

Fate of meerkats tied to seasonal climate effects

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Meerkat in the Kalahari. Credit: UZH

The effects of climate change are especially obvious in arid environments where resources are scarce and subject to seasonal availability. However, the demographic mechanisms through which

seasonal climate affects population persistence remains mostly unknown. Using detailed monthly life-history data collected by the Kalahari Meerkat Project between 1997 and 2016, scientists at the Universities of Zurich and Cambridge have now assessed how meerkats (*Suricata suricatta*) will fare in response to future changes in seasonal rainfall and temperature.

Meerkats are cooperative breeders that live in social groups. A dominant female monopolizes most of the reproduction, while subordinate helpers assist in raising her offspring. Changes in the physical and social environment affect the growth, survival and reproduction of meerkats. For example, wet and warm conditions at the beginning of summer increase the growth, survival and reproduction of these animals. In contrast, high population densities and cold weather during winter decrease individual growth and survival.

Seasonal dynamics matter

The Kalahari Desert in Southern Africa is projected to become drier and warmer as a result of [climate change](#). The new study investigates how consistently rising summer temperatures and rainfall fluctuations will affect body mass and growth of meerkats, resulting in lower rates of reproduction and offspring survival. However, this isn't the only finding of the study.

"In addition to the common practice of modeling average annual dynamics, we took a closer look at seasonal dynamics and developed a specific climate change model," says Maria Paniw of the Department of Evolutionary Biology and Environmental Studies at the University of Zurich. "We found that the picture is more complex: Seasonality matters because improving conditions in one season can partially counter the worsening conditions in the next season."

Hotter winters can alleviate negative effects

The team linked changes observed in growth, survival and reproduction to changes in seasonal rainfall and temperature. Using these links in a population projection model, the scientists projected the population dynamics 50 years into the future, creating different scenarios based on a report on climate change issued by US National Center for Atmospheric Research (NCAR).

The data shows that the combined effects of hotter and drier summers in particular may threaten the persistence of the [meerkat](#) population. In the study's projections, fewer offspring were produced, resulting in fewer helpers in the population. In this scenario, the meerkat population plummeted, increasing the risk of population collapse.

In contrast, the [negative effects](#) of less rainfall in summer would be alleviated to an extent if winters became warmer, allowing meerkats to gain weight and step up reproduction. Taking these counteracting seasonal changes into account leads to a different scenario, in which the probability of extinction is less severe and the meerkats would still persist in 50 years.



Meerkats are cooperative breeders that live in social groups. A dominant female monopolizes most of the reproduction, while subordinate helpers assist in raising her offspring. Credit: UZH

Link between seasonality and populations dynamics

"The effect of an environmental change on a population depends on how individuals interact with their biological and physical environment, and how these interactions will change over time. Our study demonstrates that we have to accurately identify these interactions, especially in terms of how these interactions vary between seasons, to predict a population's vulnerability in the face of climate change," says Arpat Ozgul, senior author of the study and professor of [population](#) ecology at the Department of Evolutionary Biology and Environmental Studies at the

University of Zurich.

Professor Tim Clutton-Brock, co-author from the University of Cambridge and founder of the Kalahari Meerkat Project, adds: "Our work emphasizes the importance of long-term, individual-based studies that extend over several decades. Only where data of this kind is available is it possible to assess the effects of [climate](#) change on animal populations and to understand the ecological mechanisms re-sponsible for them."

More information: Nino Maag et al, Cost of dispersal in a social mammal: body mass loss and increased stress, *Proceedings of the Royal Society B: Biological Sciences* (2019). [DOI: 10.1098/rspb.2019.0033](https://doi.org/10.1098/rspb.2019.0033)

Provided by University of Zurich

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