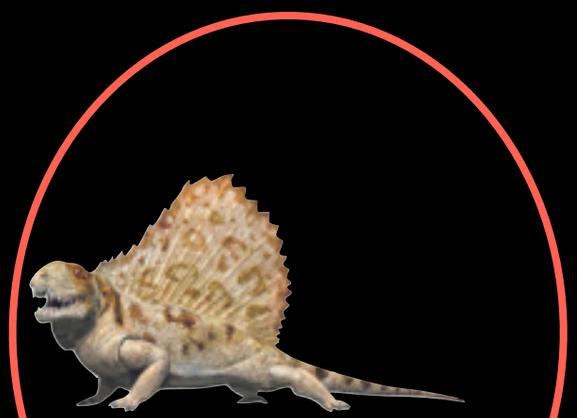


Synapsida

Anapsida

Lepidosauria

Archosauria

Diapsida

Eureptilia

Amniotes

Pelycosauria
(paraphyletic)

Sphenacodontids
Edaphosaurids

Dinocephalia

Dicynodontia

Gorgonopsia

Therocephalia

Cynodontia

Theriodontia

Therapsida

Eupelycosauria

Synapsida

Amniota

Diapsida

Anapsida

Eureptilia

Pelycosaurs: Early Permian

Eothyris

Cotylorynchus

Edaphosaurus

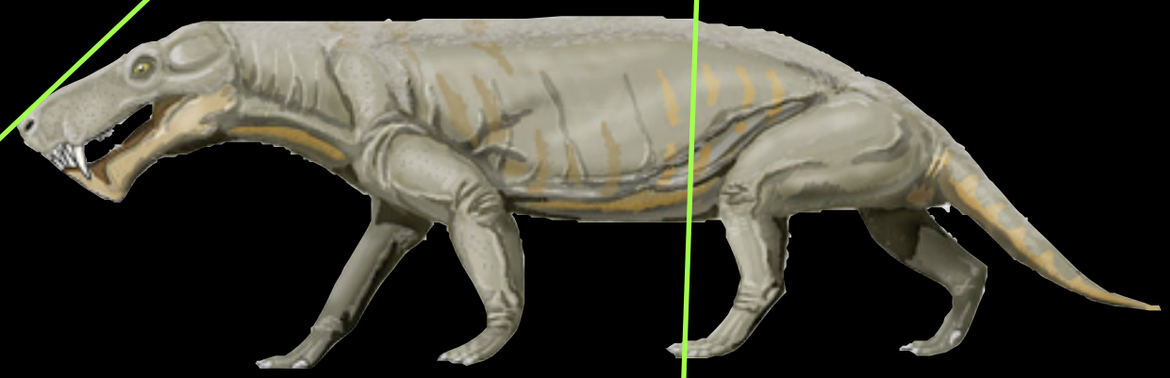
Dimetrodon

Edaphosaurids
Sphenacodontids

Tetraceratops

- Basal
- Dinocephalia
- Dicynodontia
- Gorgonopsids
- Mammal Ancest.

Moschops



Lystrosaurus

Arctognathus

Cynodontia

Therapsida: Mid-Late Permian

Synapsida

Anapsida

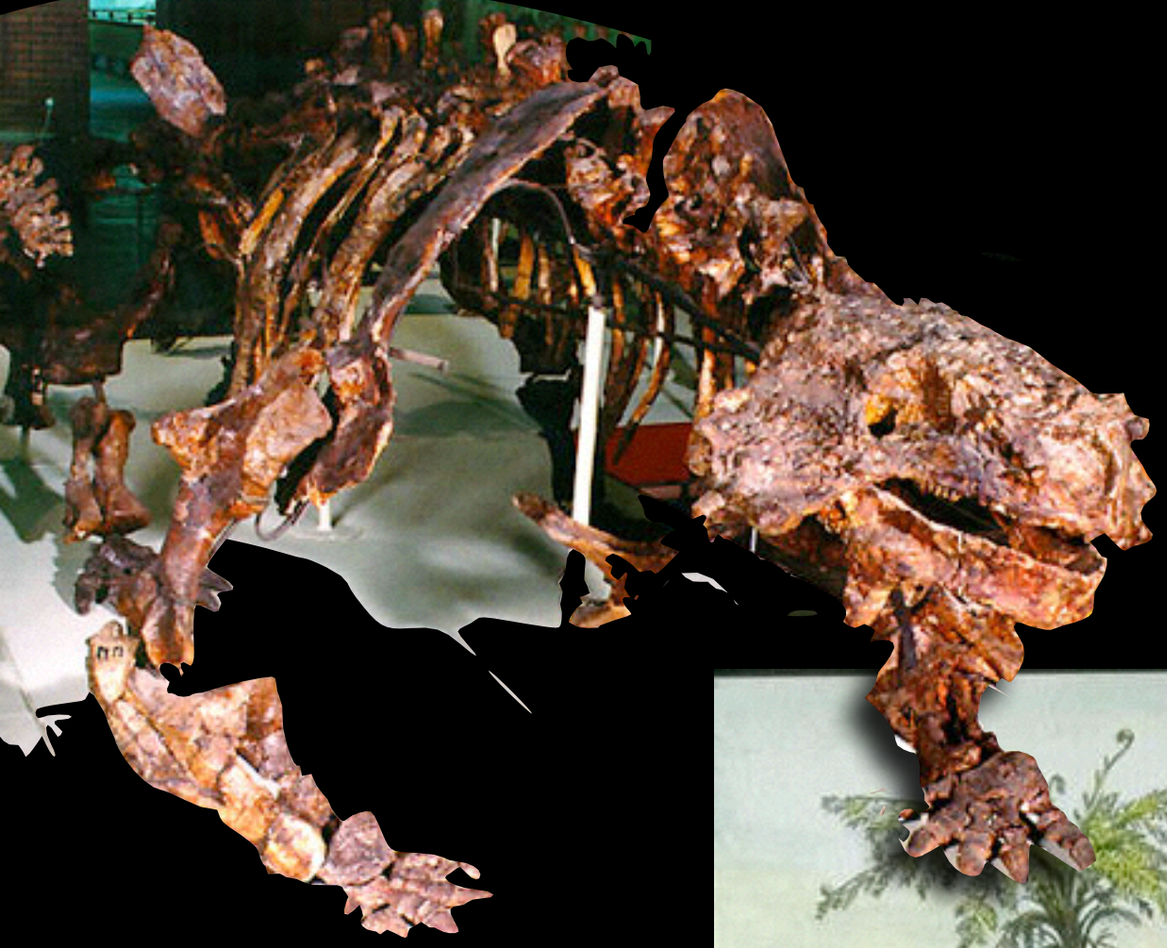
Lepidosauria

Archosauria

Diapsida

Eureptilia

Amniotes



Scutosaurus

Anapsids

-Late Permian

Pareiasaurs

-Vegetarians

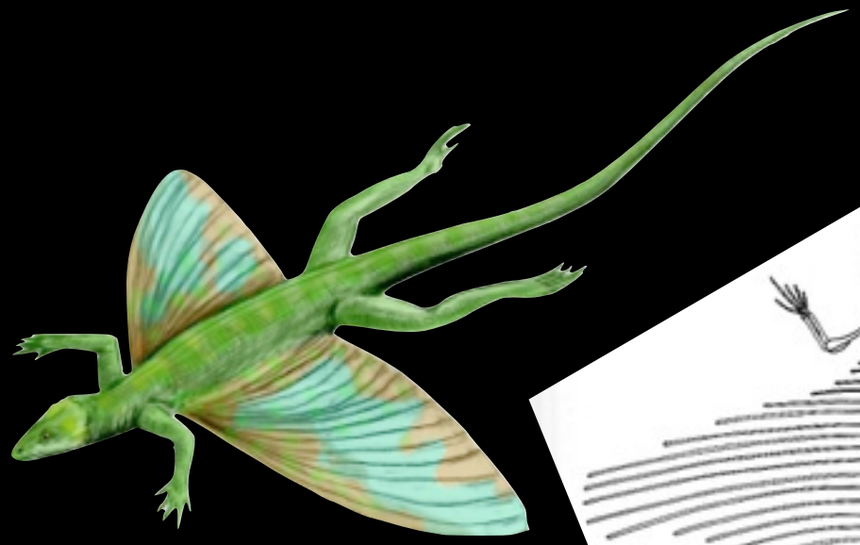
Lepidosauria

Archosauria

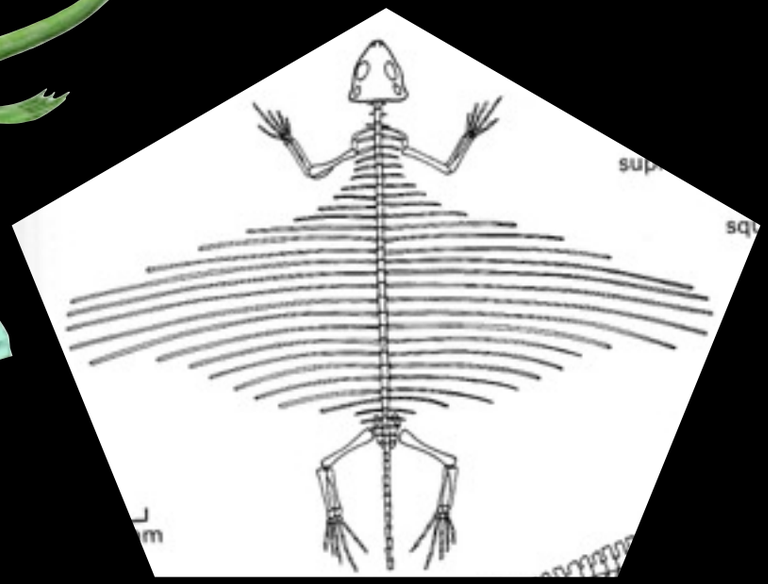
Diapsida

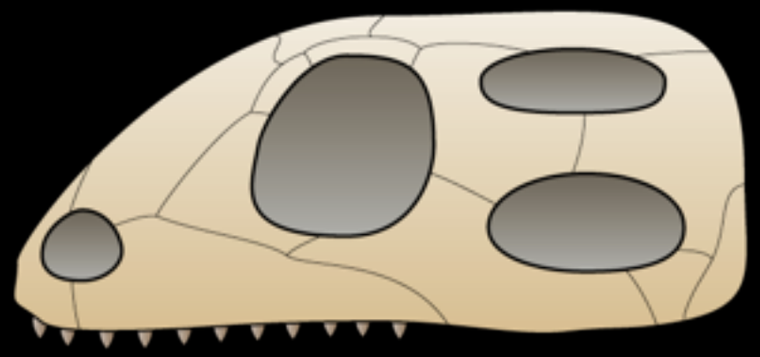
Diapsids in the Permian

Weird, Wonderful,
and Rare



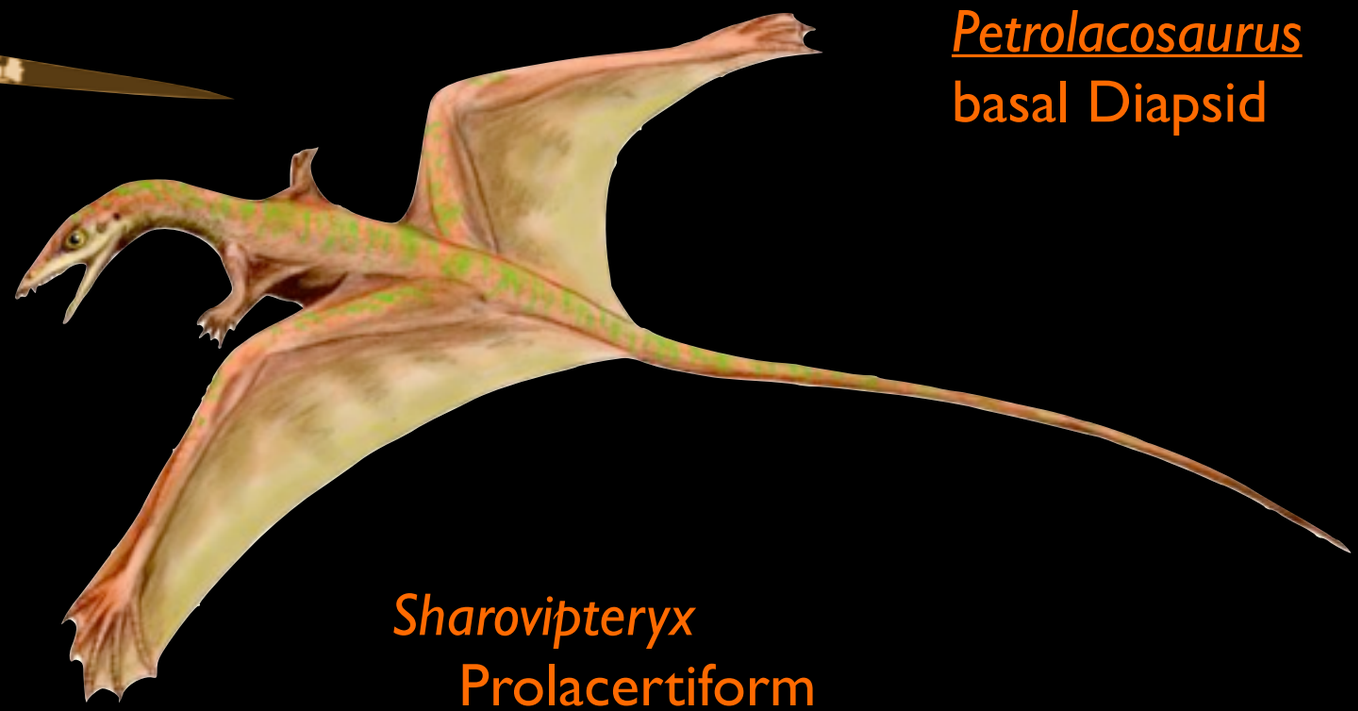
Coelurosauravus





Petrolacosaurus
basal Diapsid

Protorosaurus
Prolacertiform



Sharovipteryx
Prolacertiform

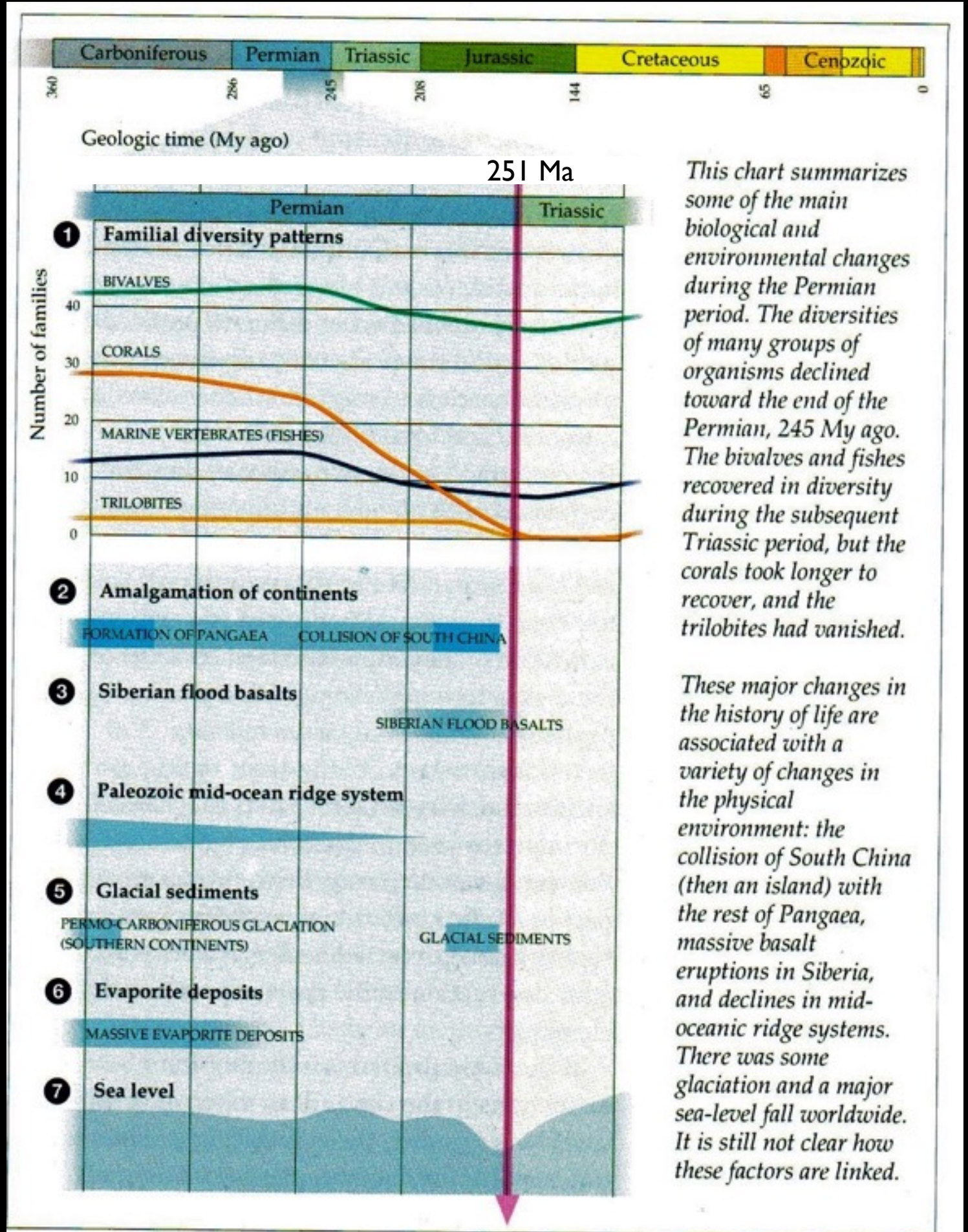
DOCTOR FUN

13 Feb 2006

Coach Darwin gives a pep talk at the Permian/Triassic halftime.

The Permo-Triassic Extinction:

The 'Great Dying'



This chart summarizes some of the main biological and environmental changes during the Permian period. The diversities of many groups of organisms declined toward the end of the Permian, 245 My ago. The bivalves and fishes recovered in diversity during the subsequent Triassic period, but the corals took longer to recover, and the trilobites had vanished.

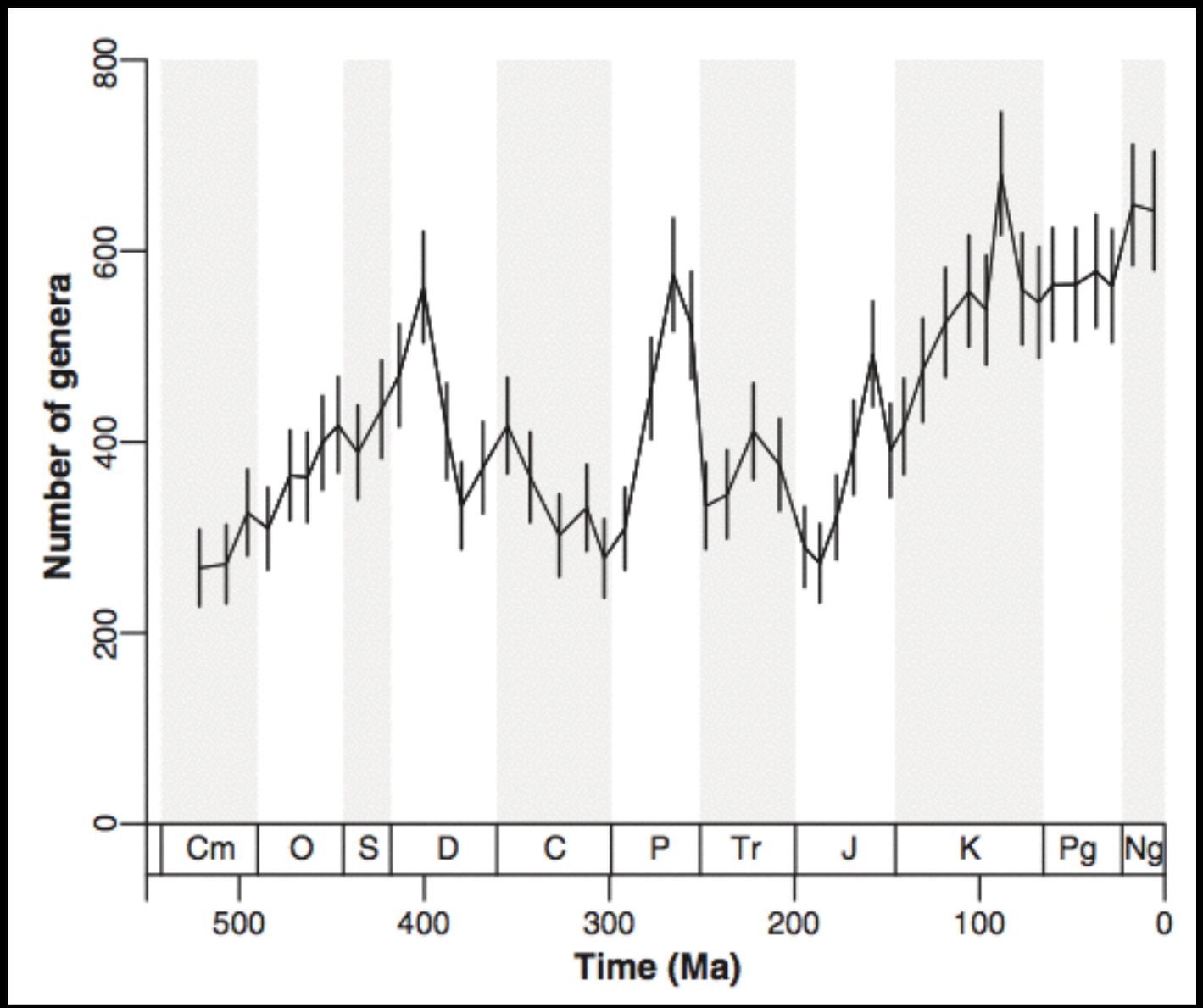
These major changes in the history of life are associated with a variety of changes in the physical environment: the collision of South China (then an island) with the rest of Pangaea, massive basalt eruptions in Siberia, and declines in mid-oceanic ridge systems. There was some glaciation and a major sea-level fall worldwide. It is still not clear how these factors are linked.

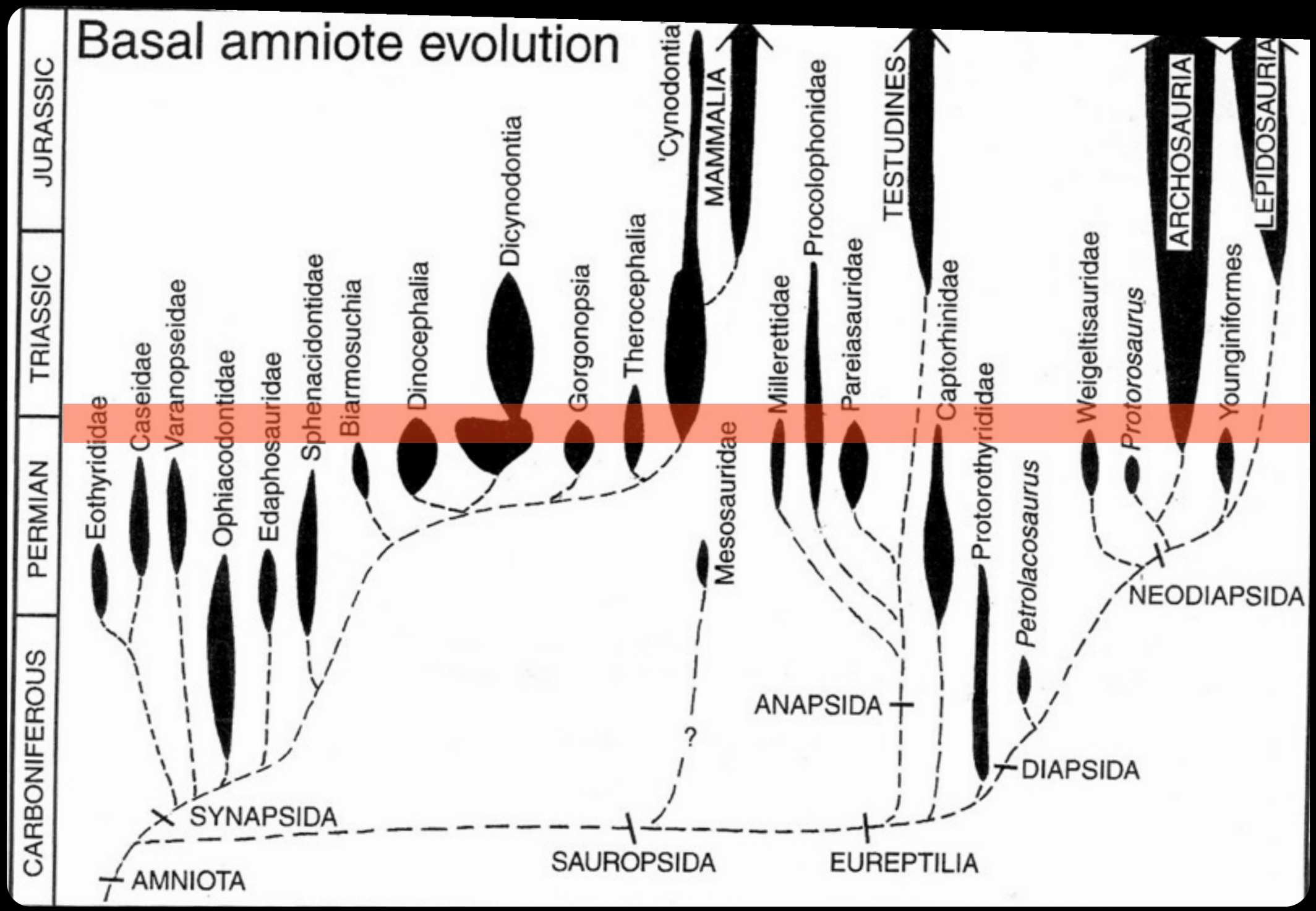
50% of marine families were lost across the Permo-Triassic @ 151 Ma

scales to ca. 90% species loss in the sea

The ‘Death Curve’

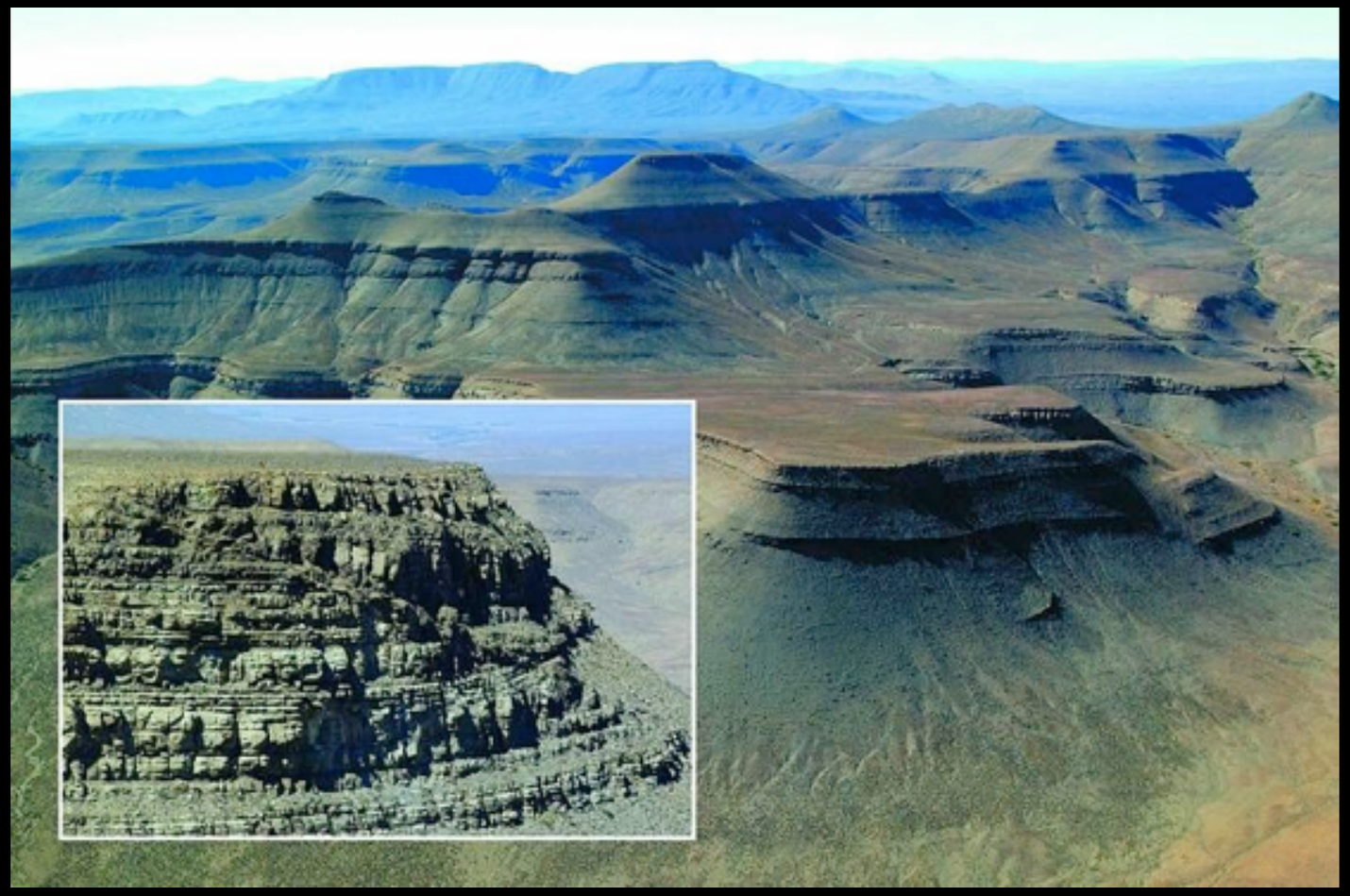
Marine Invertebrates



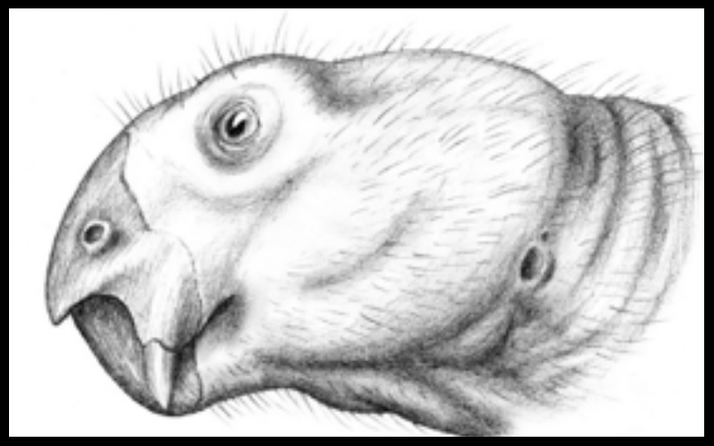

Basal amniote evolution
CARBONIFEROUS
PERMIAN
TRIASSIC
JURASSIC
Eothyrididae
Caseidae
Varanopseidae
Ophiacodontidae
Edaphosauridae
Sphenacodontidae
Biarmosuchia
Dinocephalia
Dicynodontia
Gorgonopsia
Therocephalia
'Cynodontia'
MAMMALIA
Mesosauridae
Millerettidae
Procolophonidae
Pareiasauridae
TESTUDINES
Captorhinidae
Protorothyridae
Weigeltisauridae
Protorosaurus
ARCHOSAURIA
Younginiformes
LEPIDOSAURIA
Petrolacosaurus
NEODIAPSIDA
ANAPSIDA
DIAPSIDA
?
SYNAPSIDA
SAUROPSIDA
EUREPTILIA
AMNIOTA

What caused the extinction event?

Karoo Basin, South Africa



Permian
Dicynodon Zone



Triassic
Lystrosaurus Zone

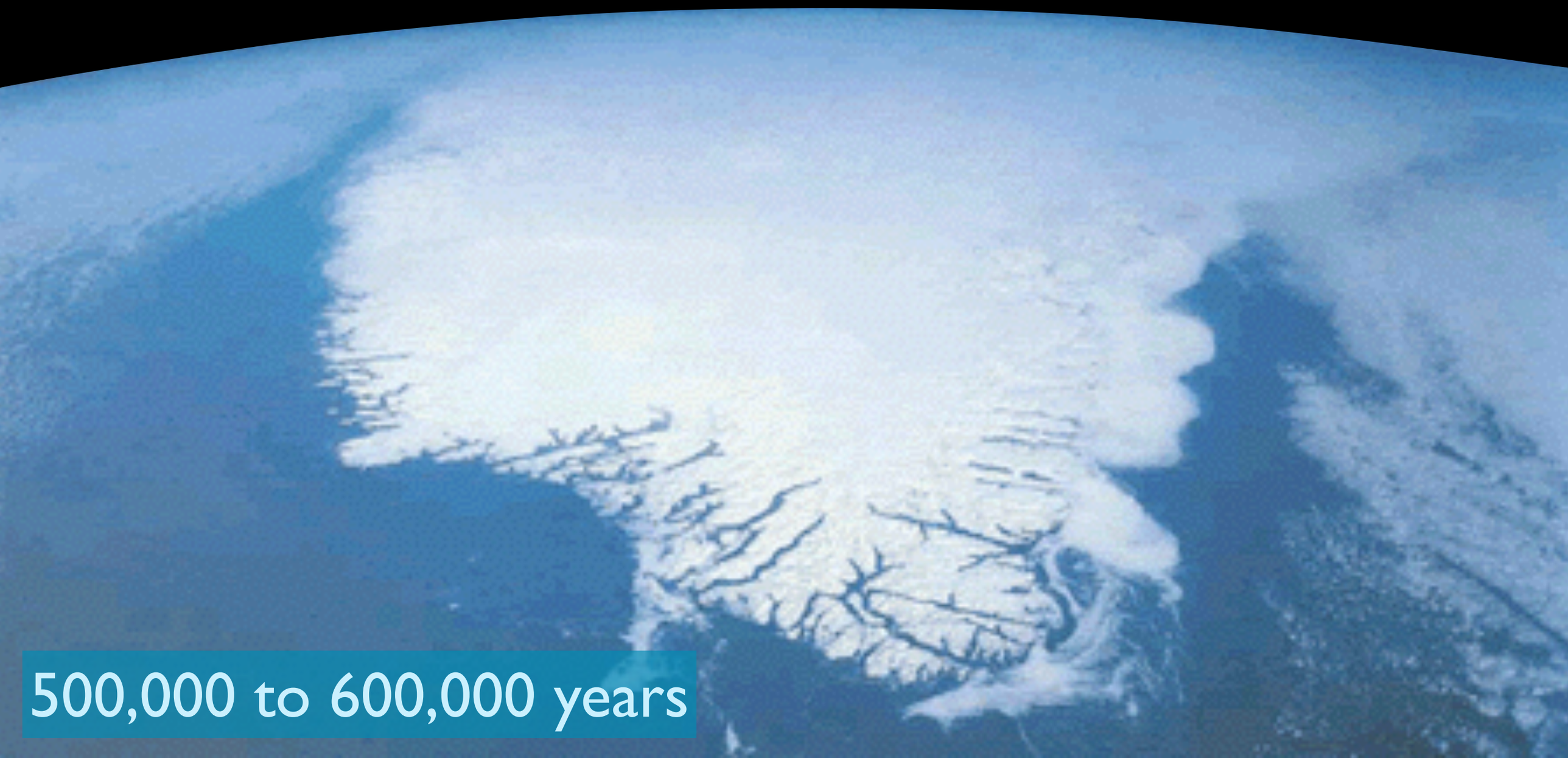
Plant Dieback => Catastraphic Erosion

Evidence:

- Increased erosion
- Fungal explosion
- Worldwide distribution
- Coal Gap

Slow Terrestrial Floral Collapse- Greenland Pollen/Spore Cores

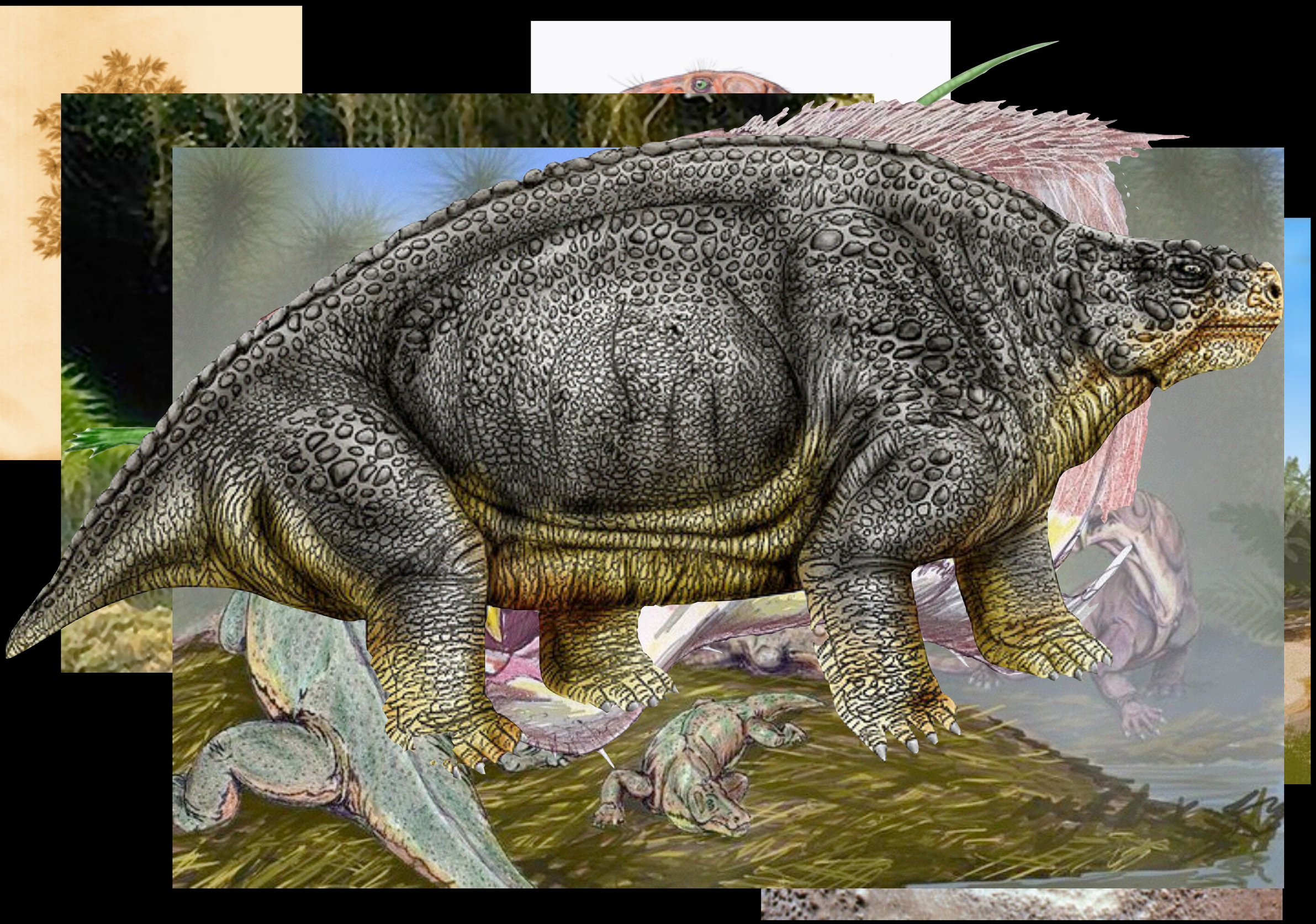
- Fungal activity followed loss of forests and herbaceous veg
- Successional weedy vegetation takes hold
- Fern and cycad expansion
- Most successional plants vanish, lycopsids remain
- Plant abundance is drastically reduced (few pollen/spores)



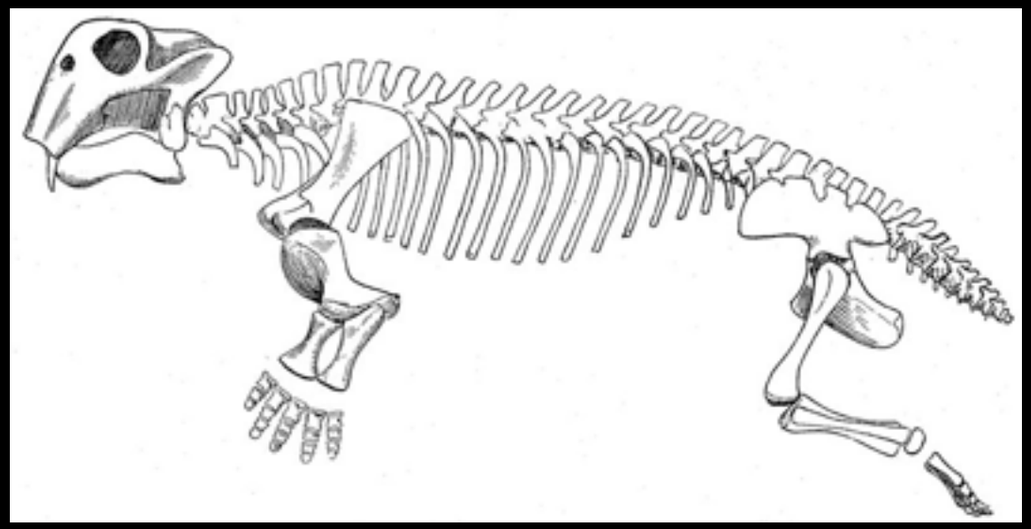
500,000 to 600,000 years

If plant collapse initiated terrestrial extinctions, what caused the plant collapse???

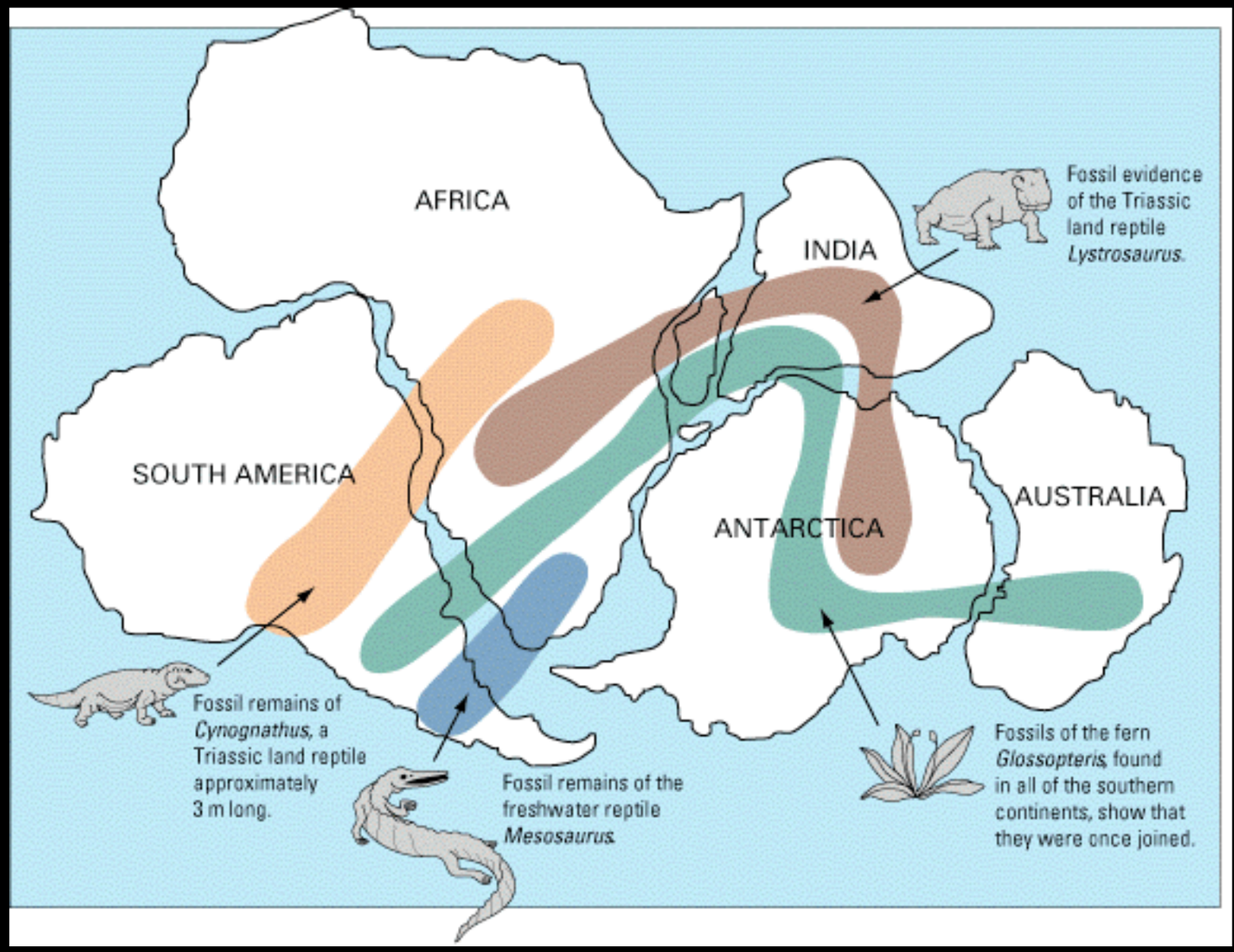
Flavor of the Day: The Siberian Traps



Lystrosaurus: the Disaster Taxon



Expansion
-Few herbivorous competitors
-Few carnivorous predators
95% terrestrial faunas!
-@ 1 meter, the largest animal on earth



There was probably nothing 'special' about *Lystrosaurus*... It was just lucky... this is a pattern in extinction events.

Temnospondyl amphibians

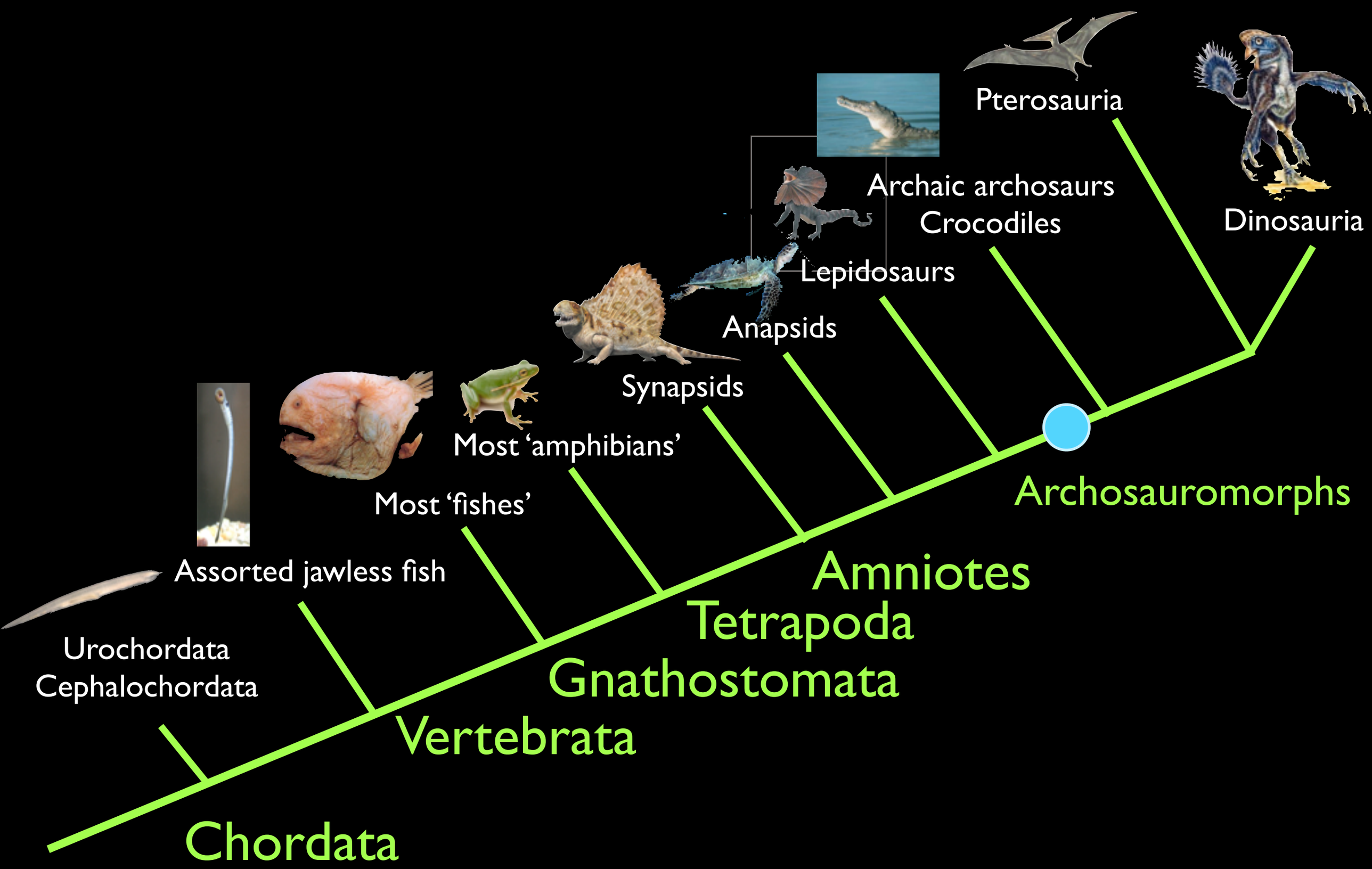
Mastodonsaurus
(aquatic)

Cynognathus
early Triassic synapsid

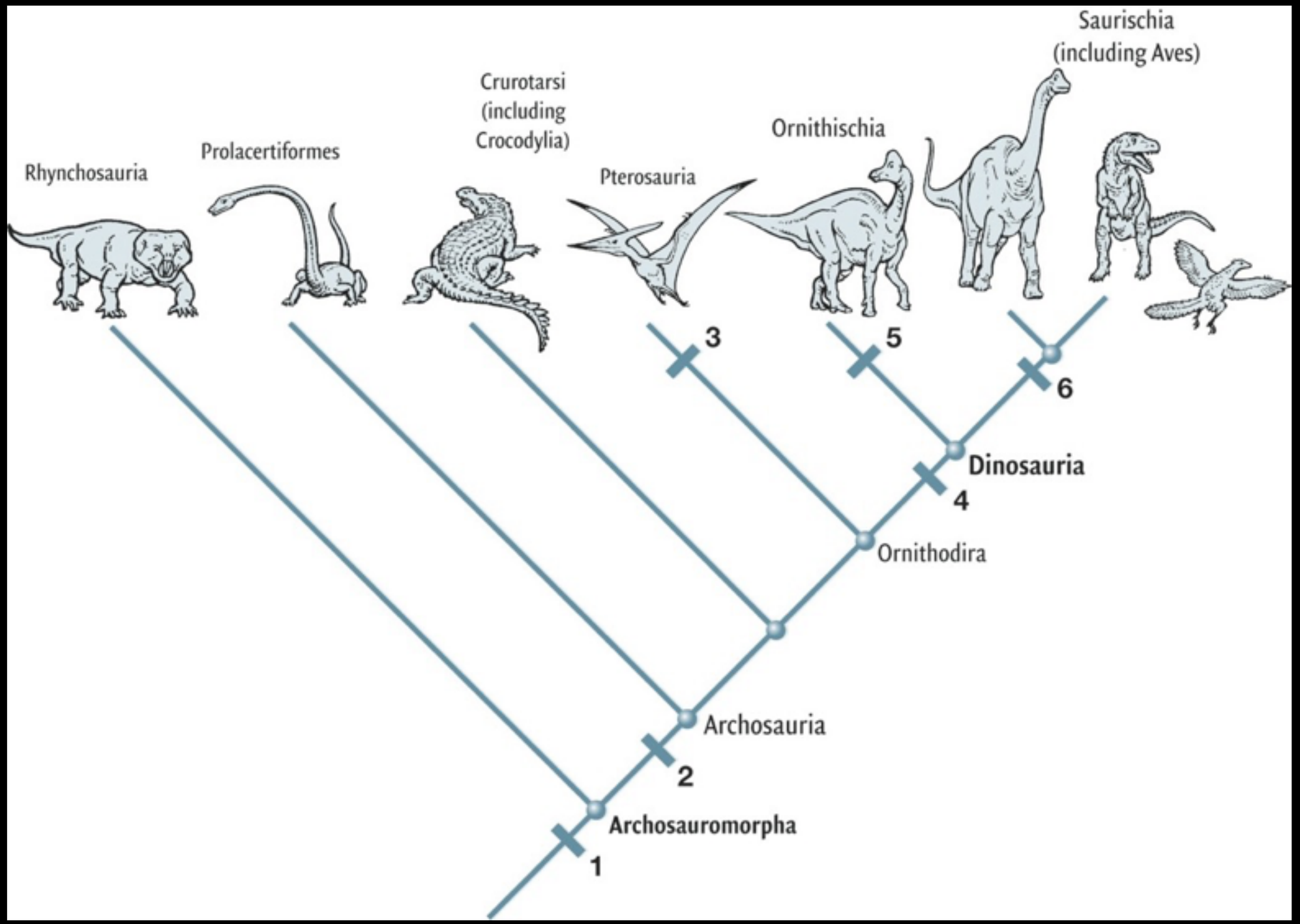
Proterosuchus
Archosaur

Dicynodonts	Remained important
Cynodonts	Herbivores

Refugia

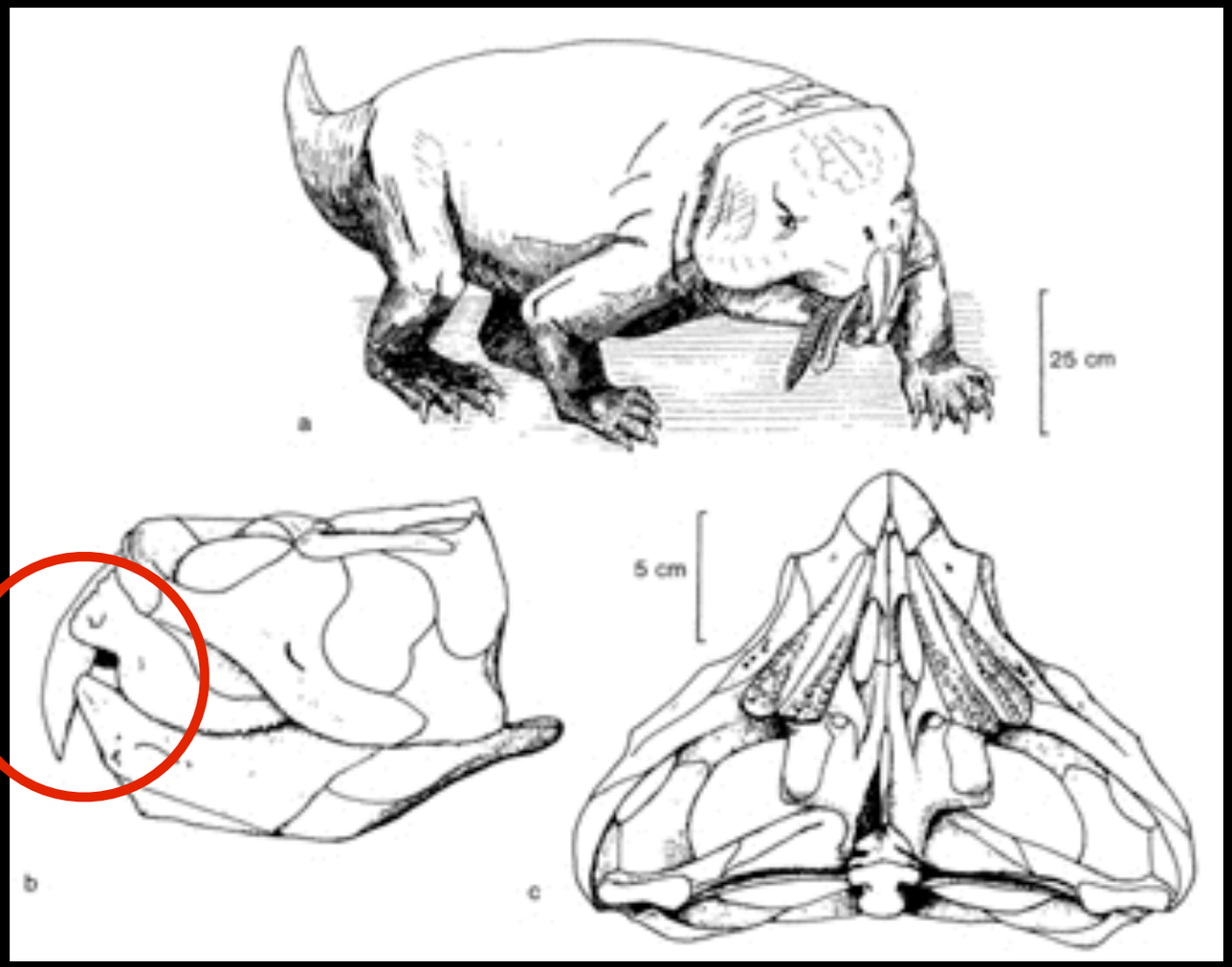

Pterosauria
Dinosauria
Archaic archosaurs
Crocodiles
Lepidosaurs
Anapsids
Synapsids
Most ‘amphibians’
Most ‘fishes’
Assorted jawless fish
Urochordata
Cephalochordata
Archosauromorphs
Amniotes
Tetrapoda
Gnathostomata
Vertebrata
Chordata

The RISE of the ARCHOSAUROMORPHS!



Rhyncosauria

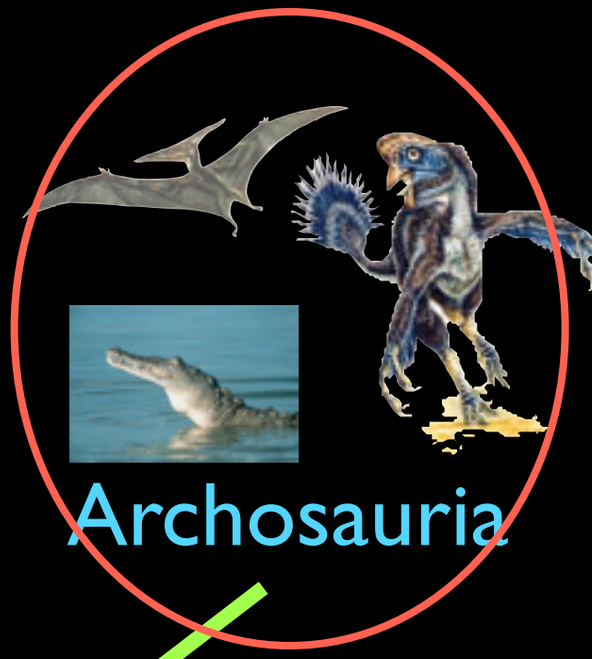
early Triassic
VERY abundant
Herbivorous
Pen-Knife Premaxilla/Dentary vs. 'rostral bone'
Precision Shear



Synapsida

Anapsida

Lepidosauria



Archosauria

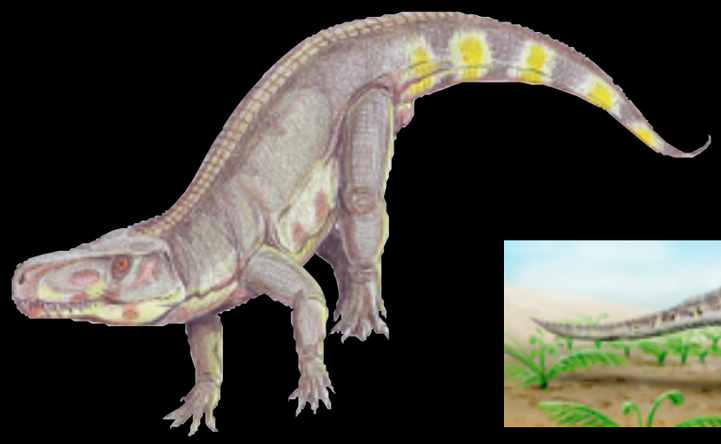
Archosauromorpha

Diapsida

Eureptilia

Amniotes

Crocodylomorpha



"Rauisuchia"

Ornithosuchidae

Pterosauria

Dinosauria

Ornithodira

Crurotarsi

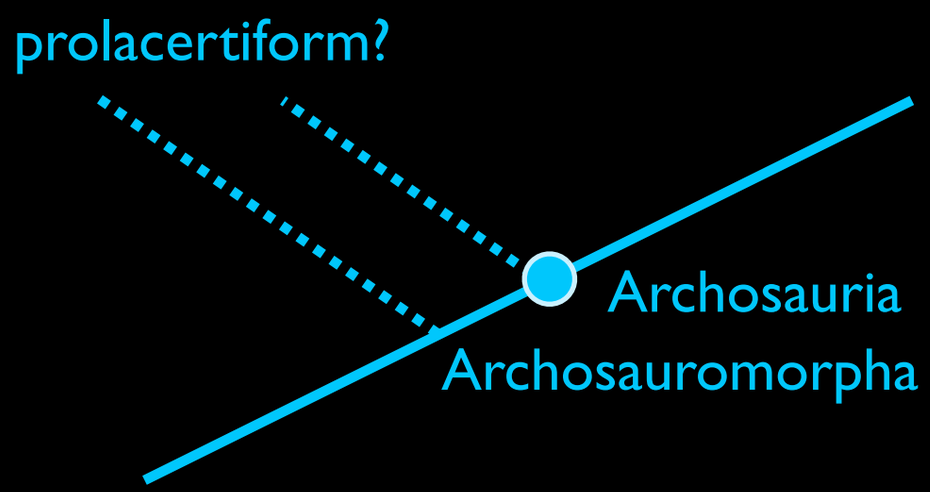
Basal archosaurs

Crown-clade Archosauria

Archosauria

Tanystropheus
Prolacertiform

Basal archosaur?
Maybe... or it split off *before* archosauria



Archosauria: synapomorphies

Antorbital fenestra (in front of eye)
Teeth with serrated margins
Mandibular fenestra

Proterosuchus
Basal Archosaur

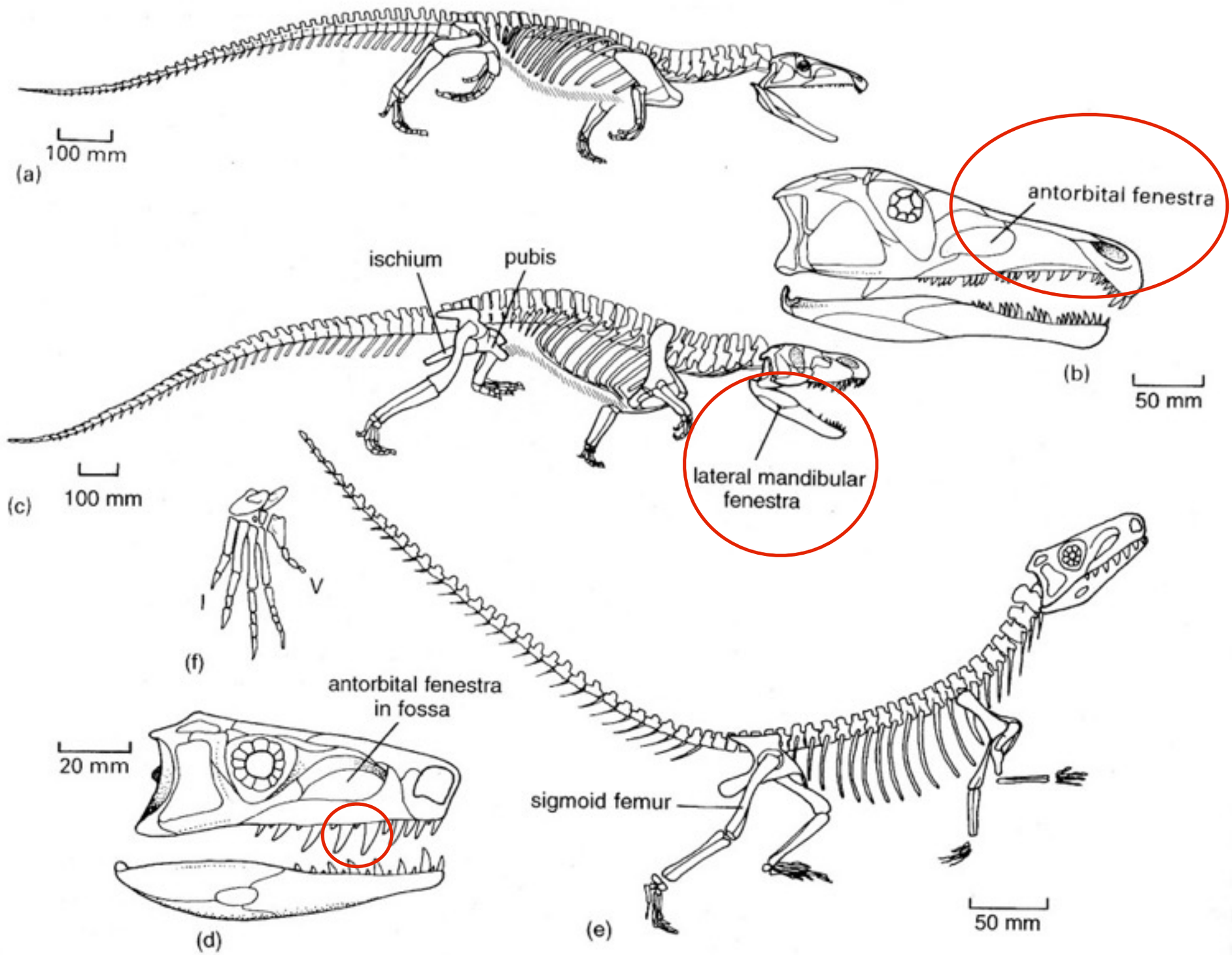


Fig. 6.2 Early Triassic archosaurs: (a, b) the proterosuchid *Proterosuchus*, skeleton in running posture, and skull; (c) the erythrosuchid *Vjushkovia*, skeleton in running posture; (d–f) the agile *Euparkeria*, skull in lateral view, skeleton, and foot. [Figures (a, c) based on Greg Paul, in Parrish 1986; (b) after Cruickshank, 1972; (c–f) after Ewer, 1965.]

Faculatative biped vs. Obligate biped

Euparkeria
Derived, Basal Archosaur
Bony dermal plates down back