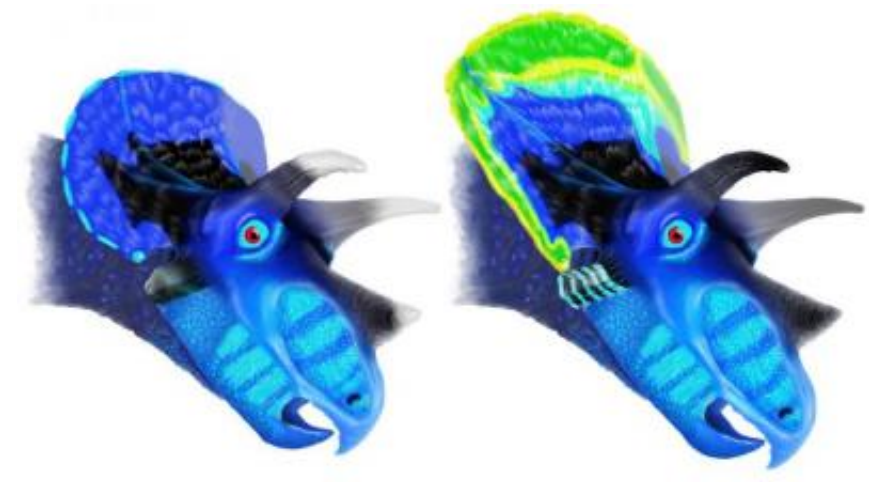
Study finds Triceratops, Torosaurus were different stages of one dinosaur

July 14 2010



The classic image of a Triceratops is on the left. On the right is the new face of Triceratops, previously called Torosaurus. (Artwork by Holly Woodward, MSU graduate student).

(PhysOrg.com) -- Research by a Montana State University doctoral student and one of the nation's top paleontologists is upending more than 100 years of thought regarding the dinosaurs known as Triceratops and Torosaurus.

Since the late 1800s, scientists have believed that Triceratops and Torosaurus were two different types of dinosaurs. Triceratops had a three-horned skull with a rather short frill, whereas Torosaurus had a much bigger frill with two large holes through it.

MSU paleontologists John Scannella and Jack Horner said in the July 14 issue of the Journal of Vertebrate Paleontology, however, that Triceratops and Torosaurus are actually the same dinosaur at different stages of growth. They added that the discovery contributes to an unfolding theory that dinosaur diversity was extremely depleted at the end of the dinosaur age.

The *Journal of Vertebrate Paleontology* is the official journal of the Society of Vertebrate Paleontology. Scannella is a doctoral student in earth sciences, and Horner is Regents Professor of Paleontology at MSU's Museum of the Rockies.

The confusion over Triceratops and Torosaurus was easy to understand, Scannella said, because juvenile dinosaurs weren't just miniature versions of adults. They looked very different, and their skulls changed radically as they matured. Recent studies have revealed extreme changes in the skulls of pachycephalosaurs, tyrannosaurs and other dinosaurs that died out about 65 million years ago in North America.

"Paleontologists are at a disadvantage because we can't go out into the field and observe a living Triceratops grow up from a baby to an adult," Scannella said. "We have to put together the story based on fossils. In order to get the complete story, you need to have a large sample of fossils from many individuals representing different growth stages."

The Triceratops study suggests that it is critical that paleontologists consider ontogeny (growth from a juvenile to an adult) as a source of major morphological variations before naming new species of dinosaurs to account for variation between specimens, Scannella added.

"Without considering changes in shape throughout ontogeny, we overestimate dinosaur diversity and hence produce an unrealistic view of the paleoecology of these animals," Scannella said.

Scannella and Horner benefited from an extensive 10-year study of the Hell Creek Formation in Eastern Montana. Led by Horner, the large-scale project was conducted to reconstruct the ecosystems that existed during the Cretaceous Period that ended about 65 million years ago when there was a mass extinction of dinosaurs. As part of the study, field crews collected hundreds of specimens. Forty percent of the specimens came from Triceratops at different stages of growth. Some of the skulls belonged to juvenile Triceratops and roughly the size of footballs. Other skulls are the size of a small car.

"Torosaurus" specimens are much rarer than Triceratops, however. None of the Torosaurus specimens came from immature animals, Scannella said. When the paleontologists did find "Torosaurus" skulls, the skulls were all large.

"If Torosaurus is actually the mature form of Triceratops, we must ask why 'Torosaurus' specimens are relatively rare compared to Triceratops," Scannella said. "It is possible that mortality was fairly high for Triceratops before they reached their fully mature morphology."

Scannella and Horner examined more than 50 Triceratops specimens for their study. More than 30 were skulls that came out of the Hell Creek Formation and are housed at the Museum of the Rockies. The paleontologists also examined skulls from several North American institutions, including the American Museum of Natural History in New York, the National Museum of Natural History at the Smithsonian Institution in Washington, D.C., and the Peabody Museum of Natural History at Yale University in New Haven, Conn.

Scannella and Horner measured the length, width and thickness of the skulls. They examined the microstructure, surface textures and shape changes of the frills. Microscope studies revealed that the tissues of Torosaurus specimens are more heavily remodeled than those of even

the largest Triceratops, strongly suggesting that Torosaurus specimens are in fact adult Triceratops, Scannella said. Even in Triceratops that were previously considered to be adults, the skull was still undergoing dramatic changes.

Many undergraduate students, as well as volunteers from around the world, participated in the project by discovering and excavating the Triceratopsspecimens in the field. Some undergraduates also helped prepare the fossils once they were brought back to the Museum of the Rockies.

Scannella said he and Horner tried for three years to look for alternative explanations for their findings. They finally agreed that the Triceratops and Torosaurus were the same dinosaur.

"Every avenue of investigation we took in attempts to falsify the hypothesis only supported the idea further," Scannella said.

Scannella said he presented his and Horner's findings at the 2009 Society of Vertebrate Paleontology Conference in Bristol, England, and it was met with equal parts intrigue and skepticism.

"Skepticism is important and a good thing," Scannella commented. "But so far, all the evidence we have strongly supports the idea."

The finding that Torosaurus was a grown-up Triceratops adds fuel to the theory that dinosaur diversity at the end of the Cretaceous Period and Mesozoic Era was far less than previously thought, Scannella said.

"A major decline in diversity may have put the dinosaurs in a vulnerable state at the time when the large meteor struck the Earth at the end of the Cretaceous Period," Scannella said. "It may have been the combination of the two factors -- lower diversity and a major global catastrophe --

that resulted in the extinction of all the non-avian dinosaurs."

If the apparent decline in diversity wasn't triggered by a meteor -- a relatively uncommon event -- Scannella said, "It may have been caused by circumstances which are more likely to affect diversity today, perhaps large-scale sea level fluctuations or climate change.

"If so, Triceratops may have a lot to teach us about biodiversity and extinction today," Scannella said. "By studying patterns of diversity in the past, we attain insights into current ecological trends."

Provided by Montana State University

Citation: Study finds Triceratops, Torosaurus were different stages of one dinosaur (2010, July 14) retrieved 24 April 2024 from https://phys.org/news/2010-07-triceratops-torosaurus-stages-dinosaur.html