

How fussy pandas maintain a balanced bamboo diet

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Researchers found that giant pandas switch between four different bamboo diets to gain key nutrients required to successfully reproduce.

(Phys.org) —Pandas are famously fussy eaters, but new research suggests there is method to their madness, with the animals switching between different species and parts of bamboo plants to maintain a balanced diet and reproduce.

According to the research - led by academics at the Chinese Academy of Sciences and co-authored by Professor David Raubenheimer from the University of Sydney's Charles Perkins Centre, Faculty of Veterinary Science and School of Biological Sciences - [pandas](#) migrate long distances to switch between the shoots and leaves of two different bamboo varieties. The four distinctive diets provide different levels of key nutrients, with shifts between the diets enabling the pandas to balance their calcium, phosphorus and nitrogen needs to successfully reproduce.

"We were surprised to discover that pandas arrange their migratory and reproductive habits around the nutritional qualities of two specific bamboo varieties, arrow bamboo and wood bamboo," said Professor Raubenheimer, Leonard P Ullmann Chair in Nutritional Ecology at the University of Sydney's Charles Perkins Centre and a co-author of the research.

The findings have profound implications for the conservation of China's iconic species, particularly given the accelerating environmental changes that threaten to transform the prevalence and location of the two bamboo species.

"Pandas in the Qinling Mountains of China move from valleys up mountains in spring, and then move back again in autumn," said Professor Raubenheimer.

"The summer forage contains high levels of protein, needed for muscle growth, but is very low in calcium, which is required for milk production and bone growth. By contrast, the winter forage has high levels of calcium but is low in protein.

"It is only by migrating seasonally, therefore, that pandas can obtain enough of both essential nutrients to breed."

The researchers tracked six pandas in China's Foping Reserve with GPS collars over a period of six years, also conducting behavioural analyses and studying food and dung samples during the four foraging cycles. The research is published in the journal *Functional Ecology*.

The nutritional balancing observed in the pandas is a key factor in the survival of the endangered species. Despite being exclusively herbivorous, the giant panda retains the simple stomach and short gastrointestinal tract of its carnivorous bear cousins. As a result, the preservation of its highly specialised diet is crucial to the continued existence of the species.

"As this study has revealed, it is critical for us to understand the nutritional basis of food selection when managing endangered species. This is true not only for the [giant pandas](#) of the Qinling Mountains, but also, for example, for the highly endangered New Zealand kakapo parrot, spider monkeys in Bolivia and the wonderful mountain gorillas of Uganda," said Professor Raubenheimer.

The study is the first study to use nutritional geometry, a system pioneered by Professor Raubenheimer and Professor Stephen Simpson, Academic Director of the Charles Perkins Centre, to relate diet to reproduction in the wild. The Geometric Framework is a modelling approach that explores how an animal solves the problem of balancing multiple and changing nutrient needs in a multidimensional and variable nutritional environment. It has been used to analyse the feeding behaviours of many species, including mice, locusts, flies, spider monkeys, gorillas, grizzly bears and humans.

Provided by University of Sydney

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