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Genetic introgression as a conservation challenge in the endangered wild camel (*Camelus ferus*) in Mongolia

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Abstract

The endangered Wild Camel (*Camelus ferus*; Mongolian: *khavtgai*; Chinese: *ye luo tuo*) is the only surviving wild species of the Camelini tribe. Restricted to remote regions of the Gobi deserts of Mongolia and China, it faces significant threats from climate change, habitat disruption and small population size. The species can hybridise with domestic Bactrian Camels (*Camelus bactrianus*), but the extent and origins of genetic introgression have remained poorly understood.

We analysed DNA from 257 individuals, using predominantly non-invasive samples collected from *in situ* and *ex situ* Wild Camel populations in Mongolia. Nuclear marker genotyping and mitochondrial DNA sequencing were used to investigate the extent and origins of introgression and assess genetic diversity within these populations.

Our results show evidence of nuclear, mitochondrial and historical Bactrian Camel introgression in the *in situ* population, as well as in some individuals within the *ex situ* herd. Nuclear introgression was detected in approximately 10–22 % of the *in situ* population. Combined nuclear and mitochondrial analyses indicated that paternal introgression was the predominant source in both *in situ* and *ex situ* populations. The *in situ* population also exhibited reduced heterozygosity and elevated inbreeding, with similar patterns observed in the *ex situ* herd.

Although hybridisation is commonly viewed as a threat to species conservation, it can contribute positively to population viability. This presents a complex challenge for conservation management, particularly where thresholds for acceptable introgression remain largely arbitrary. A detailed understanding of genetic diversity and the direction and extent of introgression is therefore crucial in evaluating the conservation consequences of hybridisation and informing evidence-based management strategies for threatened species, such as the Wild Camel.

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