weather, OR NOT?

FRANCK THERON

In some species, including humans, individuals other than the parents contribute to the upbringing of the next generation. This cooperation is an apparent contradiction in evolutionary terms, because individuals should use their resources only to benefit their own fitness and not that of others. Scientists have long tried to understand how helping behaviour can evolve. The kin selection hypothesis suggests that individuals can offset the cost of cooperating by helping their relatives, therefore contributing indirectly to promote their own genes. This explanation works wonderfully for social insects, where colonies of bees and ants are all sisters, but it does not explain all cases of cooperation, such as humans adopting unrelated children.

Even when helpers are related, we still need to understand the selective forces that promote the evolution of cooperation. One intriguing correlate is that the frequency of helping is greater where the climate is unpredictable. For example, in the Kalahari and the Australian outback, where precipitation varies dramatically annually, there are a disproportionate number of cooperative species. Consequently, it has been proposed that cooperative breeding can buffer the effects on reproduction caused by severe weather events such as droughts or heat waves.

To test this hypothesis, we need long-term data on the reproductive success of a species in relation to group size and weather conditions. And we need to know the causes of breeding failure to determine if they are related to climatic conditions.

Researchers from the Fitz and institutes in Portugal and France have been studying Sociable Weavers in Benfontein Nature Reserve, near Kimberley in the Northern Cape, for more than a decade. Breeding effort varies considerably every year, depending on rainfall and temperature. However, nest predation, mainly by snakes, also plays a major role in determining breeding success. Boomslangs and Cape cobras can eat as much as 70 per cent of the clutches in a colony. By wrapping plastic film around the trunks of trees containing weaver colonies, we can protect some colonies from snakes. This enables us to tease apart the effect of snake predation on reproduction from that of climatic variables.

A recent study led by Pietro D'Amelio shows that dry and, in particular, hot conditions are major drivers of nestling mortality through their influence on nest predation (*Ecology Letters* 25: 151–162, doi: 10.1111/ele.13913). However, when snakes were experimentally excluded, nestling mortality was still strongly associated with climatic conditions. Group size had no influence on snake predation and although positively associated with breeding success, it did not mitigate the effects of extreme temperatures on nestling mortality.

Projecting these results into the future, when global warming will increase the likelihood of hot and dry conditions, we predict that even cooperative breeders might have a limited capacity to mitigate extreme weather events. These results also fail to support the hypothesis that cooperative breeding should be more common in unpredictable climates. However, the importance of a group may go beyond the reproductive period and more studies on survival are necessary to better understand the complex dynamics between climate and cooperation.

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Wrapping Sociable Weaver nesting tree trunks in plastic prevents access to snakes, allowing researchers to study the effects of climate change and snake predation on weaver breeding success.

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