

Dinosaur frills and horns did not evolve for species recognition

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The restoration of the head of *Nasutoceratops* (copyright Andrey Atuchin).
Credit: Andrey Atuchin

The elaborate frills and horns of a group of dinosaurs including *Triceratops* and *Styracosaurus* did not evolve to help species recognise each other, according to researchers at Queen Mary University of London.

It has been suggested that different species that live in the same location may evolve features in order to distinguish one another to help avoid problems such as hybridisation, where two individuals of different species produce infertile or unfit offspring.

To test this hypothesis the researchers examined patterns of diversity in the ornamentation of 46 species of ceratopsians, the [horned dinosaurs](#), but found no difference between species that lived together and those that lived separately.

[A previous research paper](#) from Queen Mary found that the frill in one ceratopsian species, *Protoceratops*, may have evolved under [sexual selection](#). These new findings appear to add evidence to this across the entire group.

The researchers also found evidence that ornamental traits seemed to evolve at a much faster rate than other traits. As these structures are costly to grow and maintain, this finding similarly points to a strong selective pressure on these traits.

The study was published in *Proceedings of the Royal Society B*.



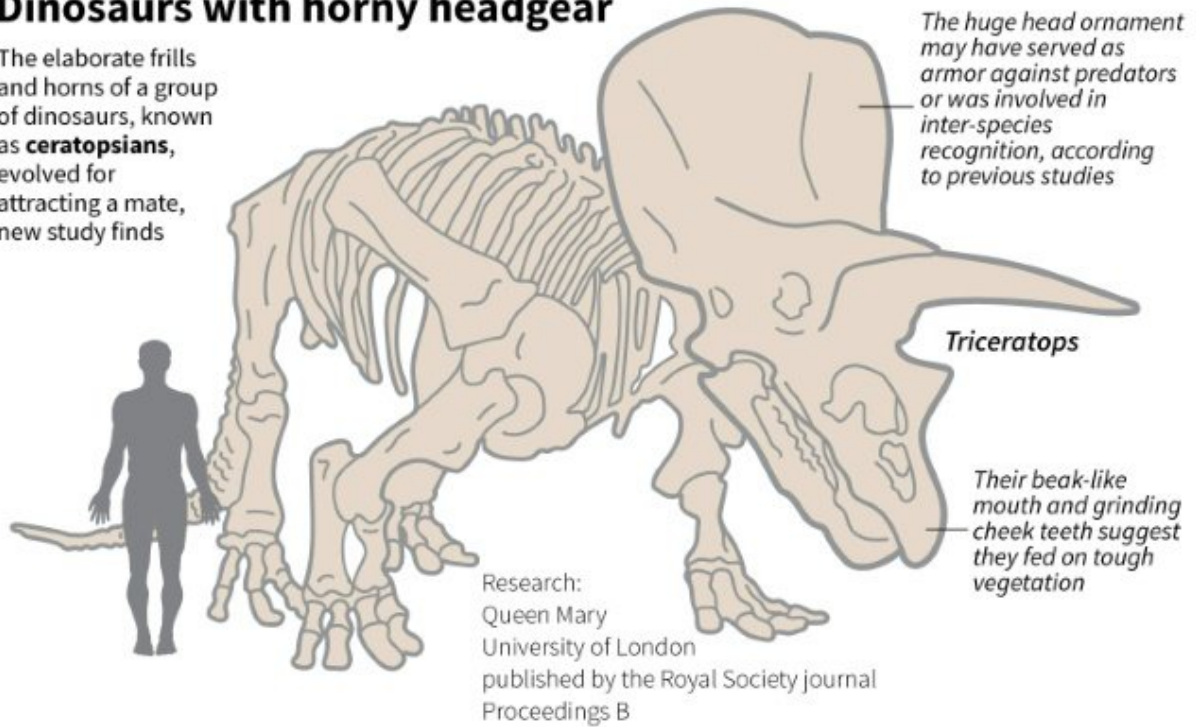
The *Protoceratops* in the Horniman Museum, London. Credit: Horniman Museum, London

Andrew Knapp, PhD candidate from the School of Biological and Chemical Sciences and lead author of the study, said: "This resolves a long-standing and hitherto untested hypothesis concerning the origin and function of ornamental traits in ceratopsian dinosaurs. Many general discussions of ceratopsian ornaments in museum signage and popular literature often include examples of what they might have been for, but these tend to be rather speculative.

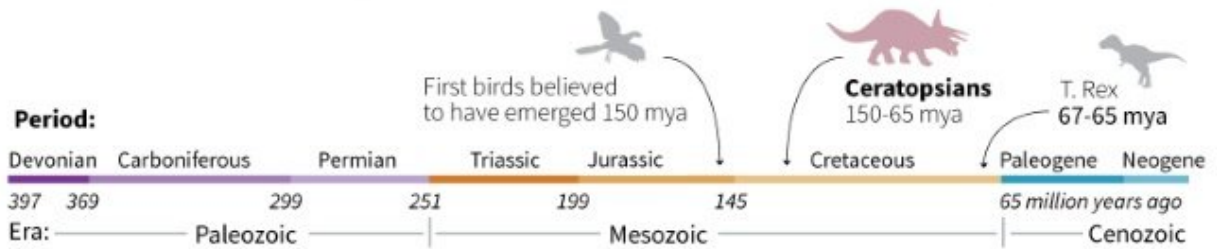
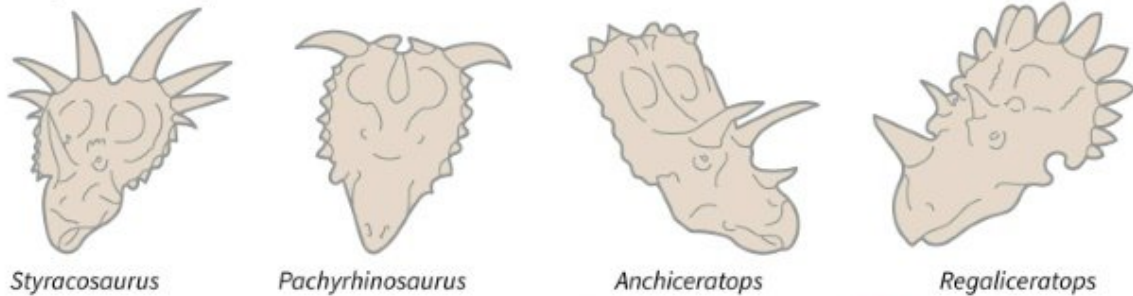
"We have shown that species recognition, one of the commonest explanations, is unlikely to be responsible for the diversity or origin of ornamentation in this group."

Dinosaurs with horny headgear

The elaborate frills and horns of a group of dinosaurs, known as **ceratopsians**, evolved for attracting a mate, new study finds



Examples of ceratopsian head shields



Sources: Royal Society journal Proceedings B, Vertebrate Paleontology and Evolution/National Geographic

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Graphic on dinosaurs with horns on their heads.

The researchers believe the implications extend beyond the scope of ceratopsians and have consequences for the study of evolutionary theory over vast stretches of time.

The [fossil record](#) offers an opportunity to see evolution in action over much longer time periods than can be achieved with living organisms, but it is difficult to assign explanations to unusual features such as [ceratopsian](#) ornaments with the limited information that fossils provide.

The researchers have now largely ruled out one explanation, [species](#) recognition, and provided some evidence for another, sexual selection.



The *Chasmosaurus* skeleton in the Royal Tyrrell Museum of Paleontology.
Credit: Royal Tyrrell Museum of Paleontology

Mr Knapp said: "If sexual selection is indeed the driver of ornament evolution in ceratopsians, as we are increasingly confident it is, demonstrating it through different lines of evidence can provide a crucial window into tracing its effects over potentially huge timescales."

He added: "Modern computer models have suggested that sexual selection can promote rapid speciation, adaptation, and extinction. In our world of increasing pressure on the natural world, these predictions may have important consequences for conservation and the fate of living things everywhere."

To test these predictions the researchers hope to look at changes in the fossil record and gather further [evidence](#) to first identify sexual selection in a fossil group.

More information: Patterns of divergence in the morphology of ceratopsian dinosaurs: sympatry is not a driver of ornament evolution, *Proceedings of the Royal Society B* (2018). [rspb.royalsocietypublishing.org/doi/10.1098/rspb.2018.0312](https://royalsocietypublishing.org/doi/10.1098/rspb.2018.0312)

Provided by Queen Mary, University of London

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