Migration plasticity in ungulates: facts and consequences in a changing European landscape.

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Migration is an important component of ungulate behavioural tactics, that is tightly linked both to population distribution and to the function ungulates exert in ecosystems, and forest in particular. The fraction of migrants in a partially migratory ungulate population, however, can vary widely across populations. By analysing movement data from the Euroungulates consortium (individual trajectories of roe and red deer from > 10 populations for this study), we analysed the effects of intrinsic factors (sex) and extrinsic conditions (e.g. topography, seasonality, canopy closure, plant productivity/NDVI, snow layer) on seasonal distribution of individuals and parameters describing migration plasticity. Although variation in plant phenology affected migration probability in both species, we found a stronger disconnect between plant productivity and migration for roe deer than for red deer, especially in spring. In a fine-scale analysis at the local scale, we also observed a strong relation between the snow layer (i.e., snow depth) and the winter distribution of roe deer, in presence of supplemental feeding. Our results suggest that climatic and landscape changes may affect future ungulate migrations and seasonal distribution of populations. However, there is urgent need to quantitatively evaluate how this change will feedback on forest productivity, biodiversity, and related ecosystem services.