

Vegetation diversity influences endozoochoric seed dispersal by moose (*Alces alces* L.)

Research Article

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Abstract: Research on moose-mediated seed dispersal is limited. However, its potential role in transferring seeds in patchy landscapes may be of great importance. In this work we examined how seasons and vegetation diversity influence the species richness and abundance of seeds dispersed endozoochorically by moose. Samples of moose faeces were collected year-round, fortnightly, from contrasting vegetation types, dominated by diverse, species-rich wetland or poor, dry pine forest. The viable seed content of dung was studied by the seedling emergence method. The mean number of emerged seedlings per 0.8 L sample and the mean number of plant species per 0.8 L sample were several times higher in the diverse wetland vegetation than in the poor pine forest vegetation. Maximum species richness and seed abundance was observed during the fructification period, and the minimum during spring. The species richness of samples did not differ between winter and the growing season, although the composition of plant species was different. The results of this study suggest that moose are efficient seed vectors, especially of grasses typical for grasslands and wetlands. The species richness and abundance of dispersed seeds coincides with the diversity of the vegetation of the animal's habitat.

Keywords: Herbivores • Seed dispersal • Seedling emergence • Species richness • Ungulates • Wetland

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1. Introduction

The seeds of many plant species are morphologically adapted to long distance dispersal by specific vectors (e.g. wind, water, birds), but most plant species are in fact polychoric, i.e. they are dispersed by multiple vectors [1]. Animals are the most important dispersal vector for a vast number of terrestrial plants [2], with evidence of directed seed dispersal [3,4]. During the last two decades, endozoochoric seed dispersal has been reported to be mediated in the temperate zone of Europe by domesticated animals, e.g.: cattle [5,6], horse [5,7], sheep [8,9], reindeer [10], and many wild European herbivores: European bison [11], red deer [12,13], fallow deer [13,14], roe deer [13,15], hare [16], rabbit [17,18], and omnivorous wild boar [15]. All these

studies have shown the great potential of endozoochoric plant dispersal and the possible role of this process in the recolonization of land after glaciation [19,20], as well as the possible use of animals as seed vectors during the process of habitat restoration [21-23].

The moose (*Alces alces* L.) is classified by theriologists as a generalist browser [24] and a concentrate selector [25]. Shoots of woody plants predominate in its diet, and, as a consequence of low proportion of herbaceous plants [26], one may expect a low number of seeds deposited in its dung. This is probably the reason why the largest European cervid has so far been little researched in relation to ungulate-mediated plant dispersal. Heintze [27] noted that moose faeces include viable seeds of several plant species, Pastor *et al.* [28,29] pointed out the potential importance

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