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Written Report; **PhD Thesis: Lichen uses – potentials of the European Guideline for mapping lichen diversity**

Mgr. David Svoboda, Charles University in Prague

Epiphytic, i.e. tree colonizing lichens are widely used in environmental monitoring. Until recently, different methodological approaches were used in various parts of Europe. This made a comparison of regional assessments often difficult or impossible. In 2002 Asta *et al*. suggested a method that intended to combine the strengths and avoid the weaknesses of methods that were broadly applied in lichen bioindication practice in different parts of Europe.

Mgr. David Svoboda has tested this methodology in various lichen monitoring projects. The aims of this Thesis were to

1) Evaluate the new European Guidelines in the Czech Republic
2) To identify major factors influencing lichen diversity and composition in Central European temperate oak forests
3) To identify the epiphytic lichen recolonization in North Bohemia

The Thesis includes five manuscripts, which are briefly reviewed below:

1) Evaluation of the European method for mapping lichen diversity (LDV) as an indicator of environmental stress in the Czech Republic; published in Biologia, Bratislava, 62:424-431, 2007.

This paper describes the pattern of epiphytic lichen diversity in the Protected Landscape Area Bohemian Karst. The author collected data in 43 sampling units and compared lichen diversity data based on the new European guidelines with a bioindication method described by Hawksworth & Rose (1970) that is based on indicator species for environmental quality.

Given the amount of information collected in this project only rather general and superficial analyses are presented in paper 1. Furthermore, the title of this paper is not appropriate. The undertaking of the paper was to present an "**evaluation**" of an indicator of **environmental stress.** I therefore expected a careful analysis of environmental data – instead the paper gives a comparison between two lichen bioindication methods, none of them being rigorously tested as "indicator for environmental stress" in the study region. It is likely that not enough environmental data are available from the study area. In this case more in-depth analyses including species composition could have been presented with this valuable floristical data set. The Hawksworth & Rose method is based on different levels of toxicotolerance of lichen species and growth forms. This paper could have studied detailed regional relations between the presence of lichen species and species groups with LDV values. It is also unclear if the data obtained from the 4 different sectors (N, E, S, W) revealed an equally good fit with the Hawksworth & Rose zones. The Asta et al. method would allow for such detailed analyses and such an analysis would possibly allow to disentangle different pollution sources e.g. from industry and agriculture.

2) Epiphytic lichen diversity in Central European oak forests: Assessment of the effects of natural environmental factors and human influences

The authors studied 48 sites from three Central European Countries and provide detailed statistical analyses of the relations between environmental and ecological variables on lichen species richness and LDV.

This paper is a valuable contribution to lichen biodiversity assessments and forest ecology. In the methods a few sentences should be added on how the count data were transformed before the statistical treatment and if e.g. Bonferroni or similar tests were included in the presentation of the p-values in Tables 1 and 2.

Species richness in forest landscapes is often related to forest stand history and lichen habitat diversity, i.e. tree species diversity, distribution of tree diameters and the availability of light in the forest stand. Although only lichen species growing on oak trees are considered in the analyses, the presence of other tree species than oak will largely influence the species list on oak. The paper does not analyse these most important parameters and it is thus possible that important (and easily measurable) ecological parameters were not considered in this paper. In the now published version the authors consider both species richness and composition. This is a substantial improvement compared to an earlier draft of the paper. The paper has been published in an international journal with a high impact factor.

3) Epiphytic lichen flora on road side trees in the Elbe sandstone in northern Bohemia; no comments on this paper.

4) Lichen recolonization in North Bohemia, Czech Republic

Lichen diversity values were obtained from 84 trees in 2005 and the assessment was repeated in 2008. The number of trees that was observed in this study is rather low compared to other published studies. Given the large range of tree diameters considered and the low number of observed trees it is no surprise that the general differences between 2005 and 2008 did not reveal statistically significant differences in LDV and species richness data.

Nevertheless, the paper is addressing an interesting topic and the information provided in Table 1 are very valuable, especially if the same trees will be re-evaluated also in future. The authors mention Appendix I, which is not included in the text.

5) Can Central European Oak Forests be characterized by Epiphytic Lichen Composition?

The authors analysed the composition of epiphytic lichen species on sampling plots in oak forests. This is an important scientific contribution to the understanding of lichen communities in Central European oak forests, especially because of the well elaborated links to regional levels of environmental pollution that have tremendously influenced the regional lichen vegetation in the study area. The data analyses are well done and condensed to a minimum of tables and figures.

I am not very happy with the title of the paper. A characterisation of oak forests would also include an analysis how the lichen communities in oak forests differ from communities in e.g. Pine forests etc. Such analyses are not included in the paper. I recommend changing the title before resubmitting it to a journal.

General remarks: The PhD Thesis is dealing with a broad variety of different data sets. As a result of the time consuming fieldwork the focus of the thesis is rather broad and the numerical analyses are often rather general. The analyses presented cover only a small part of the scientifically interesting questions that one could address with such data sets. Nevertheless, the PhD thesis of Mgr. David Svoboda is an important piece of work that is appropriate for defence. The papers presented in this thesis meet the requirements for a PhD degree.

Yours sincerely,

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Questions:

Paper 1: The author mentioned the scarcity of suitable trees for the LDV assessment in some of the mapping units. Are other tree species more frequent in these mapping units and could these be considered in addition to the selected tree species? Please explain a possible methodological approach how data that originate from different tree species could be merged in a bioindication survey.

Paper 2: Please explain the term naturality that you use in the title, given the fact that you compare different types of oak forests where different types of natural and anthropogenic disturbances led to the current stand structure and tree species composition.

Do the different lichen species groups respond in a similar way to changing species richness and LDV? Please describe which species or species groups are sensitive to a low level of "naturality".

How important is the presence of a few very old or "veteran" trees in a stand of younger trees? Which consequences for forest conservation strategies can you draw from your results?

Paper 4: You mention shifts of species groups, e.g. the decrease of acidophytes or the increase of *Parmelia sulcata*. Are these shifts the results of a quantitative shift in abundance (little changes in presence / absence data) or do these species disappear from, or colonize, new trees?

Do you have observed data that can quantify species turnover?

Where do the propagules of the recent colonizers come from? Is the observed colonization the result of long-distance dispersal or do the diaspores originate from nearby sources that were not considered in the 2005 survey (e.g. non-standard trees)?