Biotic interactions mediate patterns of herbivore diversity in the Arctic

BARRIO, I.C.¹, BUENO, C.G., GARTZIA, M., SOININEN, E.M., CHRISTIE, K.S., SPEED, J.D.M., RAVOLAINEN, V.T., FORBES, B.C., GAUTHIER, G., HORSTKOTTE, T., HOSET, K.S., HØYE, T.T., JÓNSDÓTTIR, I.S., LÉVESQUE, E., MÖRSDORF, M.A., OLOFSSON, J., WOOKEY, P.A., HIK, D.S.

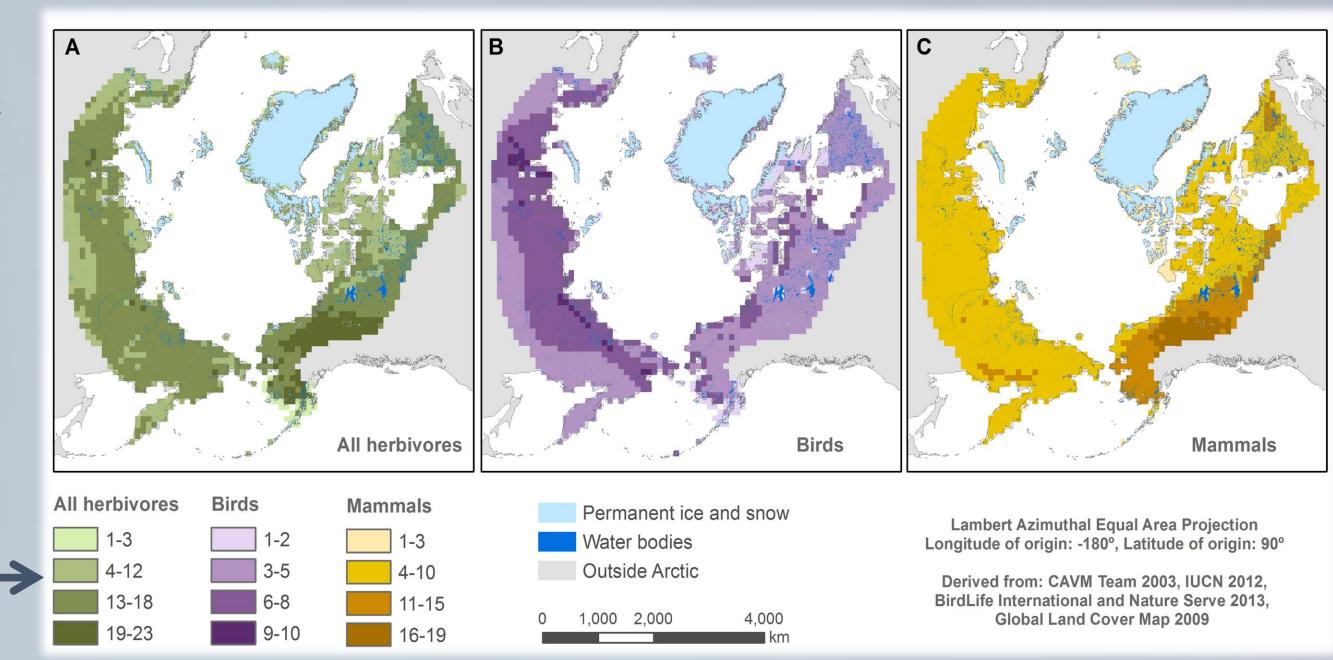
Vertebrate herbivores exert a strong trophic influence in terrestrial Arctic ecosystems

The diversity of herbivores is expected to influence the outcomes of plant-herbivore interactions

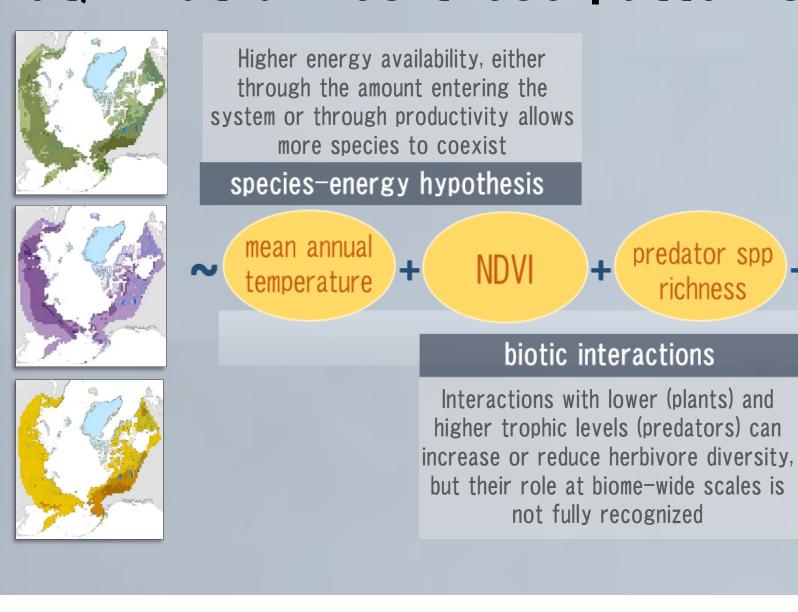




distribution maps of 73 species of vertebrate herbivores occurring in the Arctic: 20 species of birds and 53 species of mammals



But, what drives these patterns?



Environmental heterogeneity increases the number of available niches for different species to coexist and interact

environmental heterogeneity topographic heterogeneity Colonization, dispersal limitation and evolutionary effects are likely to play a role on patterns of species richness

historical/geographical

distance to coast

Soil variables can drive species richness of plants, and thus of their consumers

edaphic factors

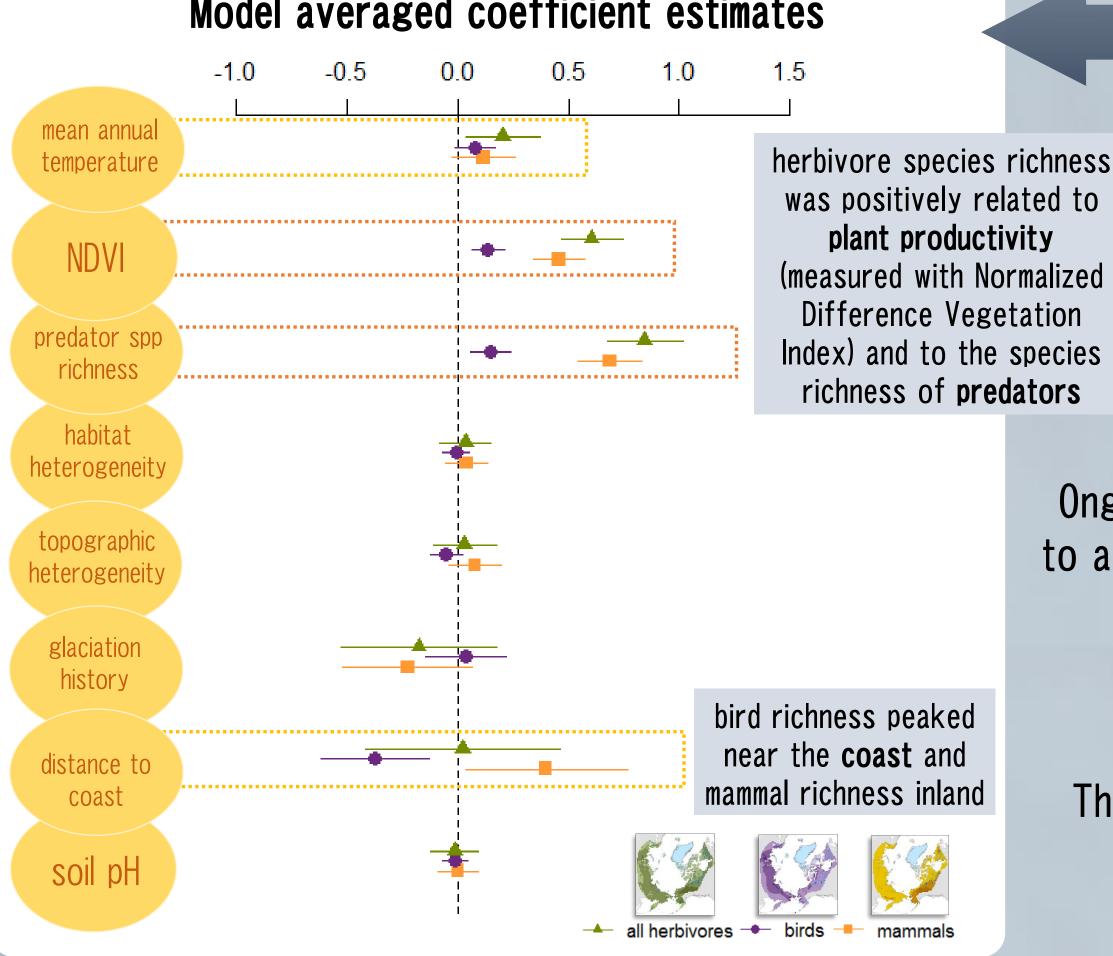
soil pH

variables representing the most relevant hypotheses to explain patterns of species richness

We tested 8

Generalized Least Square models + spatial structure (exponential variance-covariance) structure) + residual regression to statistically separate the effects of variables. Model averaging to assess relative importance of each variable

Model averaged coefficient estimates



We found broad support for species—energy hypothesis and the role of biotic interactions

Biotic interactions, with either higher or lower trophic levels or both, can drive patterns of species richness at a biome-wide scale

Ongoing environmental changes in the Arctic are most likely to affect the distribution of herbivore diversity through impacts on primary productivity and changes in predator communities

Our results highlight...

The importance of considering adjacent trophic levels when investigating patterns of herbivore diversity in the Arctic



The need to include biotic interactions to study the functioning of changing tundra ecosystems

Institute of Life and Environmental Sciences, University of Iceland IS-101 Reykjavík, Iceland. photo: Eeva Soininen For a full list of affiliations visit: Herbivory Network: http://herbivory.biology.ualberta.ca

