GENETIC CHARACTERISTICS OF KARACHAEV SHEEP INFERRED FROM GENOME-WIDE SNP ANALYSIS

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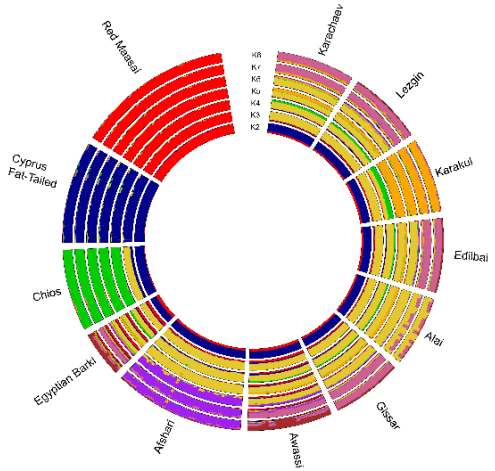
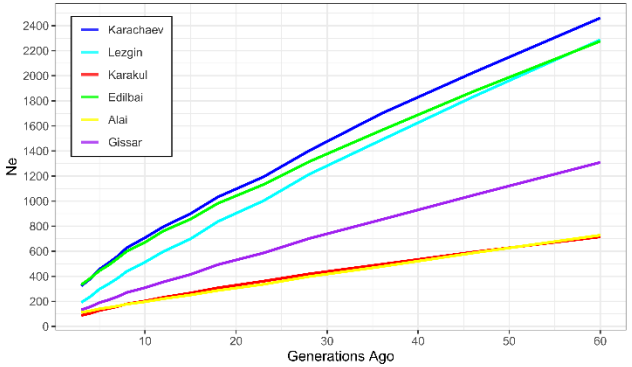
Karachaev sheep is a fat-tailed breed from North-Caucasus, Russia. It has good adaptability to local environments and excellent meat quality.

Material and methods

The aim of our study was to investigate genetic characteristics of Karachaev sheep and its relationship with other fat-tailed breeds. Samples of Karachaev (n=22), Lezgin (n=21), Edilbai (n=21), Karakul (n=21), Alai (n=20), and Gissar (n=20) breeds were genotyped using Ovine HD BeadChip. For phylogenetic analyses, we additionally included 50K genotypes of Afshari, Awassi, Barki, Chios, Cyprus Fat-Tailed, and Red Maasai breeds. PLINK 1.9 was used for quality control and performing PCA. Genetic diversity parameters were calculated in R package diveRsity. Historical effective population size (*Ne*) was estimated using SNeP 1.1. Cluster analysis was conducted in Admixture 1.3. TreeMix tree was constructed in TreeMix 1.13.



Admixture analysis



Effective population size estimation

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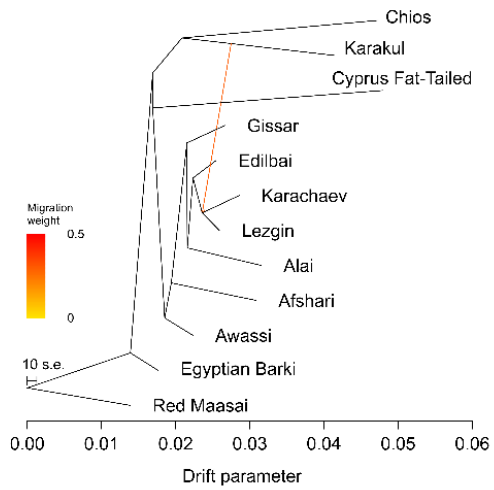
Karachaev sheep



TreeMix analysis

Results

Genetic diversity indices (observed and expected heterozygosity, allelic richness) were highest in Karachaev and Lezgin breeds. Karachaev sheep was phylogenetically closer to Lezgin and Edilbai breeds. Trends in historical *Ne* were very similar for these breeds. We observed the increased decline in Ne around 20-25 generations ago (which corresponds to 1940s) that can be associated with deportation of Karachaev people to Kazakhstan and Kyrgyzstan in 1943, which resulted in lost almost all of its livestock. TreeMix analysis allowing one migration event revealed gene flow from Karakul to Karachaev/Lezgin nod. Admixture analysis showed the presence in Karachaev sheep of Edilbai and Karakul specific genomic components (~80 and ~20%, respectively). Our study allow suggest that Karachaev breed was extinct during World War II and then was restored in 1960s after Karachaev people returned to their land. It originated from the sheep they brought from Central Asia (Edilbai), and was improved by Karakul breed and local sheep.

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