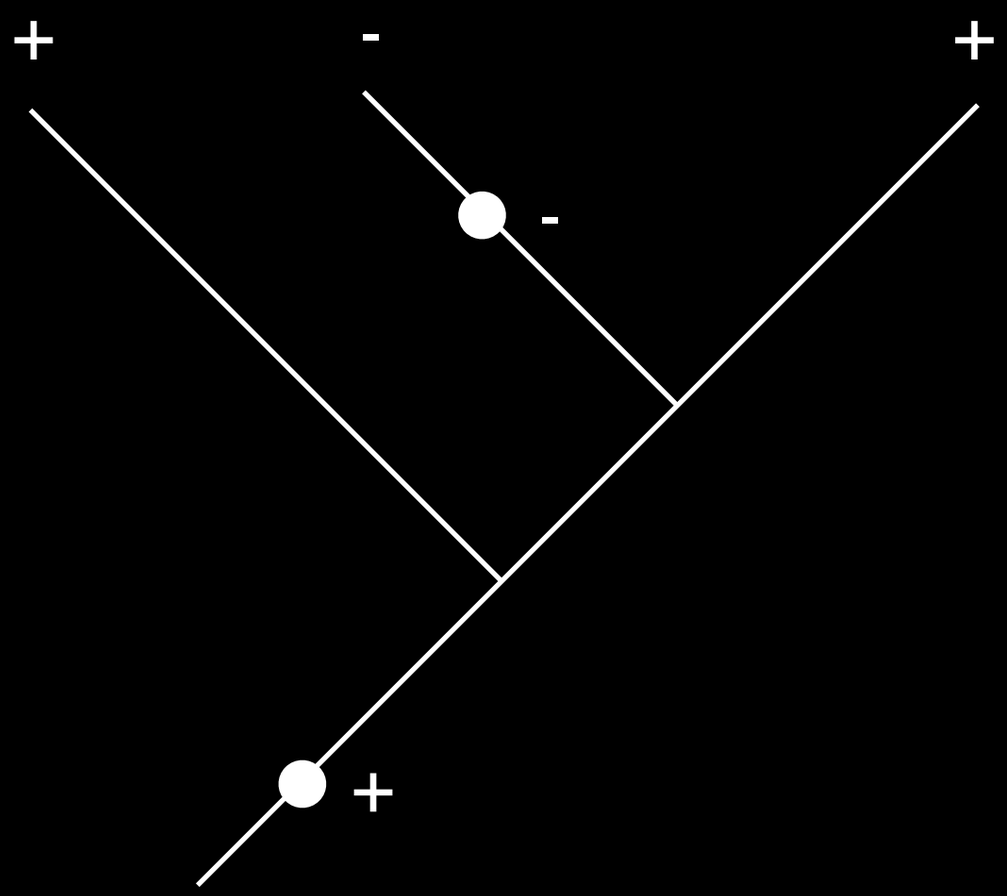
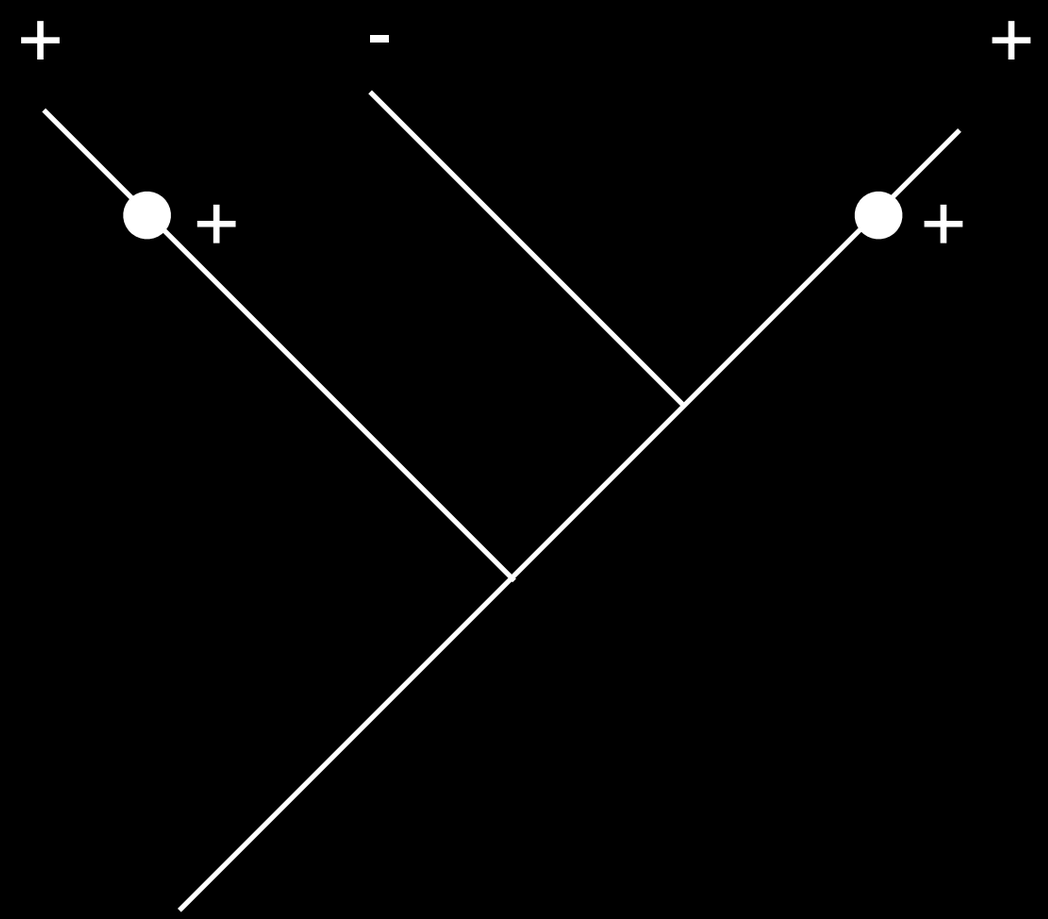


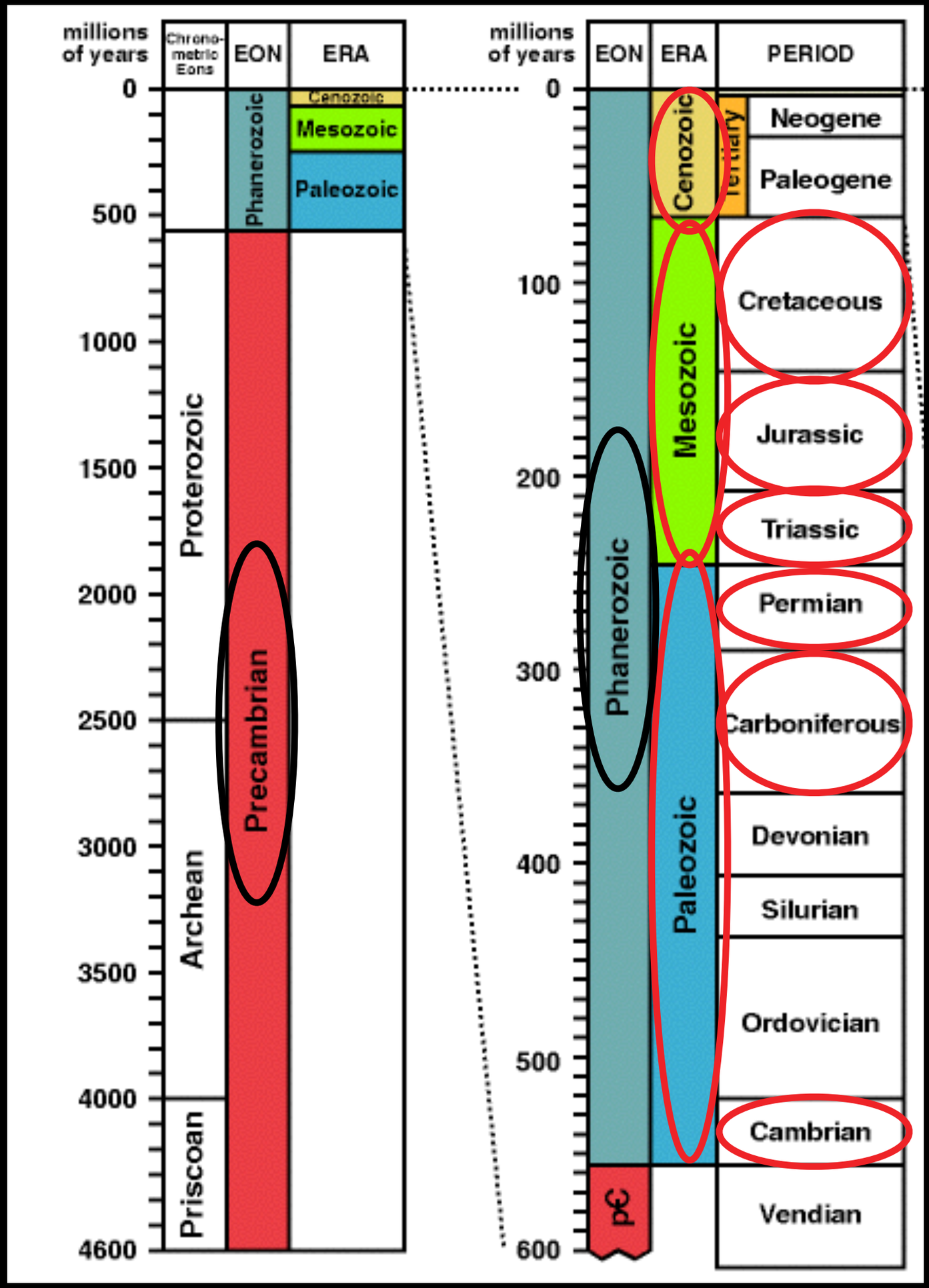
2 evolutionary events

vs.

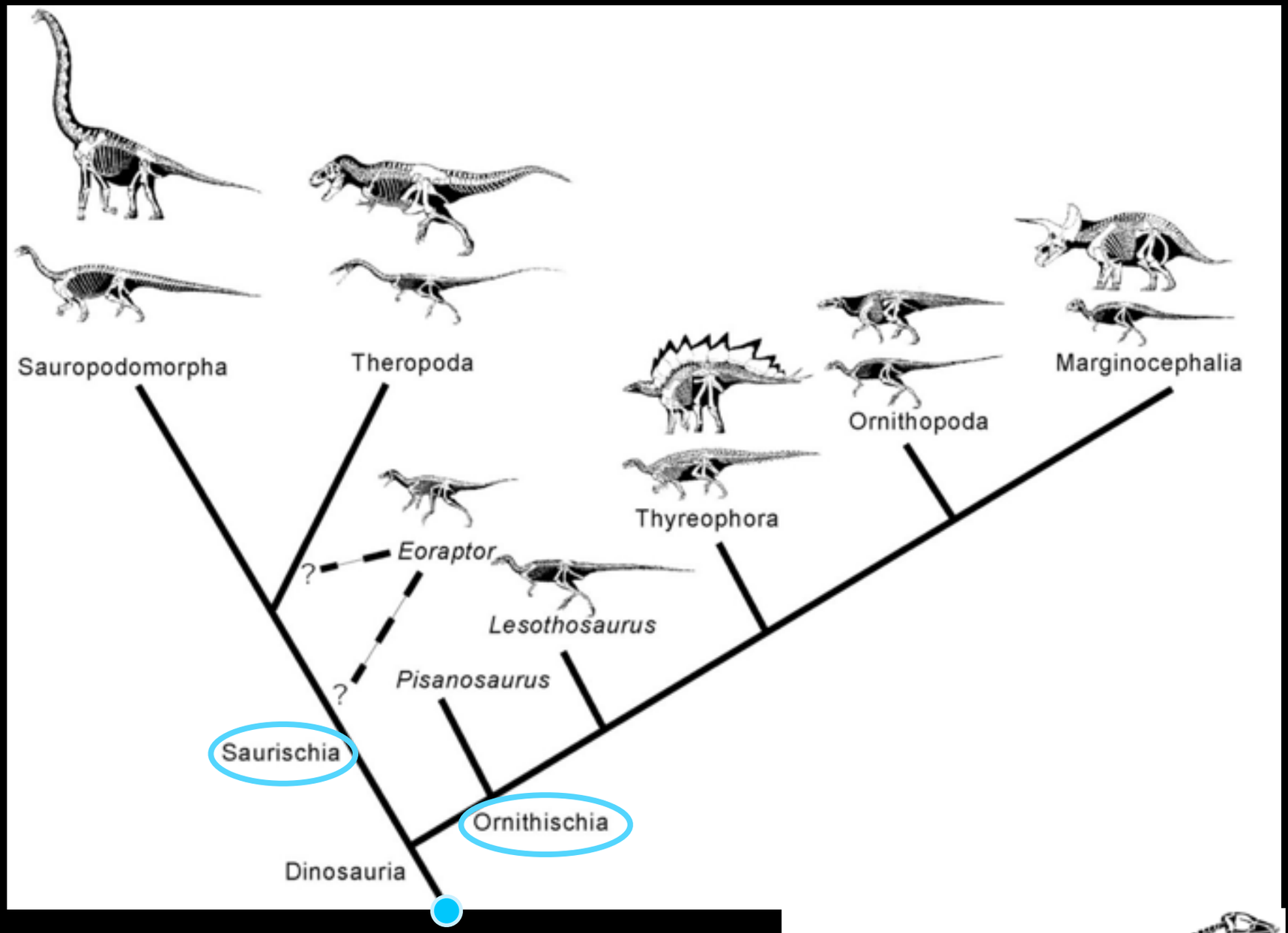


2 evolutionary events

Equally parsimonious!


millions of years
Chrono-metric Eons
EON
ERA
0
500
1000
1500
2000
2500
3000
3500
4000
4600
Phanerozoic
Proterozoic
Archean
Priscoan
Precambrian
Cenozoic
Mesozoic
Paleozoic
millions of years
EON
ERA
PERIOD
0
100
200
300
400
500
600
Phanerozoic
Cenozoic
Mesozoic
Paleozoic
p€
Tertiary
Neogene
Paleogene
Cretaceous
Jurassic
Triassic
Permian
Carboniferous
Devonian
Silurian
Ordovician
Cambrian
Vendian

DINOSAURS



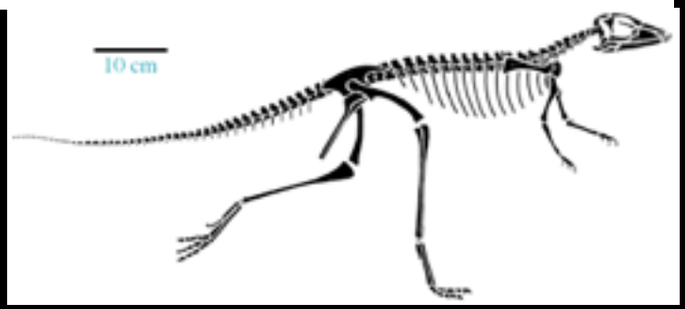
Basal Dinosaurs

Eoraptor

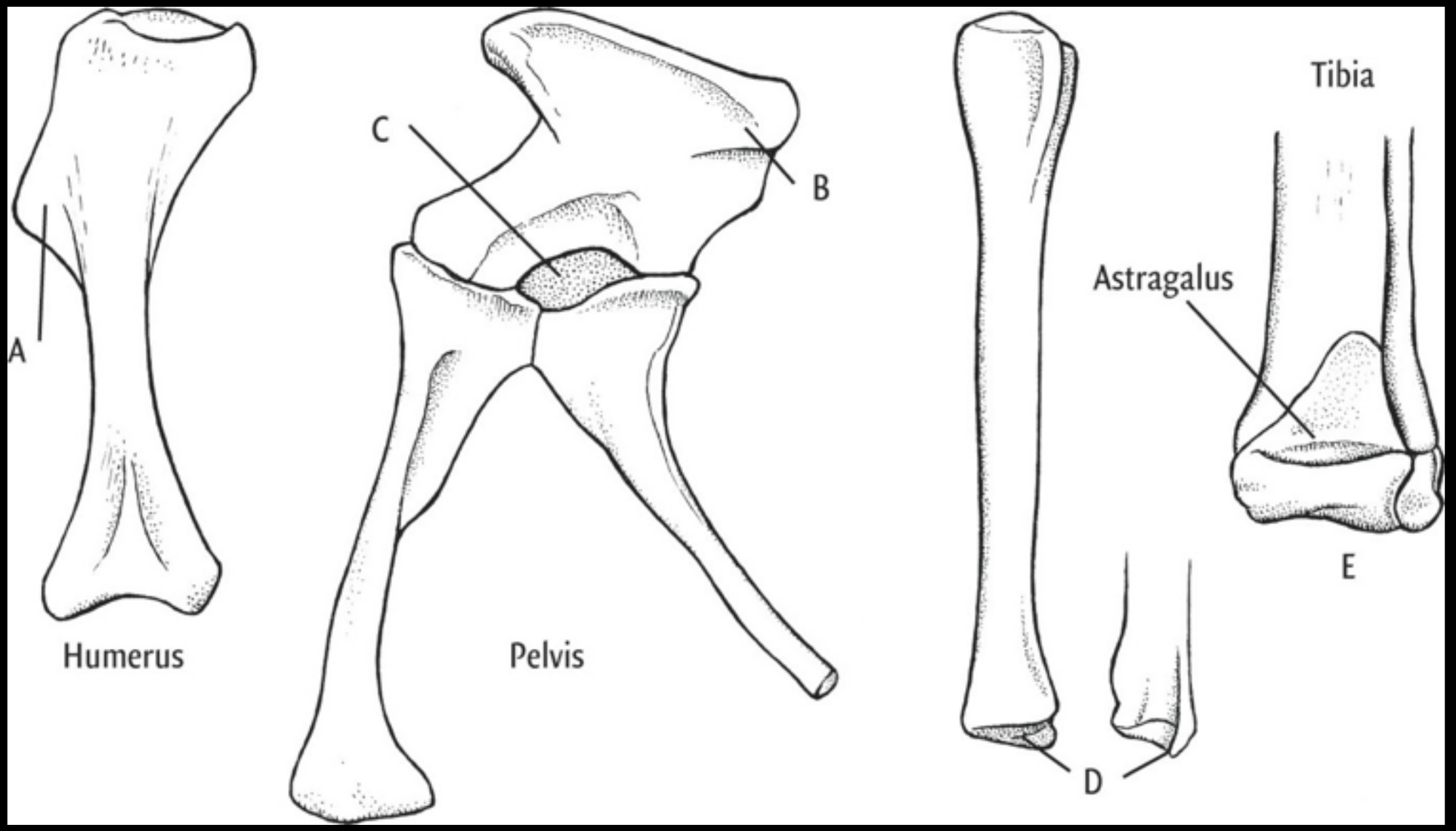
Herrerasaurus

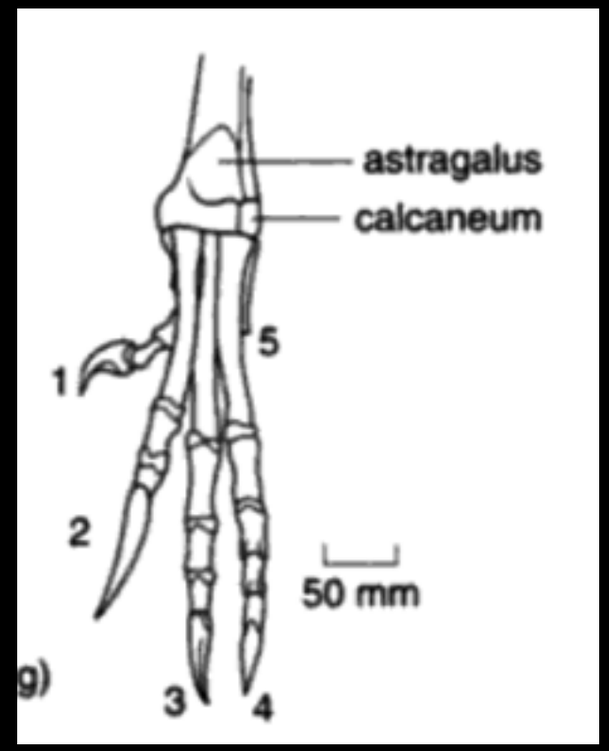
Coelophysis

Pisanosaurus



Lesothosaurus





Dinosaur synapomorphies

A) Crest on humerus
B) Shelf on top surface of ilium
C) Perforated acetabulum
D) Tibia w/ expanded end
E) Ascending astragular process on front surface of tibia

Locomotion (Pelvis)

Rauisuchians
-Pillar-Erect Posture

Buttress-Erect
DINOSAURS

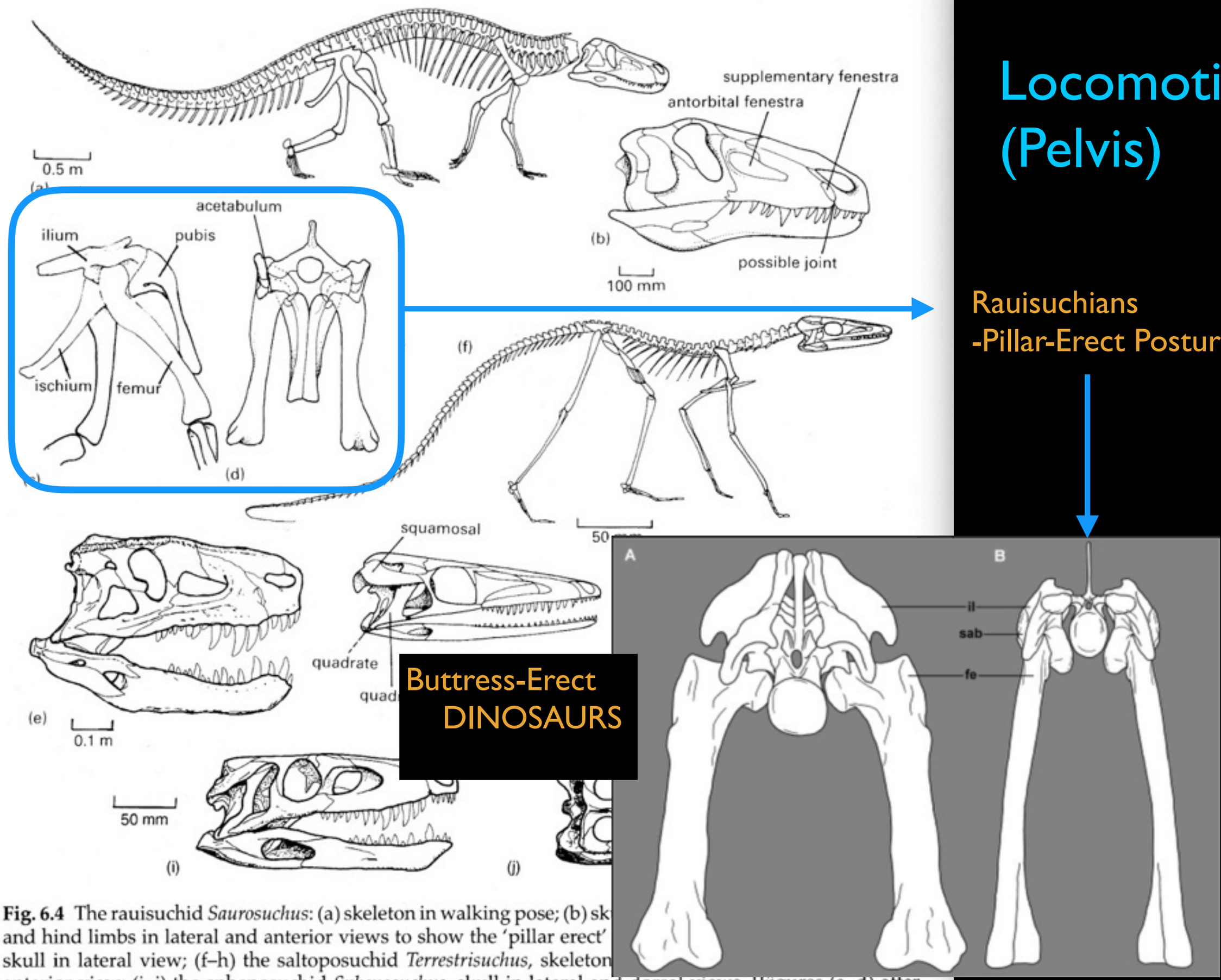
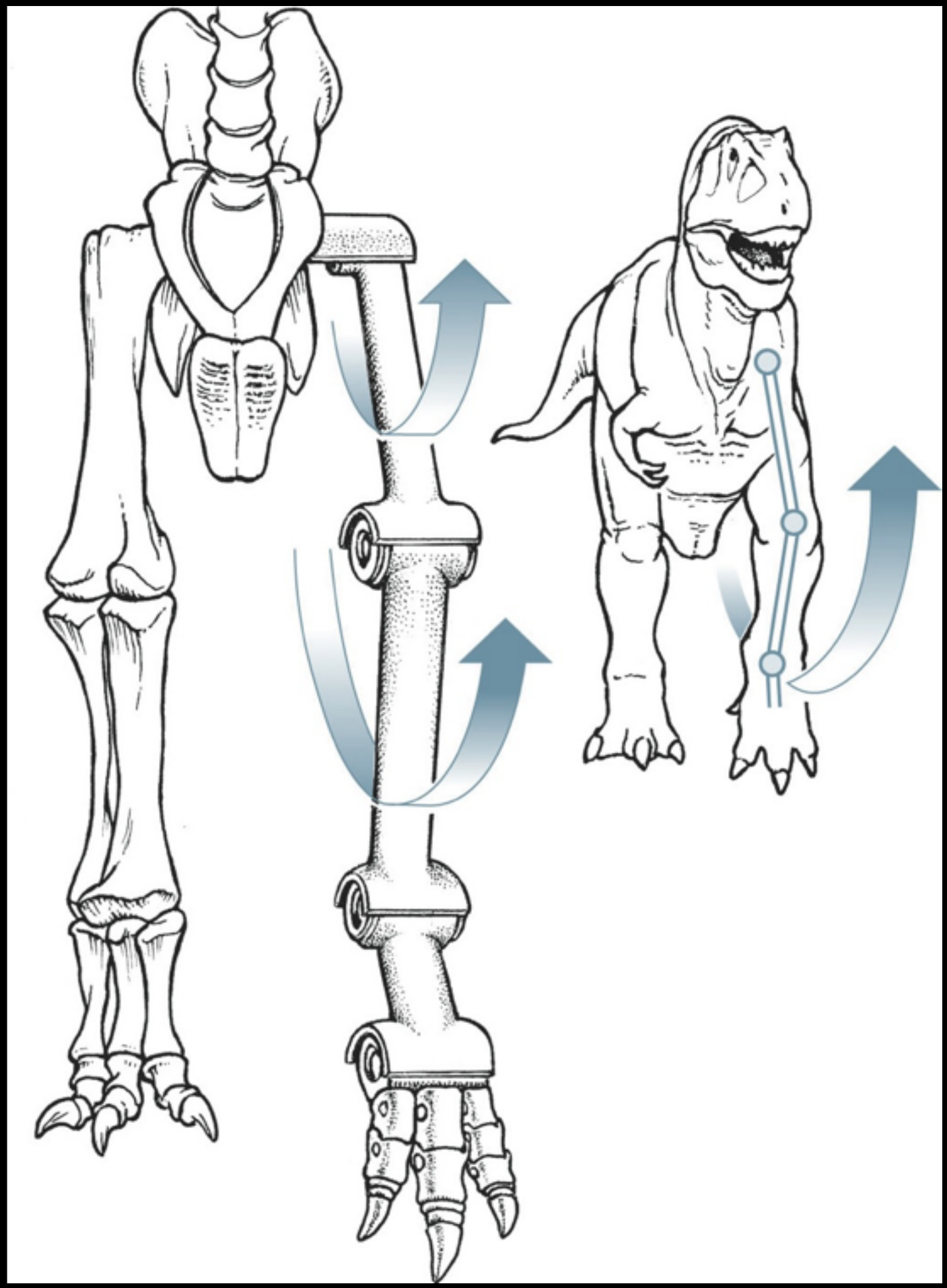


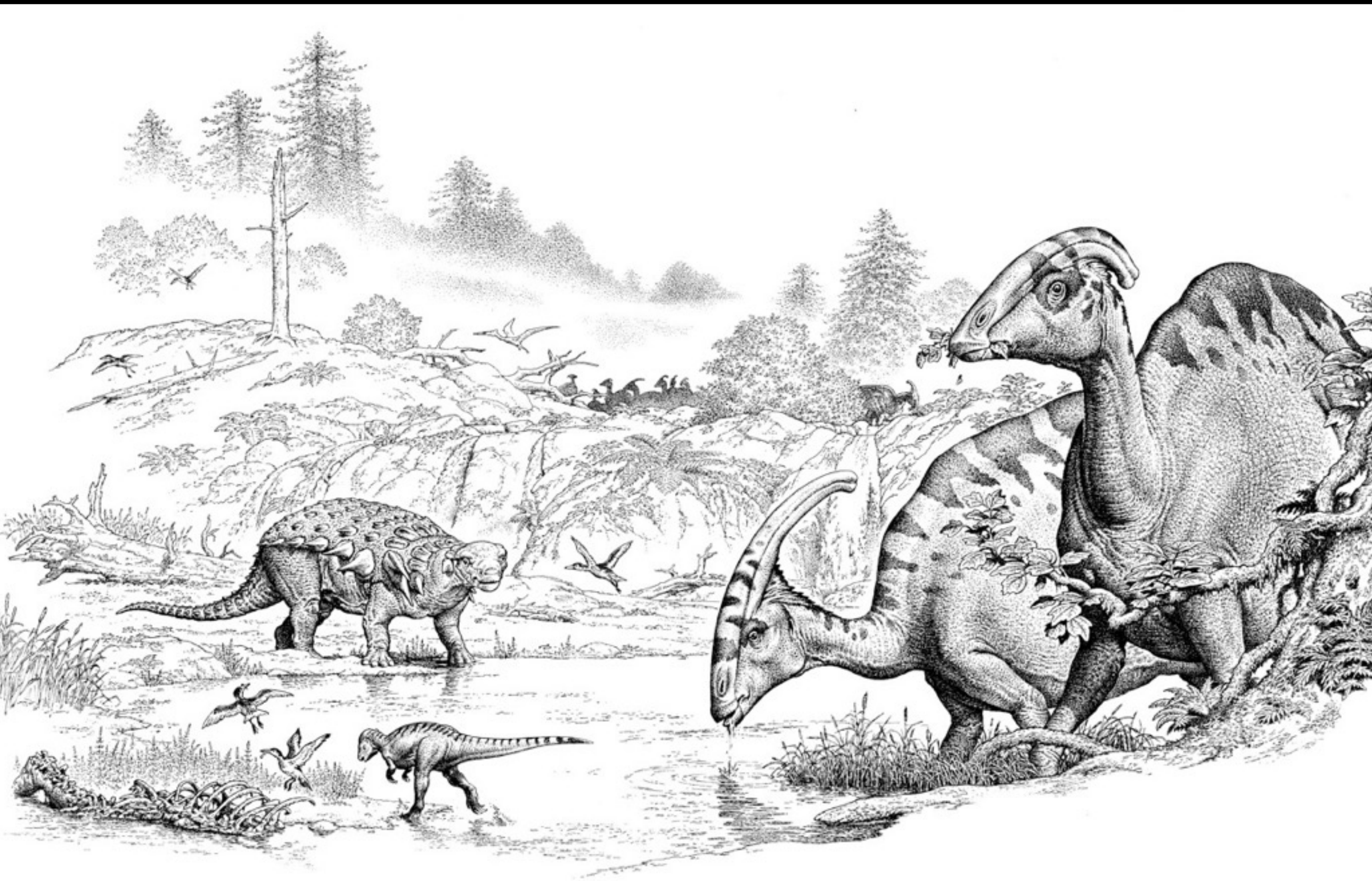
Fig. 6.4 The rauisuchid *Saurosuchus*: (a) skeleton in walking pose; (b) sk
and hind limbs in lateral and anterior views to show the 'pillar erect'
skull in lateral view; (f–h) the saltoposuchid *Terrestrisuchus*, skeleton
anterior view; (i, j) the sphenosuchid *Sphenosuchus*, skull in lateral and dorsal views. [Figures (a–d) after Bonaparte, 1981; (e) modified from Murry and Long, 1995; (f–h), after Crush, 1984; (i, j) modified from Walker, 1990.]

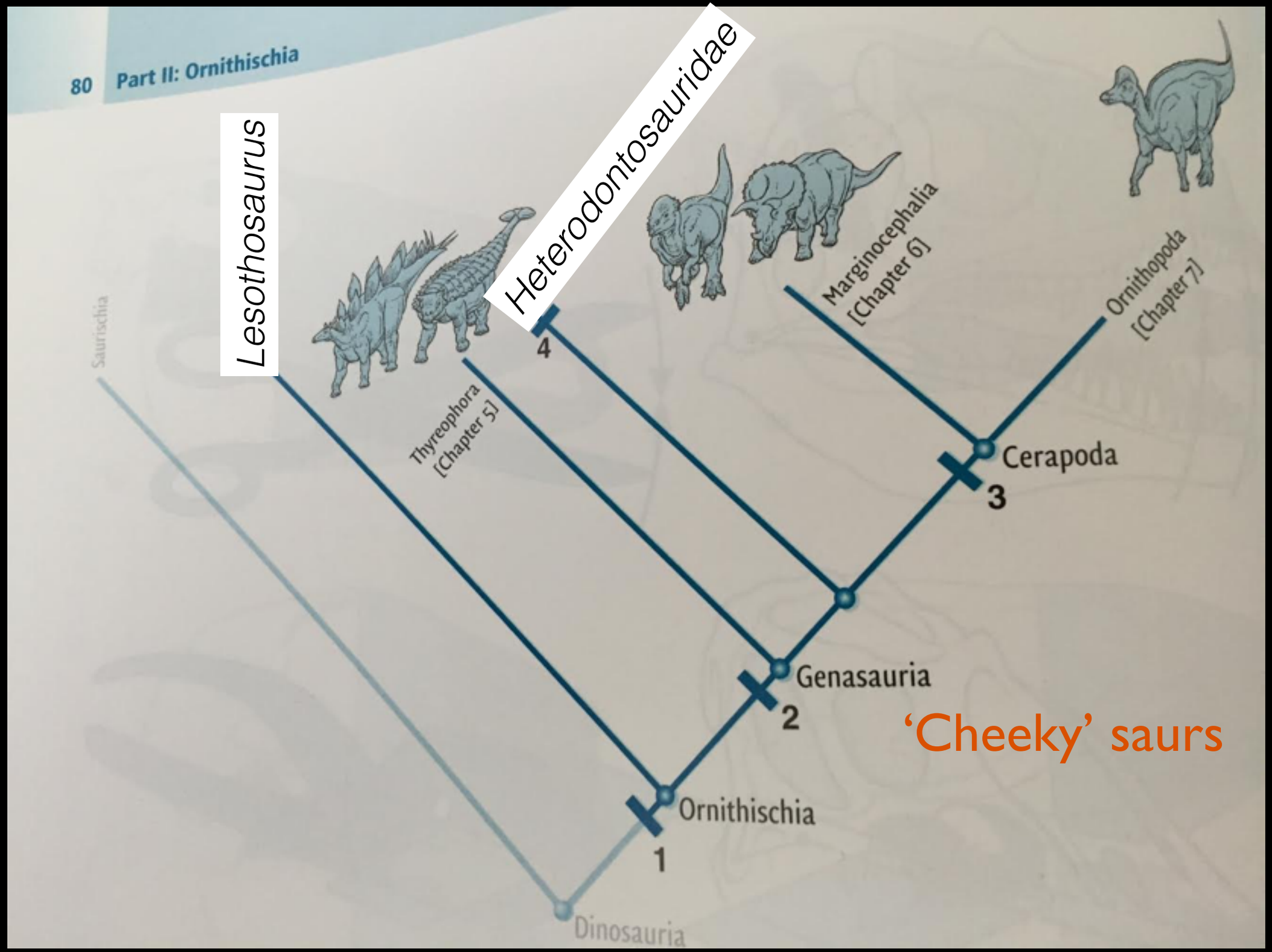


Barrel-like articulation
Constrained ‘twisting’ motion to the plane parallel with its body

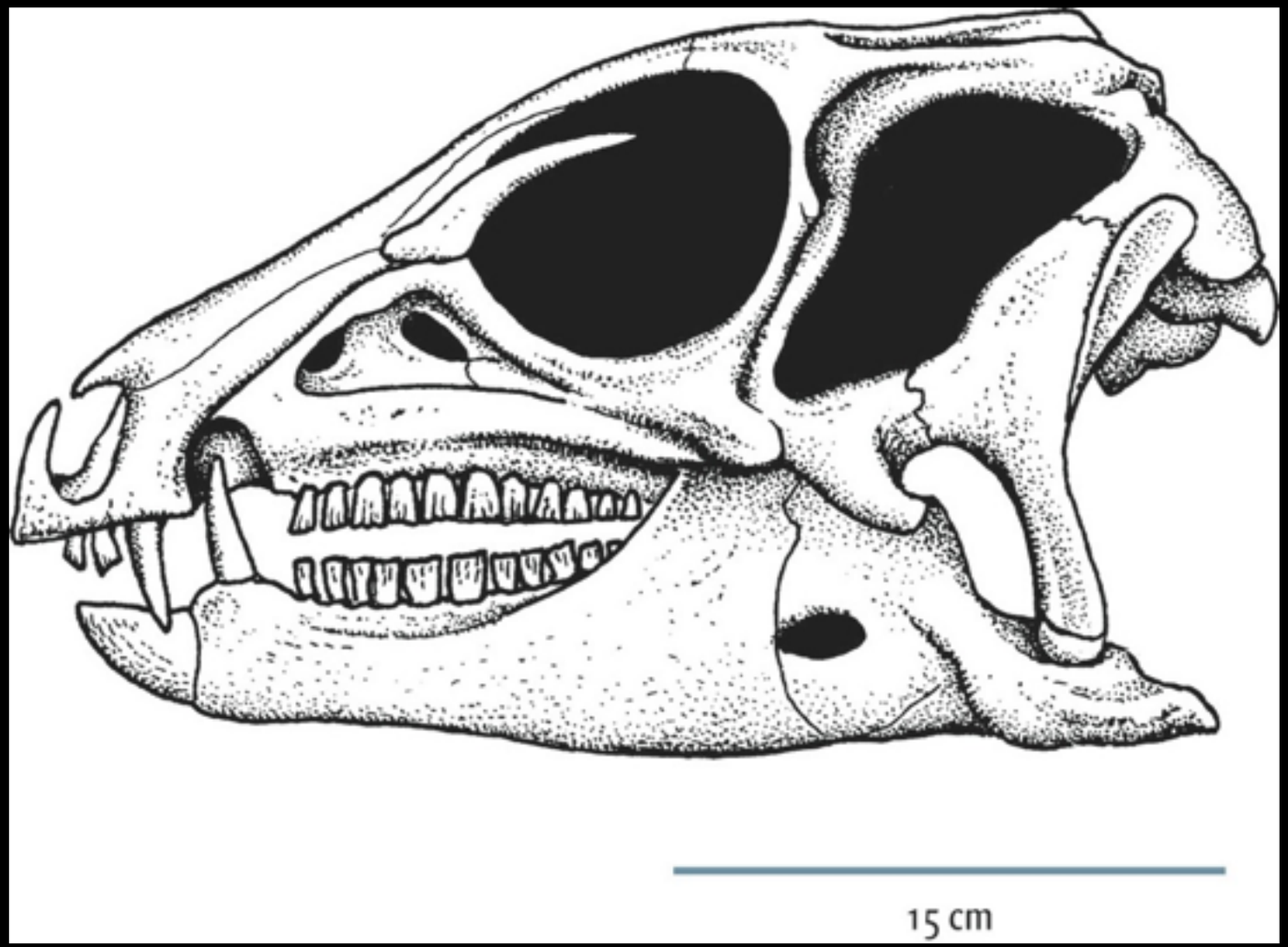
Digitigrade
vs.
Plantigrade

Ornithischians!



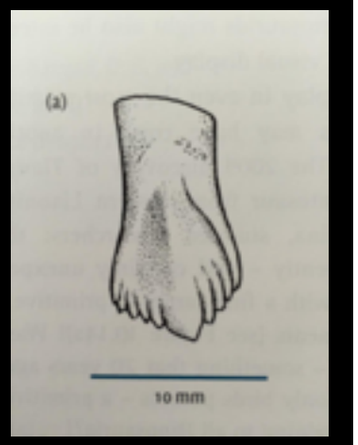


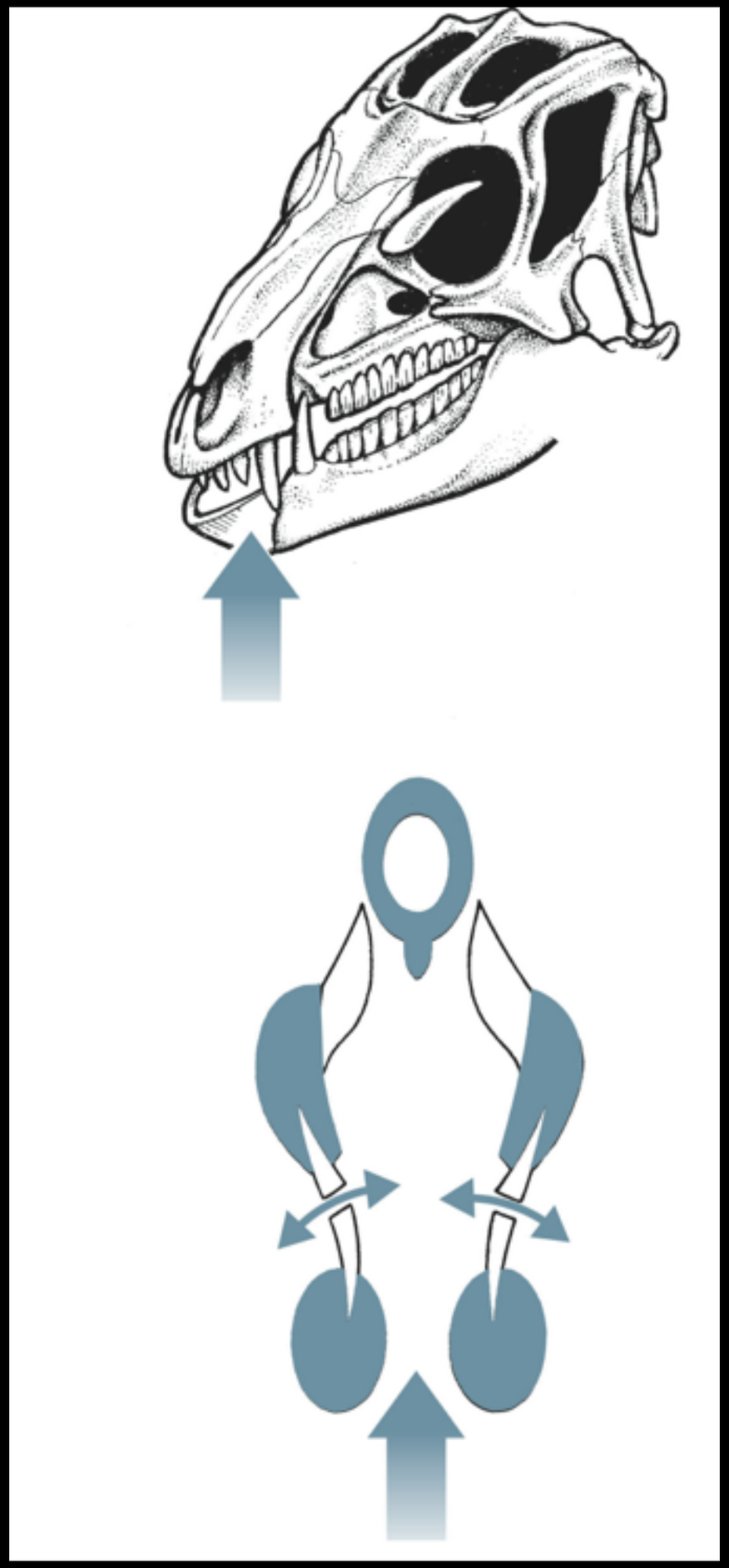
'Cheeky' saurs

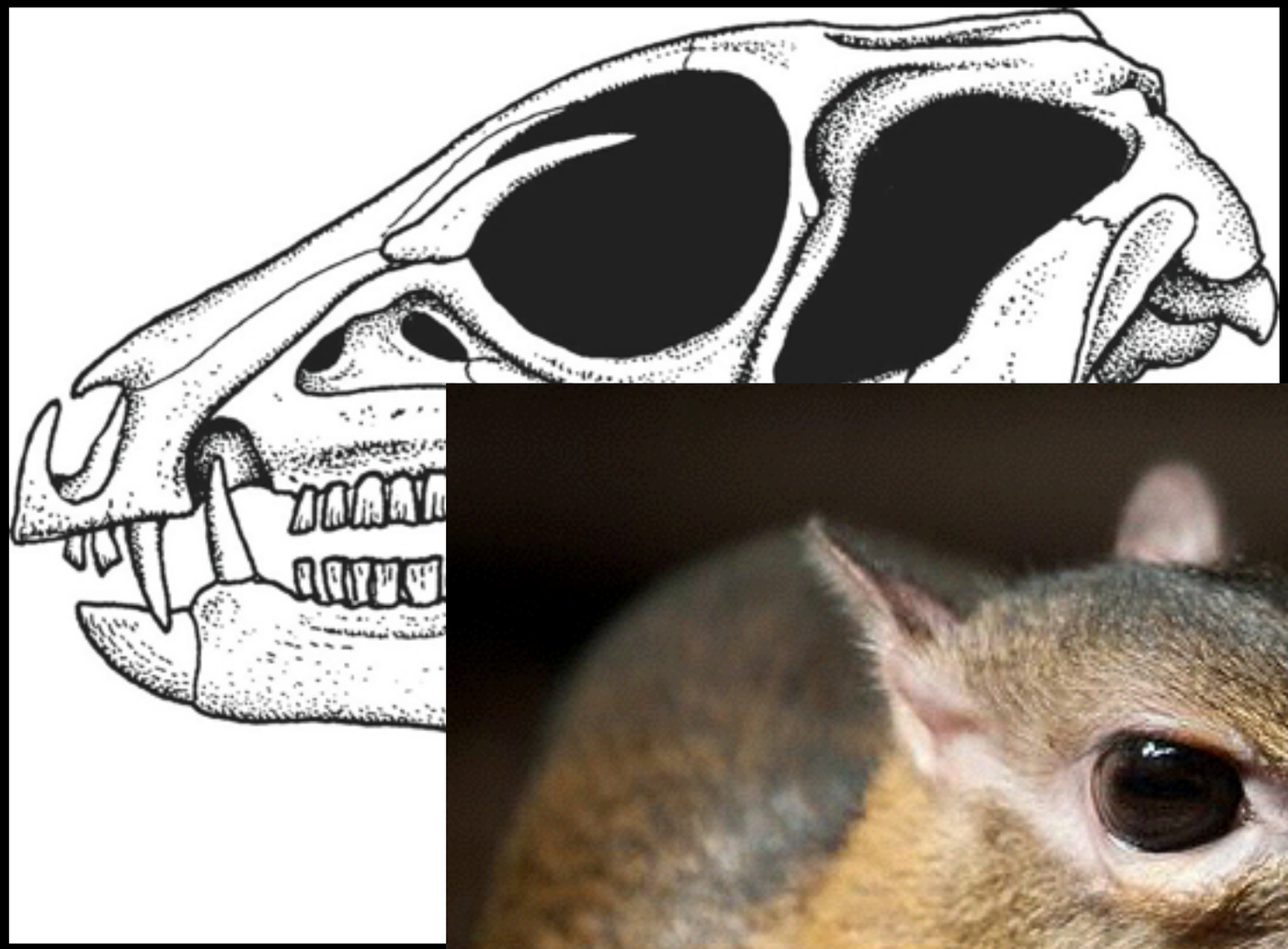


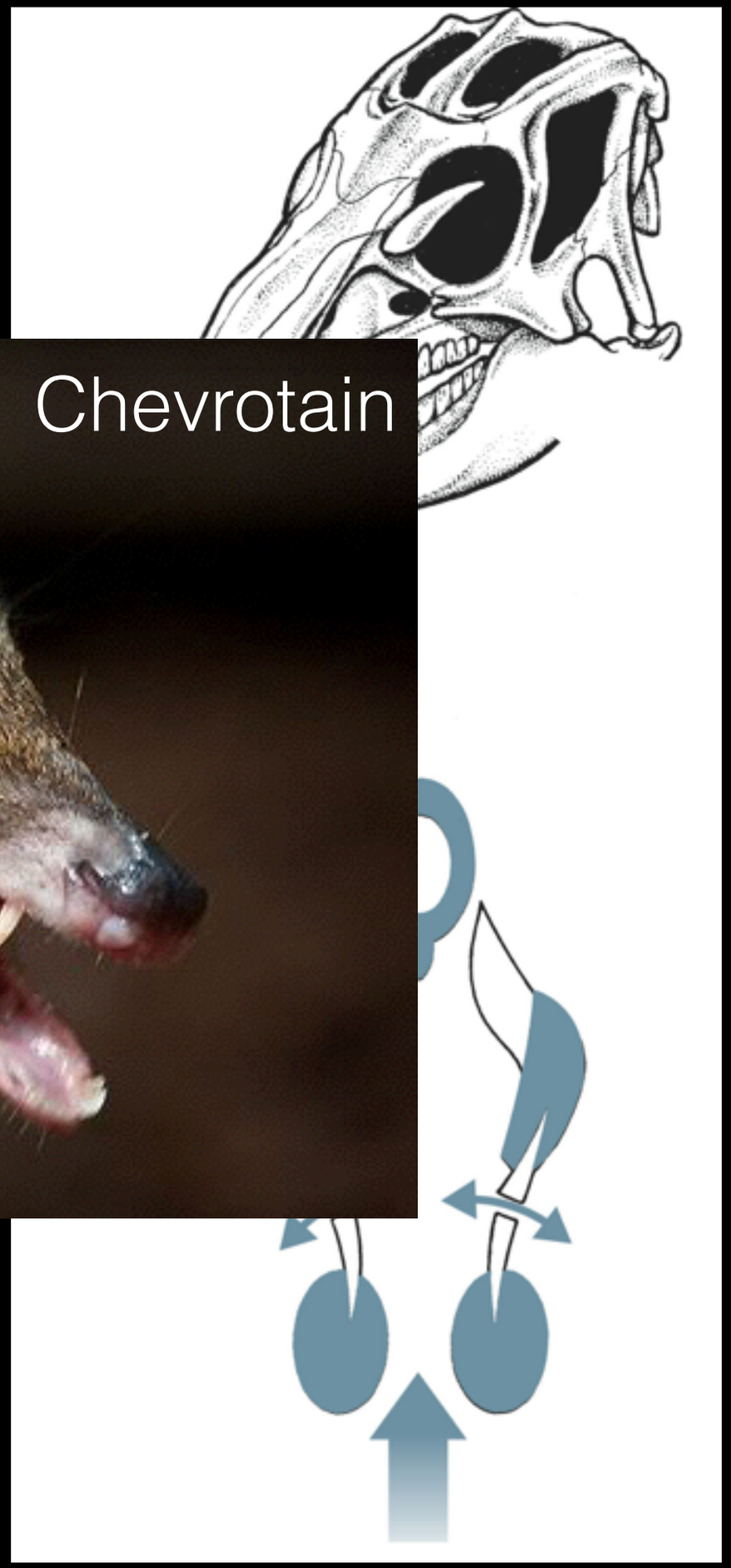
Heterodontosaurids: Not Primitive... unique chewing.

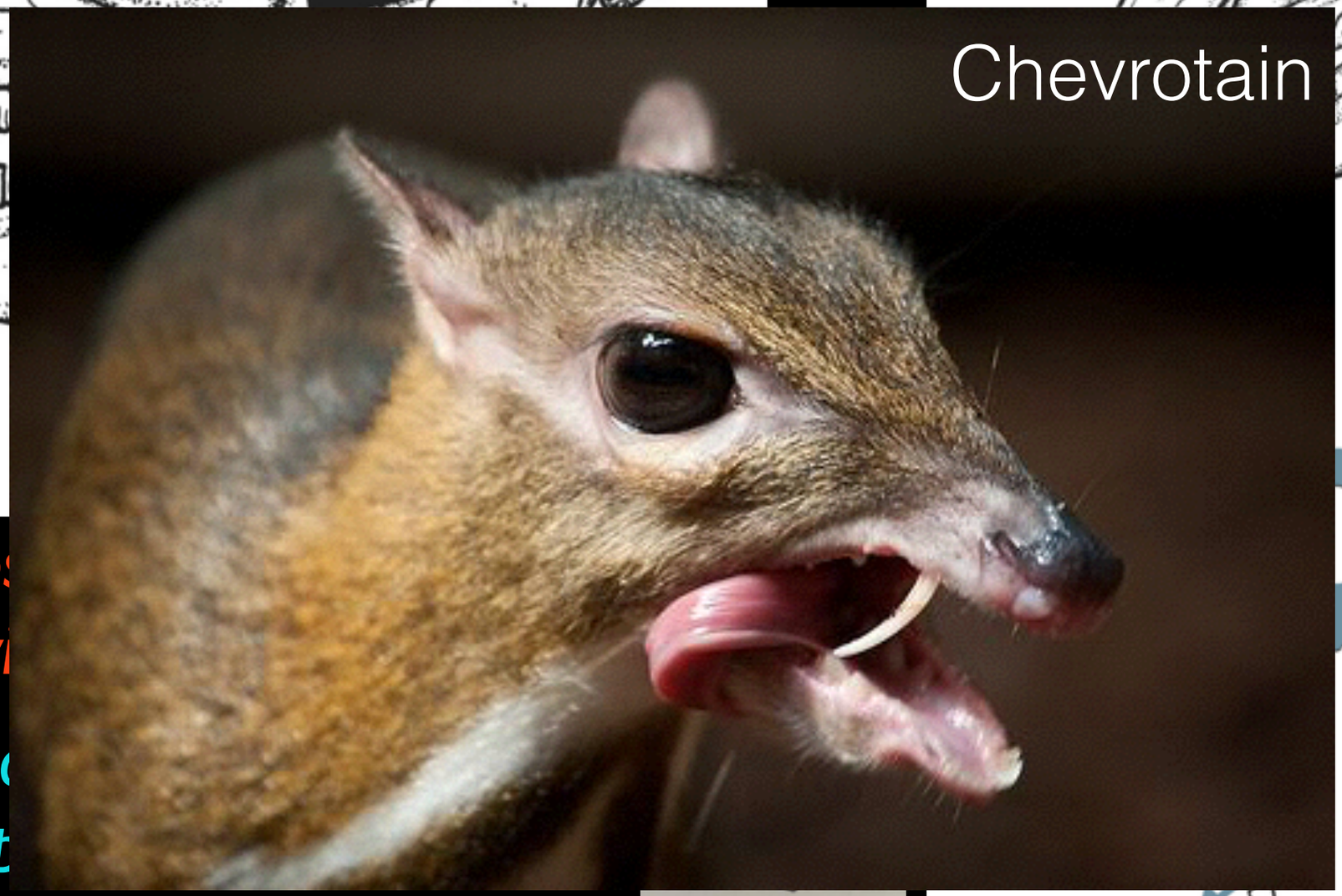
Three kinds of teeth
Anterior: Snipping/Cropping
Posterior: Chewing
Tusks: Potentially display/courtship











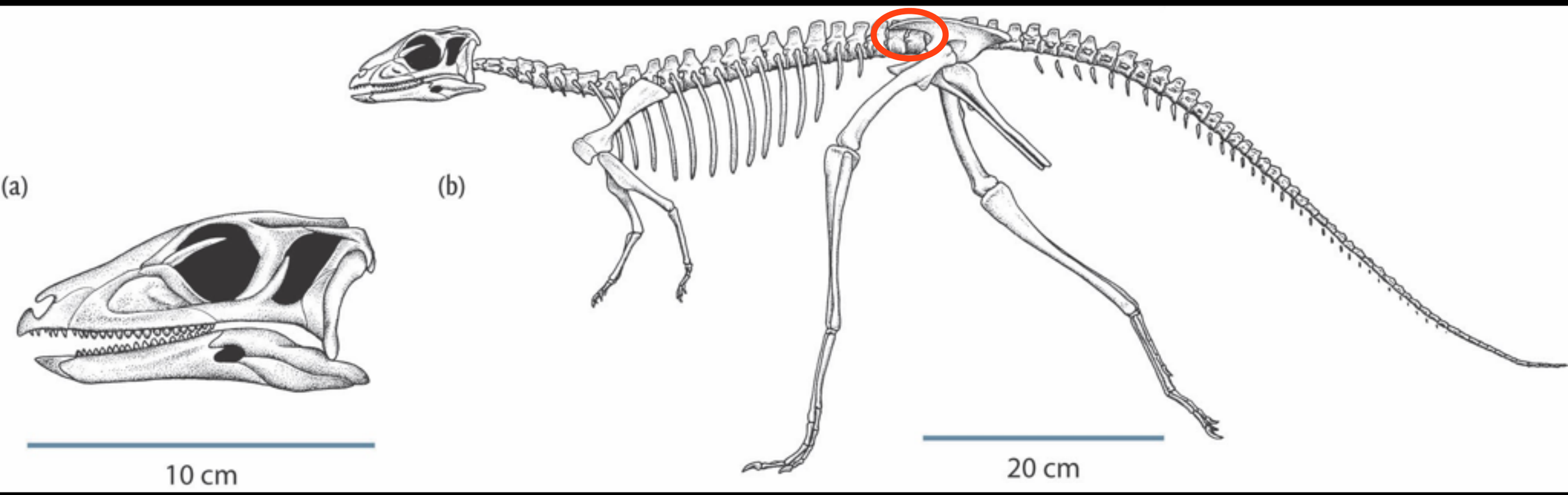
Heterodonto
unique chew

Three kinds
Anterior: Snip
Posterior: Chewing
Tusks: Potentially display/courtship

Other shared, derived traits

At least 5 sacral vertebrae
Ossified tendons above sacral region
Frontal process on illium

Lesothosaurus



How do mammals chew?

Anterior: Cropping
Diastem: Manipulation by tongue
Cheek teeth: Grinding (occluding)
Coronoid Process ~ Muscle attachments
Inset molars for cheeks ~ keep food in mouth

How do mammals chew?

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Coronoid Process ~ Muscle attachments
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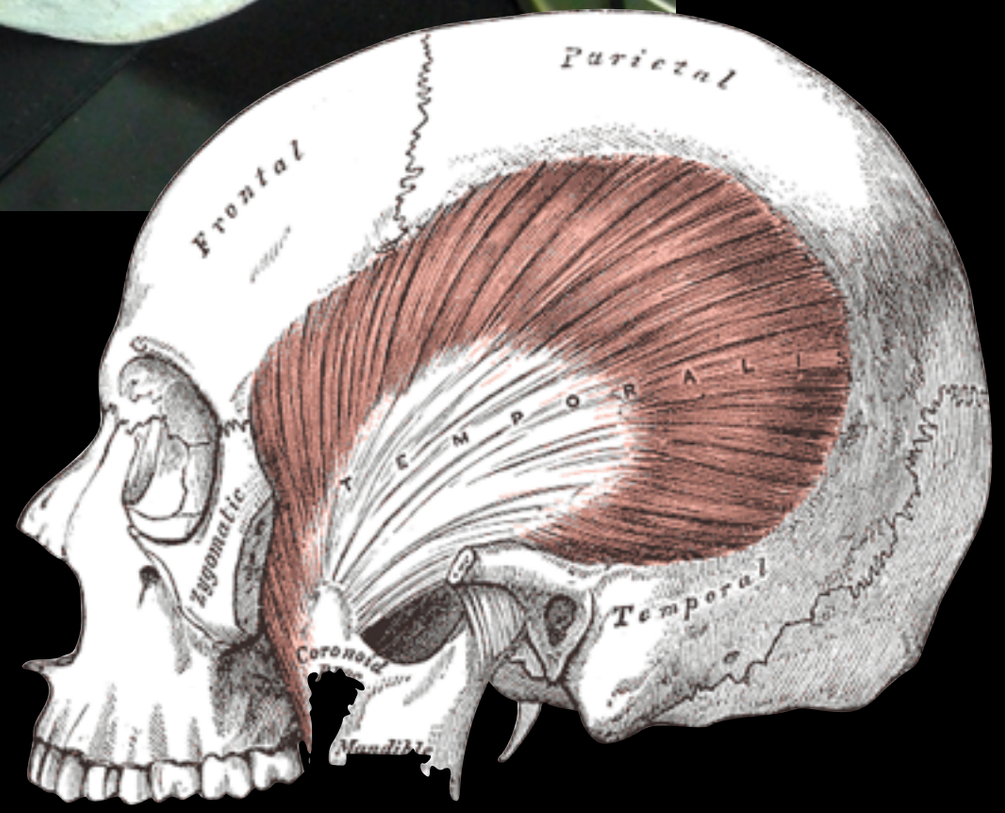
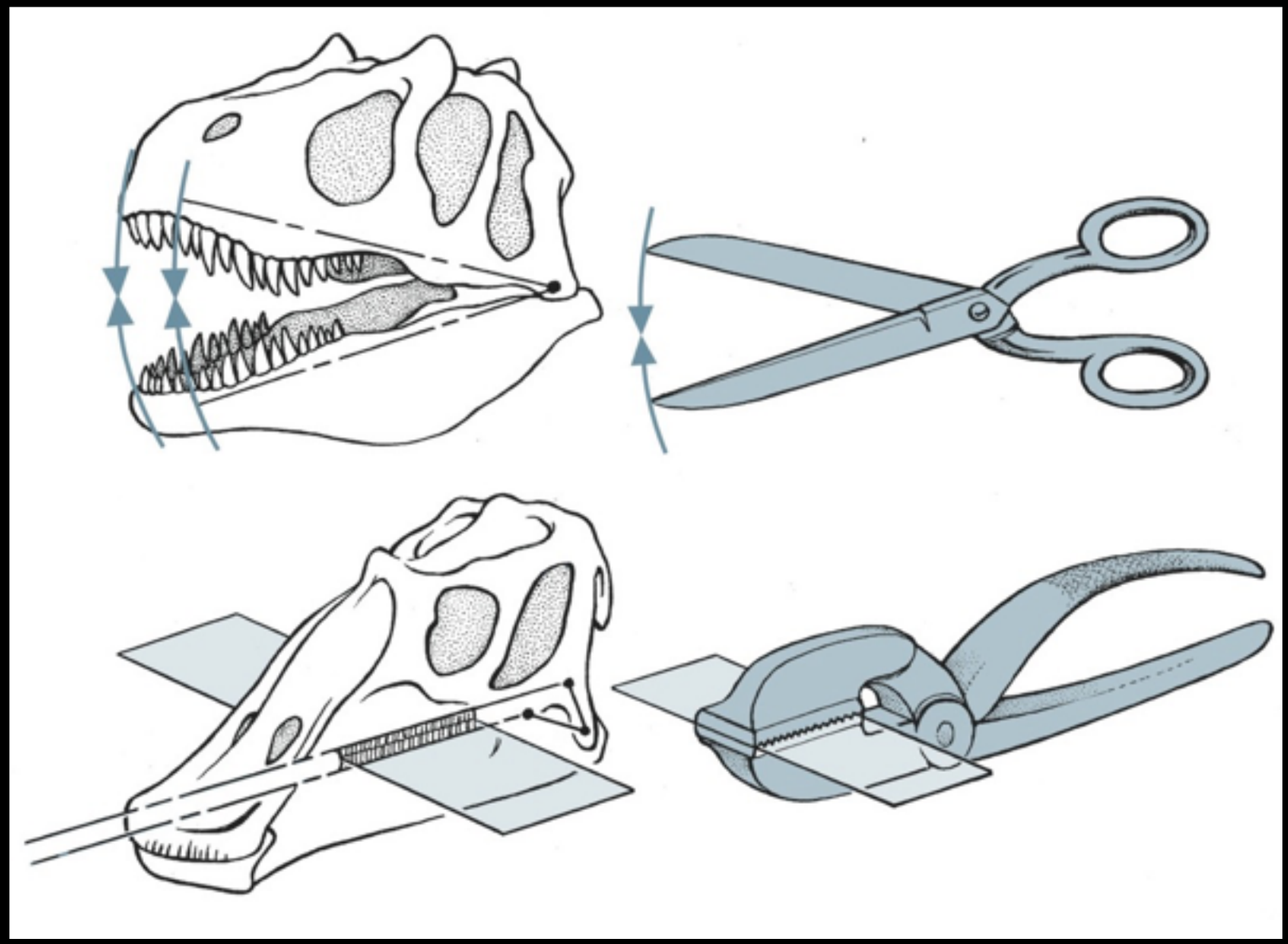


Edmontosaurus
Ornithopod

How did Ornithischians chew? In very similar ways

Anterior: Cropping: carried out by keratin RAMPHOTHECA
Diastem: Manipulation by tongue
Cheek teeth: Grinding! Dental Batteries
Coronoid Process ~ Different shape, different muscle attachments
Inset molars for cheeks ~ keep food in mouth

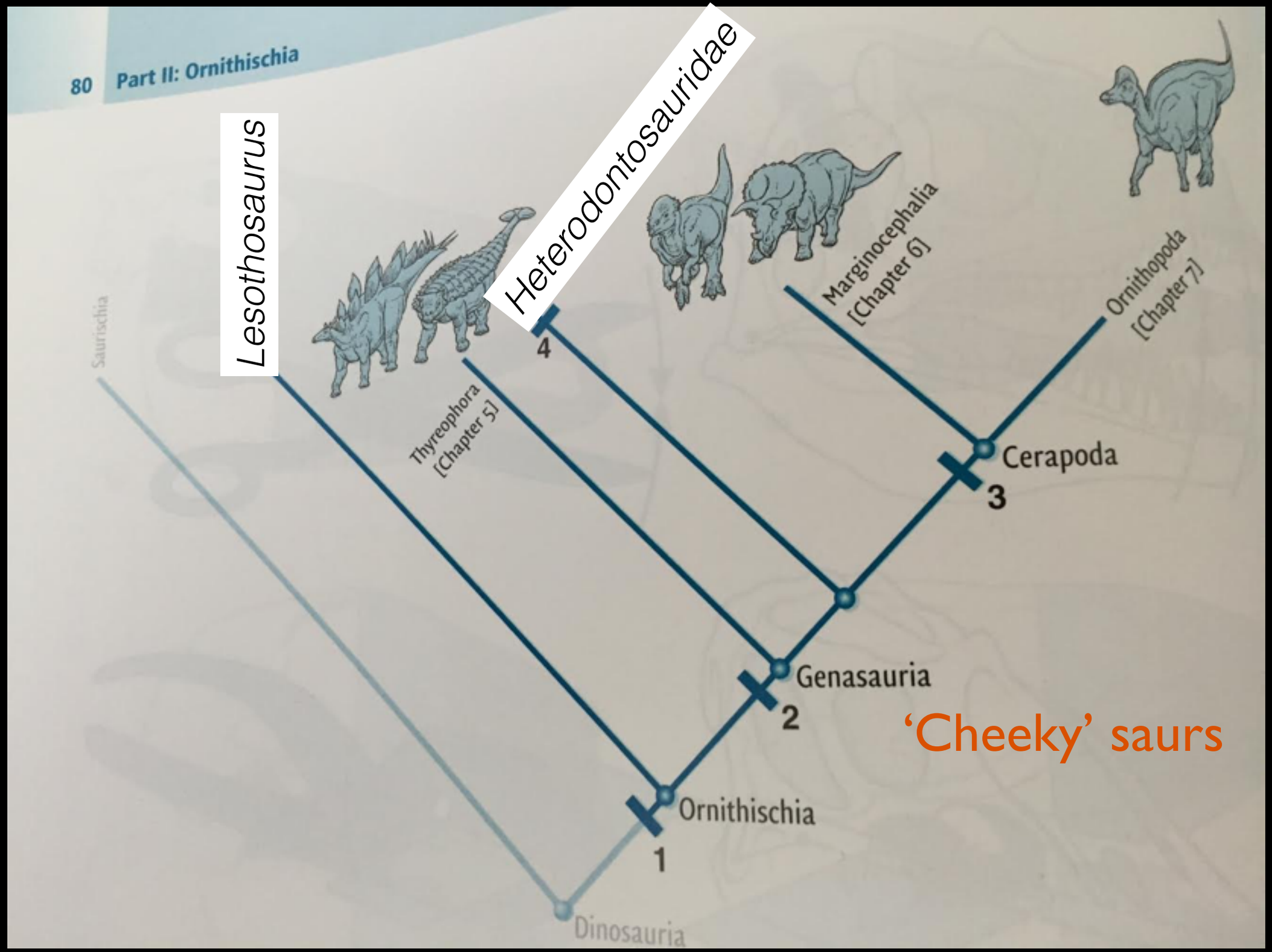


Traveling force

Small area, large force

Broadly distributed force

Large area, less force

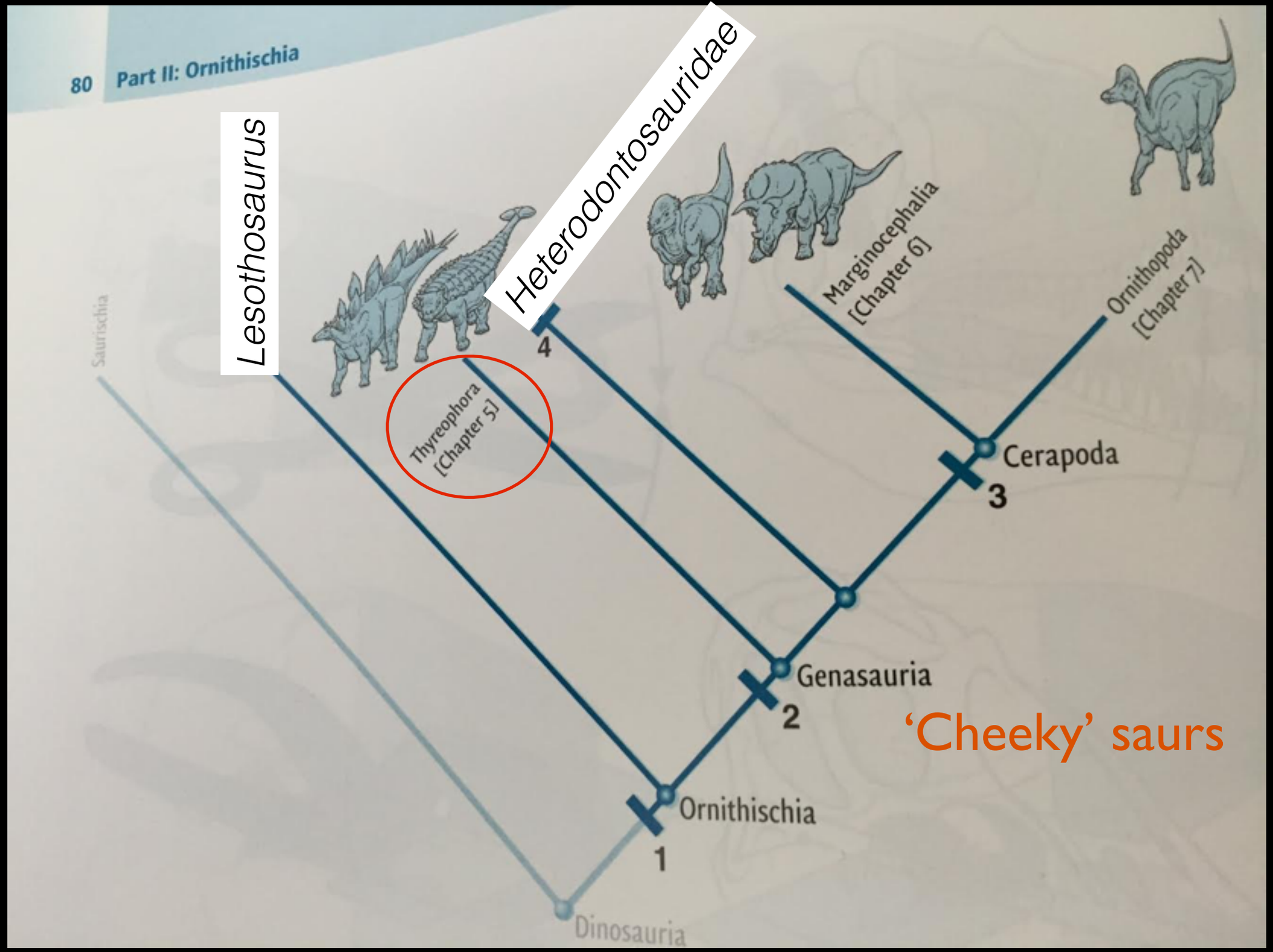


'Cheeky' saurs

Basal Ornithischians

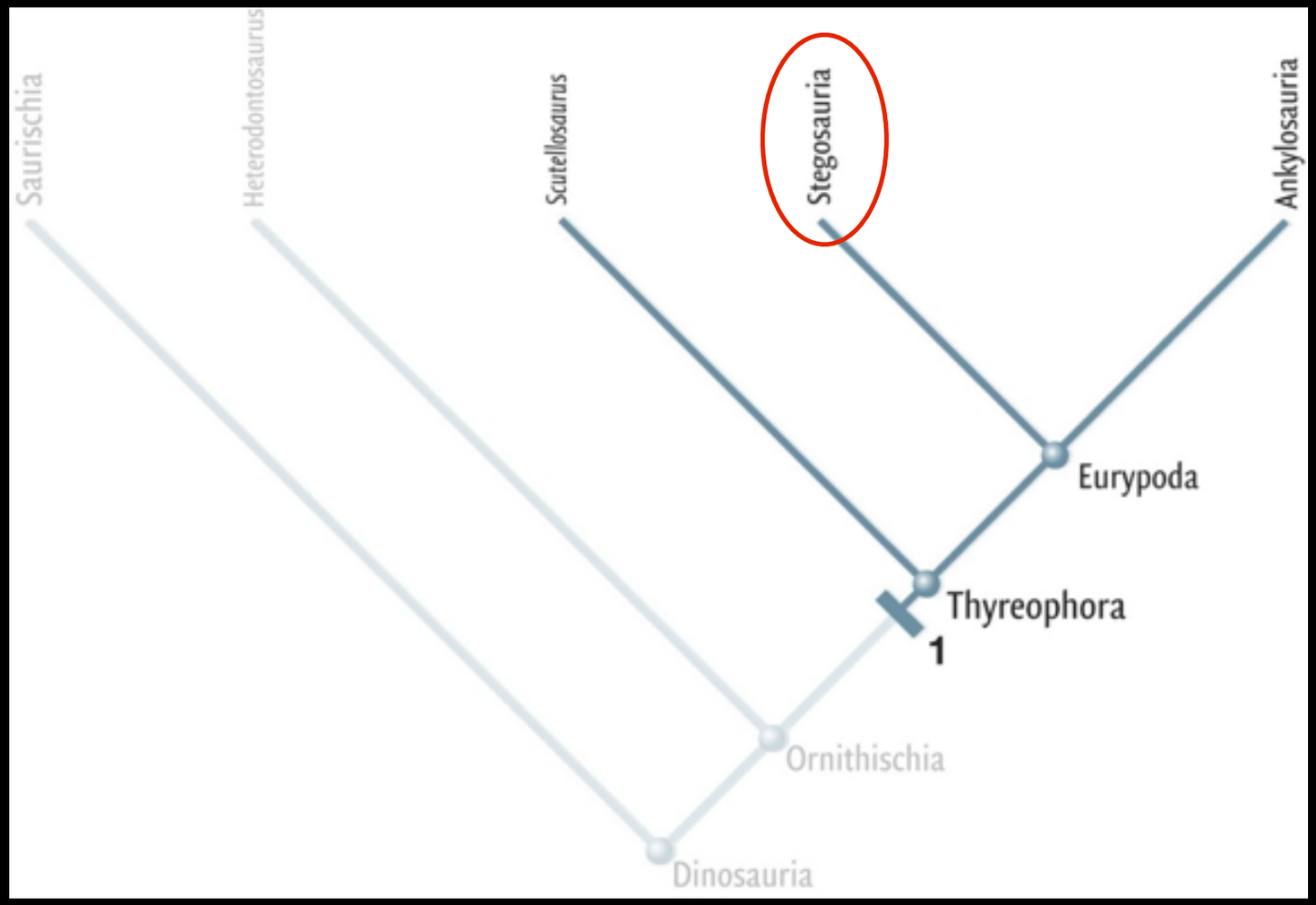
Pisanosaurus *Lesothosaurus*

Everything else in Ornithischia
is in Genasauria ⟶ Chewing



'Cheeky' saurs

Genosauria
Thyreophora
Stegosauria



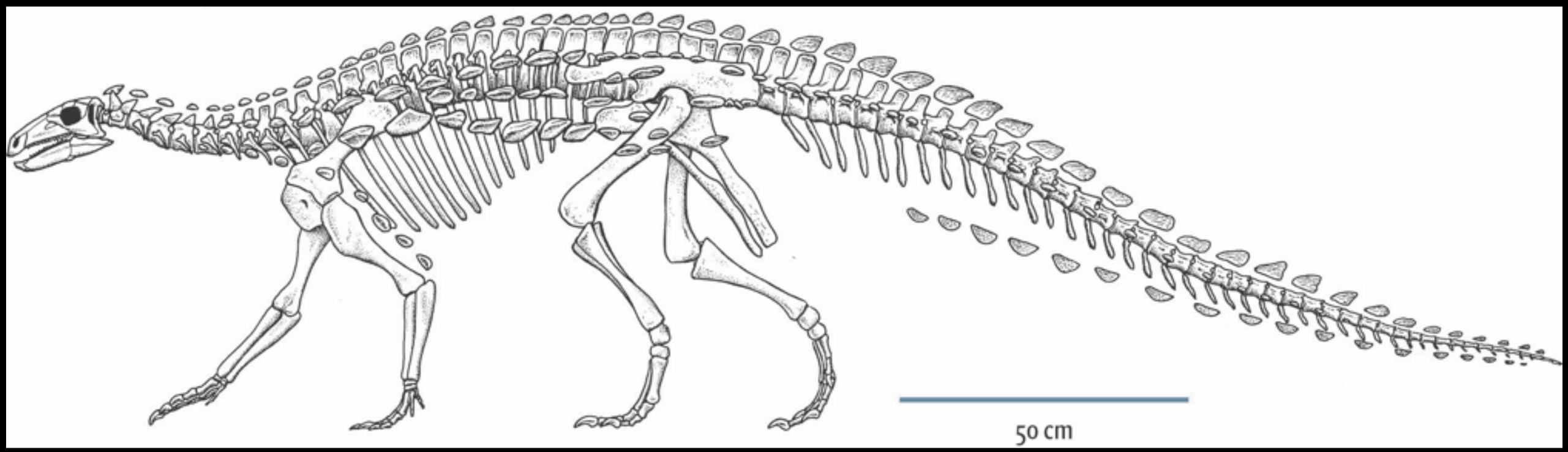
Basal Thyreophorans

bipedal to quadrupedal

osteoderms

Scutellosaurus
4 ft long
Early Jurassic, North America

Scelidosaurus
13 ft long
Early Jurassic, England



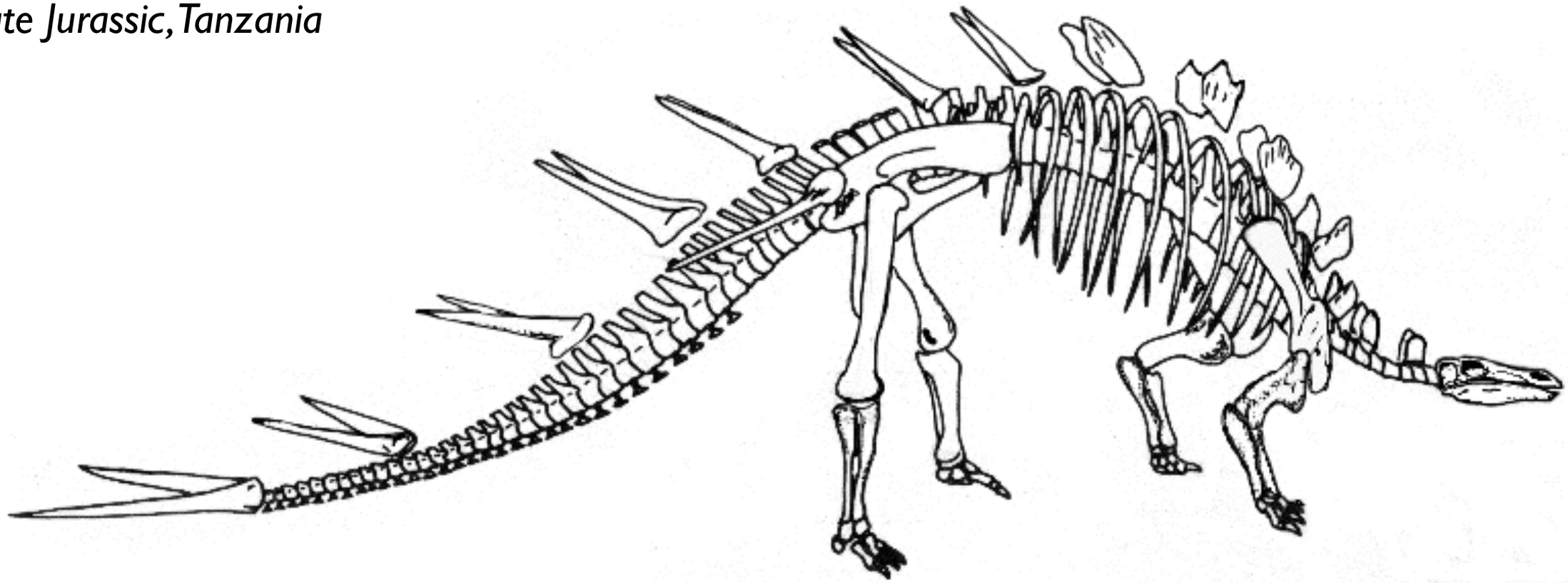
Scelidosaurus
13 ft long
Early Jurassic
England

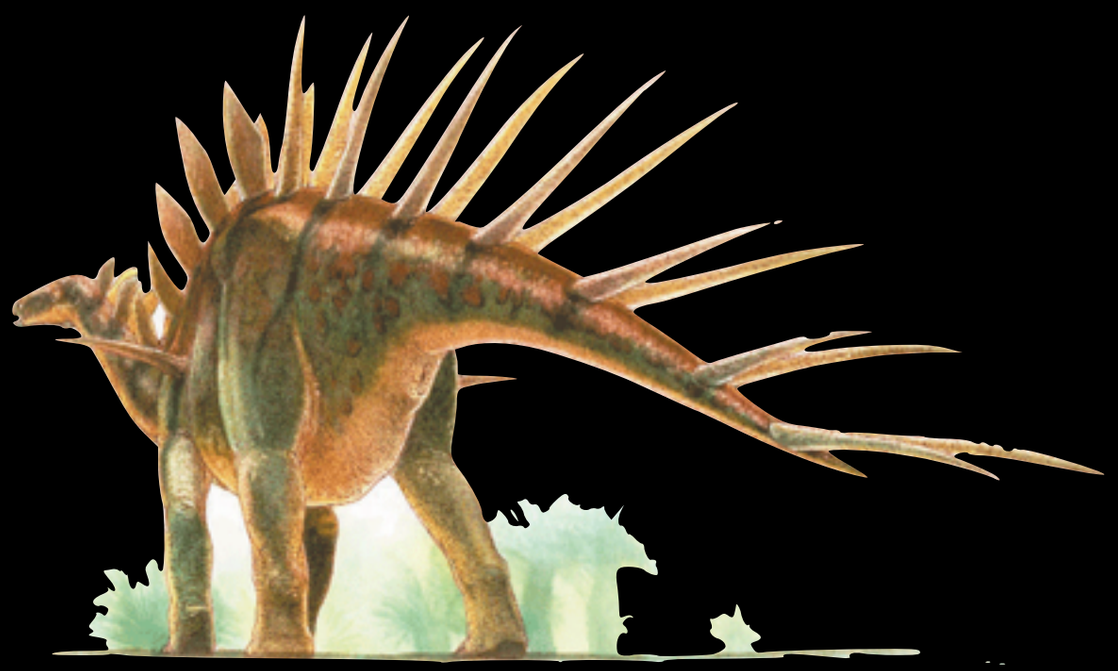
Bony Scutes
(Osteoderms)

Bony Scutes

Shared, derived traits of Stegosauria

Kentrosaurus
15 ft long
Late Jurassic, Tanzania



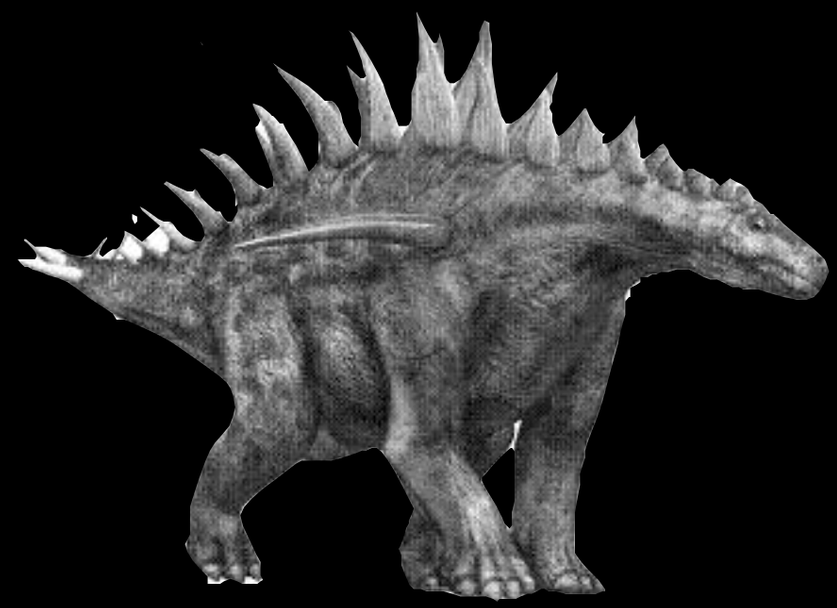


Loss of ossified tendons
Rows of osteoderms over body
  Plates/Spines
Hooved Feet
Tall thoracic vertebae

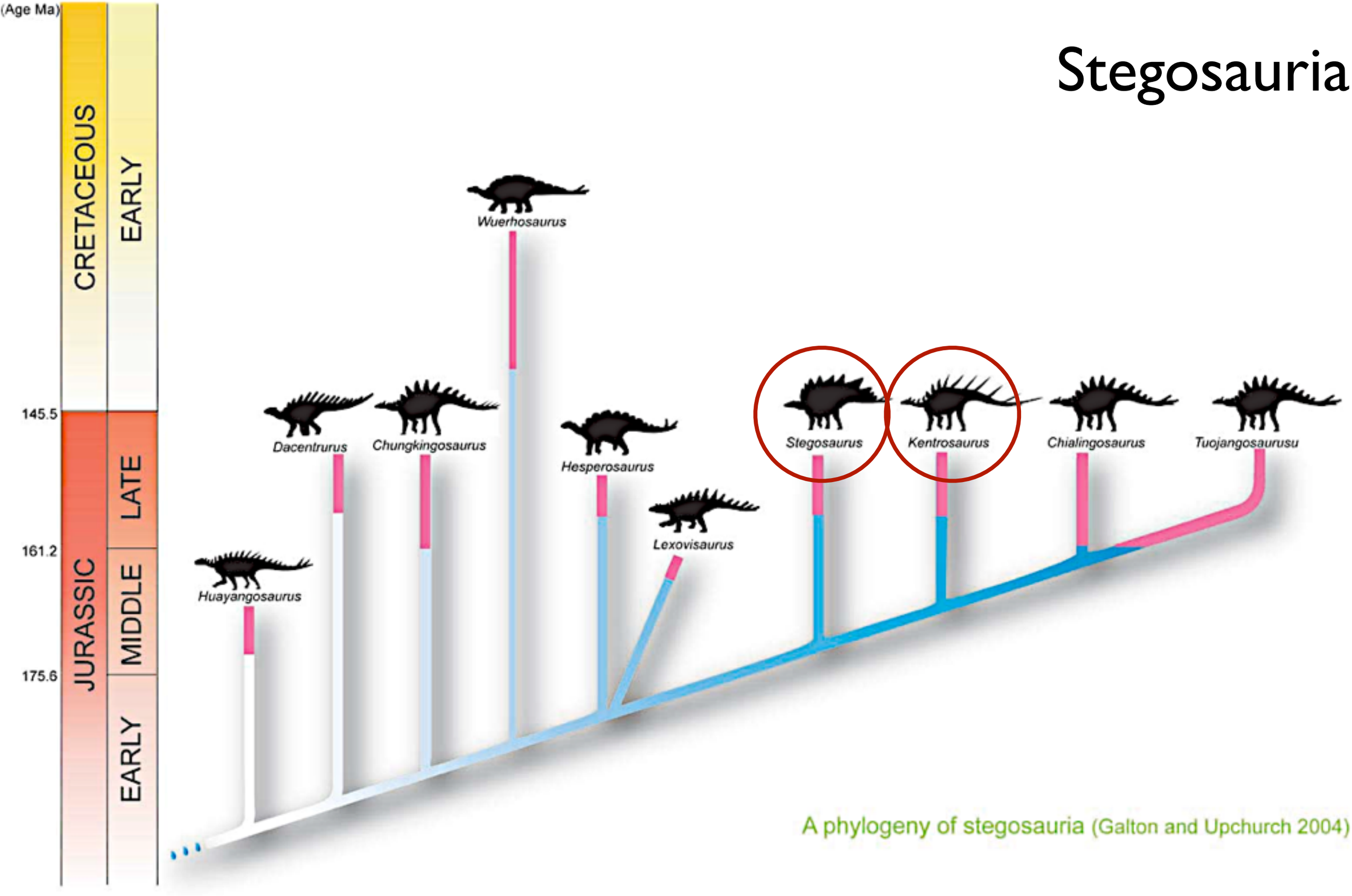
Basal Stegosauria

Parascapular spines
Thagomizer
Plates
Osteoderms

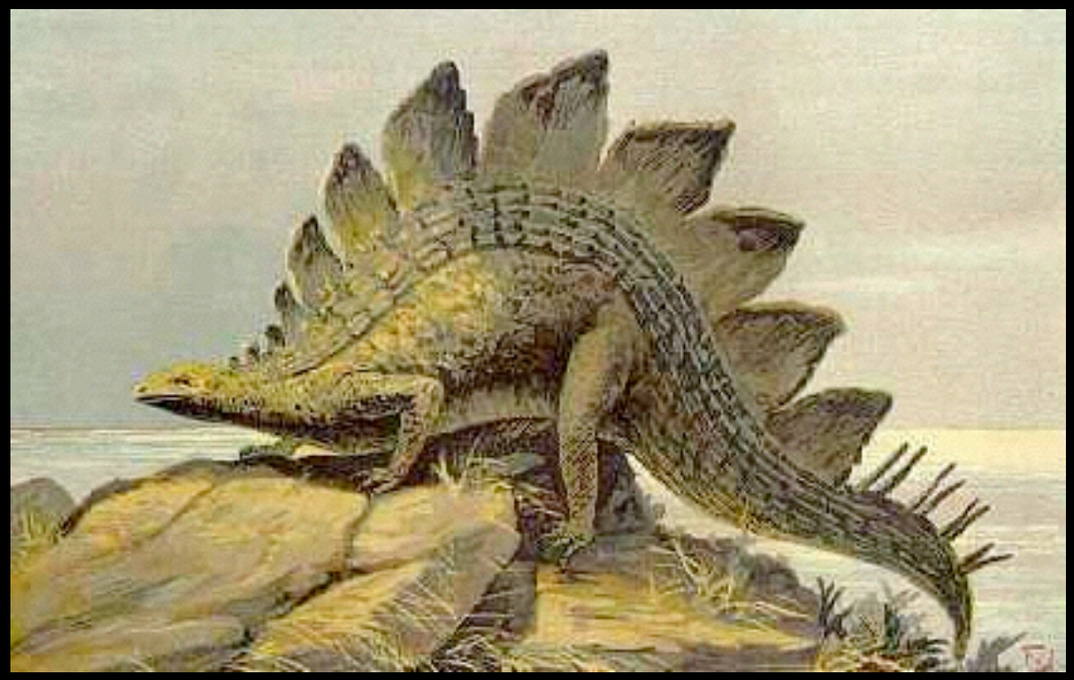
Huayangosaurus
15 ft long



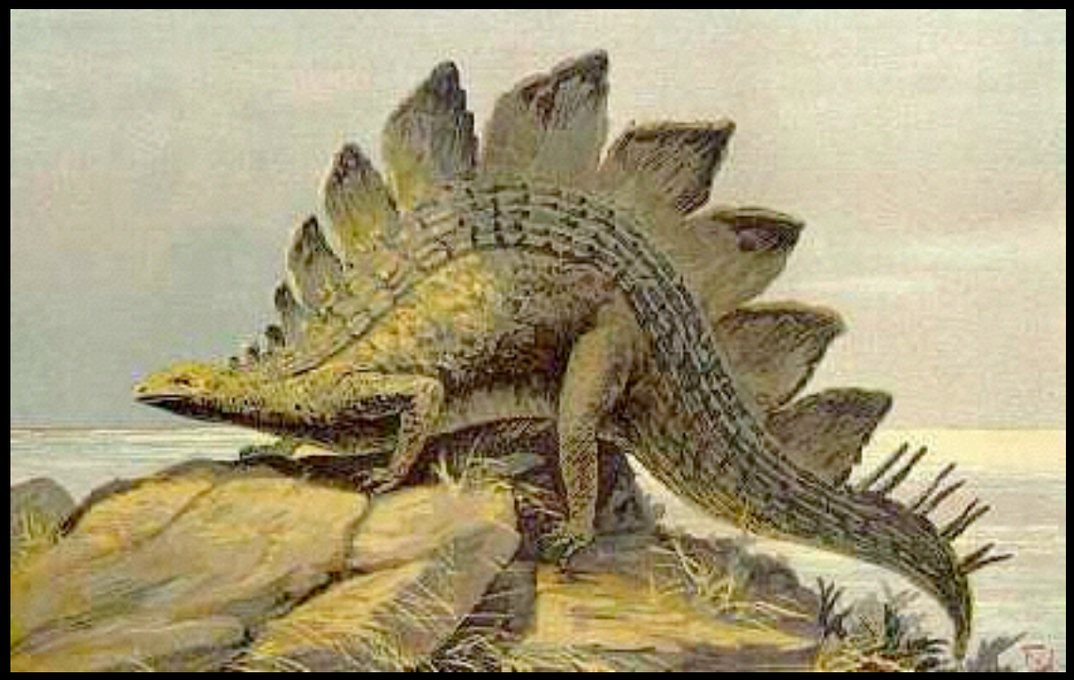
Stegosauria

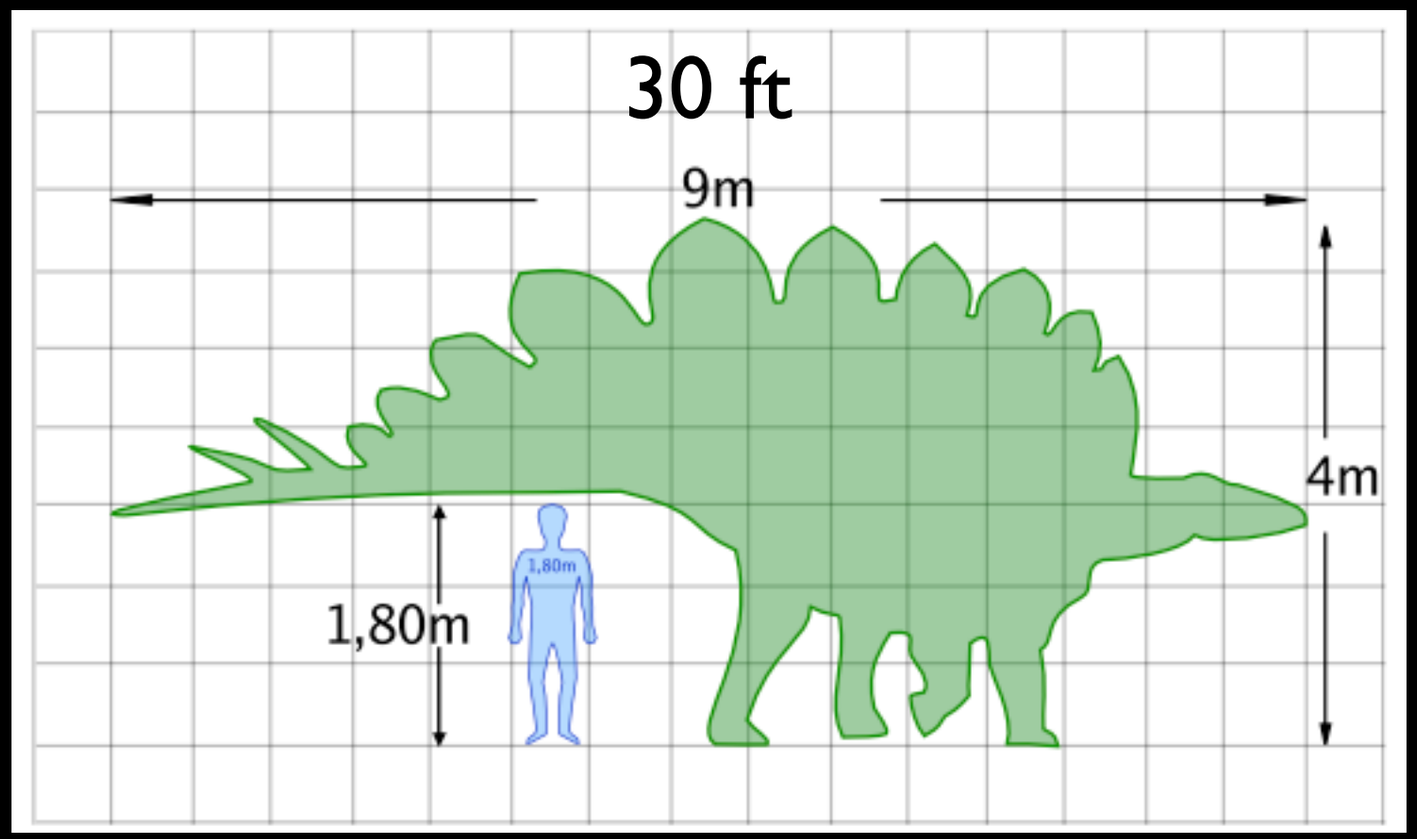


A phylogeny of stegosauria (Galton and Upchurch 2004)



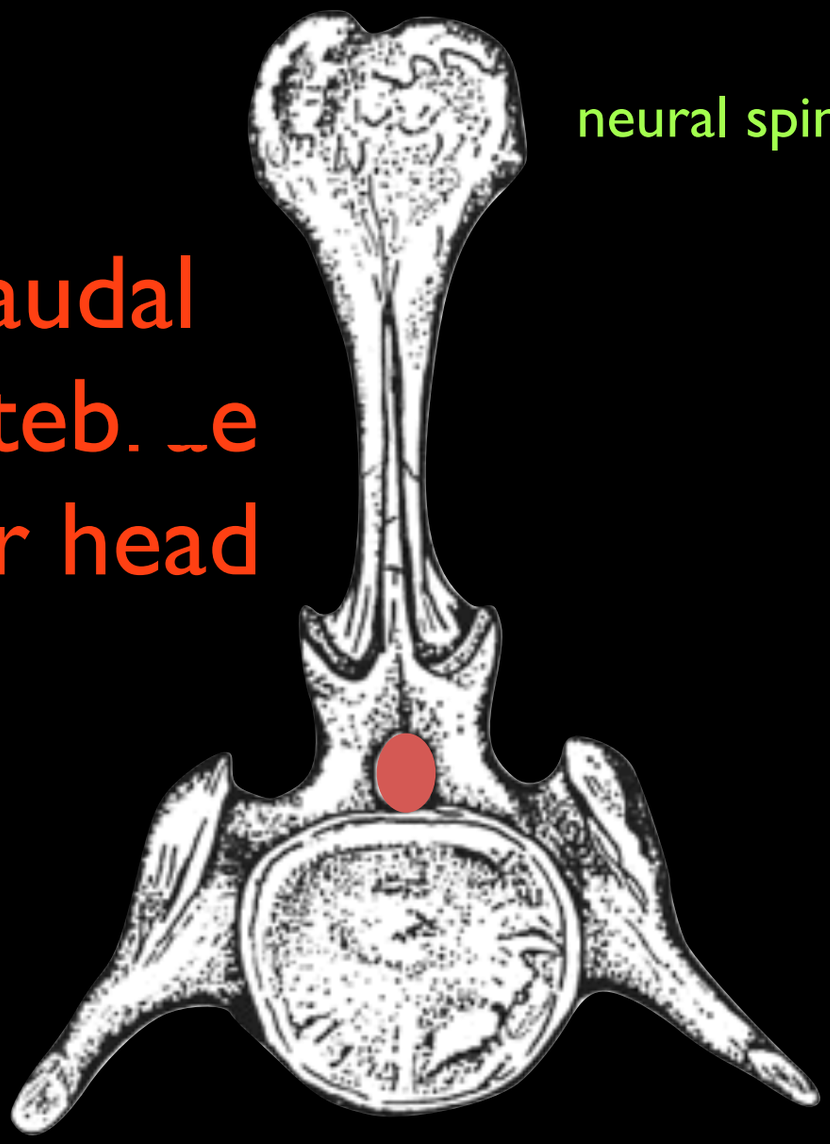
Lost World Clip
22:15-





Lost World Clip
22:15-

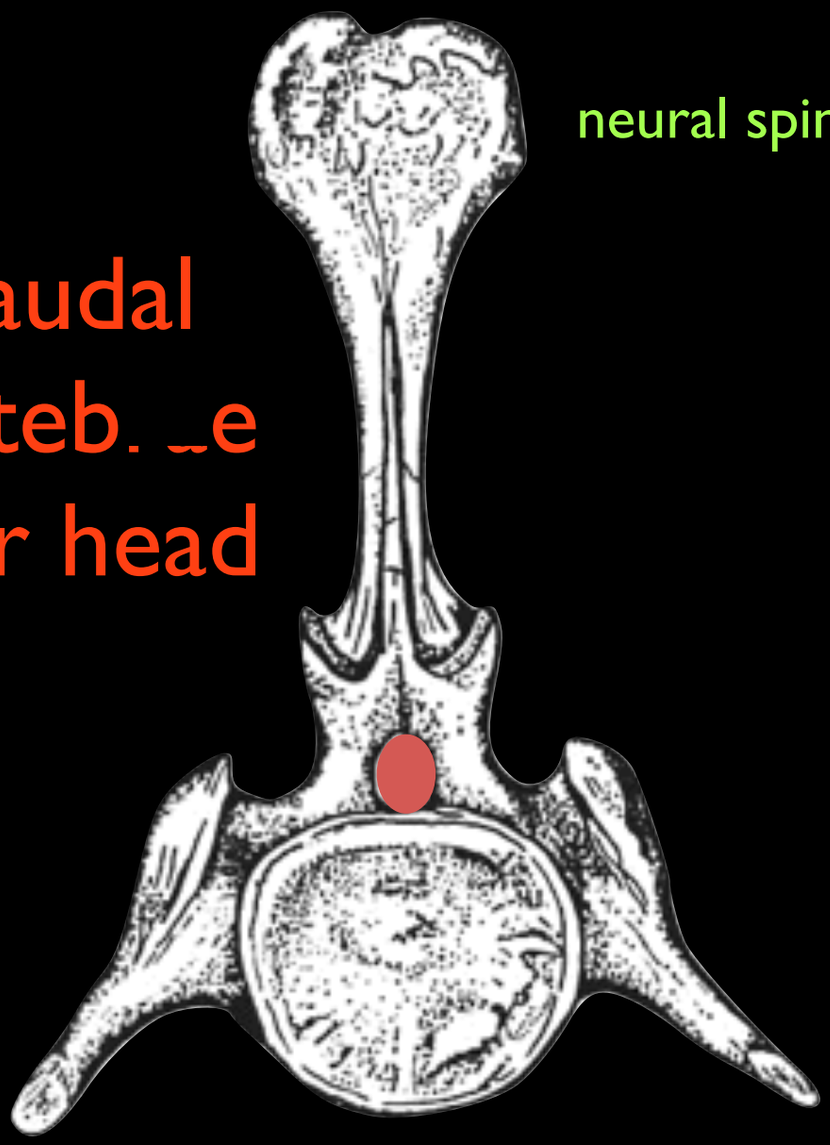
Caudal verteb. _e near head



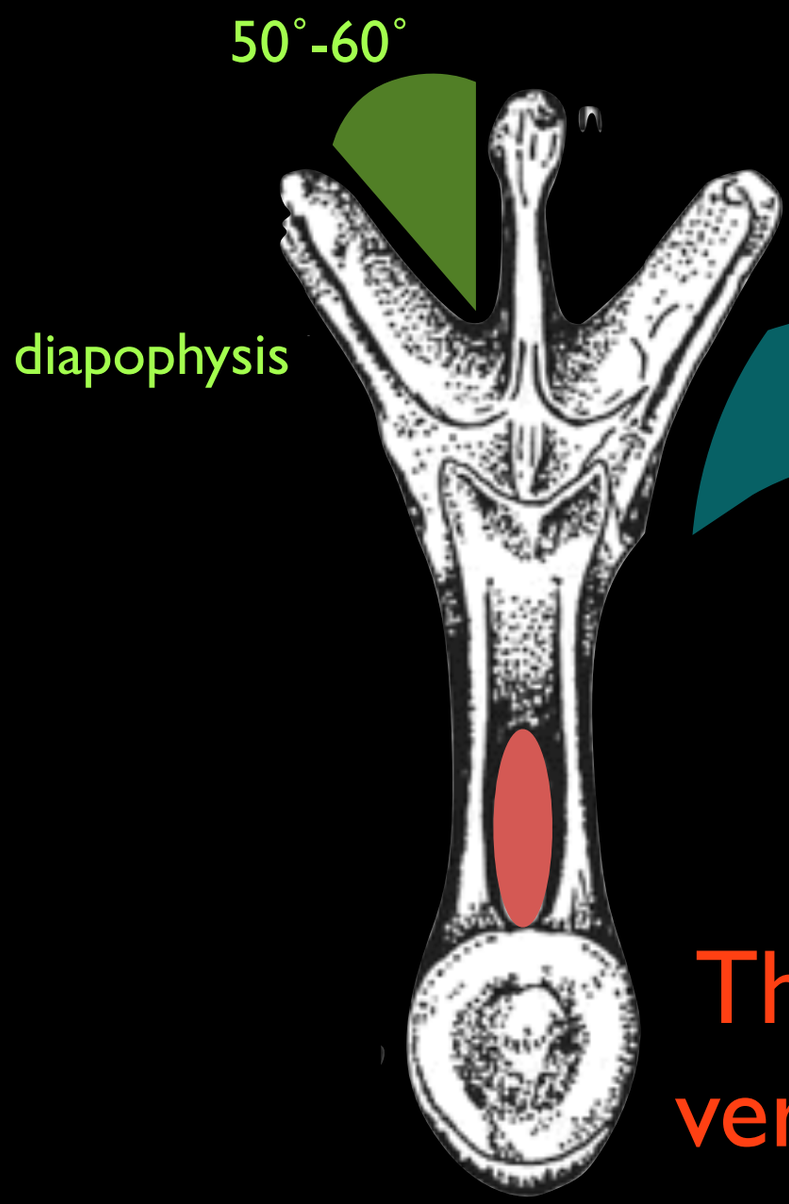
neural spine

Expansion of gut cavity provided by dorsally elongated vertebral centrum (whereas in other dinosaurs, vertebral elongation is usually occurs in the spines)

Caudal vertebrae near head



neural spine



50°-60°

diapophysis

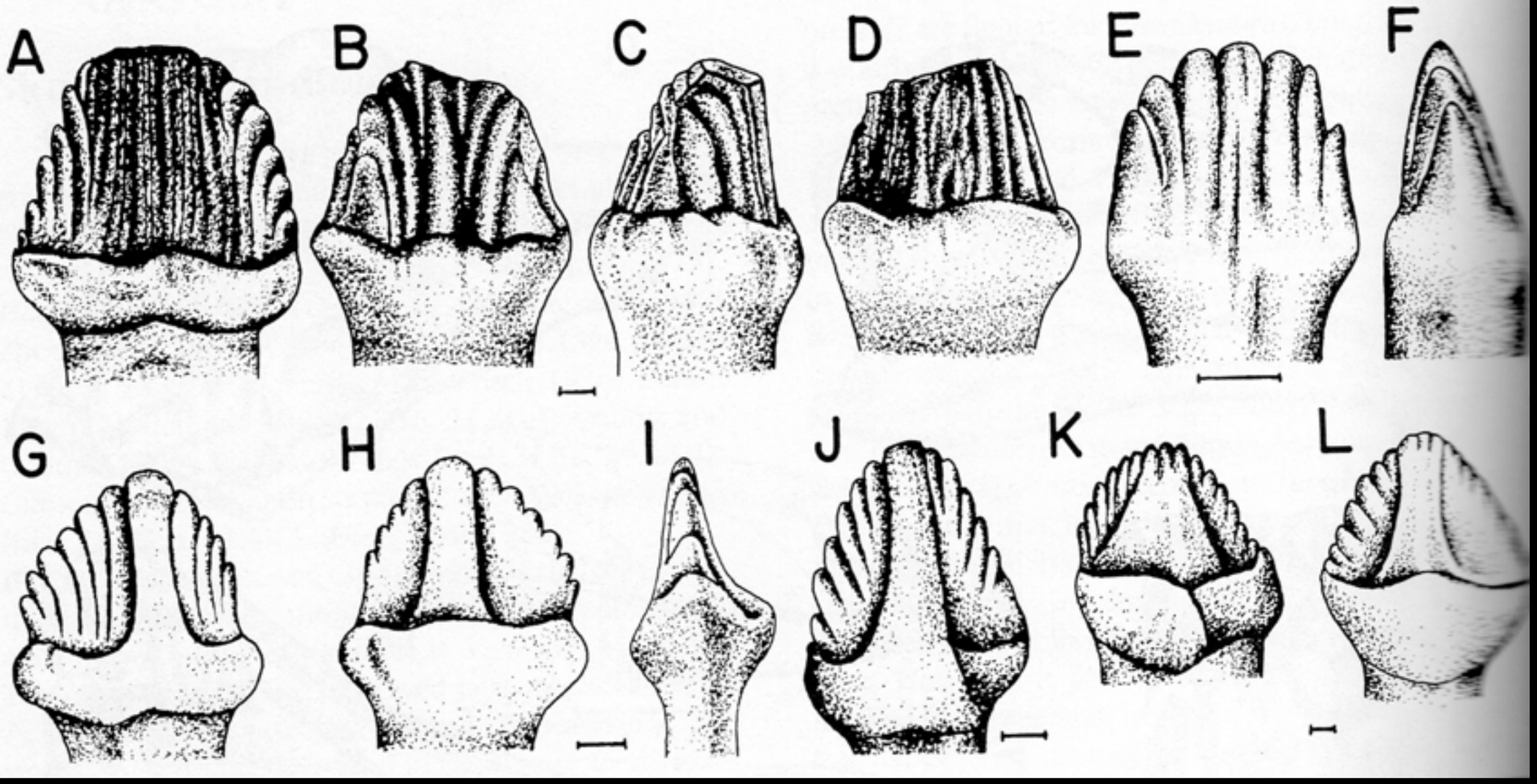
Thoracic vertebrae

Expansion of gut cavity provided by dorsally elongated vertebral centrum (whereas in other dinosaurs, vertebral elongation is usually occurs in the spines)

Diet

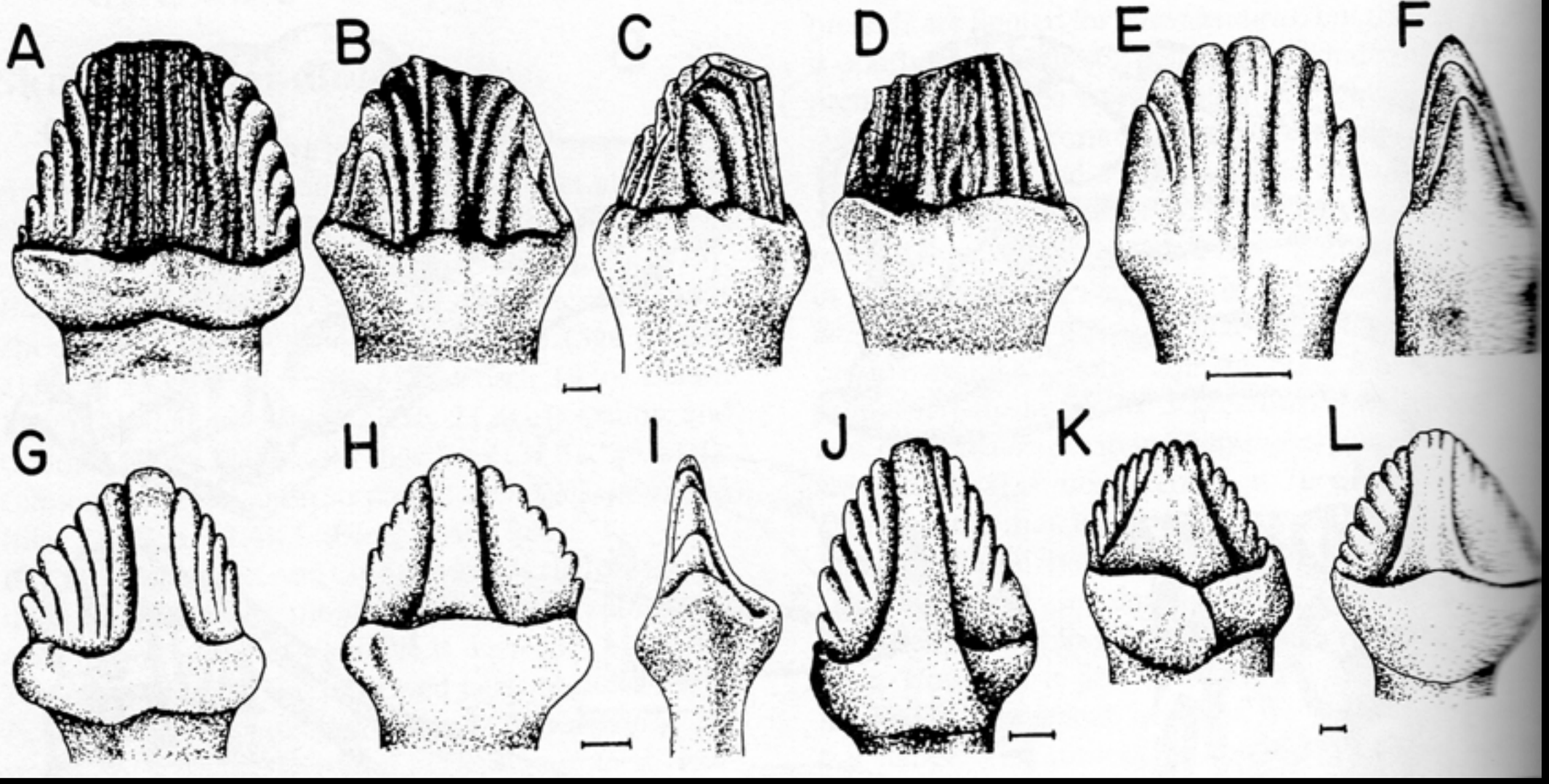
Stegosaurus

Inset tooth row: implies cheeks ~ it's a Genosaur!
Low coronoid process
Teeth are small, simple, trianglar
Spaces btw teeth... not an efficient grinder
Teeth lack regular worn surfaces



Teeth of stegosauran dinosaurs
-basal ornithischian (as opposed to derived ornithischian)
-a small cry from carnivorous ancestors

Small modifications



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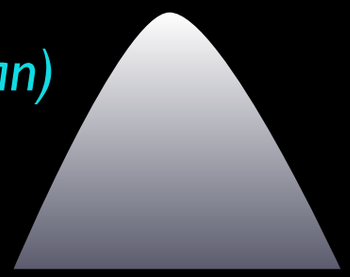
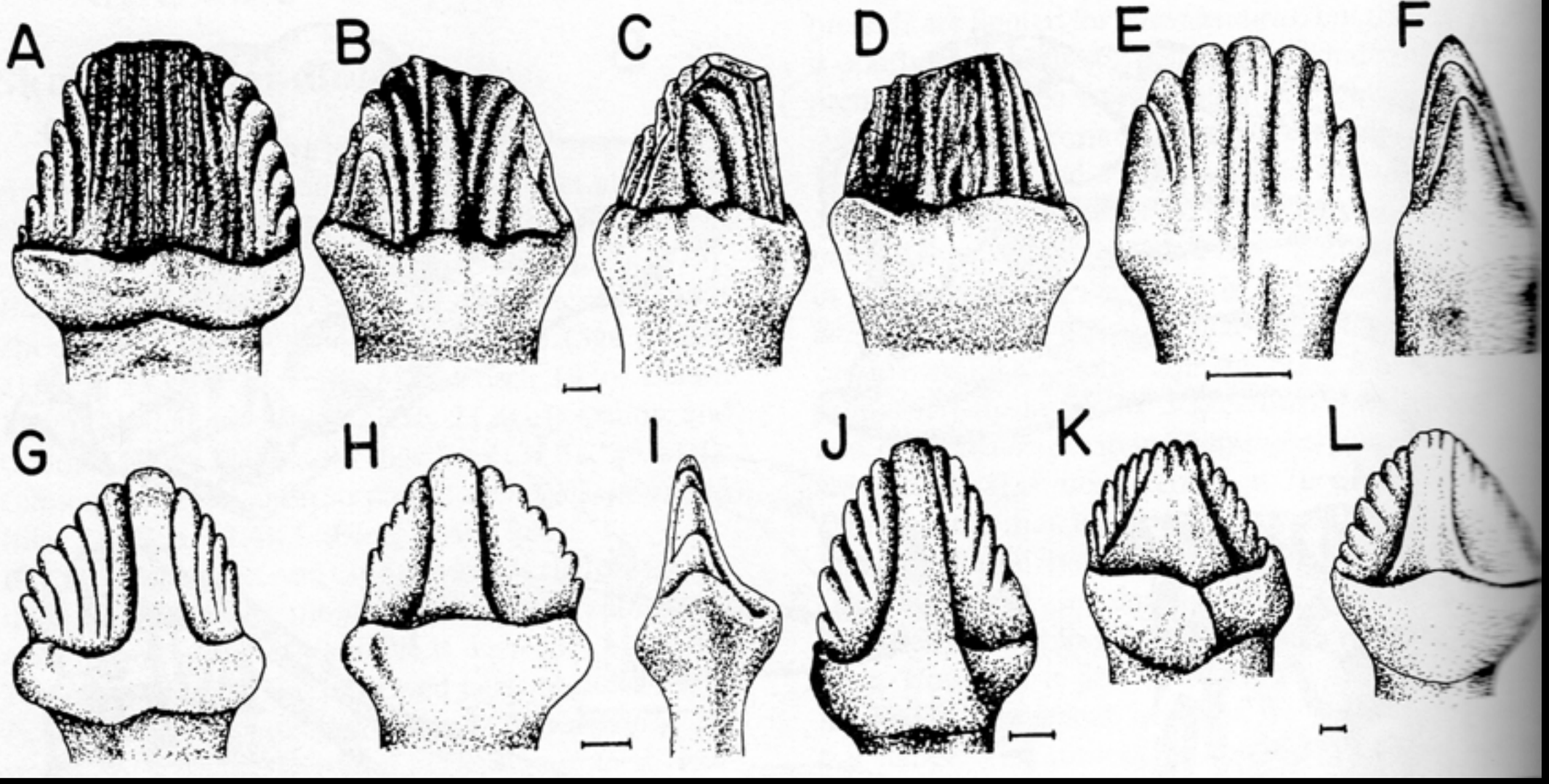


Small modifications



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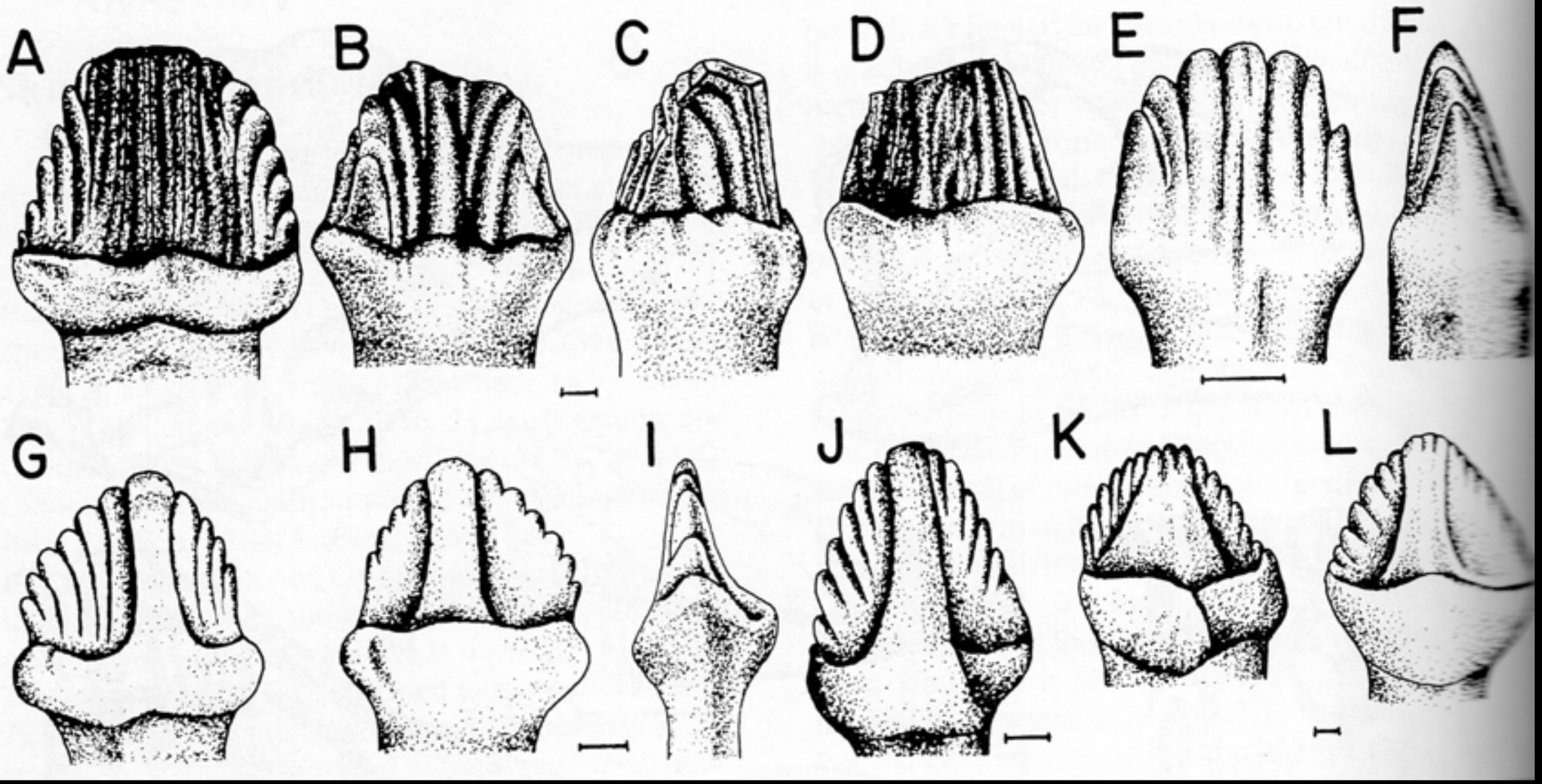

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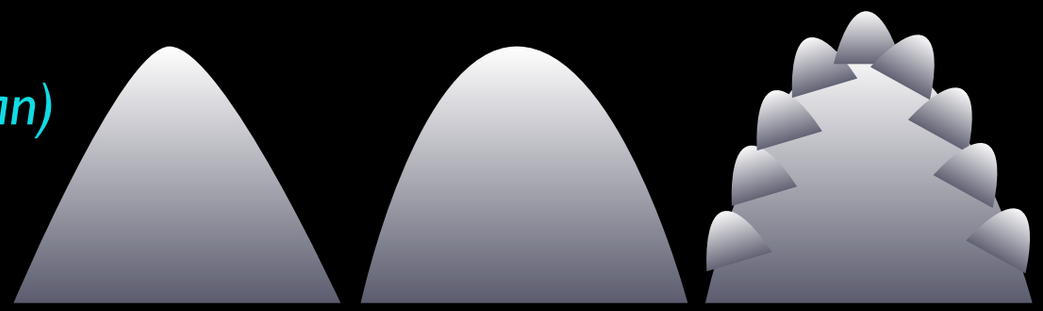
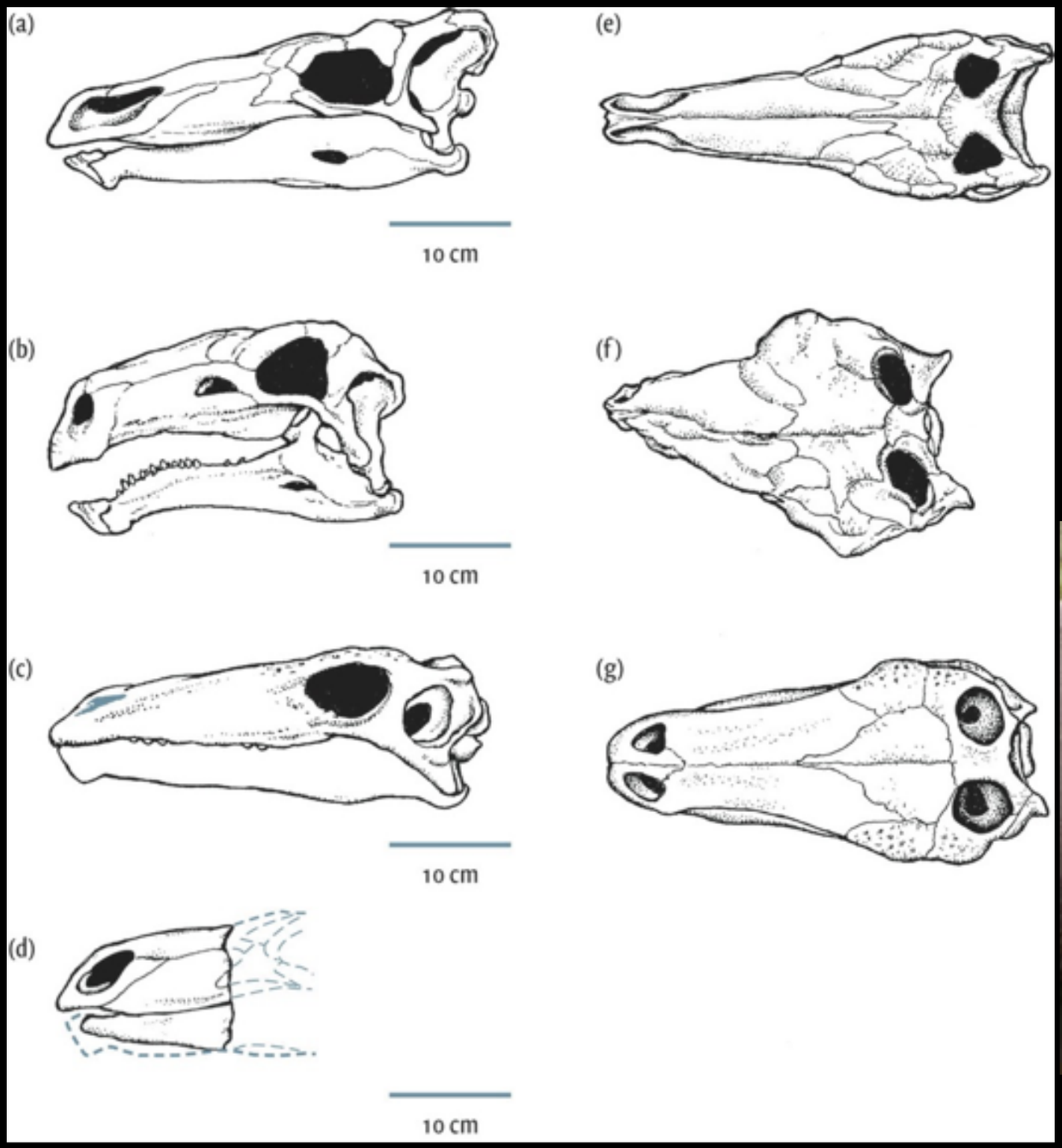


Small modifications

Diet

The story gets stranger yet...
If they didn't chew, maybe they processed it all in their gut.
Typically, you find gastrolithes with dinosaurs that process their food this way.... but no gastrolithes
So what did they eat?

Diet



Narrow jaws => selective feeding
Wide jaws => generalist feeding

'White' Rhino

'Black' Rhino

Diet

Clever girl...

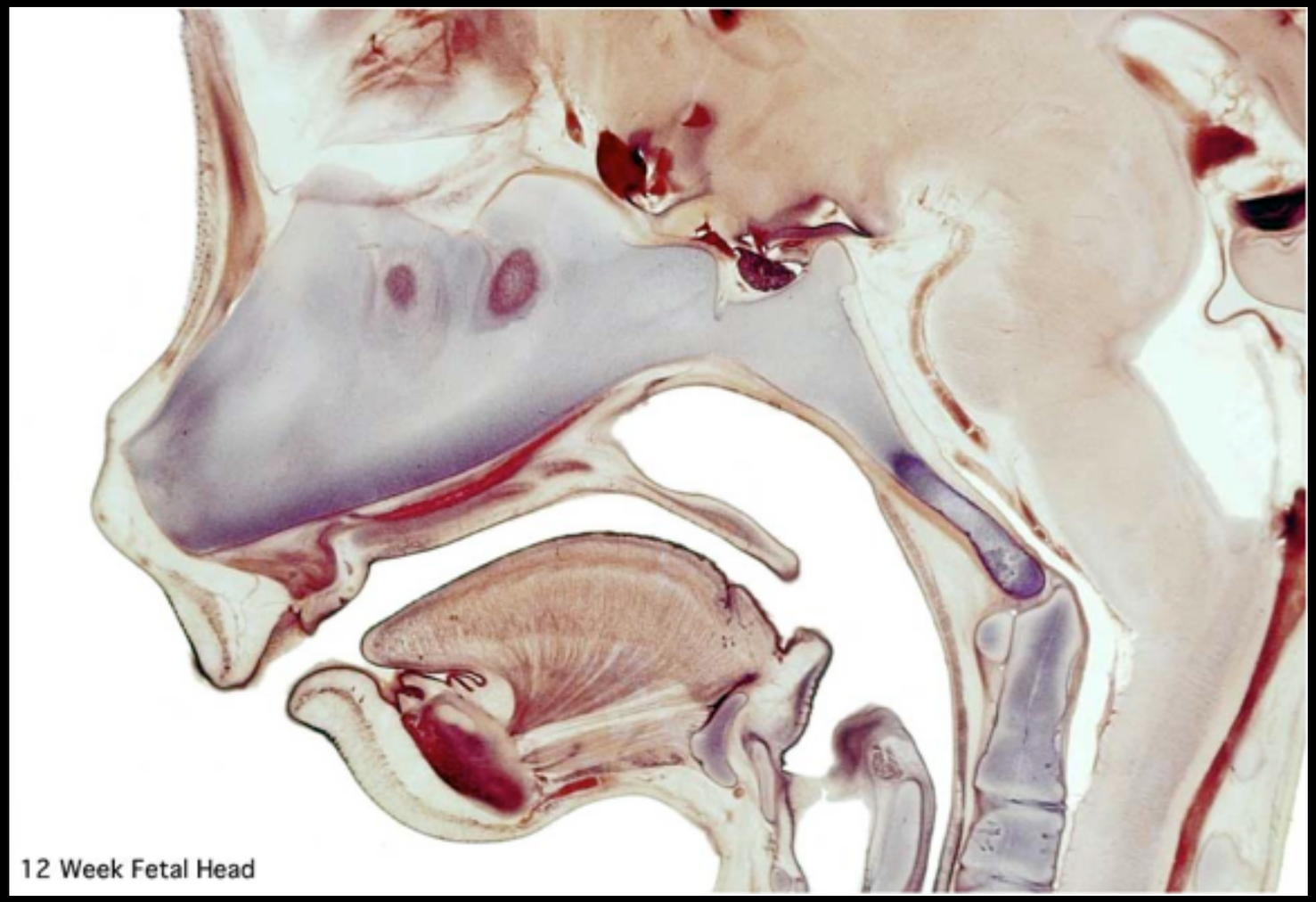
One meter

Stegosaurus

Kanyesaurus westicus

Likely low-browsers
Ferns, cycads, herbaceous gymnosperms
This is just based on 'height'

Medial Plane



Median keel along the length of the palate probably supported a soft secondary palate; may have separated the dorsal nasal passages from the mouth- ***breathe while you chew!***