

Ailurus fulgens (Himalayan Red Panda) and *Ailurus styani* (Chinese Red Panda)

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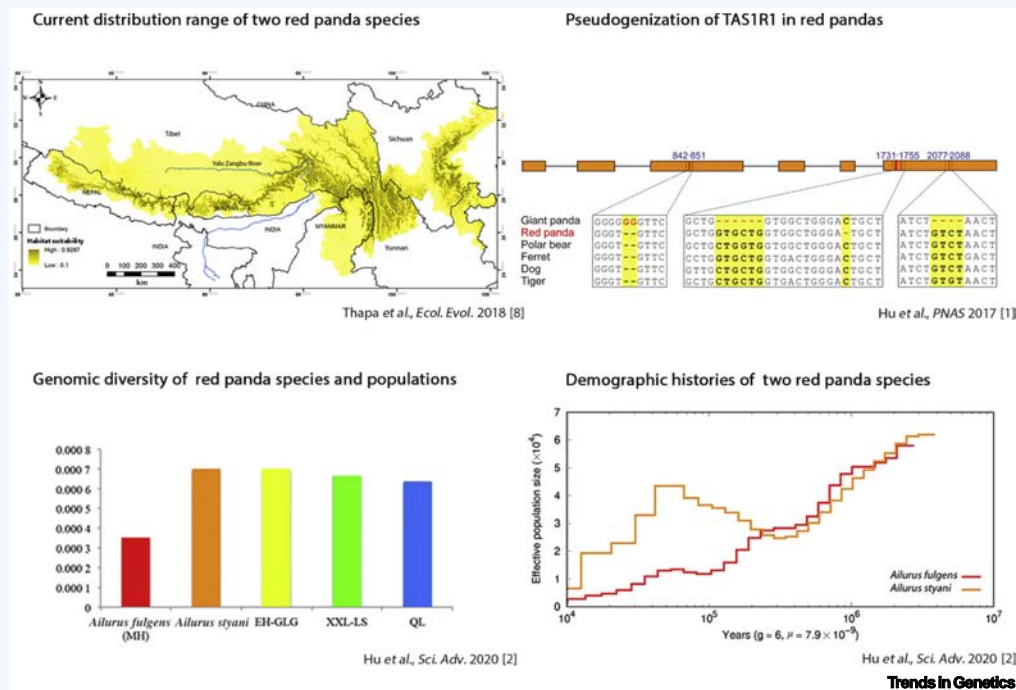


Figure 1. Combined Figure

Red pandas are endangered mammals endemic to the Himalaya-Hengduan Mountains. They were once classified as two subspecies or species based on differences in morphology and biogeography. Recent population genomic evidence confirms the classification of two phylogenetic species: Himalayan (*Ailurus fulgens*, top picture), and Chinese (*Ailurus styani*, bottom picture), with the Yalu Zangbu River as the most likely geographic boundary. Chinese red pandas have a redder face coat with less white and more distinct tail rings (darker red rings and paler white rings) than Himalayan red pandas.

Red pandas, although of the Carnivora order, have a specialized bamboo diet, a typical example of adaptive evolution. The red panda *de novo* whole genome provides insights into not only the molecular basis of this adaptive evolution but also the detailed demographic histories of the two species, from ancient times to now. Genomics and population genomics findings have important implications for the biology and conservation of these endangered species.

Fun Facts about the Genome

The umami receptor gene *TAS1R1* of red pandas became a pseudogene due to a 1-bp deletion in the sixth exon, demonstrating evolutionary convergence as a response to the specialized bamboo diet, together with the giant pandas. The limb development genes *DYNC2H1* and *PCNT* might be important candidate genes for pseudothumb development.

GENOME FACTS:

The red panda genome of ~2.34 Gb comprises 18 chromosomes (*n*), 21 940 predicted protein-coding genes, 515 tRNA genes, 961 rRNA genes, and a repeat element content of 41.23%.

The Himalayan red panda has much less genomic diversity than the Chinese red panda and a higher genetic load, with higher ratios of homozygous derived deleterious or loss-of-function variants to homozygous derived synonymous variants.

Population genomics identified three genetic populations in the Chinese red panda: Eastern Himalaya-Gaoligong (EH-GLG), Xiaoxiangling-Liangshan (XXL-LS), and Qionglai (QL).

SPECIES FACTS:

The red pandas are sister species to the skunks, raccoons, and mustelids, rather than to the giant pandas.

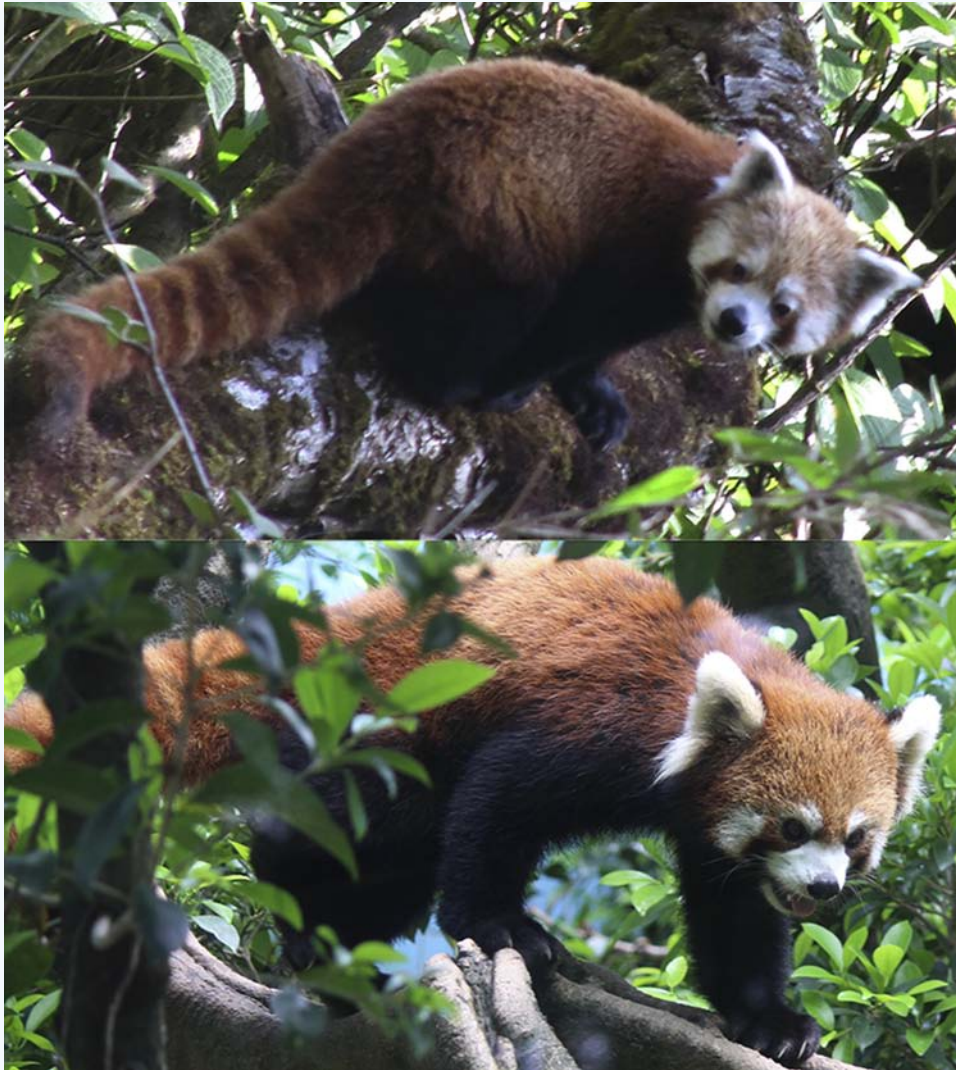
Once widely distributed across Eurasia, they are now restricted to the southern and southeastern edges of the Qinghai-Tibetan Plateau (Nepal, India, Bhutan, Myanmar, and China).

The Chinese red panda has experienced two population bottlenecks and one large population expansion whereas the Himalayan red panda has experienced three bottlenecks and one very small expansion. These two species started to diverge after the severe bottleneck caused by the Penultimate Glaciation.

In addition to their adorable appearance, red pandas have a specialized bamboo diet evolving from their carnivorous ancestors. They have evolved enlarged radial sesamoids – pseudothumbs – facilitating feeding on bamboo, similar to giant pandas.

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TAXONOMY AND CLASSIFICATION:

KINGDOM: Animalia
PHYLUM: Chordata
CLASS: Mammalia
ORDER: Carnivora
SUPERFAMILY: Musteloidea
FAMILY: Ailuridae
GENUS: *Ailurus*

Trends in Genetics

Figure 2. Himalayan (Top) and Chinese (Bottom) Red Pandas. Photograph credits: top, Arjun Thapa; bottom, Yuanyuan Chen.

Literature

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