



# Description and rediagnosis of the crested hadrosaurid (Ornithopoda) dinosaur *Parasaurolophus cyrtocristatus* on the basis of new cranial remains

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“Life reconstruction of Parasaurolophus group being confronted by a tyrannosaurid in the subtropical forests of New Mexico 75 million years ago.” Credit: Copyright Andrey Atuchin, Denver Museum of Nature & Science. Usage restrictions: This image may be used by news organizations in reports describing the research of Gates, Evans, and Sertich on Parasaurolophus.

## Abstract

For nearly 60 years, skulls of *Parasaurolophus* species have been differentiated primarily on the basis of crest shape rather than on unique morphologic characters of other cranial elements. Complicating matters is the fact that crests dramatically change shape throughout ontogeny. Without a complete growth series, it has become difficult to assess the taxonomic distinctness of each species through the lens of allometric growth. *Parasaurolophus cyrtocristatus* has proven to be especially troublesome to assess because of the poorly preserved nature of the type and only skull. A new, partial skull from the Fossil Forest Member of the Fruitland

Formation—the same geologic unit as the type specimen—is the first opportunity to re-diagnose this species as well as redefine the genus with many new traits. An undescribed, short-crested subadult skull from the Kaiparowits Formation of Utah previously assigned to cf. *P. cyrtocristatus* allows detailed comparisons to be made between the unnamed Utah taxon and the material of this species from the type locality. We find that several characteristics of the squamosal, supraoccipital, and premaxilla shared between the referred skull and the type skull are unique to *P. cyrtocristatus* (sensu stricto) within the genus, irrespective of the overall crest shape. A phylogenetic analysis that includes six new characters posits that *P. cyrtocristatus* and *P. tubicen* are sister taxa, and that the latter does not share a closest common ancestor with the long-crested *P. walkeri* as previously hypothesized. This result helps to explain why both taxa are found in northeastern New Mexico, USA and in sequential geologic units (Fruitland Formation and Kirtland Formation, respectively). Additionally, the exquisitely preserved new skull provides the first opportunity to unequivocally identify the osteological make-up of the *Parasaurolophus* cranial crest. Unlike in previous reconstructions, the crest composition in *Parasaurolophus* follows what is seen in other lambeosaurines such as *Corythosaurus*, where the dorsal process of the premaxilla dominates the crest, with the nasal forming 80% of the ventral paired tubes, and the lateral premaxillary process acting a lateral cover between the dorsal and ventral tubes. The skull of *P. cyrtocristatus* is still incompletely known, so more complete material will likely reveal new features that further differentiate this species and aid in determining the pace of ornamental crest evolution.

## Video Interview

PeerJ talks to Joseph W. Sertich

<https://www.youtube.com/watch?v=EEF7NbcYpK>

## Press Coverage

New skull of tube-crested dinosaur reveals evolution of bizarre crest

<https://phys.org/news/2021-01-skull-tube-crested-dinosaur-reveals-evolution.html>

Fossilized skull reveals how crested dinosaur got its fancy headgear

<https://edition.cnn.com/2021/01/25/americas/dinosaur-crest-skull-parasaurolophus-scn/index.html>

'Exquisitely preserved' skull of a tube-crested dinosaur that roamed North America 75 million years ago is unearthed in New Mexico badlands

<https://www.dailymail.co.uk/sciencetech/article-9183847/Exquisitely-preserved-skull-tube-crested-dinosaur-New-Mexico.html>

## Subject Areas

[Biodiversity](#), [Paleontology](#), [Taxonomy](#), [Zoology](#)

## Keywords

Ontogeny, Cretaceous, Dinosaur, Allometry, Phylogeny, Taxonomy, Campanian, Crest, Sexual selection

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