

Research shows significance of ecogeography in Khoisan genetics

A study suggests a far more complex history for the Khoisan populations than originally predicted, pointing to geography and ecology as major influences to the genetic makeup of these groups of people.

Previous work argued for a northern vs southern divergence pattern among the human groups, but this new work identifies five primary ancestries in the region, which points to a geographically complex set of migration events responsible for the heterogeneity observed in the region.



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Link to ecogeography

Published by the Genetics Society of America in its journal [Genetics](#), the investigation into the ancestries of 22 Khoisan groups, including new samples from the Nama and the = /Khomani, lead researchers to conclude that the genetic clustering of Southern African populations is closely tied to the ecogeography of the Kalahari Desert region.

The name, Khoisan, refers to several indigenous populations in southern Africa, who speak “click” languages and include both hunter-gatherer groups and pastoralists. They are genetically distinct and strikingly isolated from all other African populations, suggesting they were among the first groups to diverge from the ancestors of all humans. Much scientific interest has focused on the Khoisan as researchers try to reconstruct this early divergence; however, little genetic material was collected until the past decade.

Distinct populations

Brenna Henn, of Stony Brook University in New York, has been studying Southern African population genetics for over a decade. She notes that there is a tendency to lump all indigenous Southern Africans into a single group – often called “Bushmen” – but in fact, the Khoisan includes many distinct populations. She and her team set out to explore genetic diversity in the area and to better understand the differences between these groups.

“For the last 20 years or so, there has been a lot of interest in understanding how genetic patterns are determined by geography in addition to language,” says Henn. The genetic differences between human populations are strongly correlated with their linguistic histories, and both of these factors are also linked with geography.

Henn argues that ecology and geography together are likely a better explanation for the genetic differentiation between groups than either linguistic differences or method of subsistence (hunting/gathering or farming). However, much of the research on Southern African populations had previously focused on linguistics and subsistence, with little attention paid to ecogeography.

Henn and her colleagues analysed genetic information from the Khoisan. They collected genome-wide data from three South African populations: the Nama, the $\neq$ /Khomani San, and the South African Coloured (SAC) group. Their analysis also included samples from 19 other Southern African populations.

Adding to the body of knowledge

It quickly became apparent that the geography of the Kalahari Desert was closely tied to the population structure that they uncovered. The outer rim of the Kalahari Desert presented a barrier to genetic mixing, while populations that live within the Kalahari basin mixed more freely.

Henn points out that there are more Khoisan populations who were not sampled. Sampling in the area is a significant challenge for a number of reasons, including the complex politics of the region in the post-Apartheid era. Most populations in South Africa and Zimbabwe no longer identify as Khoisan and have been absorbed into other populations over the past 500 years. Still, their findings add to the body of knowledge surrounding the history of Southern African populations – while also complicating them.

Threads of information

“There are a lot of threads of information to bring together – linguistics, subsistence, geography, genetics, archaeology. They don’t always reconcile easily,” says Henn.

The challenge continues to fascinate Henn and her colleagues. She established a field site in 2005 and has maintained and expanded it over the years as she continues to research ancestry in the Khoisan. She emphasises that it is extremely important for investigators doing research in developing countries to work closely with local collaborators as they try to understand the genetic diversity of the region.

Much work remains to be done in understanding and uncovering the factors that contributed to the formation of Southern African population structure.

Much work to be done

“There is a huge amount of diversity in Southern Africa populations. These groups speak differently, look distinct, and have divergent genetic histories. They are not homogenous people, and the historic and prehistoric factors that led to their divergence are still being explored. It’s amazing how much work there is to do.”

The study is the result of collaborative work by researchers from Stellenbosch University (SU) and Stony Brook University in the United States. Caitlin Uren, a PhD student in the division of molecular biology and human genetics of the faculty of medicine and health sciences (FMHS) of SU, is the lead author of the paper.

The other SU co-authors of the paper are Dr Marlo Moller and Professor Eileen Hoal from the division of molecular biology and human genetics and Professor Paul van Helden, head of the department of molecular biology at the FMHS.

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