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Evaluation of the PhD-thesis of Dobromil Galvanék

The thesis submitted by Dobromil Galvanék is dealing with the impact of abandonnement restorative management on the diversity of grasslands in the Czech Republik and Slovakia. This is a cumulative thesis consisting of four articles that are topically related. In all articles Dobromil Galvanek is acting as first author with Jan Leps as co-author in three articles and Jan Ripka in the fourth one. Three articles have already been published or accepted for publication by peer-reviewed international ecology journals and one article is given as manuscript. The articles are embedded into a short introduction and a final summarizing discussion.

After a short introduction into the thesis, in Chapter I the author provides an overview on the natural history of his main study area at the edge of Mala Fatra Nationalpark in northwestern Solwakia. The first three papers are dedicated to this region with mountain grasslands of outstanding biodiversity and large scale abandonment of traditional land-use as main threatening factor. The papers concerning this region are based on a well balanced experimental design comparing continuous mowing, restorative mowing, short- and long-term mowing in an experimental approach. Besides the coherent experimental design and the comparatively long duration of sampling over four seasons the high quality and fanciness of statistics must be seen as a major strength of these chapters.

The first article "Changes of species richness pattern in mountain grasslands: abandonment versus restoration" has been published in 2008 in Biodiversity and Conservation 17: 3241-3253. According to the ISI Science Citation Index the journal has an Impact Factor of 2.146 for 2010, which means rank 12 out of 33 journals in the field of Biodiversity Conservation. The paper is dealing with the effect of abdonnemet and restorative mowing on the species richnes of moutain meadows with a particular emphasis on scaling issues. The data clearly demonstrate that the studied meadows are loosing their speices-richness rather quickly after cessation of managemet whereas restoration of former richness after reintoridction of mowing turned out to be a rather slow and time-consuming process. The results also clearly establish that losses of species-richness become first obvious at small spatial scale whereas gains of species after restoration are first visible at larger scale.

The second article "How do management and restoration needs of mountain grasslands depend on moisture regime? Experimental study from north-western Slovakia (Western Carpathians)" has been published in 2009 in Applied Vegetation Science 12: 273-282. According to the ISI Science Citation Index the journal has an Impact Factor of 1.802 in 2010, which means rank 65 out of 187 journals in the field of Plant Sciences. The study is working with the same experimental set up like the first one but with a focus on species composition in wet and dry meadow types. Even after 5 years, restored meadows still differ considerably from their continously mown conterparts. Wet meadows turned out to degrade much faster and recover much slower than dry meadows, which is most likely due to their higher productivity resulting in an increased competition for light. Full restoration of the original species composition will probably require decades in both cases.

The third article "The effect of management on productivity, litter accumulation and seedling recruitment in a Carpathian mountain grassland" has been recently accepted for publcation by Plant Ecology (published online 09.11.2011). According to the ISI Science Citation Index this journal has an Impact Factor of 1.880 in 2010, which means rank 63 out of 187 journals in the field of Plant Sciences. Under the same experimental design as in the two aforementioned articles the authors analyse the effect of living abovegrund biomass and litter on seedling recruitment under the different experimental treatments. Restorative mowing reduced litter significantly and promoted the proportion of forbs in standig crop but did not lead to a decline in total aboveground biomass. Seedling recruitment was clearly negetively correlated with the amount of accumulated litter suggesting that this is one major meachnism for the decline in species-richness after abandonnement.

Article four "The establishment of target indicator species on restored sites in Morava River Floodplain", together with Jan Ripka, is presented as a manuscript not yet submitted to a journal. In this paper data on the success of different large scale techniques for target species transfers aiming at the restoration of species-rich floodmeadows in the Morava floodplain are analysed. Since this is the evaluation of a rather large scaled "real world" restoration project samplin-design and obtained data are bit less coherent. The study is documenting limited success in transferring target species to the restoration sites by various methods. One of the most interesting findings is probably that small scale experiments may provide limited evidence when applied at larger scale.

The thesis ends up with a short general discussion outlining major findings.

The articles presented in this thesis provide a very comprehensive and scientifically sound picture on the effects and mechnisms of abandonnment and restorative mowing in mountain grasslands. They shed new empirical evidence on various theoretical concepts in plant ecology und provide a solid basis for restoration in practice. The contribution is of high international visibility and fully matches modern scientific quality standards in ecology. Through a bit more elaborated Introduction und General Discussion chapters the thesis could have been further improved.

I strongly recommend the PhD committee to allow the candidate admission to the formal PhD defense.

Norbert Hölzel

Prof: Dr. Norbert Hölzel

Review of the PhD thesis „Impact of managment on diversity of species-rich grasslands" written by Dobromil Galvánek, 2011

The submitted thesis presents five journal or book-chapter papers or manuscripts and short introductory and concluding chapters. Four papers are focused on short-term (4-years) effects of changed management on species richness, species composition, productivity and seedling recruitment in a mountain grassland, one paper is focused on evaluating a success of alluvial-grassland restoration on former arable land. Papers are well prepared, well written, and contain sound statistical analyses (author acknowledges that these analyses were led by supervisor while author only „took part"). Concerning their content, papers are rather standard in this field, providing few really new (suprising) results and new ideas, but they cover new geographical region and new vegetation types (Carpathian mountain grasslands). There is no doubt that the thesis deserves succesfull defence.

Some general comments

1. Inconsistent grassland typology

Although in Chapter 1 the author used the term „wet grasslands" for really wet (waterlogged) *Calthion* grasslands, in other chapters he used the same term for moist (semi-wet) mountain grasslands (which he called „Mountain hay meadows – *Polygono-Trisetion*" in chapter 1). Because the term „wet grasslands" is commonly used rather for *Calthion* grasslands than for *Polygono-Trisetion*, this inconsistency causes a confusion.

2. Experimental versus observational studies

Author formulates the motivation to the study, in more chapters, in the way implying that only, or predominantly, observational studies on the effect of grassland management have been conducted so far. It is obviously not true – there are dozens of grassland experiments throughout Europe whose results have been published; observational studies focused merely on the management effects are rather rare. Have you conducted detailed review of management experiments in Europe? Having reviewed a larger set of papers would provide, for example, bigger support for conclusions how management needs differ by grassland types etc.

The disadvantage of the used experimental approach is that during 4-years (i.e., 3-years of treatments) only slight changes may occur, predominantly that related to productivity and litter accumulation. There are some studies demonstrating that long-term effects, more connected with species exchange, may be different. I understand that it is difficult to assess the long-term effects in one PhD study – theoretically it would be possible by including data of some longer-term experiments from literature or from collegues, or conducting some observational study in the same study area (possibly biased by confounding factors, but covering longer time scale).

Comments to specific chapters

Chapter 2:

- p. 34, bottom: I agree with the importance of small-scale richness. In this paper, however, deeper arguments could be used- why small scale richness is important from conservation point of view? Because of grassland functioning? Higher abundance of particular species even in small reserves and thus higher stability of species´s populations? Higher genetic variability of particular species? Something different?
- p. 36, bottom: How the result of your 4-years abandonment experiment are related to the development from the Neoliothic? During 7-thousands-years history from the Neolithic, the

events such as 4-year abandonment had to be common. What is thus the problem nowadays? Eutrophication, or rather fragmentation, or something different?

Chapter 3:

- 75% endemits in grasslands – does this count include also alpine grasslands? If yes, is this information with respect to mowing relevant?
- Figure 2, PRCs: Was WEABMO treatment considered as control to both,the remaining managements in wet plots and all dry plots? Why just wet meadows were selected as a control? Is there some hypothesis behind? (I noted that abandoned wet and abandoned dry were initially similar, but diverged towards managed dry or wet types respectively ... is this the hypothesis?)
- Discussion, 1st sentence – important for what?
- 1st paragraph – you state, that moisture is better predictor than management. But abandoned wet and abandoned dry had were more similar initially than after management restoration.
- Mosaic character of study grassland complex is really advantageous for the experimental design. Nevertheless, had you some problem to delimit these two types? I know that on flysch slopes, many transitions between dry and wet grasslands occur.

Chapter 4:

- You write that there was small climatic variability during the experiment. However, during the experiment the extreme hot and dry wave occurred in 2003 in Europe – it affected locally also the West Carpathians (e.g., in my own experiment in the Bílé Karpaty there was zero precipitation during the summer, resulting in abrupt change in species composition – Hájek et al. in Klimeš et al. 2008). Do you have exact climatic data for your locality?

Chapter 5:

- May regular flooding influence nutrient availability (through nutrient input, temporally reducing conditions etc.)? This effect may be as important as hydrochory.

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