

To understand future habitat needs for chimpanzees, researchers look to the past

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A new study examines where chimpanzees found refuge from climate instability during the past 120,000 years. Credit: Emma Stokes/WCS

A new study provides insight into where chimpanzees (*Pan troglodytes*) avoided climate instability during glacial and interglacial periods in

Africa over the past 120,000 years. Using bioclimatic variables and other data, the study identified previously unknown swaths of habitat, rich in figs and palms, where chimps rode out the changes seen since the Last Interglacial period.

The findings, published in the journal in the *American Journal of Primatology*, help to increase the understanding of how climate change impacts biodiversity, and how to mitigate against predicted biodiversity loss in the future. This research was led by the German Centre for Integrative Biodiversity Research (iDiv), the Max Planck Institute for Evolutionary Anthropology, and an international team of over 80 collaborators from research institutes across the globe.

For their analysis, the authors compiled over 130,000 occurrence records of chimpanzees stored in the A.P.E.S. database of the International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC), as well as data from the Pan African Programme: The Cultured Chimpanzee (PanAf) at the MPI-EVA and iDiv, Leipzig.

The researchers quantified chimpanzee habitat suitability using [species distribution models](#) based on chimpanzee occurrences, climate and human density data, and then projected these models onto temporal snapshots of climate reconstructions at up to 1000 year intervals, dating back to the Last Interglacial period (120,000 years ago). For the first time, they were able to build a dynamic model of habitat suitability over time, permitting long-term stability (i.e. glacial refugia) to be calculated.

Results show that glacial refugia across Africa may have been underestimated for chimpanzees, with potentially up to 60,000 additional square kilometers (23,166 square miles) in the Upper and Lower Guinea Forests in West and Central Africa, and the Albertine Rift in East Africa.

In addition, results provide explicit insights into chimpanzee [habitat](#) and how it may have shifted throughout time, enabling hypotheses of how [global change](#) has affected genetic and behavioral diversity to be tested in the future.

Said lead author of the study Chris Barratt, a postdoctoral researcher at iDiv, "By integrating past climate and human density estimates, as well as species richness of keystone tropical plants (figs and palms), this study provides strong evidence of glacial refugia for chimpanzees being geographically larger than previously thought. It may well be that some of these refugia deserve greater levels of protection than they currently receive as they are important for the persistence of populations and species during periods of global change."

The results provide a new resource for understanding patterns of genetic and behavioral diversity in chimpanzees. Chimpanzees exhibit highly differentiated genetic diversity (for example, lower in West Africa and higher in East and Central Africa), as well as high levels of behavioral differentiation based on the environmental variability they are exposed to, including Pleistocene forest refugia.

Said Hjalmar Kühl at iDiv, and senior author of the study, "We are only beginning to understand how past environmental changes have influenced the diversity in great apes we find today. A better understanding of these processes will tell us when variable environments serve as engines of diversification and when not. In the end these insights into great apes will also offer insights into our own evolution."

Said Fiona Maisels of the Wildlife Conservation Society and a co-author of the study, "To effectively conserve chimpanzees (and other species) over the centuries to come, it is essential to understand the past. Humans are changing the planet's climate and its habitats ever more rapidly. Approaches such as those used in this study are vital for predicting how

these changes will affect future wildlife abundance and distribution, and to ensure space and safety for a multitude of species."

More information: Christopher D. Barratt et al, Quantitative estimates of glacial refugia for chimpanzees (*Pan troglodytes*) since the Last Interglacial (120,000 BP), *American Journal of Primatology* (2021).
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