Predictive power of vegetation and environmental factors for explaining variation of meadow snail communities

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INTRODUCTION
This study deals with the meadow snail communities and their relationships with vegetation. Studied meadows are famous for their species richness of vascular plants including many rare, and endangered species (Fig. 3). Nevertheless only a little work has been done on snail communities so far. Therefore we studied snail species richness and composition of these habitats. For explaining variation of snail communities, several environmental factors and factors obtained based on vegetation (i.e. Ellenberg indicator values - EIV) were used.

AIMS
• to investigate the influence of soil calcium content and moisture on the composition and species richness of snail meadow communities
• to compare the predictive power of these environmental factors and variables approximated based on plant composition

STUDIED SITES
A total of 22 sites were studied in dry grasslands and mesic meadows in the White Carpathians Mts. (SE Czech Republic) in 2005-2006. The sites were chosen along two main environmental gradients: the gradient of soil calcium content and soil moisture.

METHODS
At each 1 m² plot, vegetation was recorded and then the upper soil layer up to the depth of 5 cm was removed from 4 quadrats of 25 x 25 cm² for snail sampling. Soil samples were collected for laboratory measurements of calcium content and pH; soil moisture was measured in the field. 'Variables approximated from the vegetation (i.e. EIVs) were mean values of an empirical value for each plant species recorded in the plot, which reflected the ecological behaviour of plant species (Ellenberg et al. 1992). We used EIV for soil reaction and moisture.

RESULTS
All species richness and abundances were driven by interaction between soil calcium content and moisture. Alive species richness was significantly associated only with EIV for moisture contrary to numbers of alive individuals, which were correlated only with soil moisture (Fig. 2).

The main gradient of species composition was explained by calcium content as well as by EIVs for soil reaction (Fig. 1). Soil moisture was correlated with the second PCA axis. Using the RDA with the Monte Carlo permutation test we found only two significant factors: (1) interaction between soil calcium and moisture, and (2) EIVs for soil moisture. Surprisingly the measured soil moisture was not significant.

The RDA showed that environmental factors explained 30.5% and EIV explained 27.4% of the variation of snail species data.

CONCLUSIONS
We found the positive relationship between soil moisture and alive snail species richness and their abundances. The number of alive species was explained only by the EIVs for moisture, while the number of alive individuals correlated only with soil moisture. In contrast, all species richness and abundances were better explained by soil calcium content, which can be connected with longer persistence of empty shells in calcium rich sites. Alive snail composition was mostly explained by an interaction between calcium content and moisture.

Although the predictive power of environmental factors was a little higher than that of vegetation, only EIVs were able to explain the variation of alive species richness. This can be connected with the ability of EIVs to record environmental conditions over years contrary to a one-shot measurements. Therefore, the vegetation appeared to be another important predictor for explaining variation in snail communities.

REFERENCES

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