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Press Release

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Madrid, Thursday, 20 August 2026

Scarce emergence of new species drove the decline of African megaherbivores

- **A study involving the MNCN-CSIC reconstructs the evolution of Africa's large herbivores over 23 million years using more than 3,000 fossil records**

- **The results show that, contrary to what was previously thought, these animals did not suffer greater extinction than smaller species**



A rhino drinking water in front of a herd of elephants drinking water at a lake in Etosha National Park, Namibia, Africa. /Muratart Adobe Stock

A study by the National Museum of Natural Sciences (MNCN-CSIC), the National Research Center on Human Evolution (CENIEH) and the University of Alcalá offers a new explanation for the decline of African megaherbivores. These animals, weighing more than a tonne and today including elephants and hippopotamuses, are known for acting as ecosystem engineers. The results, published in *Nature Communications*, reveal that

their loss of diversity throughout history was not due to their being more vulnerable to extinction, as had previously been proposed, but rather that their decline was driven by particularly low rates of speciation —the emergence of new species.

To reach this conclusion, the team reconstructed the evolutionary dynamics of herbivorous mammals (hippopotamuses, antelopes and giraffes, among others) over the past 23 million years by analyzing 3,327 fossil records covering 396 species. The model incorporated data on body mass, tooth crown height, evolutionary relationships among families, and the environmental changes the continent has undergone.

An increasingly arid ecosystem

Around 7.2 million years ago, Africa's climate began to grow drier, driving changes in landscapes and vegetation types that led to a reconfiguration of ungulate communities –hoofed mammals–. At the start of this phase, both the emergence of new species and the disappearance of others increased. However, 3.6 million years ago new species stopped emerging at the same pace, while extinctions kept rising and accelerated at the onset of the Pleistocene, 2.58 million years ago. These data show that the loss of diversity among large-bodied animals was already noticeable long before humans had the technological capacity to hunt animals of that size.

Species affected by this decline include Deinotherium, an extinct relative of elephants distinguished by its downward-curving tusks, and the Anthracotheriidae, animals related to hippopotamuses that resembled a large pig.

"We found that, contrary to what was previously thought, larger species did not go extinct faster than smaller ones. In fact, their extinction rates were somewhat lower. The key is that megaherbivore species gave rise to new species much more slowly," explains MNCN researcher **Juan López Cantalapiedra**. During periods of peak aridity, animals under 45 kilograms went extinct only 15% faster than those over a tonne, but generated new species at a rate 2.2 times higher.

"This difference allowed small and medium-sized herbivores to better offset their losses. Large lineages, by contrast, kept losing diversity because not enough new species emerged to replace those that disappeared. This, combined with aridification, compounded the imbalance: it favored the emergence of new species among smaller ungulates while reducing it by nearly 20% among megaherbivores," notes **Óscar Sanisidro**, from the University of Alcalá de Henares.

"The expansion of open habitats, increasing aridity, and declining ecosystem productivity transformed African communities over millions of years. Our results suggest that, although human activity may have contributed to some recent disappearances, it was not the main cause of the widespread loss of these large herbivores," concludes **Ignacio A. Lazagabaster**, from CENIEH.

Juan L. Cantalapiedra, Ignacio A. Lazagabaster, Fernando Blanco, Torsten Hauffe, Faysal Bibi, María Ríos, Bastien Mennecart, Juha Saarinen, Daniele Silvestro, Manuel Hernández Fernández & Óscar Sanisidro (2026). **Lower speciation, not higher extinction, drove African megaherbivore diversity collapse**. *Nature Communications.* DOI: doi.org/10.1038/s41467-026-76105-2

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