INTERNATIONAL WILDLIFE CONGRESS

SEP 1-4, 2025 • SCANDIC HOTEL
LILLEHAMMER, NORWAY

IUGB

NKV The Nordic Board for Wildlife Research

Perdix XVI

EUROMAMMALS

ORAL PRESENTATION

Linking Movement Ecology and Zoogeochemistry: Red Deer as Drivers of Nutrient Redistribution in the Alps

Andrea Corradini (1), Kristy M. Ferraro (2), Olivier Chanel (3), Yann Bramoullé (3), Vivian Hawkinson (4) Charlotte Vanderlocht (1, 5, 6), Federico Ossi (1), Davide Righetti (7), Oswald J. Schmitz (8), Francesca Cagnacci (1)

(1) Fondazione Edmund Mach, Italy
(2) Memorial University of Newfoundland, Canada
(3) Aix-Marseille School of Economics, Universitè Aix-Marseille, France
(4) School of Environmental and Forest Sciences, University of Washington, United States
(5) University of Trento, Italy
(6) Stelvio National Park, Italy
(7) Caccia e Pesca, Autonomous Province of Bolzano, Italy
(8) School of the Environment, Yale University, United States

Animal movement is a pivotal mechanism in redistributing nutrients and shaping ecosystem processes. By transporting organic matter through foraging, excretion, migration, and carcass deposition, mobile consumers influence nutrient cycling, soil fertility, and primary productivity both directly and indirectly. Although ecological frameworks increasingly recognize animals as dynamic nutrient vectors, many zoogeochemical models simplify their contributions into static averages, ignoring the spatial and temporal variability driven by movement. This oversight neglects how movement governs the timing, location, and nature of animal–ecosystem interactions. Addressing this gap is particularly urgent as human activities increasingly disrupt these processes, underscoring the need to integrate movement ecology into zoogeochemical analyses. In our study, we developed an agent-based model that merges fine-scale GPS data from red deer (*Cervus elaphus*) in the Italian Alps with spatially detailed nitrogen (N) dynamics derived from high-resolution NDVI and land-use maps. By integrating empirical parameters of deer metabolism, activity patterns, and herd size, our approach contrasts N transfer patterns driven by migratory versus resident movements. Our findings reveal that red deer facilitate nitrogen fluxes across a range of spatial scales. Locally, these animals promote cross-habitat nutrient transfers, with forest patches receiving net nitrogen imports from adjacent grasslands during foraging. In contrast, migratory herds enable both vertical nutrient redistribution along altitudinal gradients and horizontal subsidies across valleys, effectively linking ecosystems. This dispersal of nutrient deposits across seasonal ranges buffers landscapes against nutrient extremes, whereas non-migratory individuals, confined to fragmented habitats, tend to concentrate their impacts. Notably, our study indicates that roads act as barriers that fragment historical migratory routes and disrupt nutrient flows. We also explore the economic implications of hindering the nutrient mobilization driven by migration. These results underscore the critical role of animal movement in biogeochemical processes and highlight the urgent need to integrate movement ecology into conservation strategies for maintaining ecosystem functionality, especially as human activities increasingly disrupt migratory pathways worldwide.