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Historical origin of the chamois in the northern Dinaric Mountains revealed by DNA from old trophy samples

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Two of the seven recognized subspecies of chamois (*Rupicapra rupicapra*) occupy the Dinaric Mountains: Alpine chamois (*R. r. rupicapra*) and Balkan chamois (*R. r. balcanica*). They have a possible contact zone and may hybridize in the northern Dinaric Mountains (e.g. Velebit massif). During the early 1900s, chamois populations in the northern Dinaric region were extirpated due to unsustainable intensive hunting, poaching, livestock grazing, predation, and natural catastrophic events. The last record of the chamois presence in the Velebit massif dates back to 1907, when several animals were observed for the last time.

However, there were several translocations of chamois into the northern Dinaric Mountains in the 1970s from different areas inhabited either by Alpine chamois or Balkan ones. These events left a clear genetic signature in the new population, including signals of hybridization between the Alpine and Balkan subspecies.

The aim of this study was to investigate the historical origin of chamois in the area. For this purpose, we collected four museum male chamois skulls (dated as 1886, 1893, 1895, and 1939). DNA was successfully extracted from the middle layer and the outer sheath of horns. We used microsatellite markers to analyse the genetic structure of chamois populations. Genetic assignment of samples to subspecies was performed using methods implemented in the softwares STRUCTURE and GeneClass. These methods assigned all four samples to the Alpine chamois: STRUCTURE with *q* values between 0.6 and 0.7, and GeneClass with all scores above 95%, respectively. Results indicate the presence of Alpine chamois in the Velebit massif even before the extinction of the species in this region in the early 1900s. Moreover, weak resolution of the STRUCTURE results indicates the reintroduction of animals from donor populations that were unrelated to the native populations in this massif. This, together with a potential recent hybridization, has created a complex genetic structure of chamois in the Velebit mountains.