Head-butting and teeth-baring displays in male-male combat appeared 270 million years ago

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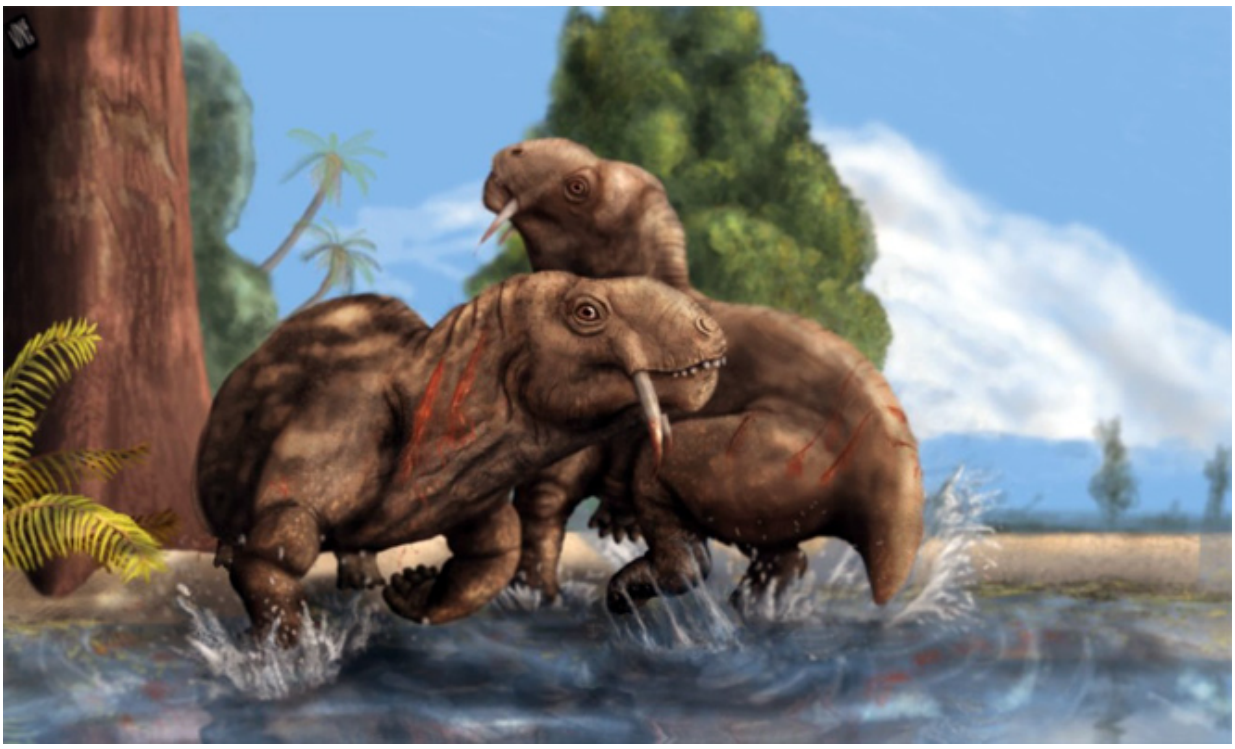

Head-butting and canine display during male-male combat first appeared some 270 million years ago.

This is what researchers from the Evolutionary Studies Institute at Wits found when they conducted an updated and more in-depth study of the herbivorous mammalian ancestor, Tiarajudens eccentricus, discovered four years ago.

Through this study, the Brazil and South Africa researchers can now present a meticulous description of the skull, skeleton and dental replacement of this Brazilian species. And they learned that 270 million years ago, the interspecific combat and fighting we see between male deer today were already present in these forerunners of mammals.

The Brazilian researcher, Dr Juan Carlos Cisneros, and his co-researchers from the Evolutionary Studies Institute at the University of the Witwatersrand, Professor Fernando Abdala and Dr Tea Jashasvili, have published their results in the journal *Royal Society Open Science* on 15 July 2015.

Brazilian and South African cousins

Saber-teeth are known to belong to the large Permian predators' gorgonopsians (also known as saber-tooth reptiles), and in the famous saber-tooth cats from the Ice Age.

When Tiarajudens eccentricus was discovered it had some surprises install: Despite large protruding saber-tooth canines and occluding postcanine teeth, it was an herbivore.

The discovery of this Brazilian species also allowed for a reanalysis of the South African species Anomocephalus africanus, discovered 10 years earlier. The two species have several similar features that clearly indicated they are closely related but the African species lack of the saber-tooth canines of its Brazilian cousin. In the Middle Permian, where these Gondwana cousins were living, around 270 million years ago, the

first communities with diverse, abundant tetrapod herbivores were evolving.

Male-male fighting

In deer today enlarged canines are used in male-male displays during fighting. The long canine in the herbivore T. eccentricus is interpreted as an indication of its use in a similar way, and is the oldest evidence where male herbivores have used their canines during fights with rivals.

"It is incredible to think that features found in deer such as the water deer, musk deer and muntjacs today were already represented 270 million years ago," says Cisneros.

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The researchers found the Tiarajudens' marginal teeth are also located in a bone from the palate called epipterygoid. "This is an extraordinary condition as no other animal in the lineage leading to mammals show marginal dentition in a bone from the palate," says Abdala.

Head-butting

In another group of mammal fossil relatives, dinocephalians – that lived at the same time as anomodonts, some of the bones in their foreheads were massively thickened. This can be interpreted as being used in head-butting combat, a modern behaviour displayed by several deer species today.

"Fossils are always surprising us. Now they show us unexpectedly that 270 million years ago two forms of interspecific combat represented in deer today, were already present in the forerunners of mammals," says Cisneros.

More information: "Tiarajudens eccentricus and Anomocephalus africanus, two bizarre anomodonts (Synapsida, Therapsida) with dental occlusion from the Permian of Gondwana." DOI: 10.1098/rsos.150090

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