

## **The History Of The Giant Panda, Written In Its Genes**

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<http://www.asianscientist.com/2012/12/in-the-lab/giant-panda-history-and-adaptations-whole-genome-sequencing-cas-bgi-2012/>

*AsianScientist* (Dec. 17, 2012) - Researchers at the Chinese Academy of Sciences and BGI in China have mapped the population history of the giant panda from three million years ago to the present.

The findings, published this week in the journal *Nature Genetics*, suggests that while global climate change was the primary driver of panda population fluctuation for millions of years, human activities likely underlie recent population divergences and decline.

The giant panda - an international symbol of wildlife conservation - is the rarest member of the bear family. Its unique diet, isolated habitat, and reproductive constraints have led to the perception that the panda is at an "evolutionary dead end," destined for extinction.

In this study, researchers carried out whole genome sequencing of 34 wild giant pandas and found that the current six geographic populations of giant panda could be divided into three genetic populations: Qinling (QIN), Minshan (MIN), and Qionglai-Daxiangling-Xiaoxiangling-Liangshan (QXL).

By reconstructing the giant panda's population history, the researchers found several important evolutionary events such as two population expansions, two bottlenecks, and two population divergences.

The modern panda may be vegetarian, but its ancestor was either omnivorous or carnivorous. As early as about three million years (Myr) ago, the pygmy panda emerged with bamboo as its primary diet. The warm and wet weather at that time provided ideal conditions for the spread of bamboo forests that led to the first population expansion of the giant panda.

At about 0.7 Myr ago, however, the panda population experienced a decline due to the two largest Pleistocene glaciations in China, leading to its first population bottleneck at about 0.3 Myr ago.

During that period, the pygmy panda was gradually replaced by another subspecies, the baoni panda that has larger body size.

After the retreat of the Penultimate Glaciations, the giant panda's second population expansion occurred and it reached its population peak between 30-50 thousand years (kyr) ago. The warm weather in the Greatest Lake Period (30-40 kyr ago) and alpine conifer forest may have played an important role in the flourishing panda population.

But during the period of last glacial maximum (LGM), the cold, dry, and inhospitable climate led to an extensive loss of panda habitat which resulted in its second population bottleneck.

Then at about 0.3 Myr ago, the panda population separated into the QIN and non-QIN populations, and at

about 2.8 kyr ago the non-QIN cluster diverged into the MIN and QXL populations.

Subsequently, the three populations experienced fluctuations: there was a drastic decline in the QIN, a slight increase in the MIN, and a more remarkable growth in the QXL populations. According to the researchers, these population fluctuations were mainly driven by global climate shifts.

Researchers also learnt about the panda's adaptation over time. The largest group of selected genes in these populations was related to its sensory system, as odor perception was crucial to its survival in dense forests.

"We have identified three genetic populations of giant panda for the current six geographic populations lived in western of China. The varied local adaptations found in our study provide invaluable resource for researchers to better select effective conservation methods to rescue the giant panda even other endangered species. The translocation of wild-caught individuals or releasing the captive-bred ones may be a feasible approach," said Shancen Zhao, Project Manager from BGI.

The article can be found at: [Zhao S et al. \(2012\) Whole-genome sequencing of giant pandas provides insights into demographic history and local adaptation.](#)

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