

## Conservation efforts and evolutionary insights: Protecting China's *Cypripedium* orchids

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Keywords: Biogeography, conservation, *Cypripedium*, phylogenetics

Approximately 50 species of *Cypripedium*, or the lady's slipper orchid, are recorded worldwide, of which half are endemic to China. Phylogenetic relationships among *Cypripedium* species were reconstructed, and niche modelling was employed to evaluate the potential distribution of each species. Additionally, ancestral area reconstructions using BioGeoBEARS were conducted to estimate historical biogeographic changes. Our findings indicated *Cypripedium* originated in Central America and experienced multiple dispersal events between North America and Eurasia facilitated either by long-distance seed dispersal events or migration across the Bering land bridge. The mountainous regions of Southwest China served as refugia for *Cypripedium* orchids during periods of heightened glaciation. These results reveal China as a vital hotspot of *Cypripedium* diversity and underscore China's crucial role in safeguarding these exquisite plants. Separately, our studies on the *Cypripedium* populations in Northeast China include mapping their distributions and investigating the diversity and community composition of orchid mycorrhizal fungi associated with the orchids. We explored the fungus-seed bag method to cultivate symbiotic fungi that facilitate the germination of *Cypripedium* orchid seeds, thus bolstering population numbers in the wild. Future studies will focus on revealing the prevalence of natural hybridization in wild *Cypripedium* populations, delving into the role of natural hybridization and polyploidization in the diversification of *Cypripedium* in China. These efforts will offer valuable insights for conservation genomics initiatives focused on these rare and endangered orchids.