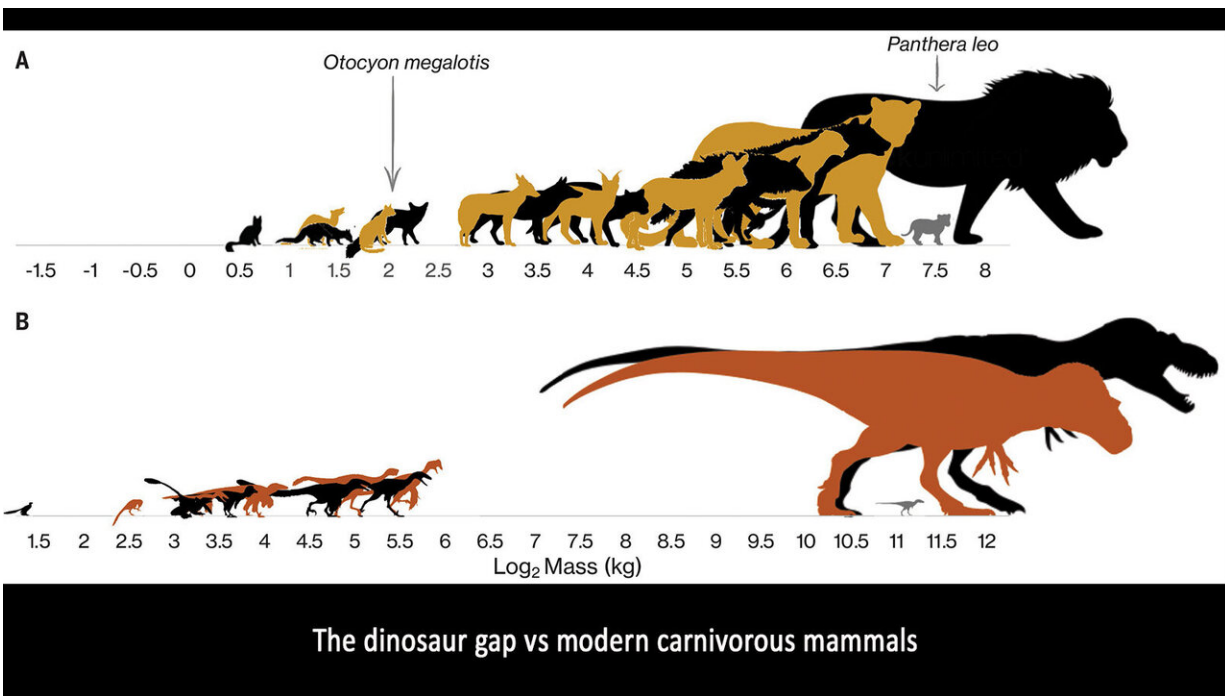


Did teenage 'tyrants' outcompete other dinosaurs?

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The Dinosaur Gap vs. Modern Carnivores illustrates the gap between prehistoric dinosaurs and modern carnivores. Credit: UNM Biology Department

Paleo-ecologists from The University of New Mexico and at the University of Nebraska-Lincoln have demonstrated that the offspring of enormous carnivorous dinosaurs, such as *Tyrannosaurus rex* may have fundamentally re-shaped their communities by out-competing smaller rival species.

The study, released this week in the journal *Science*, is the first to examine community-scale dinosaur diversity while treating juveniles as their own ecological entity.

"Dinosaur communities were like shopping malls on a Saturday afternoon—jam-packed with teenagers" explained Kat Schroeder, a [graduate student](#) in the UNM Department of Biology who led the study. "They made up a significant portion of the individuals in a species and would have had a very real impact on the resources available in communities."

Because they were born from eggs, [dinosaurs](#) like T. rex necessarily were born small—about the size of a house cat. This meant as they grew to the size of a city bus, these "megatheropods," weighing between one and eight tons, would have changed their hunting patterns and prey items. It's long been suspected by paleontologists that giant carnivorous dinosaurs would change behavior as they grew. But how that might have affected the world around them remained largely unknown.

"We wanted to test the idea that dinosaurs might be taking on the role of multiple species as they grew, limiting the number of actual species that could co-exist in a community," said Schroeder.

The number of different types of dinosaurs known from around the globe is low, particularly among small species.

"Dinosaurs had surprisingly low diversity. Even accounting for fossilization biases, there just really weren't that many dinosaur species," said Felisa Smith, professor of Biology at UNM and Schroeder's graduate advisor.



New research suggests offspring of enormous carnivorous dinosaurs, such as *Tyrannosaurus rex*, may have fundamentally re-shaped their communities by out-competing smaller rival species. Credit: UNM Biology

To approach the question of decreased dinosaur diversity, Schroeder and her coauthors collected data from well-known fossil localities from around the globe, including over 550 dinosaur species. Organizing dinosaurs by mass and diet, they examined the number of small, medium and large dinosaurs in each community.

They found a strikingly clear pattern:

"There is a gap—very few carnivorous dinosaurs between 100-1000kg [200 pounds to one ton] exist in communities that have megatheropods," Schroeder said. "And the juveniles of those megatheropods fit right into that space."

Schroeder also notes that looking at dinosaur diversity through time was key. Jurassic communities (200-145 million years ago) had smaller gaps and Cretaceous communities (145-65 million years ago) had large ones.

"Jurassic megatheropods don't change as much ? the teenagers are more like the adults, which leaves more room in the community for multiple families of megatheropods as well as some smaller carnivores," Schroeder explained. "The Cretaceous, on the other hand, is completely dominated by Tyrannosaurs and Abelisaurus, which change a lot as they grow."

To tell whether the gap was really caused by juvenile megatheropods, Schroeder and her colleagues rebuilt communities with the teens taken into account. By combining [growth rates](#) from lines found in cross-sections of bones, and the number of infant dinosaurs surviving each year based on fossil mass-death assemblages, the team calculated what proportion of a megatheropod species would have been juveniles.

Schroeder explained that this research is important because it (at least partially) elucidates why dinosaur diversity was lower than expected based on other fossil groups. It also explains why there are many more very large [species](#) of dinosaurs than small, which is the opposite of what would be expected. But most importantly, she added, it demonstrates the results of growth from very small infants to very large adults on an ecosystem.

"Dinosaurs have been a life-long passion. I was, and still very much am a 'dinosaur kid.' My interest in dinosaur diversity came about when I realized that no one was really looking at dinosaurs the way we look at modern mammals and birds," Schroeder said. "There's a ton to be gained from applying the methods of modern and paleo-ecology to dinosaurs. Fortunately, we're now in an age of dinosaur research where a lot of information is available digitally, so the big data-intensive questions of

ecology are now becoming more plausible for dinosaur paleontology."

More information: K. Schroeder et al., "The influence of juvenile dinosaurs on community structure and diversity," *Science* (2021).
[science.sciencemag.org/cgi/doi ... 1126/science.abd9220](https://science.sciencemag.org/cgi/doi/10.1126/science.abd9220)

Provided by University of New Mexico

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