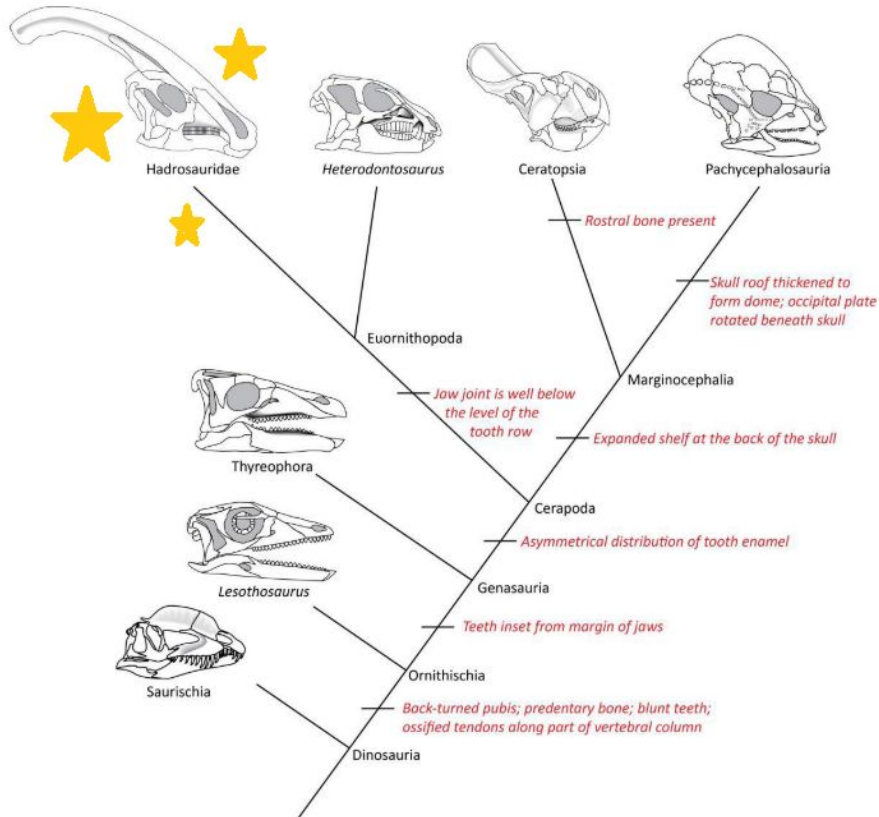


Hadrosauridae

By Rebekah Mullins,
Daniela Rascón,
and Valeria Pizarro

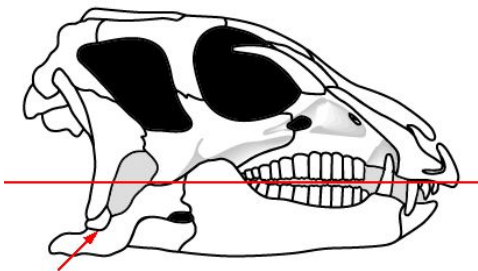
Relationship Within Clade and to Others



- Hadrosauridae is a clade of herbivorous ornithischian dinosaurs
- Sister taxon is Heterodontosaurus
- Dinosauria → Ornithischia → Genasauria → Cerapoda → Euornithopoda → Hadrosauridae
- Diversified into 3 main lineages:
 - Hadrosaurinae (non-crested forms)
 - Saurolophinae (solid-crested forms)
 - Stephanosaurinae (hollow-crested forms)

Synapomorphies that Diagnose the Clade

- Euornithopodan synapomorphy:



The articulation of the skull and jaw is well below the level of the tooth row.

- Some hadrosaurs evolved elaborate nasal crests on their skulls

- Highly derived chewing apparatus with an extra joint in the upper jaw to allow the tooth-bearing bone to flex laterally and shear tough plant matter

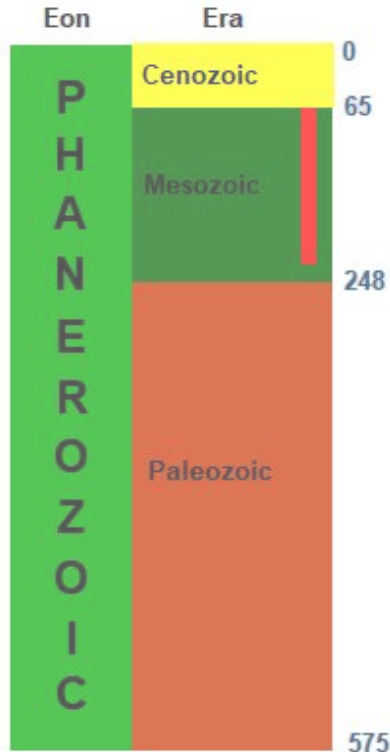


Hadrosaur dentition model

When and Where did they Live?

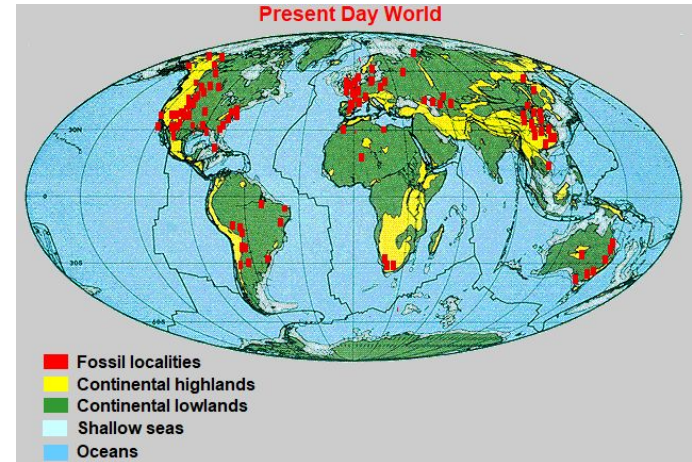
WHEN:

- Fossil record begins in the Middle Jurassic (~170mya)
- Went extinct at the K-T boundary
- Hadrosaurs were at their largest, most diverse, and most successful during the Late Cretaceous

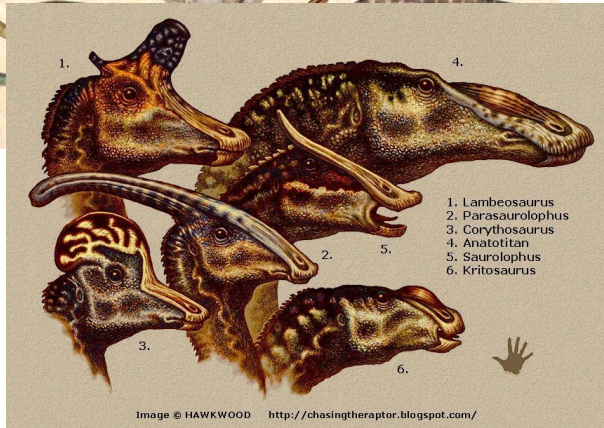


WHERE:

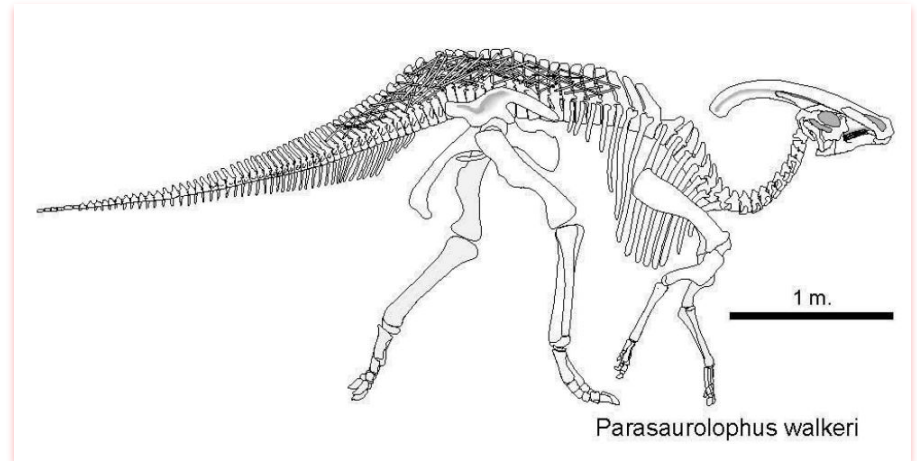
- Hadrosaurids were very common during the Late Cretaceous in Europe, Asia, the Americas, and Antarctica



Typical Morphology



- Mediolaterally-expanded rostra
- Hypertrophied nasal passages
- Many species also had conspicuous supracranial crests



How did they live?

- Did they nest?
 - Yes! Fossilized nests and hatchlings have been found, and hadrosaurs likely tended to their young, bringing them bits of fruit and leaves. Communal nests suggest hadrosaurs might have migrated to nesting grounds. As hadrosaurs were too large to sit on eggs to keep them warm, they likely covered them in vegetation like some crocodiles.



How did they live?

- What did they eat?
 - Hadrosaurs were able to reach low-hanging vegetation as well as ground vegetation with their beak and obligate bipedality, while other ornithischians like ceratopsians were restricted to grazing. Their teeth, as batteries with even scratches suggesting repetitive jaw motion, indicated a stemless diet: likely of horsetails and other common grass-like coverage. Decomposed wood has also been found in coprolites, eaten for the bacteria and fungi or small invertebrates.



How did they live?

- Behavior; were they social?
 - Fast-running; could possibly outrun a tyrannosaurus rex
 - Land-dwelling; tail too stiff to be a rudder in water like previously suspected (see fig. 1)
 - Active in short bursts throughout the day; discovered by analysis of scleral rings compared to birds and lizards (see fig. 2)

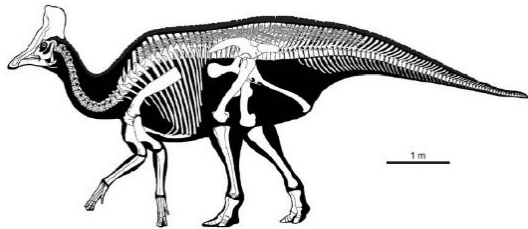
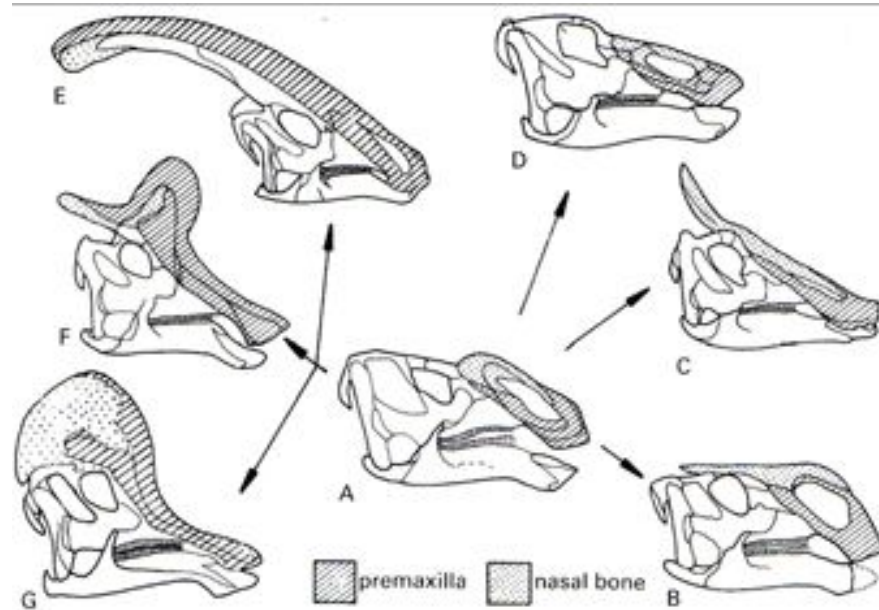
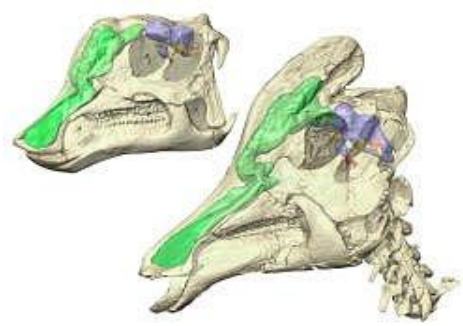


Fig. 1



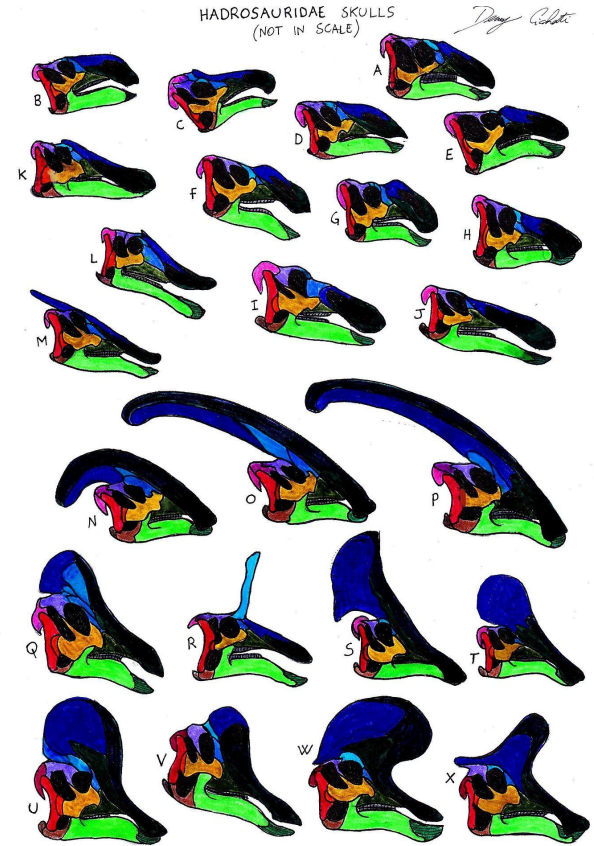
Controversies and Uncertainties

- Hadrosauridae have been a mystery for different reasons, such as their elaborate and diverse crests atop their heads. There were also differing theories about whether these dinosaurs were terrestrial, amphibious or marine.
- Initially back in 1933, Alfred Sherwood Romer suggested that crests served as breathing aides, such as snorkels. It was pointed out, though, that the end of crests do not had holes where air could've come out of.



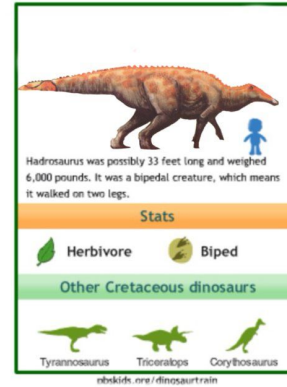
Controversies continued

- Today, it's generally accepted that these crests likely served as resonating chambers for different kinds of calls among members of their species
- It's thought that these structures evolved for:
 - Species recognition
 - Sexual selection



Popular Media Portrayal & How it's Wrong

- PBS Kids: *Dinosaur Train*
 - Does not show the variations within Haudrosauridae
- Jurassic Park Model Toy
 - “corythosaurus”



“A new species of *Gryposaurus* (Dinosauria: Hadrosauridae) from the late Campanian Kaiparowits Formation, southern Utah, USA”

- Hypothesis:
 - describe this new taxon
 - Use the *G. monumentensis* specimen to further differentiate *Gryposaurus* from *Kritosaurus*
- Methods:
 - Physical analysis of specimen
 - Phylogenetic analysis
 - A total of 120 characters were analysed amongst the 15 taxa “using a branch and bound search under ACCTRAN optimization in PAUP version 4.0b10”
 - based on matrices presented by Horner, Weishampel & Forster (2004), supplemented with characters from Weishampel et al. (1993) and new characters resulting from the study
- Sample Size: a mostly complete hadrosaurine skull and compilation of past research/findings
- Additional tests to evaluate hypothesis:
 - Further stratigraphic testing in order to understand *G. monumentensis* and its relationship with other specimens found nearby

Conclusion

- Conclusion: not every member of the genus *Gryposaurus* possesses the characteristic of a larger infratemporal fenestra. Furthermore, there is yet another unidentified species of *Gryposaurus* as it was found through biostratigraphic methods that a major environment change occurred and thus enabled speciation.
- Phylogeny: *Gryposaurus* is positioned one node above *Kritosaurus* which points to a close relationship between the two taxa. These two genera are dry similar on the surface but this study offers the conclusion that they should indeed be separate genera.



Questions Raised

If not enough specimens have been found and there is even an unidentified species of *Gryposaurus* then why are they coming to the final conclusion that it is a separate genera from *Kritosaurus*? This can essentially only be studied further with the discovery of more specimens to fill in gaps.

There is a clear gap in the genus *Gryposaurus* since an unidentified specimen was found stratigraphically lower than *G. monumentensis* and this points to a faunal turnover in species. Exactly how diverse is the genus? Further dating can help pinpoint how long it took for speciation to occur and can help point towards how many variations there are.

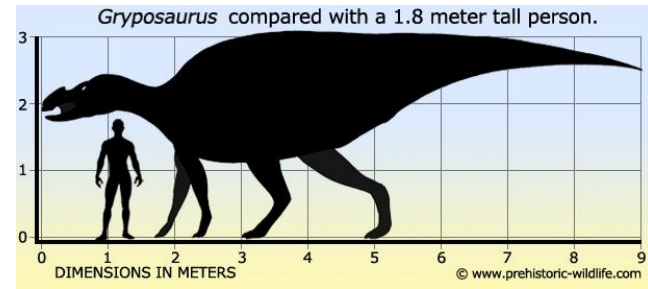
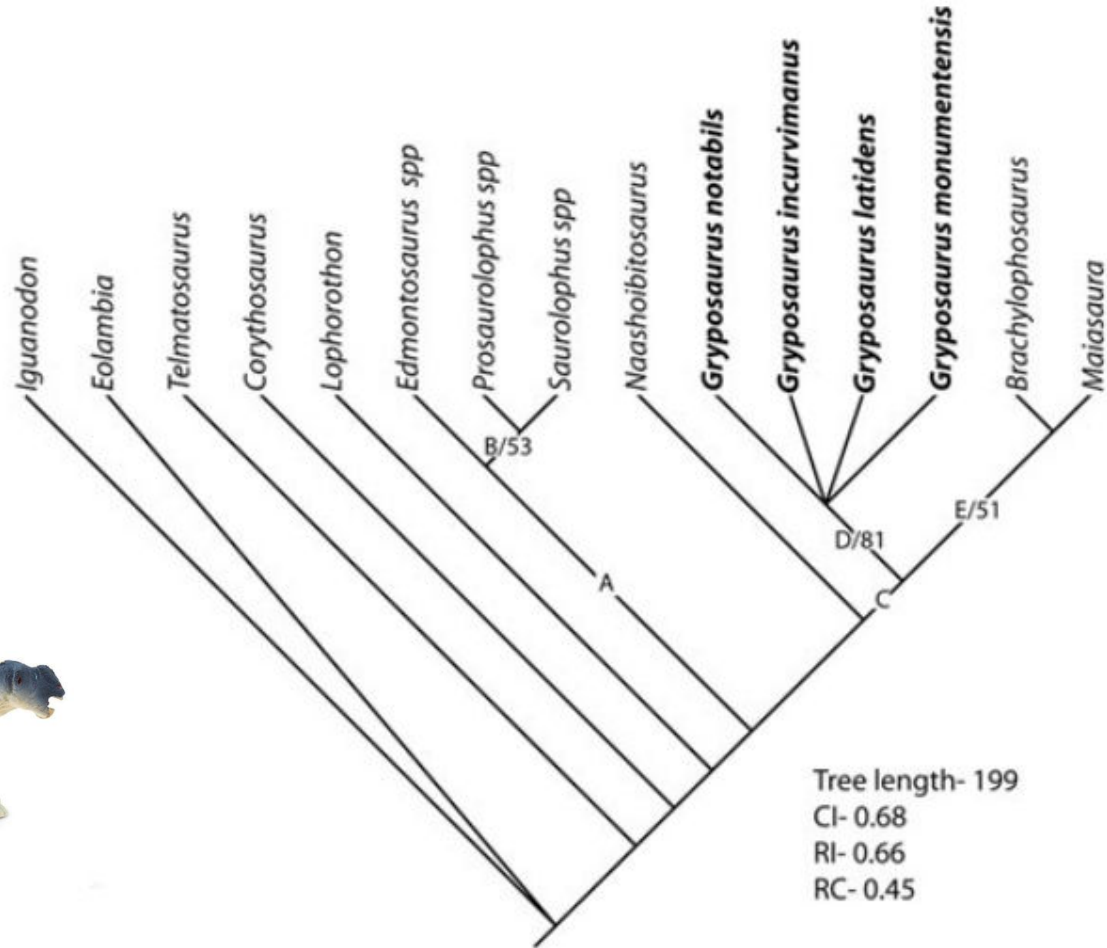


Fig. 16



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