The interaction between mesic and steppic grasslands on the boundary of temperate and boreal zones

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Background and aim of the research

- Lithuania is on the boundary between temperate and boreal zones (Fig. 1);
- Occurrence of various and unique grassland communities in Lithuania. In these communities, diverse species compositions that are characteristic of the *Molinio-Arrhenatheretea* and *Festuco-Brometea* communities are found;
- Such origin of the communities causes a lot of difficulties in classifying phytocenosis;
- The main goals of the research were: i) to evaluate the relation of characteristic species of the *Molinio-Arrhenatheretea* and *Festuco-Brometea* classes; ii) to assess the interaction between characteristic species and topographical elements

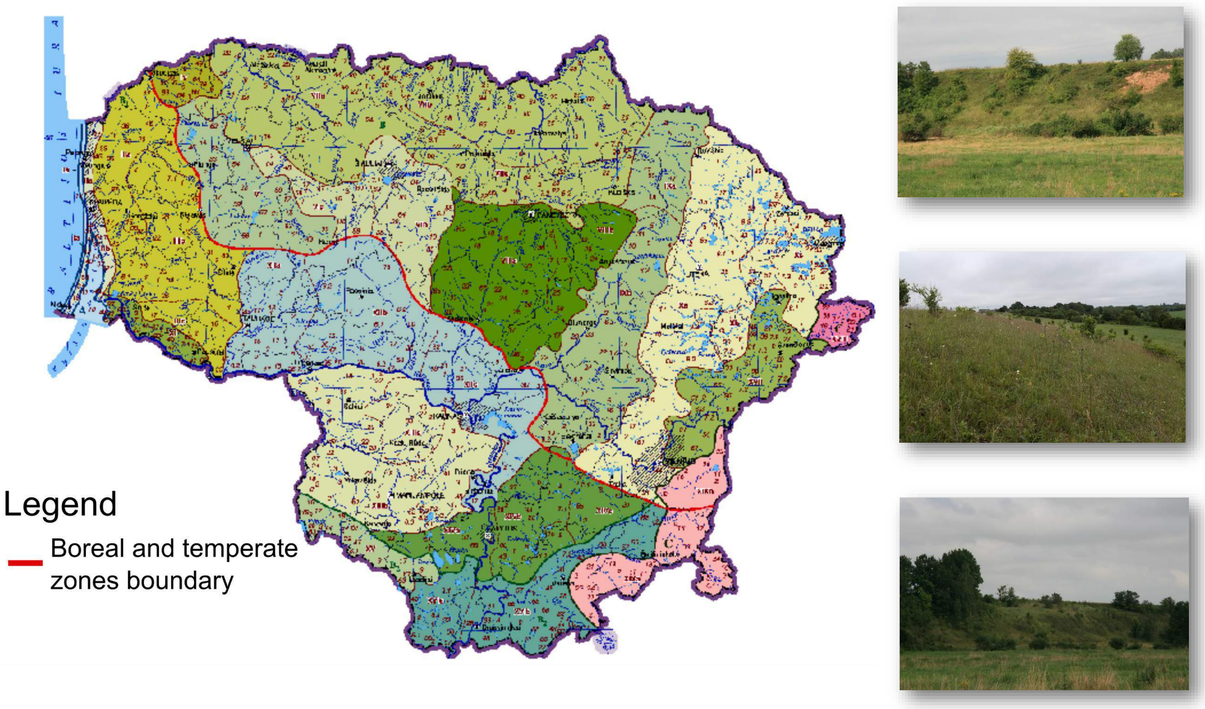

Fig. 1. The botanical-geographical classification of Lithuania

Methods

- The data were collected in northern Lithuania (Lielupė, Venta, Šventoji and Bartuva river basins), in natural steppic and mesic grassland communities (Fig. 2)
- The relevé plot was 100 m2, all data set contained 129 relevés
- Site topographical features were evaluated (slope inclination and exposition, level of terraces);
- Data were analyzed using Juice 7.0, R-project and Past 3.1 software;
- Characteristic species were distinguished according to the national vegetation survey;
- The average distance from relevé to *Carpinus betulus* distribution boundary was 74.8 ± 25.7 kilometres;

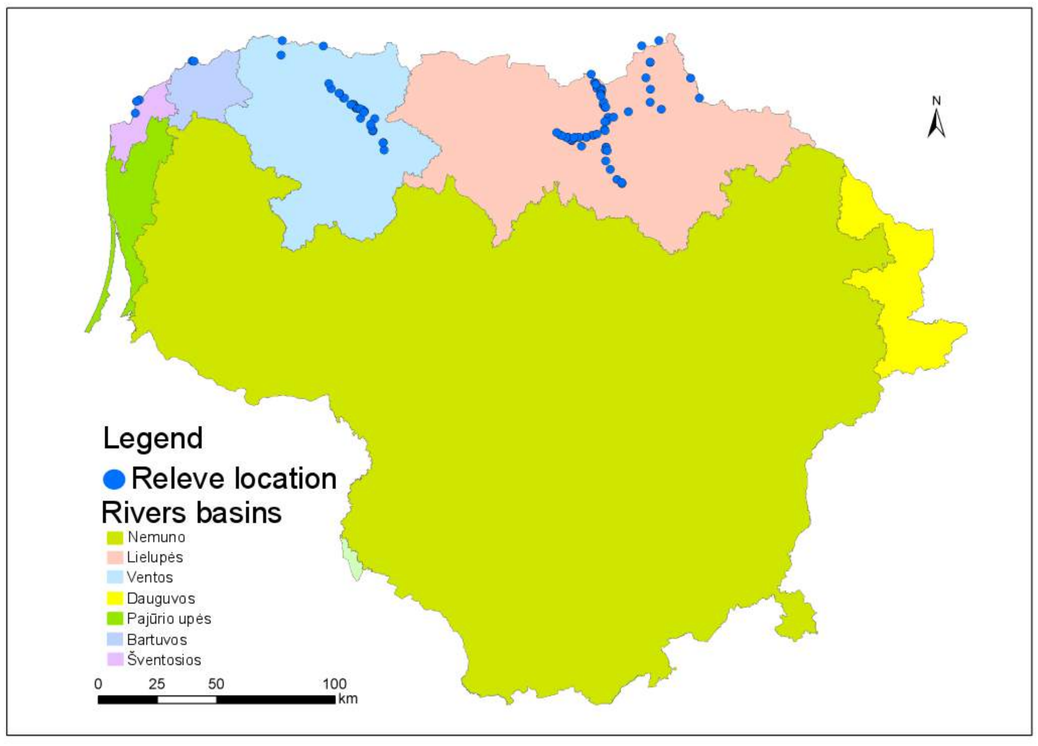

Fig. 2. Relevé distribution in northern Lithuania and river basins

Results and discussion

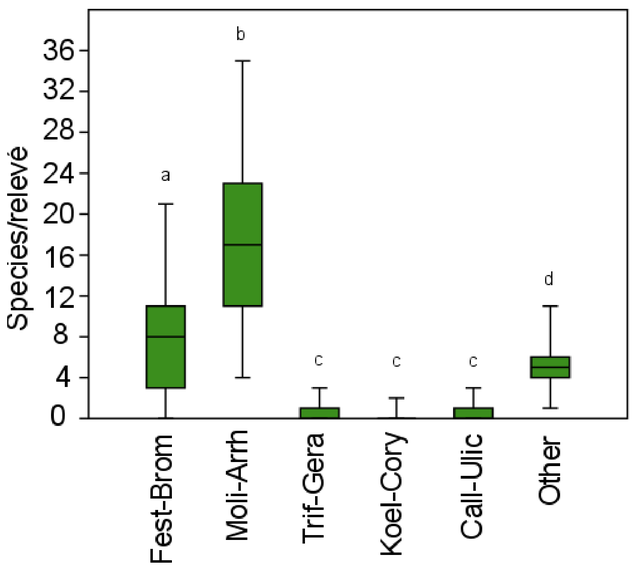

Fig. 3. Species characteristic of phytosociological classes (letters indicate statistically significant differences between characteristic species, ANOVA $p < 0.05$, Tukey's pairwise test $p < 0.05$)

In all data set (129 relevés), the species characteristic of five phytosociological classes were found; a total of 260 plant species were registered in the communities (Fig. 3). Most species were characteristic of the *Molinio-Arrhenatheretea* class (on average 17.6 ± 7.41 species per relevé) *and Festuco-Brometea* class (7.38 ± 5.16). The portions of species characteristic of the *Trifolio-Geranietea* (0.35 ± 0.65), *Koelerio-Corynephoretea* (0.11 ± 0.34) and *Calluno-Ulicetea* (0.38 ± 0.61) classes were not significant, and most of these species were sporadic.

Species characteristic of other phytosociological classes were merged into one group, on average 5.07 ± 2.17 species per relevé. This analysis shows that all communities in northern Lithuania have at least four species from the *Molinio-Arrhenatheretea* class.

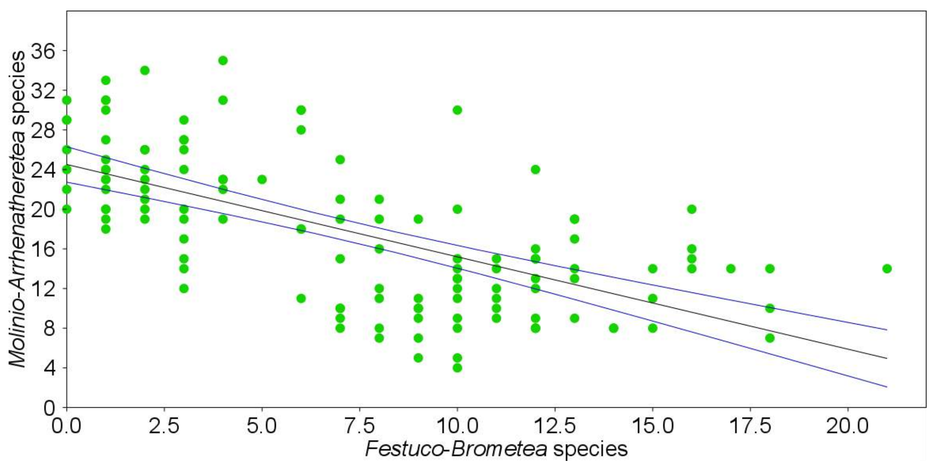

Fig. 4. Correlation between characteristic species of the *Molinio-Arrhenatheretea* and *Festuco-Brometea* classes ($r_p = -0.64$, $p < 0.05$)

The general linear model (Fig. 4) shows statistically significant negative moderate correlation between species characteristic of the *Molinio-Arrhenatheretea* and *Festuco-Brometea* classes. The moderate negative relation shows that some species, which are characteristic of one or another class, could occur together despite the ecological conditions. We did not find *Festuco-Brometea* communities without species from the *Molinio-Arrhenatheretea* class.

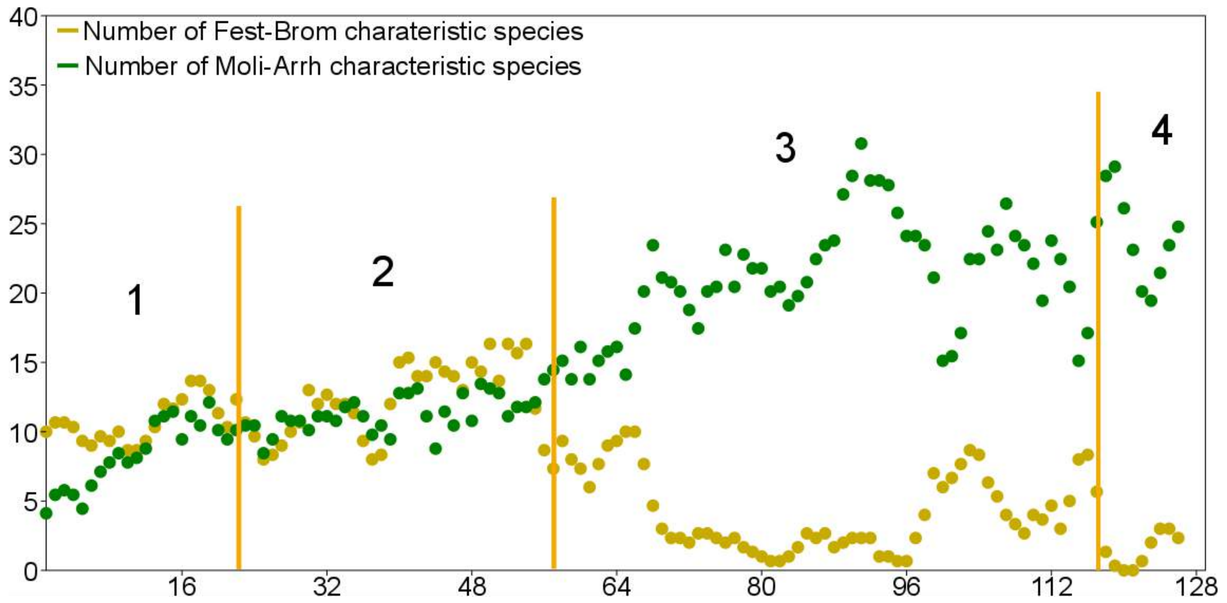

Fig. 5. Interaction between characteristic species and topographical elements (1 - communities on steep (50–70°) southern exposition slopes; 2 - gentle (10–45°) varying exposition slopes; 3 - high level terraces; 4 - low level terraces)

The data set was divided into four groups according to the occurrence of communities in topographical elements of the site (Fig. 5). The positive moderate correlation ($r_p = 0.55$, $p < 0.05$) was determined between species characteristic of the *Molinio-Arrhenatheretea* and *Festuco-Brometea* communities situated on steep slopes, while in communities situated on gentle slopes no significant linear relation was recorded ($r_p = 0.12$, $p > 0.05$). There is a main trend (negative moderate and weak correlation) in communities situated on high level terraces ($r_p = -0.36$, $p < 0.05$) and low level terraces ($r_p = -0.48$, $p > 0.05$), but the latter one is not statistically significant.

Conclusions

- The dry grassland in northern Lithuania occurs on three main topographical elements (high level of terraces, steep and gentle varying exposition slopes).
- Species which are characteristic of five phytosociological classes are found in communities most of which are characteristic of the Festuco-Brometea and Molinio-Arrhenatheretea classes.
- At least four species characteristic of the Molinio-Arrhenatheretea class occur in the dry grassland communities.
- The most diverse communities occur on gentle varying exposition slopes, where characteristic species of both the Festuco-Brometea and Molinio-Arrhenatheretea classes are found.