Non-Dinosaurians of the Mesozoic

- Calling the Mesozoic "the Age of Dinosaurs" is actually not quite correct
- Not all reptiles of the Mesozoic were dinosaurs.

Many reptiles (and other amniotes) have returned to the sea:

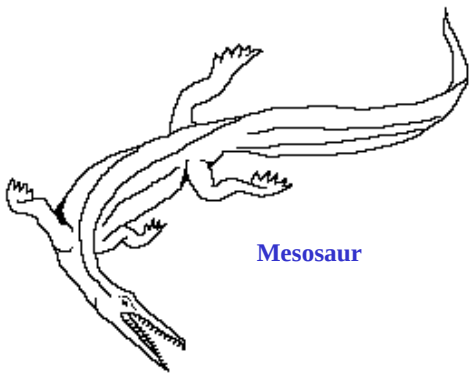
- Abundant food
- Equitable temperatures
- Easy migrations

However, aquatic amniotes have to deal with:

- Breathing (remain air-breathers)
- Feeding (small fish, large fish & amniotes, shellfish, vegetation, etc.)
- Locomotion (flippers, fins, etc.)
- Reproduction (come out of water to lay eggs or some form of internalized reproduction)

First marine "reptiles" (or maybe non-reptilian sauropsids, the sister group to Reptilia) were **mesosaurs:**

- Early Permian of Gondwana
- Long needle-like teeth for catching small fish
- Big (webbed?) hands and feet for paddling, tall deep tail for swimming
- Could probably crawl on land, and probably laid eggs on land
- Probably did not travel far from shore



Mesosaur

Most primitive relatives of Mesozoic marine reptiles were similar in general form

- long needle-like teeth,
- webbed hands and feet,
- deep tail,
- some terrestrial ability,
- probably shore-dwelling or fresh-water

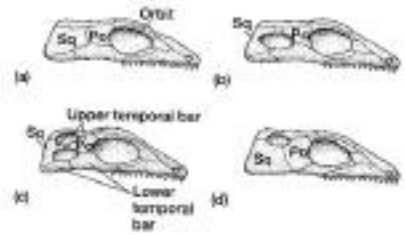
to mesosaurs, but later forms become more specialized for life in the sea.

Many different clades of Mesozoic marine reptiles, from almost every clade:

- Most were Euryapsids
- Anapsids - Testudines (marine turtles)
- Diapsids - Lepidosauria, both Rhynchocephalia (pleurosaurs) and Squamata (mosasauroids)
- Diapsids - Thalattosuchians (marine crocs)

Thalattosuchians

Euryapsida: the sister group to archosaurs and their relatives (Archosauriformes). Euryapsida + Archosauriformes together are called Archosauromorpha.



- First appear in Early Triassic
- Most primitive members have webbed fingers and could likely crawl around on land
- Early euryapsids (and most later ones) seem to have been fish eaters, with needle- or cone-shaped teeth.

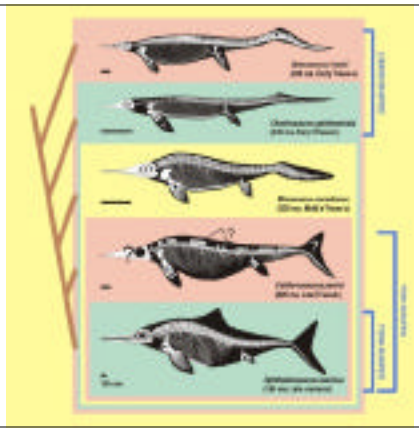
A variety of smallish Triassic forms: thallatosaurs, huphesuchians, pachypleurosaurs, nothosaurs, and placodonts (the latter with big crushing teeth, probably mollusk eaters)

Two highly specialized aquatic euryapsid groups: ichthyosaurs and plesiosaurs.

Ichthyopterygia (ichthyosaurs):

- First appear in Early Triassic; die out in the earliest part of Late Cretaceous
- Range from 1.5 to 15 m long
- Most of long snouts and cone-shaped teeth: fish or squid eaters
- Fore- and hindlimbs turned into flippers (for steering)

- Carbonized impressions show big tail fin and dorsal fin: very dolphin- or tuna-like
- VERY large eyes in some species: probably dove to deep water hunting squid
- HIGHLY transformed anatomy: probably very fast swimmers but incapable of surviving on land
- Remains show that they retained young inside body until birth



Plesiosauria (plesiosaurs):

- First appear in latest Triassic; die out at the end of the Cretaceous
- Fore- and hindlimbs turned into large flippers for swimming; tail generally short
- Include the largest known marine reptiles of all (bigger than all theropods, and in fact bigger than all dinosaurs other than sauropods!)

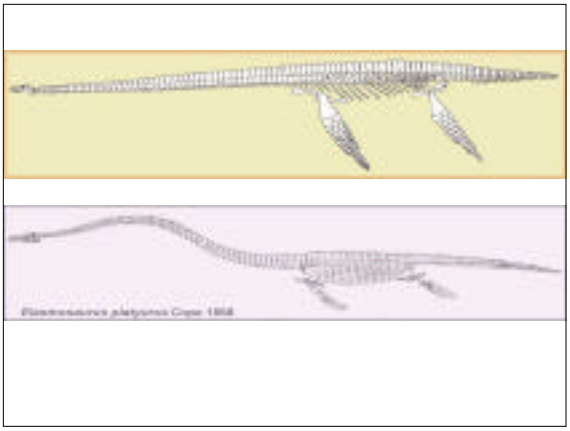
Might have been able to crawl up onto land to lay eggs, like sea turtles

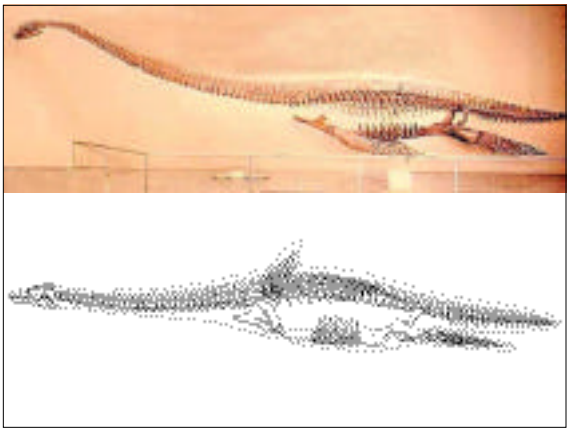
Two general body types:

- Small head, needle-like teeth, long neck: small fish or squid eaters

- Large head, big cone-shaped teeth, shorter neck: large fish or marine reptile eater

The large-headed forms appear to evolve a number of times from the long-necks



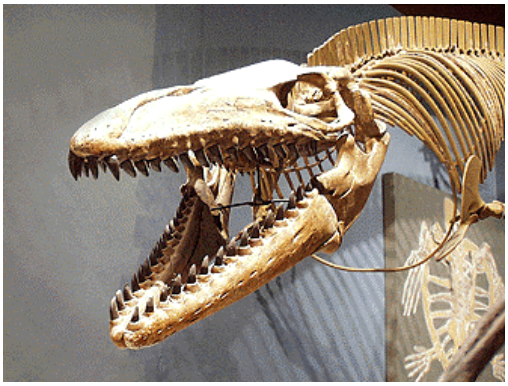


Mosasauridae (mosasaurs):

- Late Cretaceous only; survived until very end of Cretaceous
- True lizards
- Mosasauroidea includes Mosasauridae and some non-oceanic semi-aquatic forms
- Close relatives of monitor lizards and sister group to snakes
- Forelimbs powerful webbed flippers; hindlimbs reduced

- Tail powerful and deep
- Most mosasaurs with large cone-shaped teeth: fish, squid, ammonoid, and marine reptile eaters; a few have crushing teeth for feeding on shellfish
- Remains show that they retained young inside the body until hatching

Mosasaur



Marine turtles:

A couple of different closely-related families of marine turtles

- First groups are Late Cretaceous; some died out in Early Cenozoic, others survive to today
- Fore- and hindlimbs turned to flippers, forelimbs provide most of the thrust
- Feed on shellfish, fish, jellyfish, vegetation, etc.
- Shells are typically thinner than land-living turtles
- Crawl onto beach to lay eggs, but otherwise fully marine

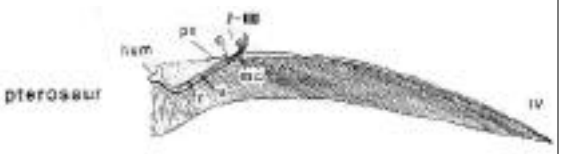
Just as several different groups of reptiles went back to the sea, some others took to the air.

A number of Permian & Triassic gliding reptiles, but **only two powered flying groups:**

- **Avialae** (birds, a type of theropod dinosaur)
- **Pterosauria** (pterosaurs, possibly the sister group to Dinosauriformes within Ornithodira, but may be more primitive archosauriforms)

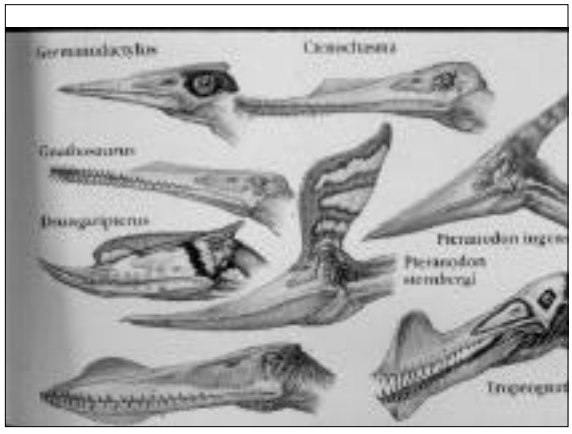
Pterosaurs:

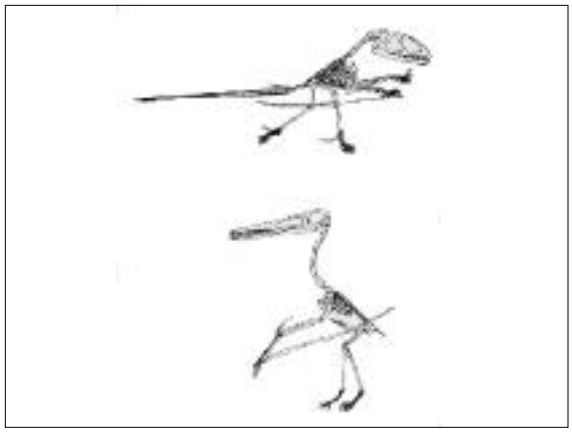
- First appear in Late Triassic; died out at very end of Cretaceous
- Had long hindlimbs and S-shaped neck.
- Flew using extended manual digit IV (ring finger)
- Skin stretched between finger and body, between legs, and from arm to neck



- Wings reinforced by special internal fibres
- Body covered with hair-like structures
- Some think they walked bipedally, but most evidence suggests quadrupedal (almost gorilla-like)
- Active powered fliers with large muscle attachments
- Possibly warm-blooded
- Ranged from 15 cm to 12-14 m wingspan!

- Earlier forms relatively small, short metacarpi, and long tails; later forms (Pterodactyloidea, the true pterodactyls) could be very large, had long metacarpi, and short tails
- Variety of diets: insectivores, fish eaters, fruit eaters, etc.
- No evidence of direct competition between birds and pterosaurs.





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