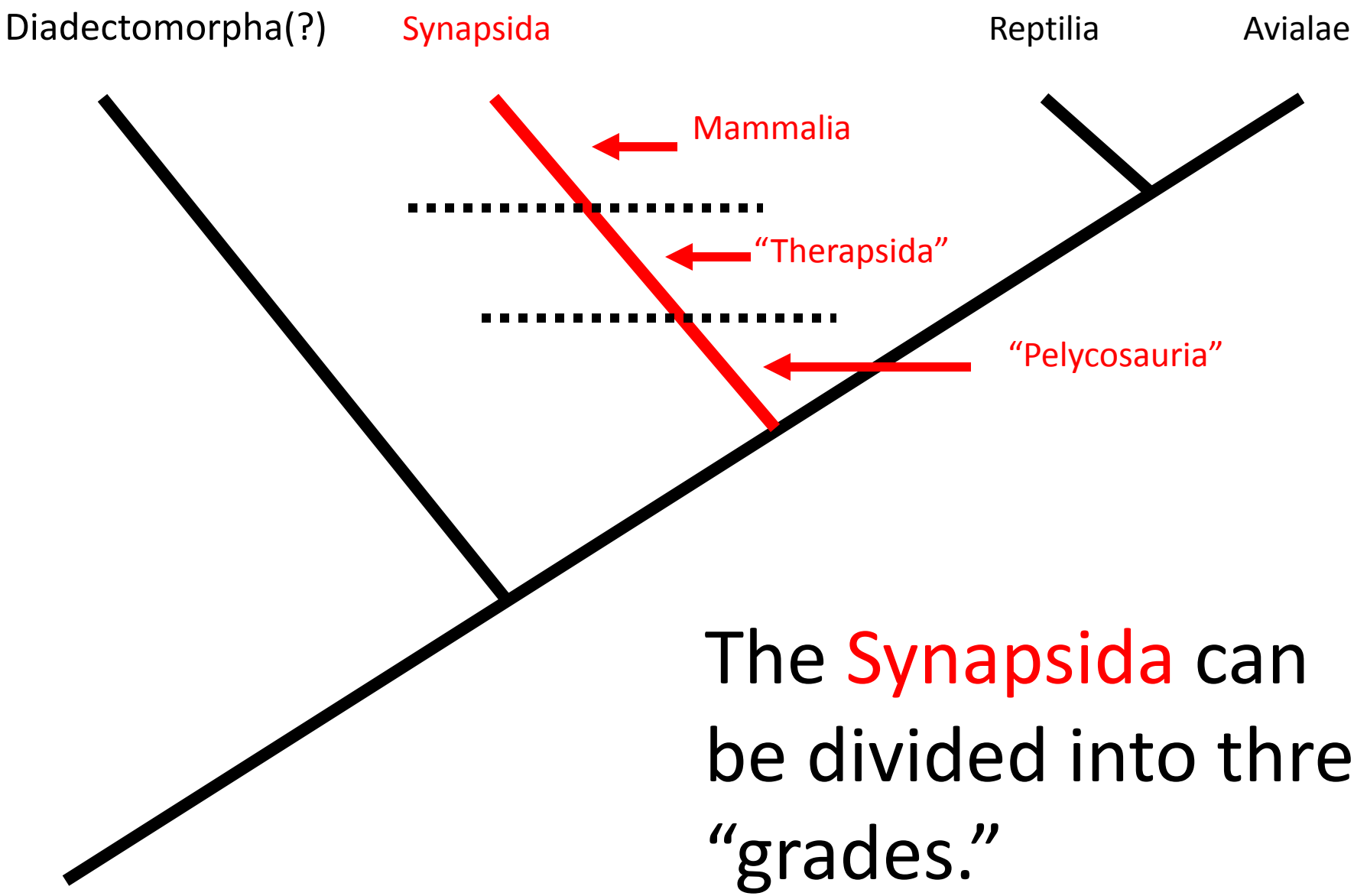
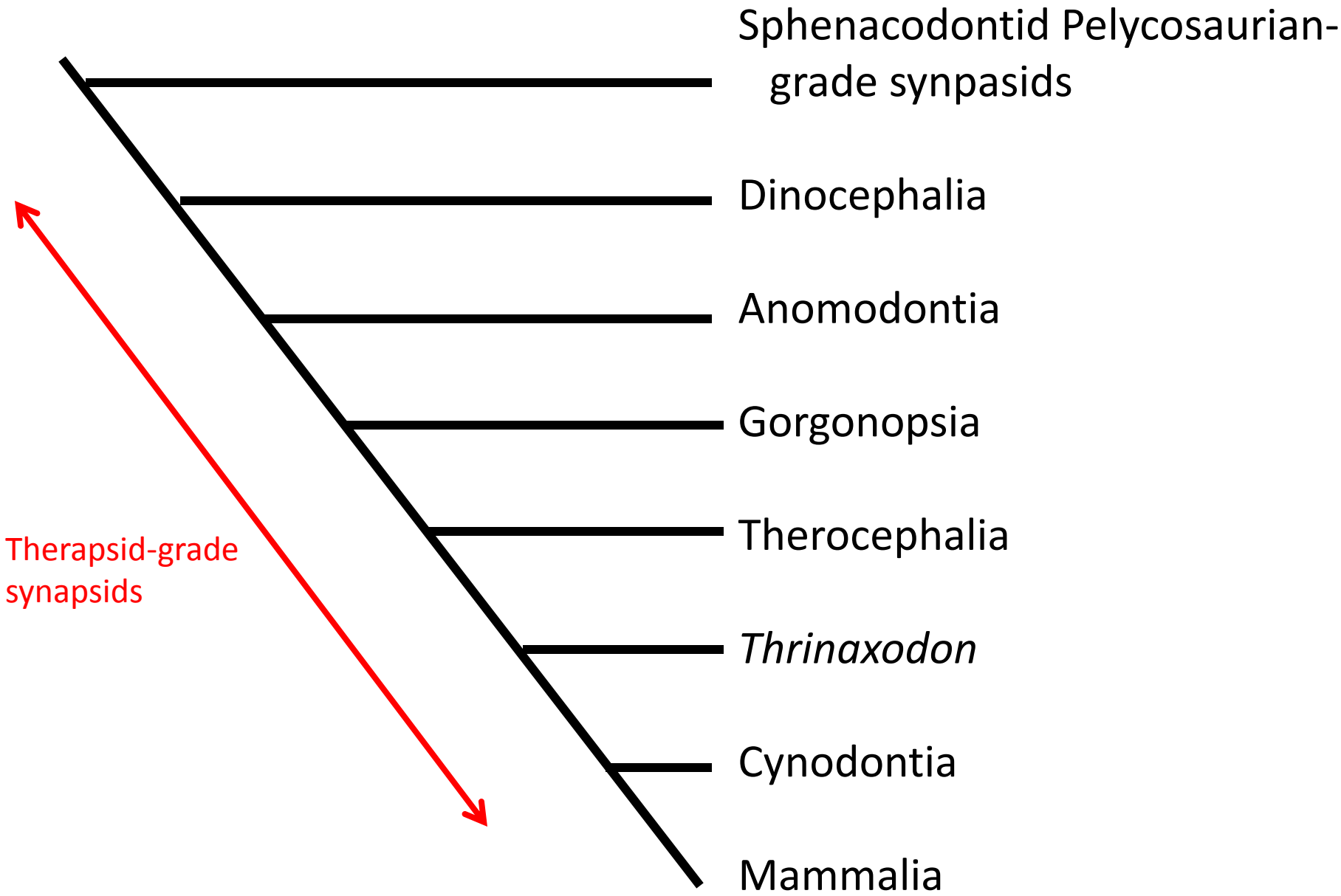
Stuart S. Sumida
Biology 342

(Over) Simplified Phylogeny of Basal Synapsida



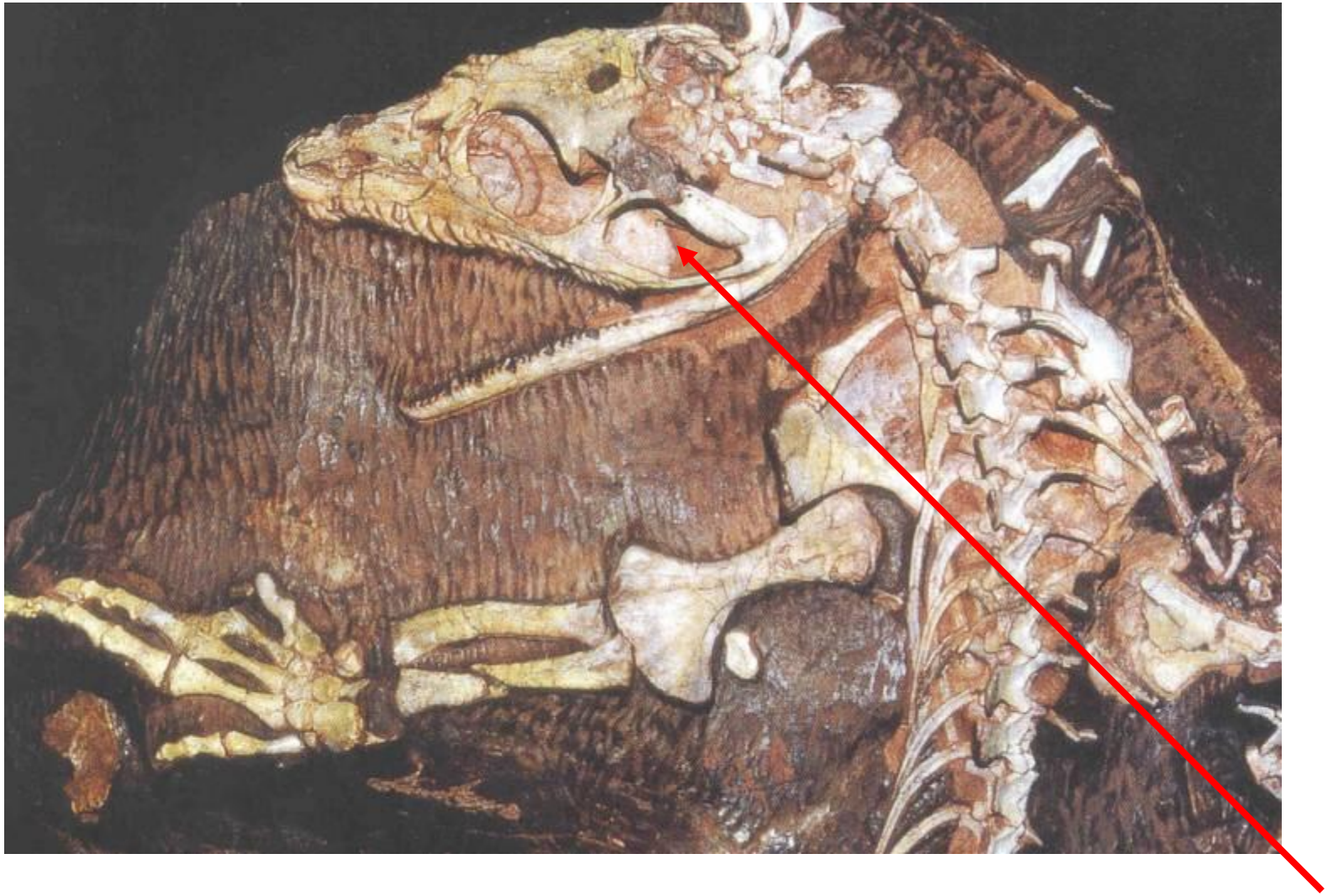
The Synapsida can be divided into three "grades."


Sphenacodontid Pelycosaurian-grade synpasids
Dinocephalia
Anomodontia
Gorgonopsia
Therocephalia
Thrinaxodon
Cynodontia
Mammalia
Therapsid-grade synapsids

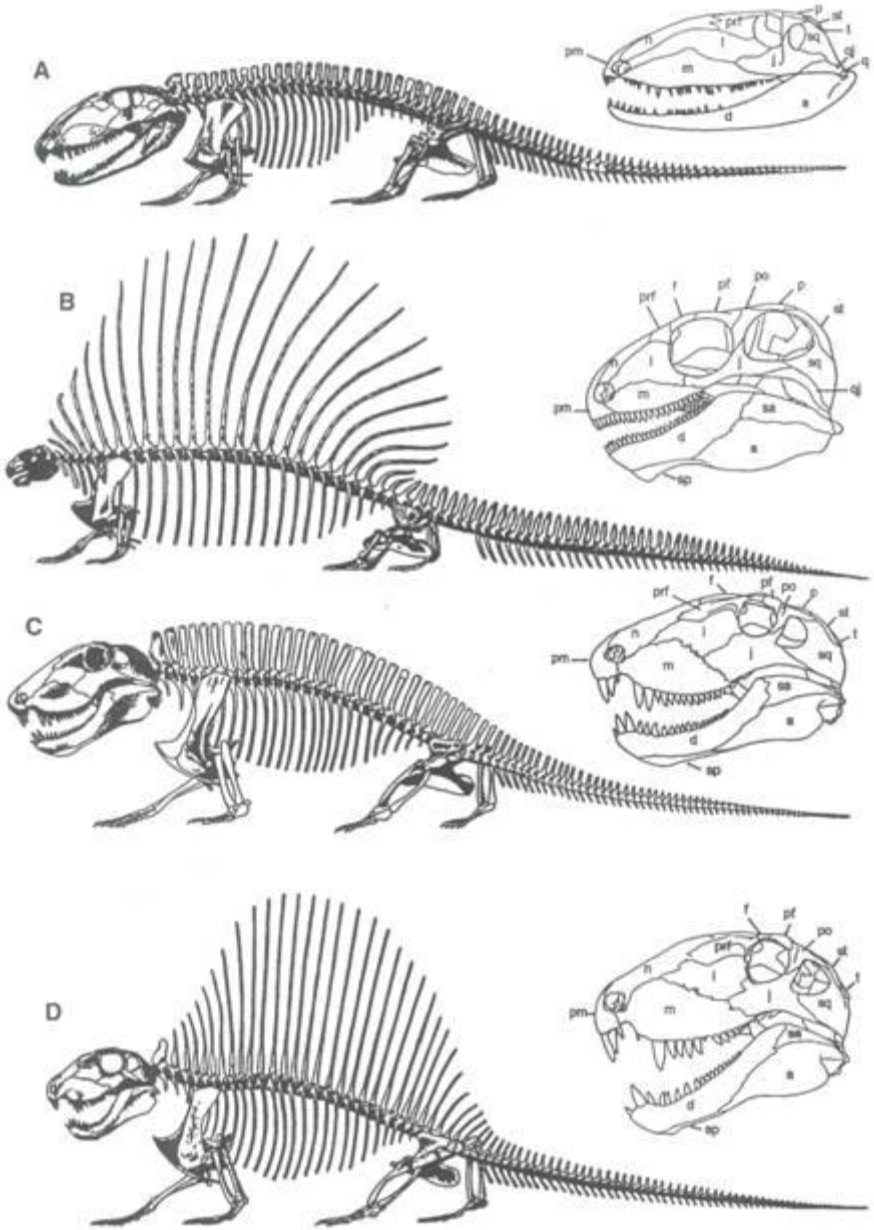
The phylogenetic tree presented here is extremely simplified, highlighting only major groups of therapsids.

Each successive taxon demonstrates part of the progression toward a more mammalian skull and dental configuration (heterodonty), and a more mammalian postcranial skeleton approaching parasaggital limb position.

It is presumed that these anatomical changes were mirrored by physiological changes on the path toward mammalian endothermy and other metabolic characteristics.



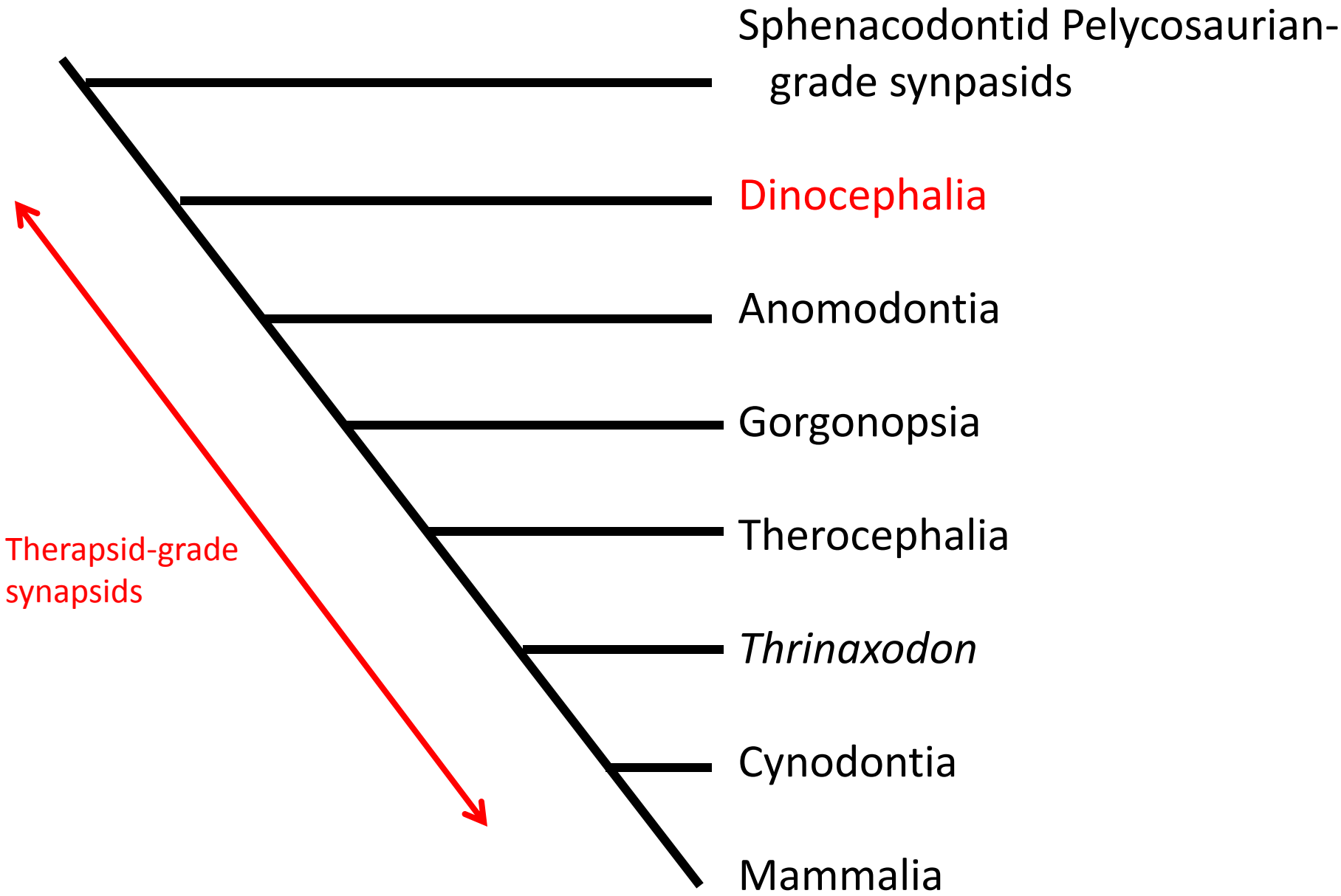
Basal Synapsida (“Pelycosauria”): A single opening on side of skull



Basal synpasids:

Mid-Carboniferous to Early Permian

320-280 mybp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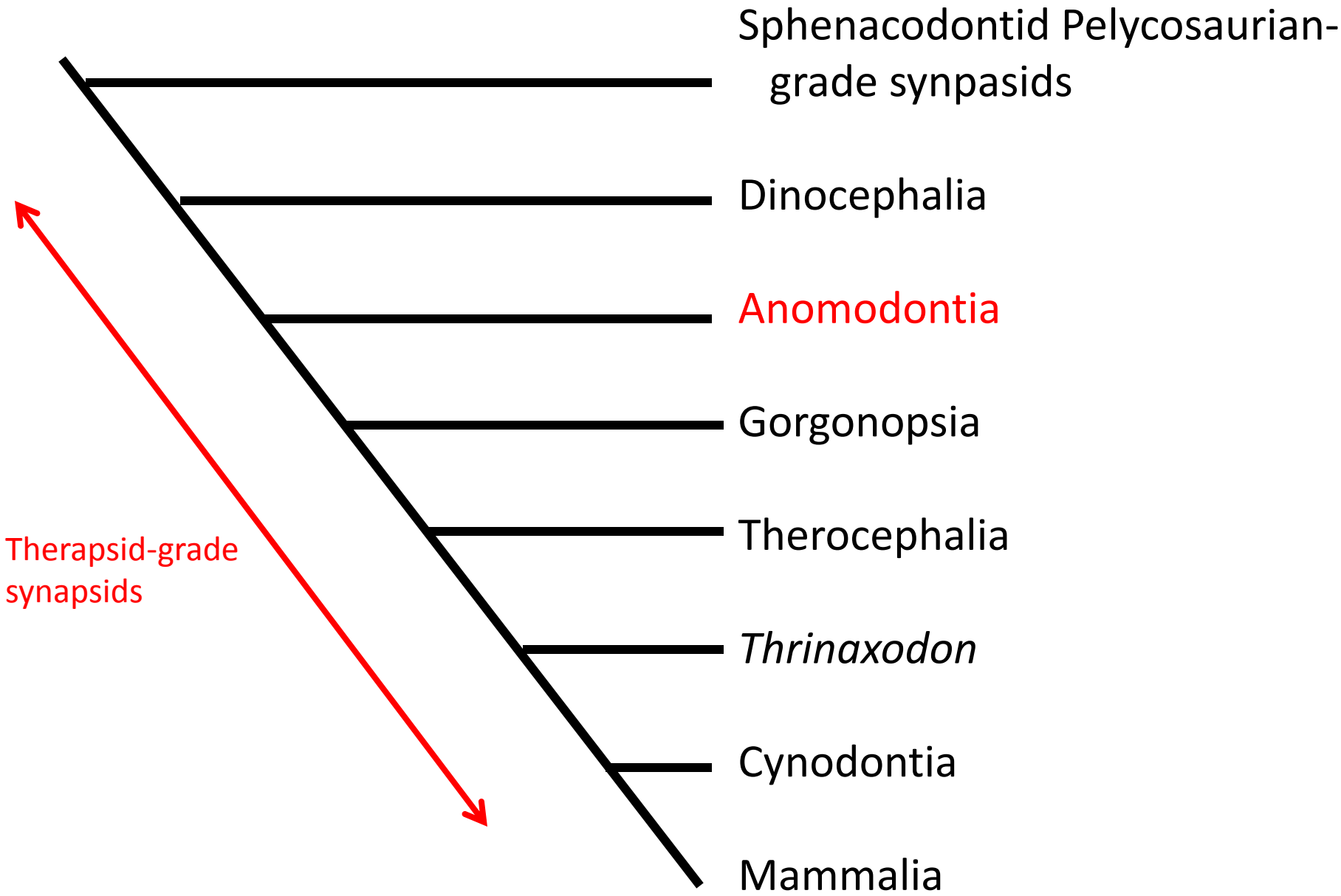
DINOCEPHALIA

- Middle to Late Permian
- Large, predatory therapsids with slightly more parasaggital posture than pelycosaurs.
- Interlocking incisors
- Note overall similarity of skull to that of sphenacodontid pelycosaurs

***Titanophoneus* – a large predatory dinocephalian from the Late Permian of Russia**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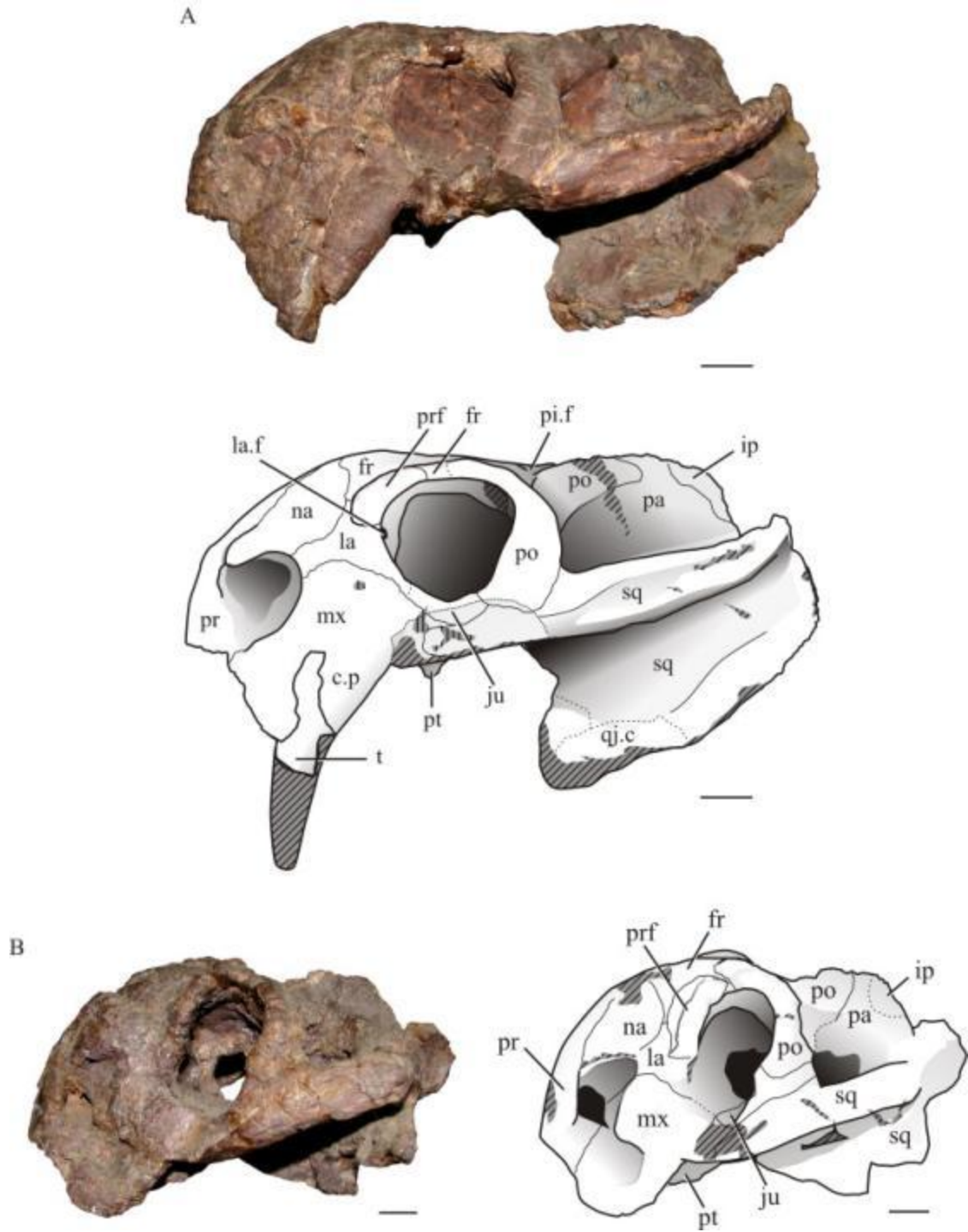
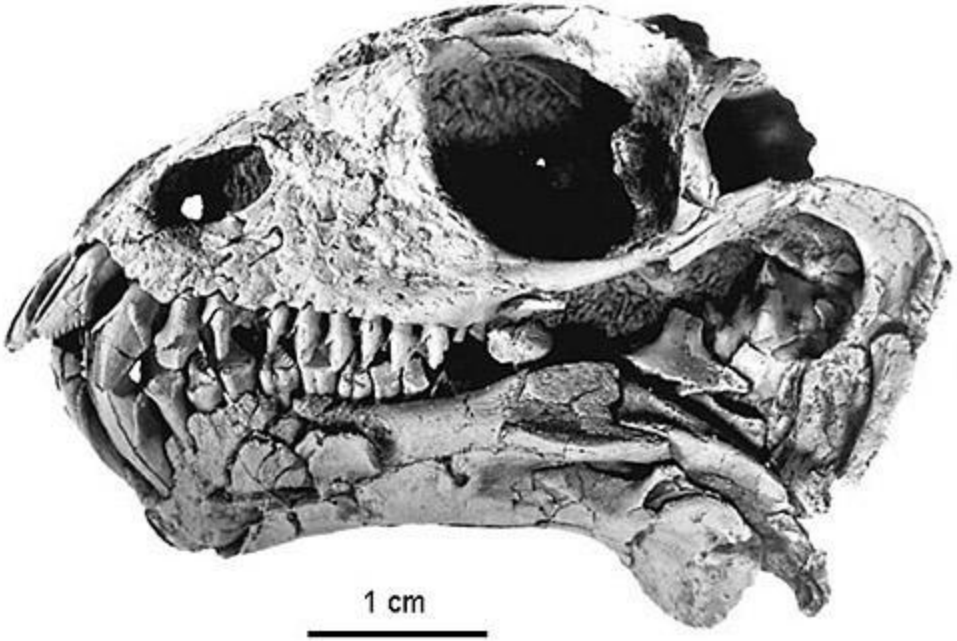
ANOMODONTIA

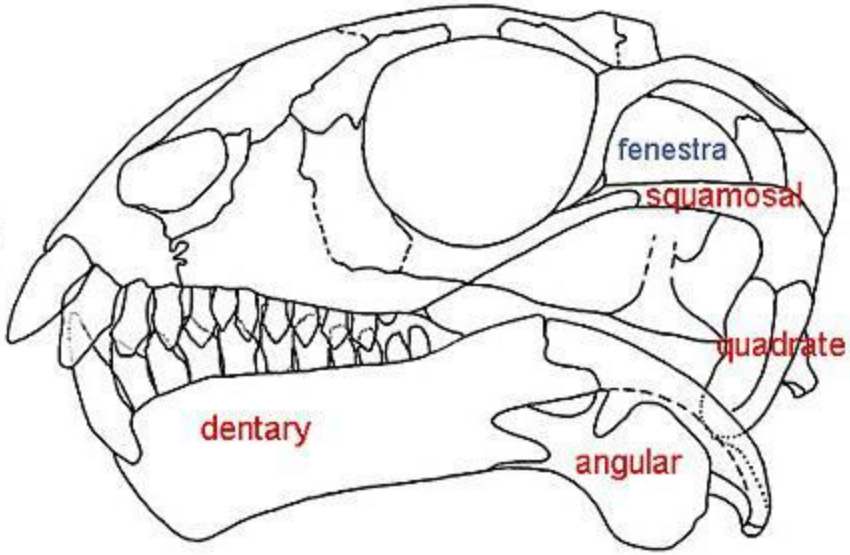
Anomodonts are one of the early major experiments in herbivory amongst therapsids.

Highly derived nearly toothless skull except for large tusks that may have been used for digging, or for display.

Dominant group of terrestrial herbivores during the Triassic.

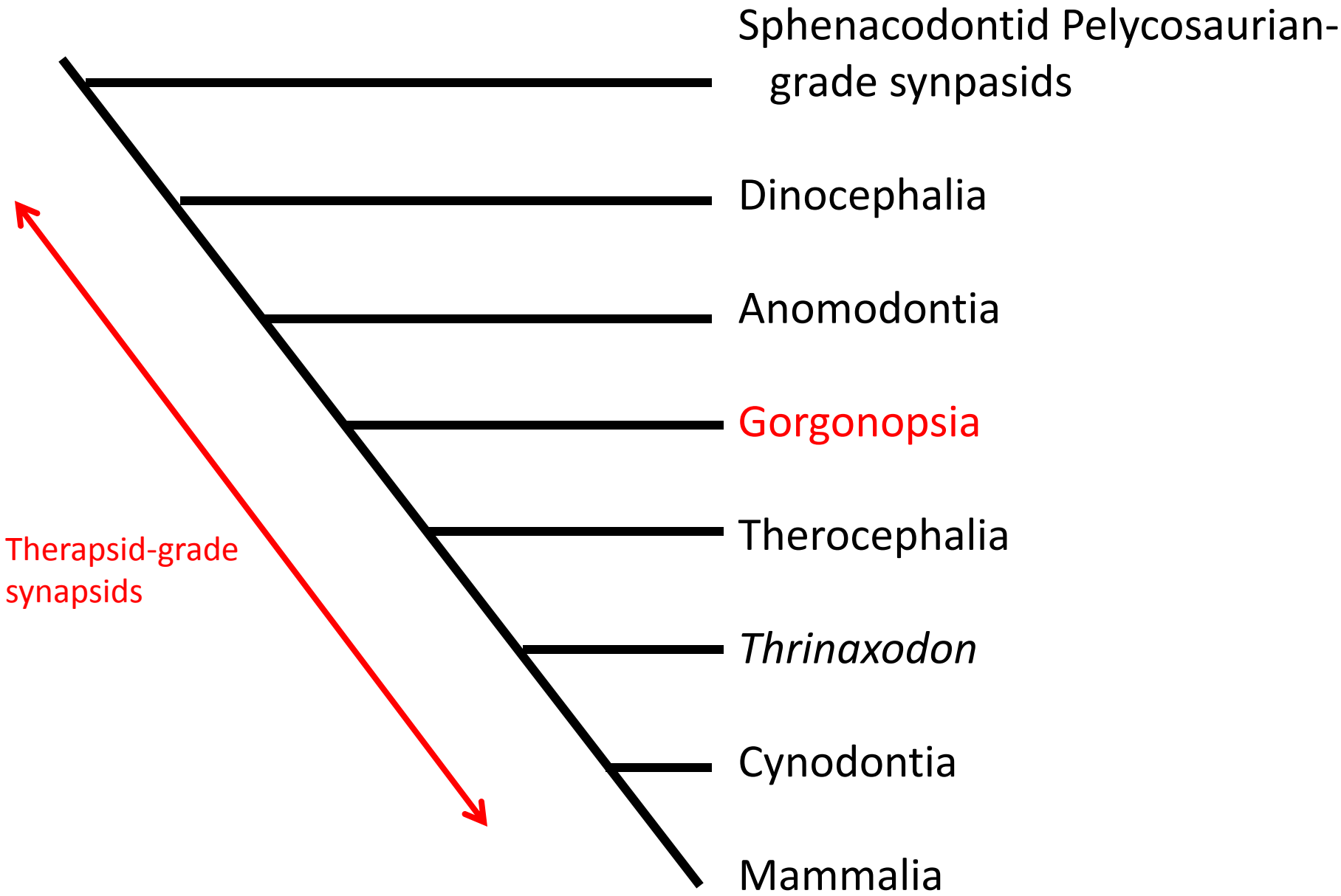






from N Rybczynski & R R Reisz, *Nature* 411:684 (2001)

The anomodon *Suminia*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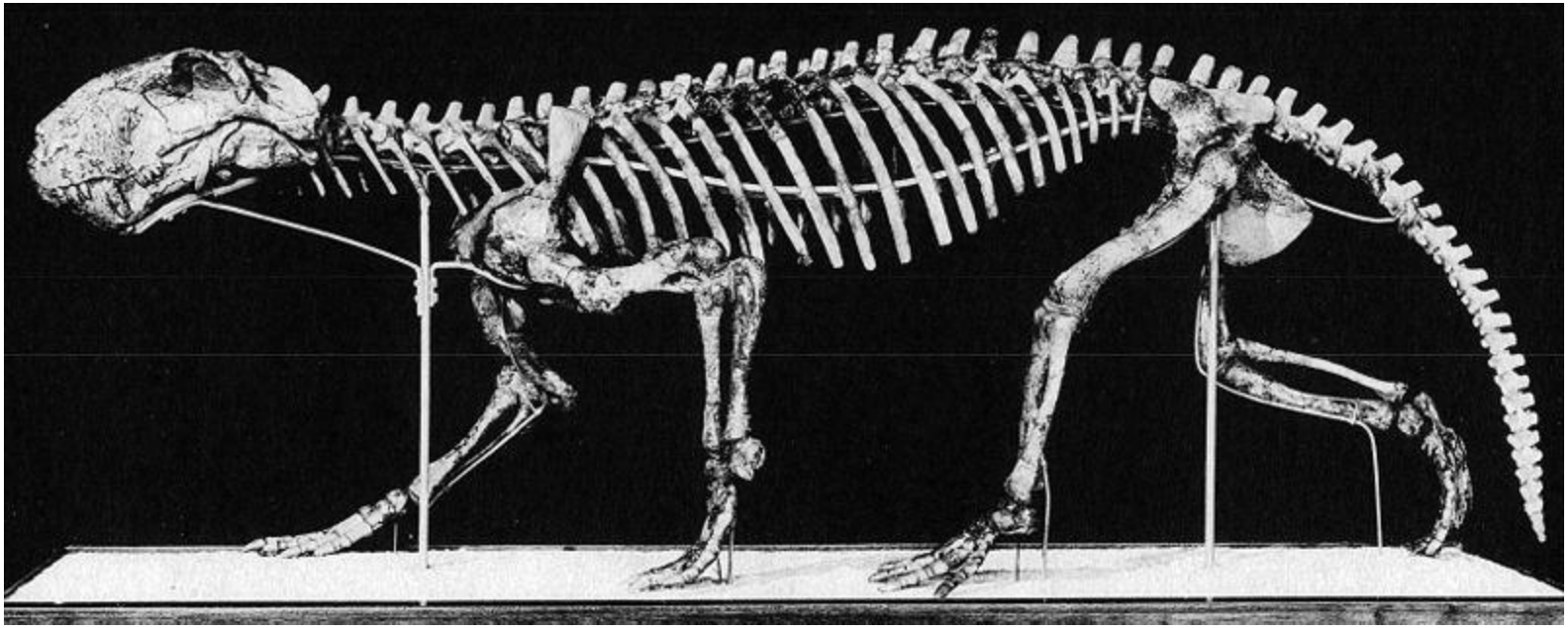
GORGONPSIA

•Late Permian group.

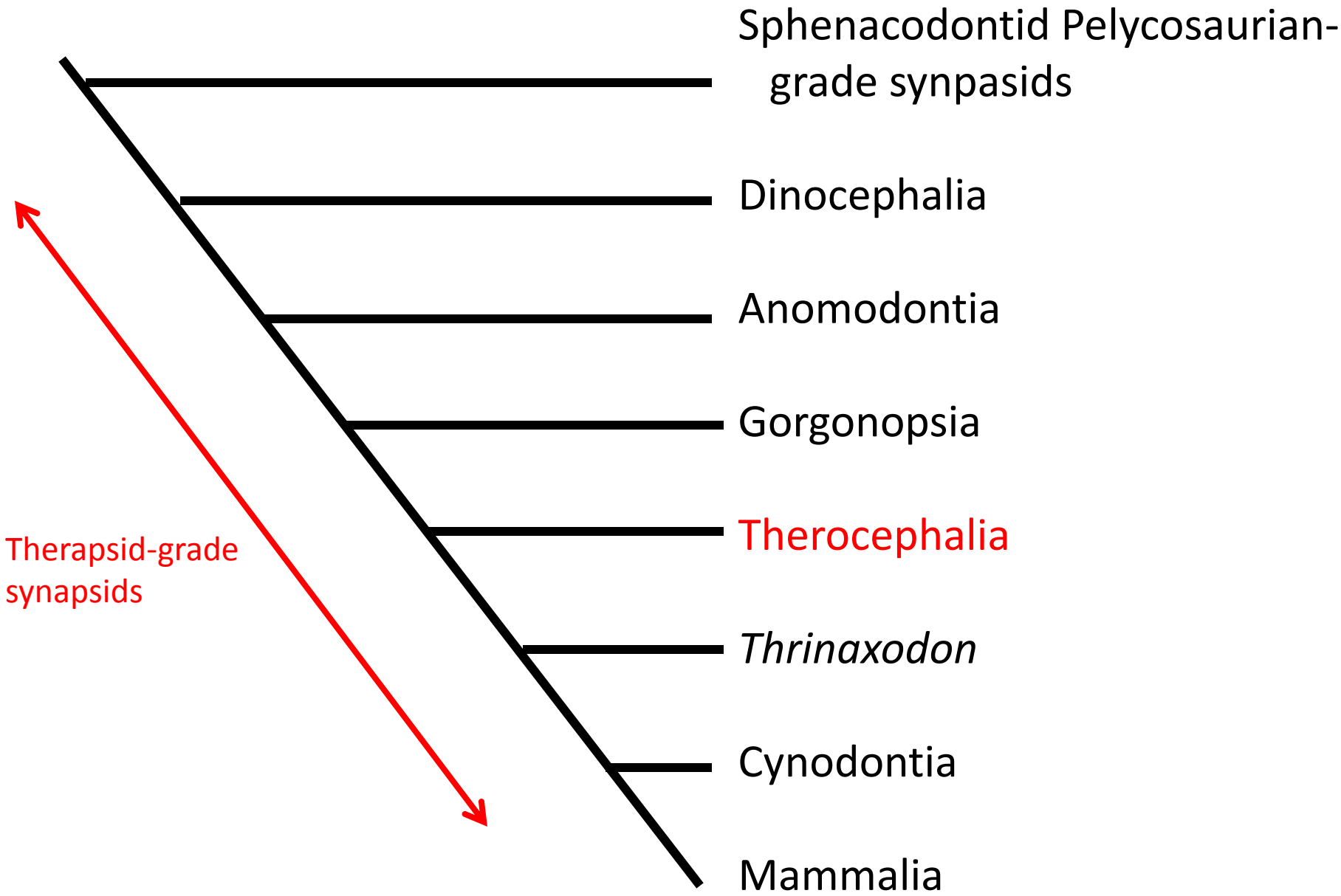
•More advanced differentiation in dentition and more completely parasaggital posture.

•Ferocious looking with extremely large caniniform teeth.

•Most a meter or less in size.



The gorgonopsid *Lycaenops*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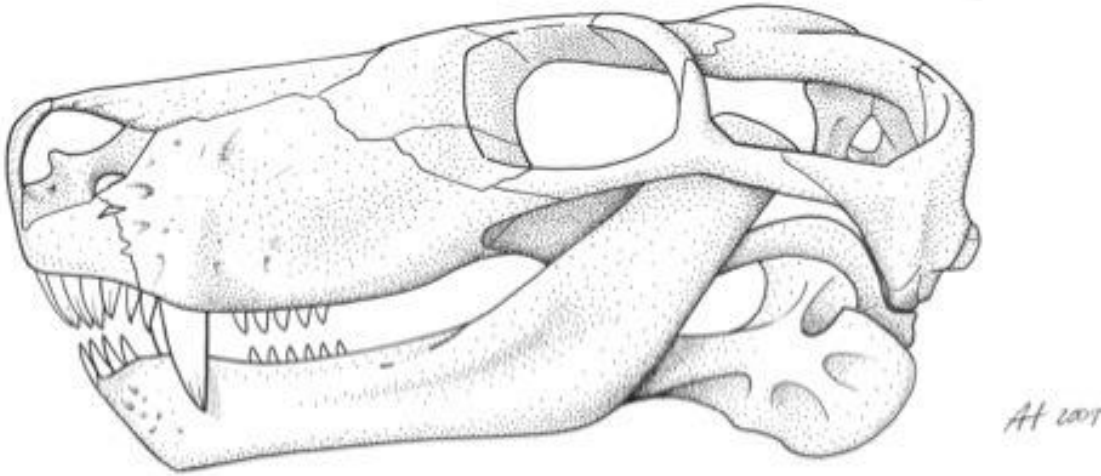
THEROCEPHALIA

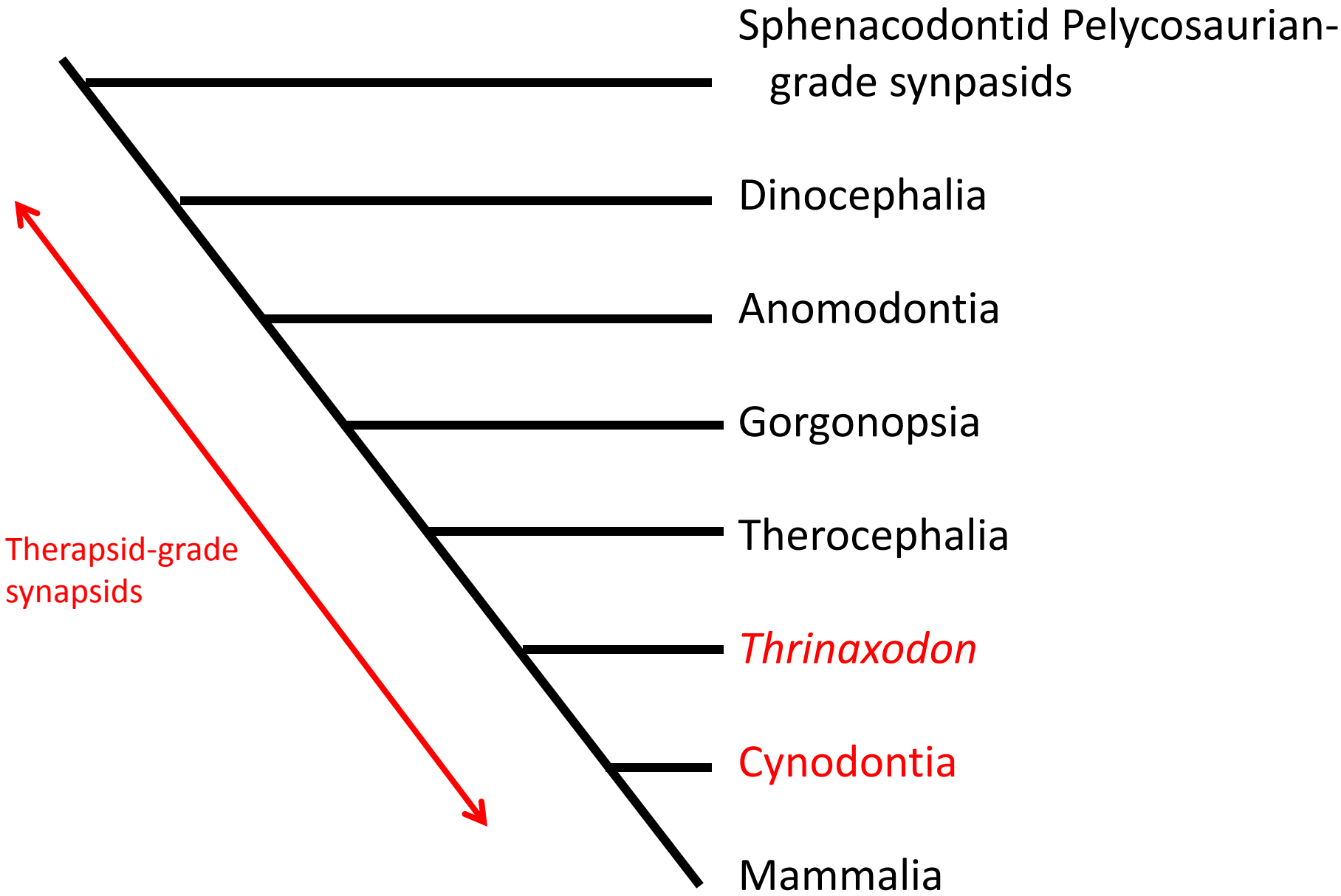
Middle Permian to Middle Triassic group.

Robust and large-headed carnivores.

Show beginnings of development of a secondary palate.

Many small therocephalians have small pits on their snouts that probably supported vibrissae or whiskers

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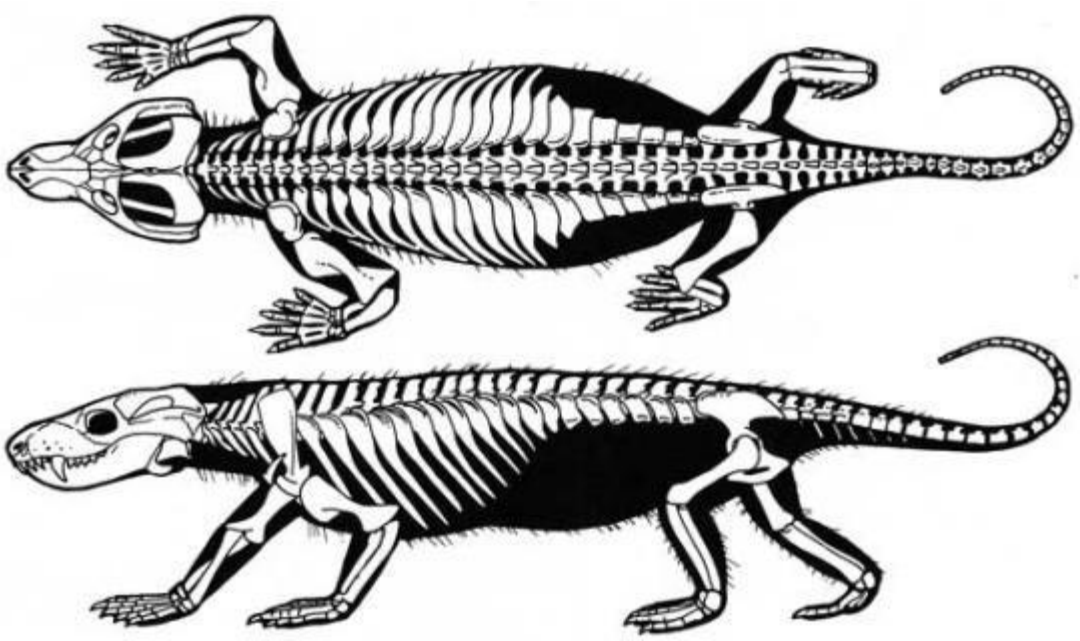
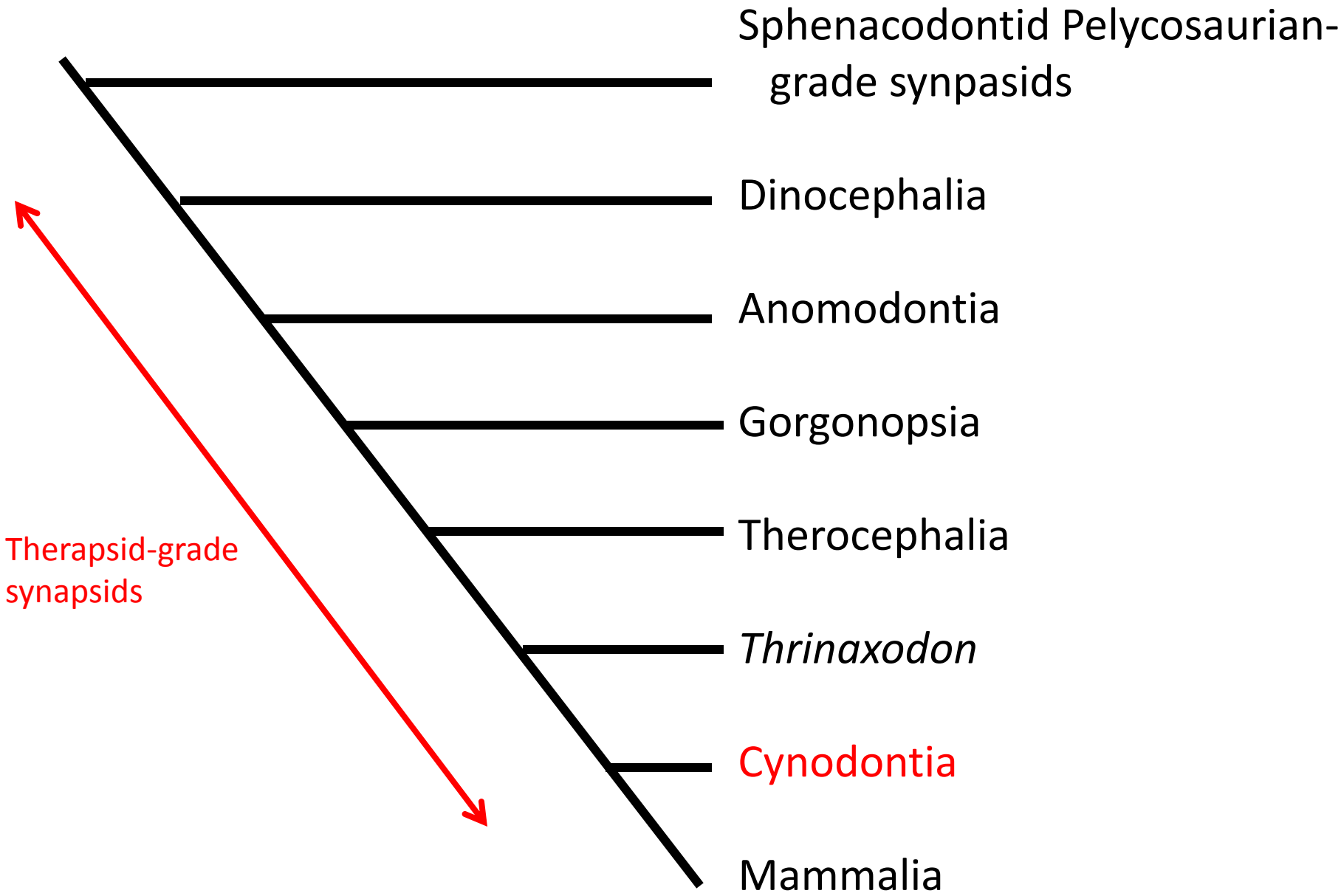
Thrinaxodon

•A particularly important genus in that it demonstrates numerous features close to mammals.

•In *Thrinaxodon* and more derived cynodonts, the postcanine teeth are multicusped. The postcanines wear together during mastication, forming irregular facets.

•*Thrinaxodon* and mammals also share an elongated lumbar region, with 6 lumbar vertebrae and lumbar zygapophyses oriented horizontally. This facilitates lumbar flexion-extension and may have affected coupling of breathing tides and locomotor cycles.

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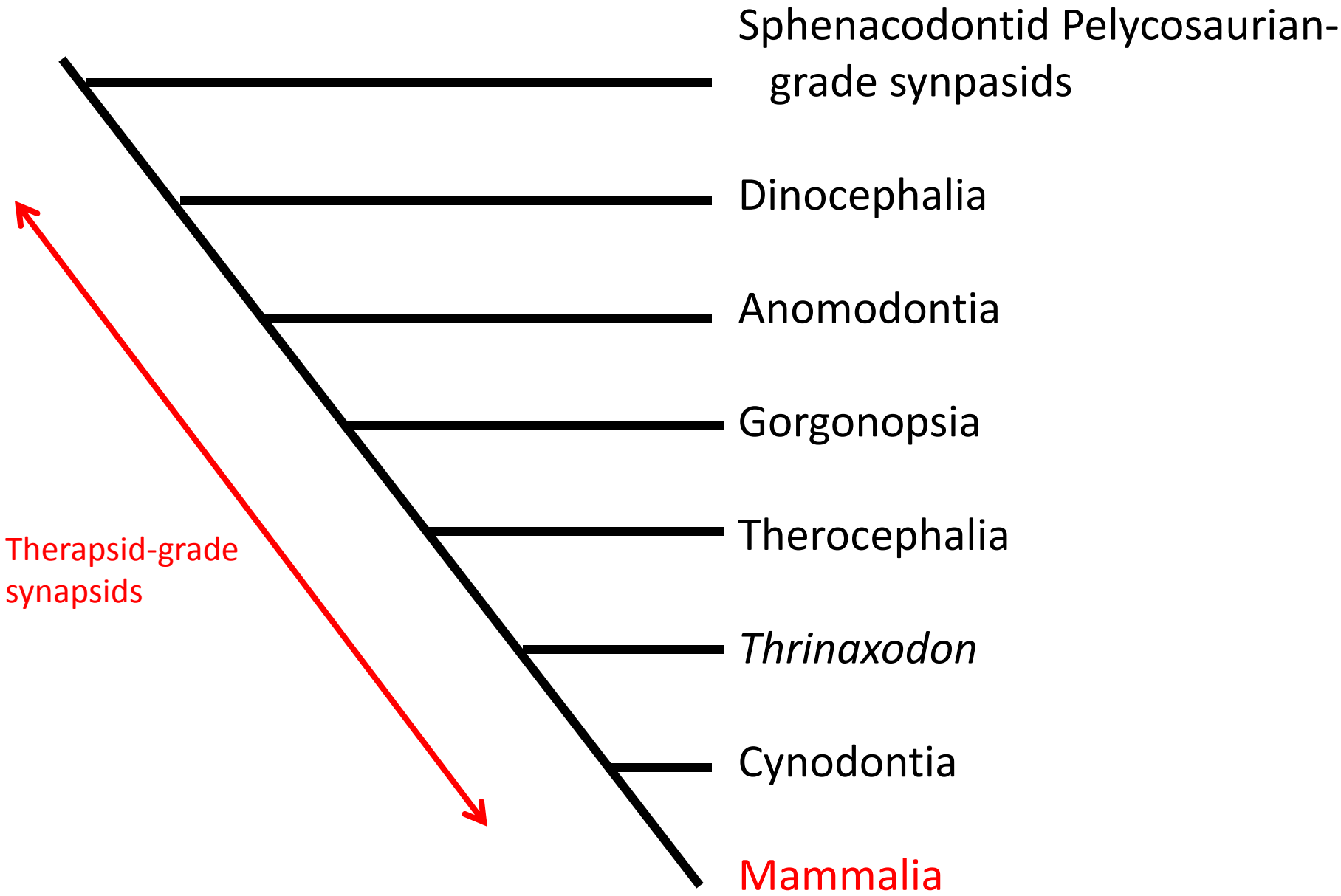
Cynognathus (Triassic)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Earliest known true mammals:

Known form the Late Triassic.

Example; *Eozostrodon* and relatives, known from what is now British Isles and South Africa.