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Postcranial Phenotypic Adaptations to New Habitats Following Domestication --- An Investigation on Ovis Metacarpals by 3D Geometric Morphometrics

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Domestication is a complex evolutionary process in which wild organisms are moved to anthropogenic environments with a series of phenotypic changes in response to artificial selection and new habitats. In recent years, phenotypic variations have been detected between wild and domestic species, as well as different breeds of domestic species, through dental and skeletal elements. However, the mechanisms of phenotypic adaptations in the postcranial skeletons to new environments following domestication are still poorly understood. In this study, the morphological variations on the metacarpals of a primitive sheep (*Ovis aries*) breed – Soay sheep, are investigated. Controlled modern samples with known sex, age, and diets from those living feral on St Kilda (Scotland) as well as those re-located and raised on East Anglian farms were analysed using 3D geometric morphometrics. Specific morphotypes were found associated with the animals' age, sex, and anthropogenic stressors in the new ecological niches under human control. Importantly, apart from the traditionally observed contributing factors to the morphological changes mentioned above, the animals' locomotor adaptations to the different physical terrains – flat and enclosed East Anglian farms in contrast to the mountainous St Kilda – were observed, indicating that the animals' movement into the new landscapes following humans' management might be detected using the specific morphotypes. This study bears testament to the process of initial caprine domestication, and provides insights into the bovids biological mechanisms during the co-evolutionary process between the humans, animals, and physical environments. The specific interlinks between the phenotypic features and the animals' adaptations following domestication and translocation could serve as a basis for the further studies on the process and effects of the beginnings and spread of farm animals across prehistoric Eurasia.