

Review of doctoral thesis of Lucie Hemrová on the topic *Dynamics of species of fragmented dry grasslands at the landscape scale*

This thesis represents a mosaic of studies about different aspects of grassland species dynamics in a fragmented cultural landscape. It consists of an Introduction and five chapters, representing manuscripts of two not yet published and three recently published papers (in *Preslia*, *Landscape Ecology* and *Annals of Botany*). Individual studies are united together by study object, represented by vegetation of acidophilous and calciphilous grassland patches in a cultural landscape, and by study approach, combining aspects of population biology, landscape ecology and distribution modelling.

As three of the manuscripts have already undergone the scrutiny of review before publication, I will go through only swiftly, focusing mostly on not yet published manuscripts in Chapters 3 and 4.

The **Chapter 1** focuses on the dynamic of *Jasione montana* in acidophilous grassland patches and comparison of different methods identifying suitable habitats currently not occupied by this species. Right at the beginning I have to say that this paper is my most favourite one. It compares suitability of habitat predicted by model with real survival of experimentally sown individuals in the field. When I calculate some numbers by a model, I always wonder how real these numbers are. Experimental confirmation is in my opinion far the best way to evaluate it.

What is your experience with Beals smoothing method? You obviously like it, so I am curious - do you really believe in its results?

I feel a bit sceptical when I see that the co-occurrences of species for calculation of individual probabilities are calculated from the same dataset on which they are in turn applied. This has a feeling of circularity and I guess that better solution would be to use co-occurrences calculated from external vegetation database. What is your opinion about this and why external data were not used?

*When calculating Beals smoothing, was the target species (in this case *Jasione montana*) included or excluded from particular plot for which the probability of its occurrence have been calculated, and why? Similarly, when calculating mean Ellenberg indicator values for each plot, was the value for *J.m.* included into calculation, and why?*

Chapter 2 introduces new method of measuring habitat isolation, incorporating species richness of source habitats. I found it interesting from the theoretical point of view that the richness of species in abandoned fields is better predicted by presence of dry grasslands nearby which are species rich rather than large. However, I am afraid that this approach has very limited practical use, because it requires field data which cannot be derived e.g. from land use maps. *But I am open to change my opinion if you can convince me!*

Chapter 3 attempts to evaluate the effect of patch connectivity and size on distribution of selected species and selected functional traits. I was amazed by number of statistical tests which are done in this paper (I counted 782). I understand that this is an exploratory study based on correlative approach, but the attitude “let’s test everything and see what will be significant” is a perfect example of statistical fishing. Application of Bonferroni’s (or other) correction for multiple testing will not help – if it should be applied correctly, it can’t be $P < 0.05/8$, but most probably $0.05/782$, which makes it impossible to get any significant result. Perhaps it needs completely different strategy of analysing data, or different approach for interpretation results.

There are plenty of numbers in this study, and for numbers I can’t see the plants. I would be happy if you can tell us a natural history of (let’s say) three species of your choice, for which you believe that the analysis brings something interesting which accords with your field experience (e.g. species X occurs mostly on large islands, which can be related to the fact that it disperse in the following way...).

What were the criteria for selection of Ellenberg indicator values into analysis – why light and nutrients? And how to interpret the fact that larger islands in the past have significant effect on recent presence of light demanding species (Table 4)?

I can’t see the link between Table 3 and Figure 1 in the manuscript; the captions to Fig.1 says that habitat configurations in 1954, 1980s and 2000s have been used as covariates, but in that case they should not be represented by vectors in ordination diagram. Can you make it clear which result in Table 3 is relevant for Fig.1?

Chapter 4 tests the question how does the number of suitable habitats, age of habitats and functional traits predict habitat occupancy. I like the idea that the presence of suitable habitats in surrounding can represent measure of isolation, but I have serious technical issues with analysis itself.

As I understand it, habitat occupancy for certain species is defined as the ratio between frequency of the species and the number of suitable habitats, and suitable habitats are defined as habitats where given species currently grows plus suitable habitats determined by Beals smoothing. In that case the relationship between habitat occupancy and number of suitable habitats (Fig. 1) will be obscured. When I compare values of habitat occupancy in Table 1 with values of species frequencies (Table 1 in Chapter 3, based on slightly different number of grasslands), I see that very frequent species are those with high occupancy values. Frequent species will occur on high number of suitable habitats, and because total number of all habitats is limited, they must have high habitat occupancy, simply because almost all suitable habitats are also currently occupied by this species. This is obvious on Fig. 1 from the lack of variation in habitat occupancy in case of species with high values of both habitat occupancy and number of suitable habitats (species in upper right corner). Since habitat occupancy and number of suitable habitats are not independent from each other, their relationship cannot be tested in traditional way. Perhaps some type of permutation test may help, but not sure about that.

Relationship on Figure 2 will have similar problem. Species with high habitat occupancy are frequent species, and their mean habitat age will tend to be close to average value of habitat age of all sampled grasslands. Less frequent species (with lower habitat occupancy) can, on the other side, have higher variability of mean values (you are unlikely to get mean habitat age 3.6 if you average

300 grasslands, but you can get it if you average only 20). In my opinion the relationship on Fig. 2 is intrinsically unimodal, with the maximum located at the mean value of habitat age for all sampled grasslands – with a bit of imagination I can see it there. As a conclusion, I don't believe results of this study – *but again, I will be more than happy if you can change my mind!*

Chapter 5 studies the effect of landscape configuration and browsing by ungulate mammals on population dynamics of endangered species *Scorzonera hispanica*. It looks like a nice paper, using sophisticated predictive model which I can hardly see through, because I am not working with this kind of methods. Anyway, results show that the current populations of *S.h.* are most likely not going to extinct completely because of browsing, which is good news.

*The last question is related to Introduction. You plan to study the reason why some species (such as *Anthericum ramosum*, *Brachypodium pinnatum*, *Bromus erectus* or *Inula salicina*) are often being dominants in grassland patches. What is your hypothesis causing this dominance and how do you want to experimentally approach it?*

Although I was rather critical in some points, generally I like the thesis. I believe the purpose of doctoral thesis is not to deliver perfect work free of mistakes, but to demonstrate ability to think creatively, learn from mistakes and search for alternative solutions. The thesis is a mature work of young scientist, and I fully recommend it for defence.

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19 January 2013