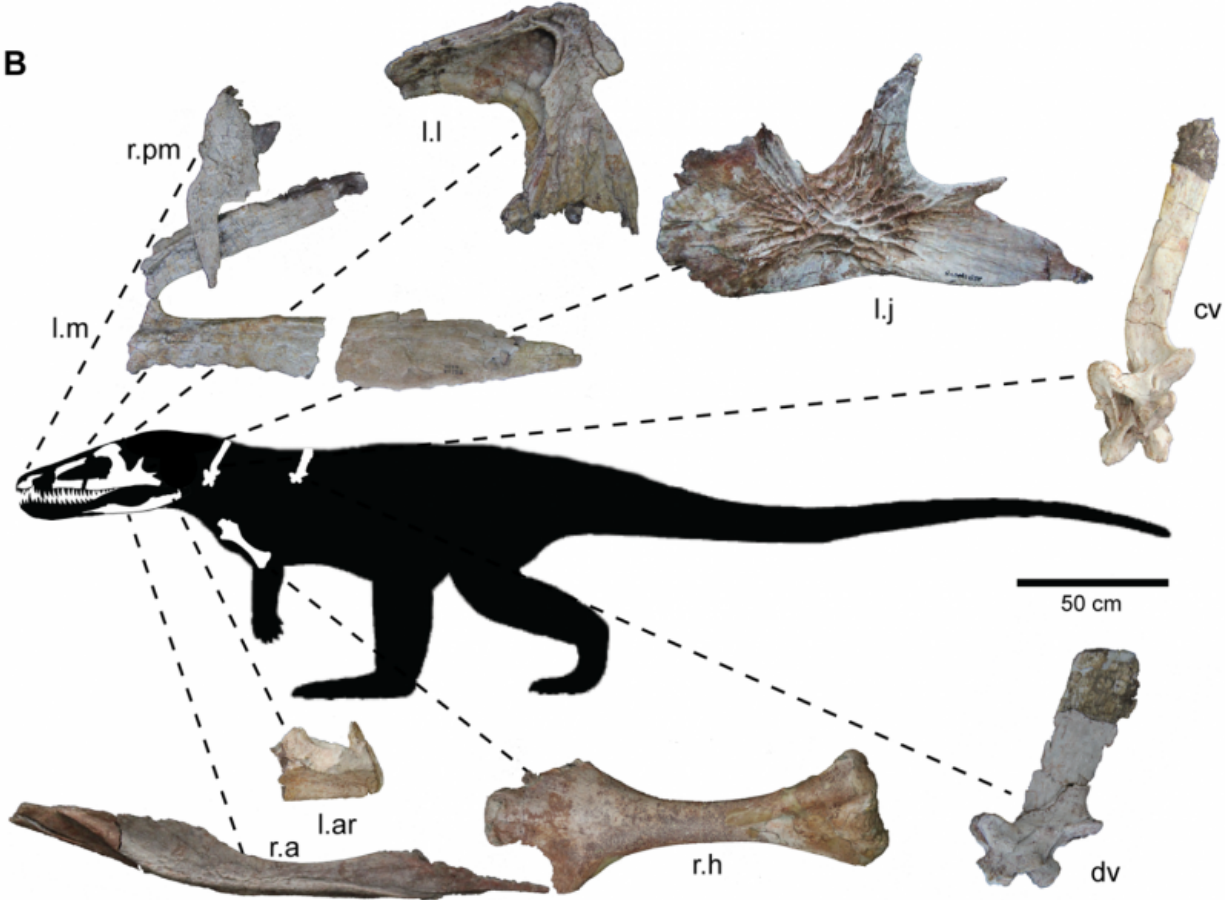
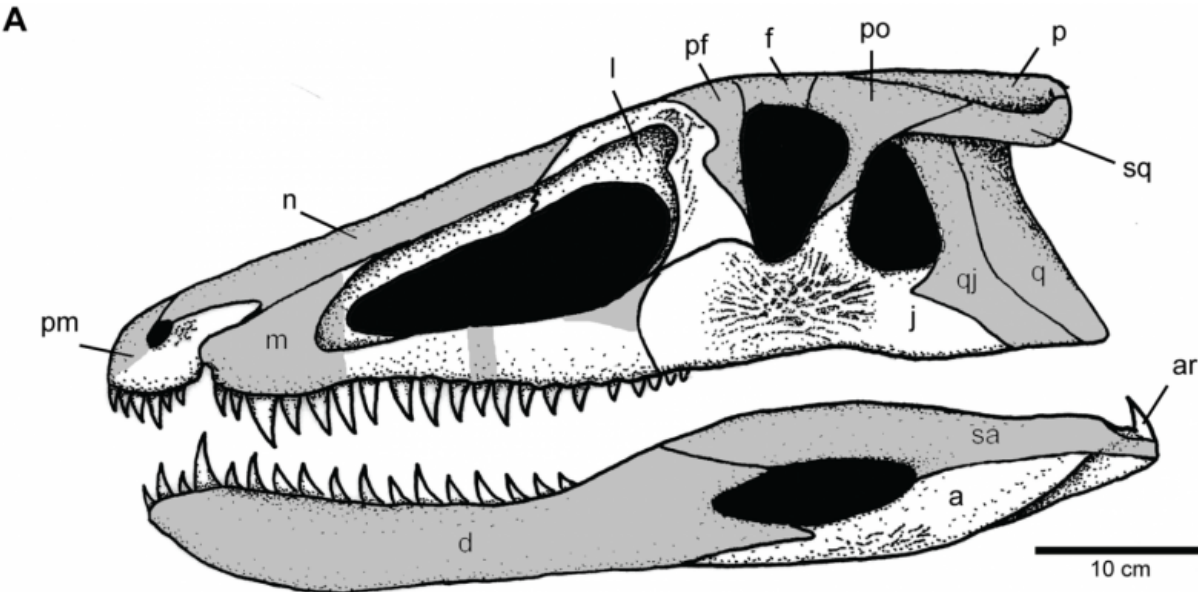


# The first crocodile ancestors

August 2 2016, by Jon Tennant

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Skeletal reconstruction of Carnufex. Credit: Public Library of Science

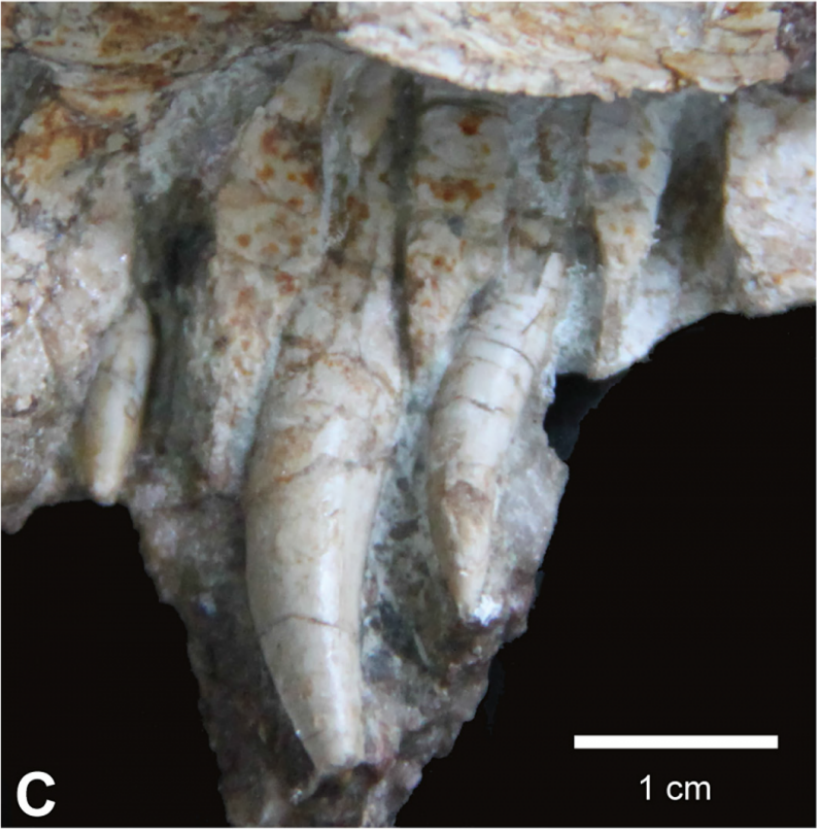
Did you know that birds and crocodiles are practically cousins? Around 230 million years ago, you wouldn't have been able to tell the difference between the two different lineages. This is because birds and crocodylians (which includes alligators, caiman, and gharials) are part of a much larger group called Archosauria, or ruling lizards, which means they share a common ancestor far back in time. When they split from each other, they formed two major evolutionary pathways: the bird-line archosaurs, which also includes all dinosaurs, and the crocodile-line archosaurs, which includes crocodylians and their ancestors, the crocodylomorphs.

Back at around the time of this split, during a time known as the Late Triassic, the world was much more different than it was today. Small crocodylomorphs prowled the land, along with the earliest dinosaurs. There were a host of other bizarre reptiles, such as the predatory rauisuchids, which might be closely related to the first crocodylomorphs, and small, fox-like sphenosuchians.

One of these was an animal known as Carnufex. Not only is that an awesome name, but it was also an impressive beast to behold, coming in at around 3 metres in length. It had serrated teeth for tearing apart its prey, and a long, slender body for rapid movement. Importantly, it is from around the time when this dinosaur-crocodile split occurred, and therefore should hold important clues to the evolutionary history of these groups.

Susan Drymala and Lindsay Zanno from North Carolina recognised the importance of Carnufex in helping to solve the dinosaur-crocodile divergence issue, and set out to conduct an impressive anatomical assessment of the well-preserved fossils. The fossils belonging to Carnufex also come from North Carolina, and were first discovered in

2003. They consist mostly of skull material, which is important for determining diagnostic relationships in archosaurs, and several bits of the spine and limbs.



The teeth of Carnufex, perfect for piercing and slicing flesh

By analysing the anatomy of Carnufex along with a large range of other similar animals, they were able to work out its evolutionary relationships. What they found is that, quite like many early diverging species, Carnufex had a mosaic of features, some more crocodylian, some more dinosaurian.

What this implies is that Carnufex is actually one of the earliest diverging crocodylomorphs, and therefore was highly important in determining the early fate of this ancient group. It was closely related to another crocodylomorph called Redondavenator, which was also fairly hefty in size.

This is important for several reasons. Carnufex was no tiddly croc, but a pretty large and fearsome predator. Other crocodylomorphs around at this time were usually small, nimble hunters, quite different from Carnufex. What this means is that the very first crocodylomorphs, such as Carnufex, were much larger than we previously thought, and developed their smaller body size later on, something which we can trace based on their [evolutionary relationships](#). This also means that evolution of a smaller body size was something that occurred subsequent to the acquisition of features defining crocodylomorphs, rather than before.

In the Late Triassic, this means that Carnufex would have been one of the top predators roaming the plains of North America. This is quite exceptional, as other crocodylomorphs at the time were by no means top tier predators, with this role usually taken on by other now extinct archosaurs. Shortly after (geologically speaking..) Carnufex, this top

predator tier was taken by theropod dinosaurs, which went on to dominate for around 150 million years.

What is clear is that Carnufex was a key stage in crocodylomorph evolution, and may have been critical in helping them survive the end-Triassic mass extinction, which took out almost all other archosaur groups around at the time.

**More information:** Susan M. Drymala et al. Osteology of *Carnufex carolinensis* (Archosauria: Psuedosuchia) from the Pekin Formation of North Carolina and Its Implications for Early Crocodylomorph Evolution, *PLOS ONE* (2016). [DOI: 10.1371/journal.pone.0157528](https://doi.org/10.1371/journal.pone.0157528)

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