

# Gene flow in giraffes and what it means for their conservation

March 12 2024

---



Reticulated giraffe. Credit: Mogens Trolle

Giraffes are a beautiful and powerful example of what adaptive evolution can achieve. However, in recent years, they have attained notoriety for a completely different reason: it has been suggested that

instead of one giraffe species, there might be no fewer than four different species. Such dramatic taxonomic reappraisals in highly conspicuous and well-known "flagship" taxa are very unusual.

The suggestion caused some uproar in the scientific community and received a lot of media attention. Much is at stake because the way that most nature conservation works is focused on species, meaning that each species must receive its own dedicated conservation action plan and must be monitored individually.

If we recognize four rather than one species of giraffe, it follows that each of them will have a lower population size and be more vulnerable to extinction, not only raising the conservation stakes considerably but also the conservation costs.

## **Giraffes form four distinct, but not isolated lineages—and some are even hybrids**

The results of the new study, [published](#) in *Current Biology*, confirm that [giraffes](#) are highly genetically structured, which means that populations tend to become isolated from each other rather easily. It also means that giraffes do appear to be separated into [evolutionary lineages](#) that are quite genetically distinct from each other.

But there were also some big surprises: "When we started getting results from our analyses of gene [flow](#) between different giraffe lineages, we had to check twice," says Laura D. Bertola, one of the first authors of the study and postdoc at the Department of Biology.

"The results showed not just a little gene flow here and there but major hybridization events. For example, the reticulated giraffe, which occurs in Kenya, Ethiopia, and Somalia, appears to be the result of a 40%–60%

mixture of an ancient northern lineage and an ancient southern lineage of giraffes, and therefore a hybrid. Today, the other descendants of these ancient northern and southern giraffes sit at either end of the giraffe tree and are highly genetically differentiated, but at some time in the past, they evidently met and interbred, giving rise to the reticulated giraffe," says Bertola.

The team also found historical gene flow among several other branches of the giraffe tree, and, in fact there are so many gene flow events among giraffe lineages that the [evolutionary history](#) within giraffes resembles a "reticulated" network rather than a tree.

## **What this means for giraffes and their conservation**

Biologists do not agree on what the best definition of species is, nor how to resolve at what stage two populations are sufficiently different that they belong to two different species. However, it is often assumed that extensive gene flow can only take place between populations that belong to the same, and not different, species.

Therefore, the finding of widespread historical gene flow between giraffe lineages that are today highly genetically differentiated raises important doubts about whether or not high genetic differentiation is necessarily a sure sign of speciation, at least in giraffes.

"Our findings touch on a very delicate matter in biology, namely that we do not have a universally agreed species concept. Therefore, it can be very difficult to settle how many species there are within a group," says Rasmus Heller, Associate Professor at the Department of Biology and one of the senior authors of the study.

"However, we show something more tangible which has so far been overlooked in evolutionary studies on giraffes: namely that giraffe

lineages have had extensive gene flow among them. Giraffes seem to have retained their ability to interbreed freely, which they also still do in captivity."

"So, instead of solving how many species of giraffes there are, we prefer to highlight that gene flow has occurred pretty freely among even the most genetically differentiated lineages of giraffes, whenever conditions were right for this to happen," explains Heller.

The study also concludes that regardless of the number of giraffe species, the different lineages are so genetically differentiated that they definitely deserve extensive protection in all parts of their range. If we want to protect biodiversity effectively, we cannot stop at the species level, but also need to look at the diversity within and between species.

"Giraffes are such endlessly fascinating animals, and this study confirms just how much genetic variation there is, even on small geographical scales. This provides a further incentive for conserving all the different lineages of giraffes, whether they be called species, subspecies, populations, or whatever," says Yoshan Moodley, a co-author of the study from the University of Venda in South Africa.

"Studies that focus on the whole complexity of the evolutionary process are needed, instead of studies focusing on answering simplified binary questions such as whether or not there is one, four or dozens of species, whatever that may be," says Moodley.

**More information:** Laura D. Bertola et al, Giraffe lineages are shaped by major ancient admixture events, *Current Biology* (2024). [DOI: 10.1016/j.cub.2024.02.051](https://doi.org/10.1016/j.cub.2024.02.051). [www.cell.com/current-biology/fulltext/S0960-9822\(24\)00234-3](https://www.cell.com/current-biology/fulltext/S0960-9822(24)00234-3)

Provided by University of Copenhagen

Citation: Gene flow in giraffes and what it means for their conservation (2024, March 12)  
retrieved 29 April 2024 from <https://phys.org/news/2024-03-gene-giraffes.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.