# Genetic differences among monkeys in Tanzania show troubling pattern

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An endangered monkey species in Tanzania is living in geographical pockets that are becoming isolated from one another. The situation, researchers say, is mostly driven by the monkeys' proximity to villages and the deliberate burning of forests to make way for crops and pastures.

An international team, led by Maria Jose Ruiz-Lopez, a postdoctoral researcher at the University of Oregon, combed five distinct forested areas from 2011 to 2012. Gathered were 170 fecal samples of the Udzungwa red colobus monkey (*Procolobus gordonorum*), for DNA analyses. These monkeys are considered an indicator species of ecological change.

The region studied has fertile soils and forests scattered in valleys and along mountain ridges in the Eastern Arc Mountains, part of a vast region known as the Eastern Afromontane Hotspot. It is home to many plants and animals that live nowhere else in the world.

The team employed a landscape-genetics approach not commonly used in tropical zones to probe genetic differences in 121 different monkeys and see if human activity is playing a role in ecological changes occurring in the region, said corresponding author Nelson Ting, a professor of anthropology and member of the UO's Institute of Ecology and Evolution.

Landscape genetics relies on geographic information systems and combines landscape ecology with population genetics. Alone, population

genetics allows researchers to see such differences but not explicitly explain why they exist. In this study, the largest genetic differences were found between monkeys that were separated by villages and areas that experienced the highest densities of fires, based on fire data spanning 2000-2007.

"We found that human activities are driving genetic differentiation in these monkeys across this landscape," Ting said. "This ecosystem is an important one for conservation in general because of the high level of diversity in it. This research is showing that this ecosystem is in a precarious state. This monkey is a forest-adapted species that lives in the trees. We really thought that the best explanation for what is driving genetic differentiation would be forest coverage."

The team's conclusions are in a paper placed online ahead of print in *Heredity*, a journal of the Genetics Society based in the United Kingdom.

The monkeys' proximity to villages and human-made fires emerged as most important as the researchers studied multiple variables one at a time. They also looked at such variables as forest coverage, altitude, ruggedness of the terrain and proximity to railroads. All the data were merged into a composite model.

The villages and fires, Ting said, are preventing the monkeys from migrating. "Smaller populations are becoming more isolated, and that makes them more susceptible to a reduction in genetic diversity, inbreeding and a host of related extinction variables."

Translating the findings into conservation practice is complicated, he said. "There are no easy solutions. Can we reduce human impacts and fires on the landscape? How to do that is difficult. We hope that the information we provide can help local communities to come up with local solutions."

The team obtained permission to work in the region from the Tanzania Commission for Science and Technology, Tanzania Wildlife Research Institute and Tanzania National Parks.

**More information:** *Heredity* paper: www.nature.com/hdy/journal/vao … full/hdy201582a.html

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