

Lichen uses – potentials of the European Guideline for mapping lichen diversity

David Svoboda

My projects had one common feature, namely the application of the European Guideline for mapping lichen diversity as an indicator of environmental stress (Asta et al. 2002). This methodology was developed in an effort to make a standardised protocol for European screening of epiphytic lichens for various purposes. The dissertation is focused on selected topics and the main objectives can be summarised as follows:

- 1) To evaluate the potential of the LDV method for determination of general air pollution, and the possibility of applying the new methodology in the Czech Republic.
- 2) To compare results given by the LDV method and the older qualitative method by Hawksworth and Rose (1970).
- 3) To determine the principal factors influencing the epiphytic lichen distribution in Central European oak forests, and to elucidate possible correlations among natural and human caused environmental factors in a large scale study.
- 4) To investigate the epiphytic lichens living in temperate oak forests, their features and possible lichenological differentiations; to determine indicative species for old growth forests and natural woodlands under different climatic conditions and human influence in the Central Europe.
- 5) To determine the recolonization of epiphytic lichens in Northern Bohemia by employing the LDV method.

The European Guideline was proved to be a useful standardised instrument for detection of pollution and environmental alteration. However, the European Guideline is rather exigent in tree selection. When compared with the Hawksworth and Rose method, the European Guideline gives more accurate results that can be easier repeated.

The effect of environmental factors on lichen diversity in central European oak forests results from the power of factors and from the degree of dependence between the variables (environmental factors). Some correlations among human caused and natural factors may be very high. It may be very difficult to determinate an influence of particular factor on lichens (living organisms): parameter with stronger correlation with lichens could sometimes override the effect of other environmental parameter. According to the results, the difference in precipitation amount may significantly decrease the effect of air pollution in some areas. However, strong air pollution levels may obscure effects of altitude or/and forest age, factors usually regarded as determining for epiphytic lichen diversity. Although these findings are not so surprising, it is necessary to take the covariations between the variables into account and analyse more environmental factors when we evaluate the human impact on the environment using lichens. The results endorse the naturality as synergistic effects of ecological variables and human influence can distort the results of lichen biomonitoring surveys.

Analyses of species composition on oaks gave in total one hundred and four taxa of epiphytic lichens. The majority of the species is negatively correlated to the pollution factors; species from *Parmelion caperatae* are strongly correlated to the precipitation amount, high LDV and potential radiation. Cluster analysis recognized six main groups of lichens growing on oaks. The groups 1-3 are correlated to stands with pronounced human impact, and they are characterised by high affinity to acid bark. The group 4 comprises of several species favoured by eutrophication on oaks, partially belonging to *Xanthorion* alliance. Groups 5 and 6 are particularly correlated to the environmental variables characteristic for mature forest stands with long ecological continuity. The group 5 is dominated by presence of the *Parmelion caperatae* species and lichens from related associations as the *Pertusarieum amarae*. Group 6, the most numerous group, correspond to mature oak stands with the most developed lichen diversity. These characteristics together suggest that group 5 and 6 could be treated as close-to-terminal lichen community in central European oak forests.

Recolonization of epiphytic lichens in North Bohemia. The current study highlights the importance of a quantitative approach to lichen studies in identifying the patterns of lichen distribution and recolonization. Obtained data show the historical and recent evolution of the lichen diversity, and suggest the continuation of lichen recolonization in Central Europe. Negative influence of direct traffic and urban areas (villages with local pollution sources) has been traced despite the relatively low pollution levels.

The above mentioned results are summarized in several articles included in the thesis.