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Author(s)	KADARIYA, Rabin
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Name

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Genetics, ecology and conservation of Himalayan black bears (*Ursus thibetanus laniger)* in Annapurna Conservation Area of Nepal

（ネパール・アンナプルナ保護区におけるツキノワグマ（*Ursus thibetanus laniger*）の遺伝子、生態および保全について）

Asiatic black bears (*Ursus thibetanus*) have a widespread distribution in mountain landscapes, and are considered vulnerable globally, but are low-priority species for conservation in Nepal. Habitat fragmentation, illegal hunting, and human-bear conflict are the major threats to Asiatic black bears across their global range. Having an adequate level of genetic variation in a population helps with adapting to rapidly changing environments, and thus is important for the long-term health of bear populations. Sound understanding of ecological requirements is needed to develop effective policies for the conservation of Himalayan black bears.

In Chapter I, genetic diversity, structure, and the phylogenetic

relationship of Asiatic black bears were elucidated from the Annapurna Conservation Area (ACA) of Nepal to other subspecies by organizing non-invasive surveys. To assess levels of genetic diversity and population genetic structure, eight microsatellite loci were genotyped using 147 samples and 60 individuals were identified in an area of approximately 525 km^2. The Asiatic black bear population in the ACA has maintained high levels of genetic diversity (H_E = 0.76) as compared to other bear populations from range countries. A signature of population substructure was not detected among sampling localities and this suggests that animals are moving freely across the landscape within the ACA. Primers specific to bears were designed to amplify a 675 bp fragment of the mitochondrial control region from the collected samples. Three haplotypes were observed from the entire conservation area. The complete mitochondrial genome (16,771 bp), the first obtained from wild populations of the Himalayan black bear (*U. t. laniger)*, was also sequenced to resolve the phylogenetic relationships of closely related subspecies of Asiatic black bears.

In chapter II, habitat characteristics, seasonality, and occurrence of cultivated crops in the diet of black bears were described in the ACA, Nepal. An analysis of 261 feces showed wild fruits (21 species), grasses (two items), agricultural crops (four items), insects (two items), and animal matter. The occurrence of agricultural crops and wild fruits in bear diets were reversed in

monsoon and autumn season. Agricultural crops constituted 85.3% (Percent Volume: PV = 76.3%) in monsoon and dropped to 3.6% (PV = 3.4%) in autumn whereas wild fruits constituted 5.9% (PV = 1.8%) in monsoon and increased to 90.7 % (PV = 83.2%) in autumn. Although bears were omnivores, acorns were the most preferred food item in autumn and maize during monsoon season. Himalayan black bears vary their diet seasonally, reflecting changes in food availability. Black bears were well distributed in forested areas of ACA with an elevation range of 1,680 to 3,582 m, in highly preferred mixed broad-leaved forests.

This is the first genetic and ecological assessment of Asiatic black bears in Nepal and the information herein should be incorporated in Nepal's national assessment, and when revising the IUCN status and conservation action plan for Asiatic black bears. This study also confirmed the existence of an ancient lineage of Himalayan black bears in western Himalayas that deserves consideration in future conservation plans.