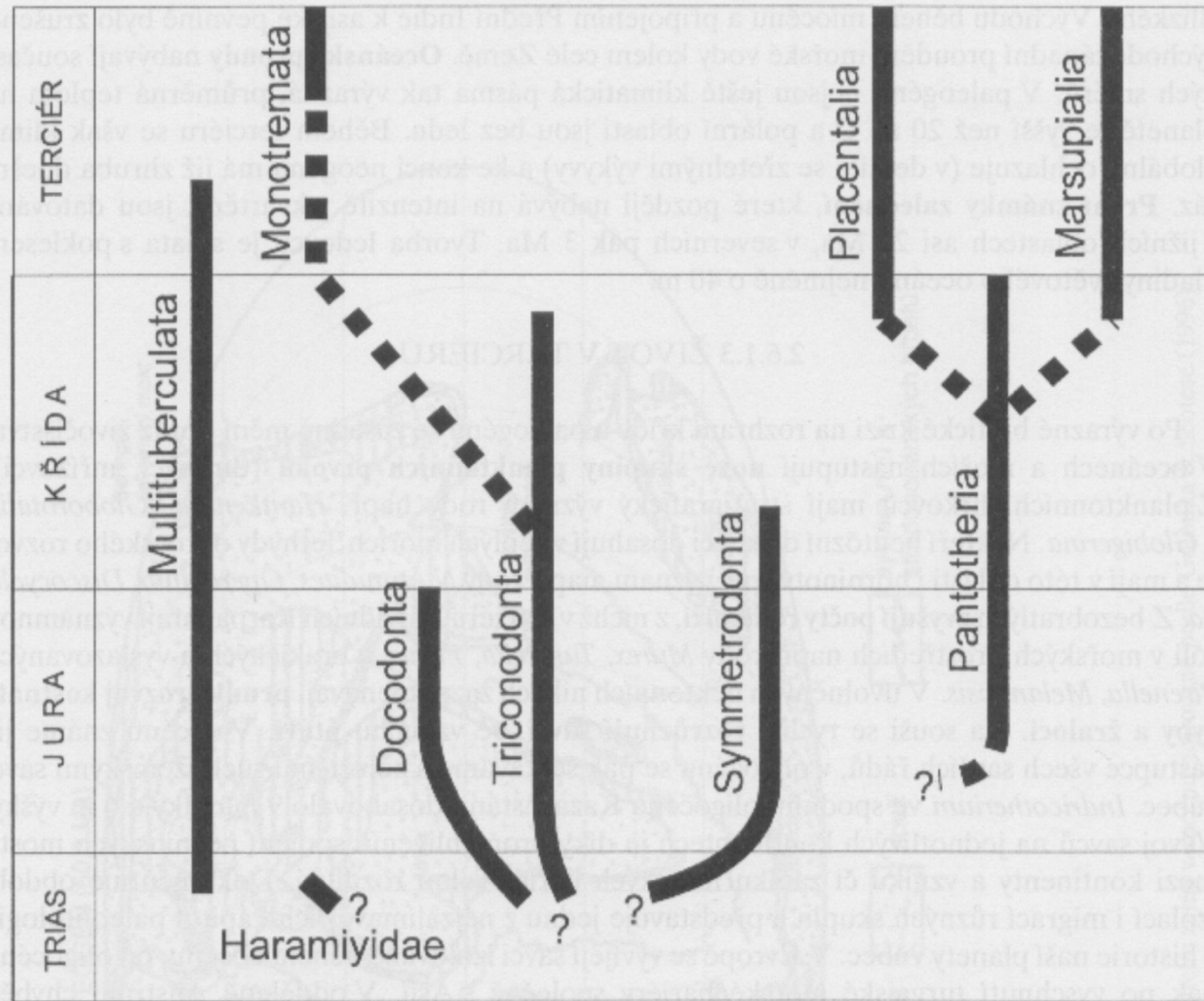
Diagram showing the relationships between the various mammal-like reptiles. Mammal-like reptiles did not survive beyond the end of the Triassic period, but one group, the Cynodontia, gave rise to the first mammals at the end of the Triassic, about 200 million years ago



Mammals

# Prototheria (Vejcorodí)

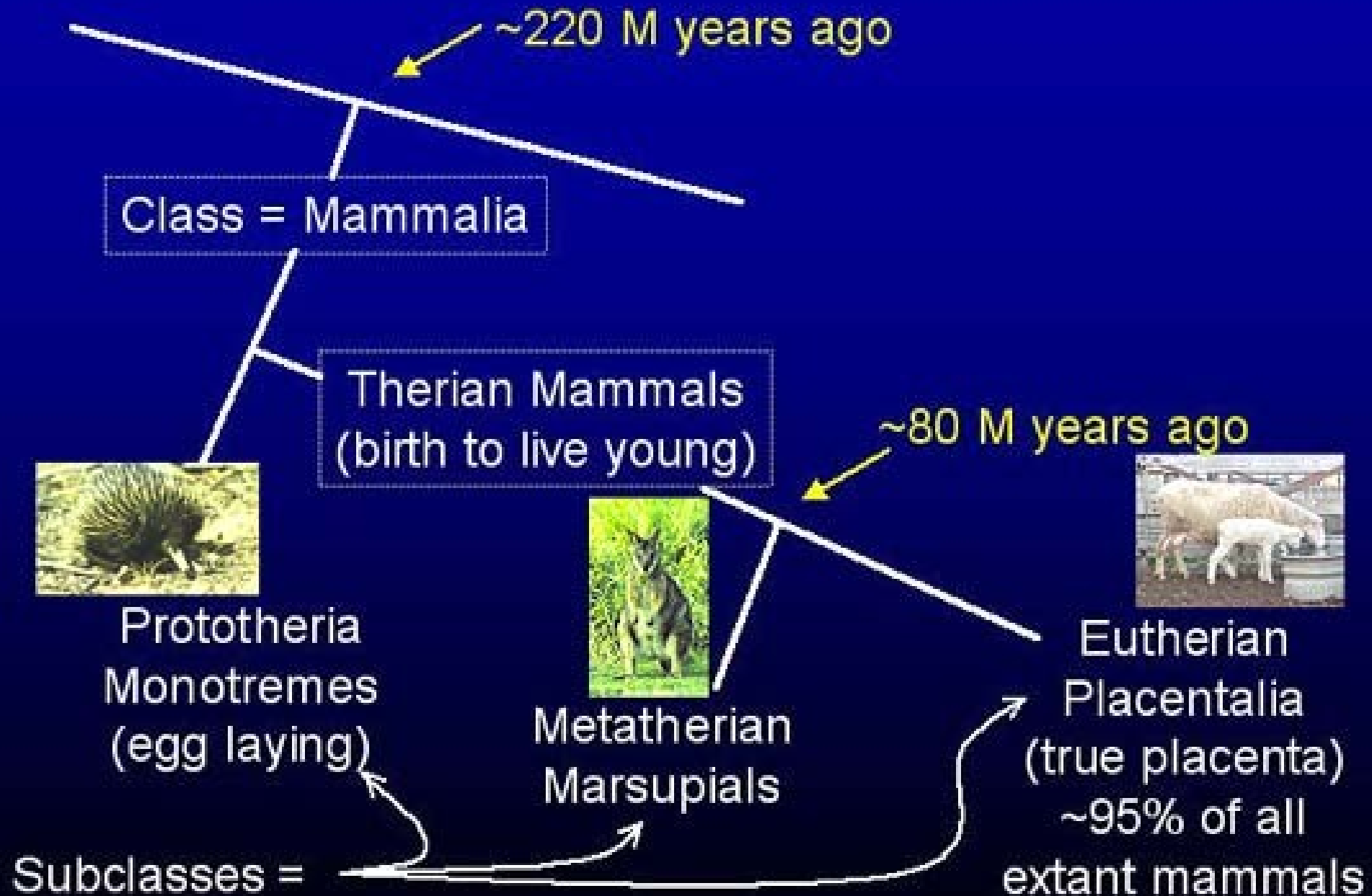
# Theria (Živorodí)



Obr. 85. Vývojové vztahy a stratigrafický rozsah hlavních skupin savců. Upraveno podle Wicander & Hourac (1989).



# Origin of Mammalian Species





## **SUBCLASS: PROTOTHERIA**

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- **NO PLACENTA**
- **Egg laying mammals**

# Monotremata

- Oviparous egg laying mammals
- **Only 3 in existence**
- Duck-billed platypus and two species of spiny anteaters called echidna.
- Not completely endothermic (their body temperature is lower and fluctuates more than other mammals)

Ježura



# Marsupials

- Marsupials give birth to tiny immature young that crawl to a pouch on the mothers belly immediately after they are born.



# Characteristics of Placentals

- Placental mammals carry unborn young in the uterus until young can survive in the wild.
- Oxygen and nutrients are transferred from mother's blood to baby's blood



