Cooperation helps mammals survive in tough environments

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Meerkats in the Kalahari Desert. Credit: Dieter Lukas

Cooperatively breeding mammal species, such as meerkats and naked-

mole rats, where non-breeding helpers assist breeding females in raising their offspring, are better able to cope with living in dry areas than related non-cooperative species, new research reveals.

A comparative study of mammals, by University of Cambridge researchers Dieter Lukas and Tim Clutton-Brock, shows that cooperatively breeding species occur in dry areas, yet are absent in tropical climates—even though these are the places on earth with the highest biodiversity.

Researchers have found that most cooperatively breeding mammals live in areas that receive an average of less than 70mm of rain per year—less than one-tenth of the amount of average rainfall in the USA or the UK. While many have long argued that climate and social behaviour are linked, the Cambridge team say these findings provide a detailed understanding of how helping behaviour is connected to the environment individuals live in.

"Rainfall often affects food availability, and cooperatively breeding mammals appear better able to cope with the uncertainties of food availability during periods of drought," said Lukas, from Cambridge's Department of Zoology.

In this study, published in the journal *Royal Society Open Science*, the researchers mapped the global occurrence of mammalian species living in different social systems to determine how averages and variation in rainfall and temperature explain species distributions.

They found that although the presence of non-breeding adults in breeding groups is not associated with contrasts in climate, non-breeders commonly play an important role in raising the offspring of breeders in species living in dry environments.

"Long-term field studies show that helpers improve offspring survival, and our findings highlight that such cooperation is particularly important under harsh conditions," said Clutton-Brock. Previous studies of birds show that here, too, non-breeding adults often help breeders to raise their young in species living in dry unpredictable environments.

Researchers say the activities of helpers in groups of cooperative mammals may ensure that infants and juveniles born in the group (who are usually closely related to them) are adequately fed, even when resources are scare.

In turn, non-breeders may gain future benefits from helping because it increases their chance that their group will survive adverse years, giving them a chance of inheriting the breeding position.

Groups of cooperative breeders occupy territories year-round. During droughts, mortality can be high, and only the largest groups might persist. "However, females in cooperatively breeding mammals can have very high rates of reproduction as soon as conditions are suitable. Populations can rebound, and dispersers move to fill vacant territories," said Lukas.

By contrast, he says that many other mammals that live in arid areas are migratory, moving as resources are exhausted, such as the large ungulate herds roaming across the African savannahs.

Researchers say the new study also indicates that cooperation enables cooperative breeders to occupy a wider range of habitats than non-cooperative species which are limited to more favourable habitats.

Cooperative breeders are also twice as likely as non-cooperative mammals to occupy human-modified habitats suggesting that cooperative breeding may make it possible to colonize new

environments. "Cooperative breeders may also persist in areas where changes in climate make life increasingly difficult," said Clutton-Brock.

More information: Dieter Lukas et al, Climate and the distribution of cooperative breeding in mammals, *Royal Society Open Science* (2017). DOI: 10.1098/rsos.160897

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