Ailuropoda melanoleuca (Giant Panda)

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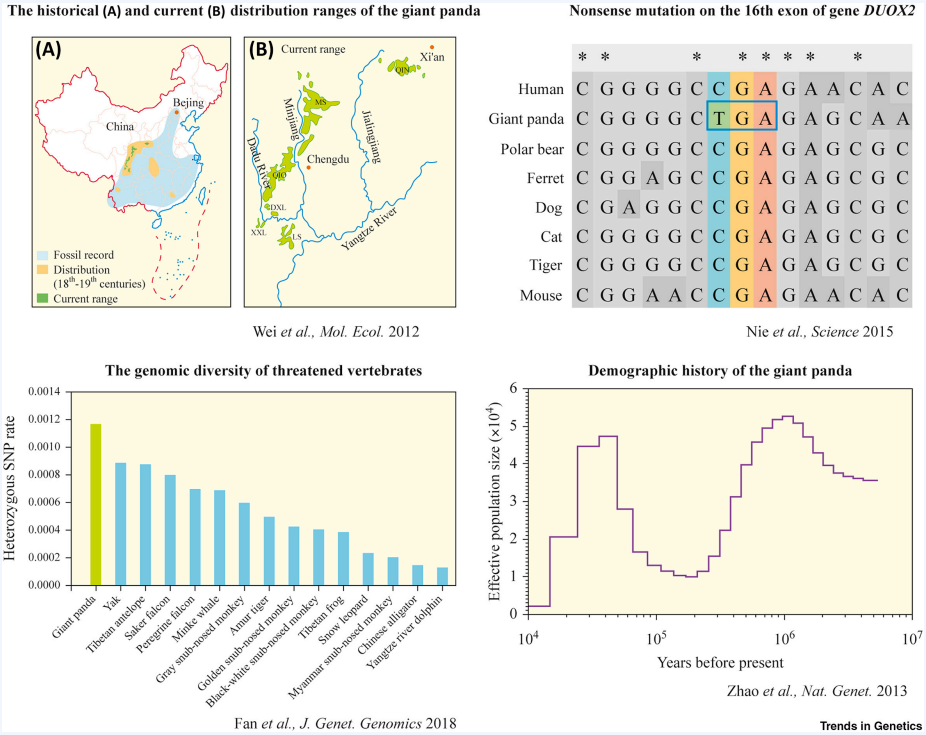
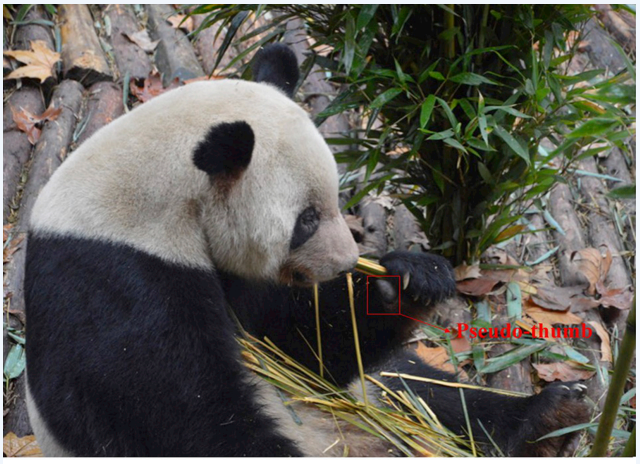


The giant panda, *Ailuropoda melanoleuca*, is a flagship and umbrella species for global biodiversity conservation. As one of the oldest existent species, the evolutionary history of the giant panda can be traced back to 7–8 million years ago. This species has evolved unique morphological and physiological phenotypes to adapt to the changing environment. A complete genome assembly and gene set annotation are important to reveal the genetic mechanisms of how it evolved. The genome-wide genetic diversity of the giant panda is higher than other endangered species, and two population expansions and two population bottlenecks (i.e., severe population decline) have been identified during its evolution. Future work to study chromosome evolution among Carnivora (see below) and structural variations in the population will provide more novel insights for the adaptive evolution of giant pandas.



Trends in Genetics

TAXONOMY AND CLASSIFICATION:
KINGDOM: Animalia
PHYLUM: Chordata
CLASS: Mammalia
ORDER: Carnivora
FAMILY: Ursidae
GENUS: *Ailuropoda*

GENOME FACTS:
The giant panda genome comprises 42 chromosomes (2*n*), totaling ~2.4 Gb, with a repeat content of 41.29% (>31% retroelements) and a GC content of 41.69%.

There are 23 371 annotated protein-coding genes in the giant panda genome. As one of the most endangered mammals on Earth, the estimated genomic heterozygosity rate of the giant panda is 1.35×10^{-3}, which is higher than other endangered species, suggesting that the panda has substantial genetic evolutionary potential.

Population genomics revealed two population expansions, two bottlenecks, and two divergences from the origin to the present giant panda, driven by paleoclimate change and human activities.

SPECIES FACTS:
The giant panda and its habitat offer a variety of ecosystem services that are valued locally and nationally.

The giant panda, once widely found across China, is currently confined to six fragmented mountain ranges in southwestern China, with a total wild population size of about 2000.

Belonging to the order Carnivora, the giant panda almost exclusively feeds on a bamboo diet. Although the panda feeds on herbivorous diets, macronutrients digested and absorbed resemble the diets of carnivores rather than herbivores.

The giant panda's paw has five fingers and a pseudo-thumb, which helps it manipulate bamboo while eating.

The body weight of a giant panda cub at birth is approximately 100 g (0.2 pounds), which is only 1/900 of the mother's body weight.

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Fun Fact about the Genome:
Pseudogenization and adaptive variations of protein-coding genes may relate to unique traits of the giant panda. For instance, the pseudogenization of the *umami* receptor gene *TAS1R1* may be an evolutionary response to the panda's specialized bamboo-feeding diet; the nonsense mutation of *DUOX2* may be related to the panda's low thyroid hormone levels and low daily energy expenditure. Two limb development genes, *DYNC2H1* and *PCNT*, are identified to be important candidate genes for pseudo-thumb development. Four genes (*ADH1C, CYP3A5, CYP4F2*, and *GIF*) may be involved in the utilization of essential nutrients (amino acids and fatty acids) of the specialized bamboo diet.

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