

## Plant biomass and prediction of debarking caused by rodents in artificial regeneration of forest stands

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### Abstract

In the last ten years a strong intention was observed to replace spruce monocultures with mixed coniferous-broadleaved stands close to natural composition. This was accompanied by much higher rodent impact on the broad-leaved plantations than previously. To protect planted trees on forest clearings, we conducted the research in Drahaný Highland (350-550 m a.s.l.) and monitored the bark damage in young beech trees, rodent density dynamics, broad-leaved trees seed harvest and a snow cover in four years period. Intensity of bark damage was not related to the rodent abundance but was influenced by high seed crop and above the average snow cover. Primary production dynamic might be a good predictive factor of broad-leaved bark damage by voles. Applicability of this method should be proved for long periods and in various natural conditions.

Keywords: density, seed crop, snow cover, voles

### Introduction

In forestry practice, prediction of rodent impact would be most helpful tool to protect young trees in reforestation against bark damage. The main pre-requisite for a correct forecasting is the long-term monitoring of rodent dynamic, of their impact, their food supply and other related data. However, there is paucity of such informations. The main cause of bark damage is insufficient food supply, especially in winter.

Forecasting of damage by rodents in agriculture is realized by monitoring of common vole density (Zapletal et al., 2001). In forestry, monitoring of rodent population dynamic is complicated and not sufficiently effective (Gill, 1992). Moreover intensity of bark damage might be very variable and area specific (Suchomel et al., 2009). In general, bark damage on plots were influenced above all by quality of food supply and shelter conditions (Kamler et al., 2011).

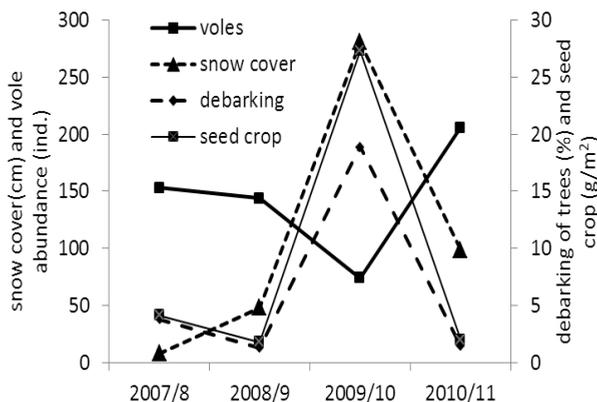
The key problem would be then to predict deficient food supply on which bark damage arise. In this study, we analyzed the factors, which may influence the winter bark damage and its extent on the broad-leaved forest young trees.

### Materials and methods

In Drahaný Highland (Central Moravia, Czech Republic) monitoring was realized in mixed coniferous-broad-leaved stands environment in altitude 350-550 m a.s.l. From autumn 2007 to spring 2011 on 11 clearings with planted beech plots research was concentrated on autumn rodent density (*Myodes glareolus*, *Microtus arvalis* and *M. agrestis*; 610 individuals), the broad-leaved trees seed harvest in the surrounding environment, and spring bark damage extent on beech (1,300 controlled individuals).

### Results

The highest extent of bark damage was in winter with the lowest previous autumn vole number. Just an opposite situation was in winter with highest vole density (Figure 1). The intensity of bark damage was related to snow cover. After winter with low snow cover damage was rare, after winter with high and long lasting snow cover bark damage was about ten times higher. The winter with high bark damage was preceded by rich autumn seed harvest.



**Fig. 1** Relations between debarking young beech tree, abundance of voles, seed crop and snow cover (snow cover represented by the sum of snow height in pentads from November until March)

## Discussion

Our results from highland indicate that here are two main factors influencing the beech bark damage: good seed harvest and high and long lasting snow cover. Good years reflect favorable conditions leading to high primary production (Hilton and Packham, 1997) on which voles are dependent (Tast and Kalela, 1971). Snow cover restricted the vole spatial activity and their access to good quality food. After a good primary production year rodents overwintered in good condition with a low mortality to the end of winter. In early spring, with still some snow cover, vole populations turned to bark consumption. In the year after good overwintering vole population graduated. Generalization of these conclusions should be verified by further research in various environments.

## Acknowledgements

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