Doctoral dissertation summary

Diversity of plant communities associated with oak stands of Bircza and Krasiczyn Forest Districts in the context of selected historical and environmental characteristics

mgr Jan Ziobro

Forest changes related to human activity are the topic of numerous scientific studies. The preserved old-growth forests, being the home to rare plant and animal species, are of the recognized high conservation value. The value of treed communities shaped by traditional agro-silvo-pastoral economy is far less acknowledged. This is why such communities, facing agricultural and forestry specialization and intensification, belong to the most vulnerable and threatened ecosystems.

In the Bircza and Krasiczyn forest districts there are numerous oak-dominated stands, which were not developed by the modern forestry model. The elements of silvopastoralism were still being practised in the Subcarpathia foothills in the mid 1900s. The objective of this work was the ecological characteristics of the plant communities associated with sub-mountain oak stands, the identification of changes they undergo, and suggesting appropriate conservation measures.

The particular aims of the study included:

- geobotanical and phytosociological characteristics of plant communities associated with sub-mountain oak stands;
- assessing the state of conservation of the ecotonal character of the remnants of silvopastoral oakwoods, with a particular consideration of co-occurring forest and grassland species;
- determining the association of the ground vegetation with environmental characteristics and with the history of land use;
- assessing the conservation efficacy with respect to the oakwood communities and indicating possible additional / alternative measures of their restoration and conservation.

The study was performed in 35 study areas, where 140 research plots were established. Each plot was characterised by the phytosociological releve, stand biometric characteristic, and physical-chemical soil data. Based on the available topographic historical maps, the changes in the land use structure of the plots' landscape context was assessed for the last 150 years. The releves' data were subjected to standard phytosociological tabular procedure as well as to non-specific exploratory analyses - hierarchical cluster analysis, HCA, detrended correspondence analysis, DCA, and (with the explanatory, environmental variables) redundancy analysis, RDA, and canonical correspondence analysis, CCA.

Most of the analysed communities (70%) are associated with the continuity of the forest cover, at least since the mid-1800s. Other communities are of the secondary character - they have developed on the former arable land, meadows, and wood pastures. In most cases, they are localised close to the edge of larger forest areas, on gentle slopes, on mostly acidic and heavy soils, poor in nutrients.

As many as 252 species of vascular plants were identified in the studied communities, most of them being representative for the forest flora, including "ancient forest species." The remaining species were associated with either grasslands, mantle-and-fringe vegetation, ecotonal, ruderal, and agricultural habitats. In most of the releves the species diversity was low due to disfavourable environmental conditions, caused by the overshading effect of the abundant underwood.

The classification of the phytosociological data allowed to distinguish two syntaxons - subcontinental lime-hornbeam forest, *Tilio cordatae-Carpinetum betuli*, and acidic mountain beech forest, *Luzulo luzuloidis-Fagetum*. The vast majority of the communities belonged to the sub-type *Tilio-Carpinetum typicum*, a few to *Tilio-Carpinetum stachyetosum* and to the ecotonal form, with a high share of species from the neighbouring non-forest communities. One of the study areas had undergone an experimental restoration through the removal of the dense hazel underwood, "unsealing" the forest/grassland interface, and allowing the penetration of grassland species into the wood community.

DCA revealed the existence of three particular community groups: one corresponding with both *Tilio-Carpinetum* subtypes, one with *Luzulo luzuloidis-Fagetum*, and one with mixed features. A more detailed picture of the releves variability emerged from HCA. The distinguished clusters referred to typical forest communities (two clusters), to secondary afforestation on the agricultural land, and to the communities at the edge of forest areas. Part of such oak stands, with wide-stretching tree crowns, have a documented history of the silvopastoral use. Both RDA and CCA revealed that one of the important factors determining the present character of the studied communities is the land use history. In the areas subjected to the long-lasting forest cover there was a stronger dominance of forest species with a higher share of ancient forest species. The longer distance from the woodland/farmland edge into the forest interior, the smaller the fewer non-forest species occurred. The latter were favoured by the higher soil pH and soil nutrients content.

The studied communities were characterised by low species diversity, possibly caused by the disappearance of the shade-intolerant and thermophilous species. This phenomenon, known from other parts of the Europe's continental region, has been documented in the rich

topical literature. Semi-open oak groves at the edge of forest areas in rural landscapes are subjected to the analogous process, being gradually transformed to shadowy species-poor deciduous forest communities. In the past, these communities used to constitute vast ecotonal zones, where forest species co-occurred with their counterparts originating from open areas. The present-day forestry, focused on the production of beech and fir timber, amplifies the negative successional changes, triggered by cessation of the traditional woodmanship and silvopastoralism.

The contemporary conservation methods, dedicated to “natural forest” communities (passive protection of natural processes and active conservation, aimed at stand “improvement”) are not the measures one could use to preserve the unique characteristics of semi-open oakwoods. Also the effect of the radical undergrowth removal, unless followed by an enduring disturbance regime, preventing the regrowth of underwood, would be limited and short-lasting. This is why, the most efficient conservation method would consist of the initial stand thinning and unsealing the woodland/grassland interface, followed by enduring traditional use, in particular forest grazing.