



Assessment of the PhD thesis of Matěj Man

Elaborated by Tomáš Hájek (University of South Bohemia in České Budějovice)

The thesis entitled "Forest bryophytes and microclimate" joints two seemingly contrasting interests of Matěj, bryophyte ecology and computer programming. The latter qualification became crucial for the processing of large microclimatic datasets to answer research questions concerning bryophyte functioning in forest understorey, as well as for the creation of the Database of Lichens and Bryophytes of the Czech Republic to gather relevant data on bryophytes. The topic is important from both scientific and application perspectives.

The thesis is clearly organized and all the parts are easy to follow. The text is very well written in simple, understandable language and appropriately supported by high-quality graphical content. There is a minimum of technical/typographical weaknesses in the thesis.

In his thesis, Matěj first introduces the objects and questions of interest and discusses the results of four papers that form the core of the thesis.

The first two presented papers look for the most important microclimatic factors controlling forest bryophyte communities. The results of the two studies are complementary because they are based on partially different measured parameters. The dataset of Paper 1 could yield more results or even another paper focused on the bryophytes species, i.e. the variability in species composition and richness. Have the data been analyzed in this way? I would welcome more mechanistic interpretations of the main results (here I recall the author's remark that "our focus on methodological development sometimes outpaces our capacity to resolve biological or ecological questions")...; for instance, "Maximum air temperature and growing degree days were the most important microclimatic predictors of bryophyte assemblages" – but what is the proposed mechanism behind that? The answer could be inferred from the results of paper 2. In what specific direction the duration of snow cover could affect the bryophyte assemblages (based on previous studies cited)?

Chapter 4.2 (VPD Effects on Bryophytes; Paper 2) discusses in detail the conditions at the plant–atmosphere interface; however, the VPD was measured at the height of 1.5 m above the soil surface, representing somewhat different conditions. How the VPD results can differ when measured just above the soil or moss surface? I think that VPD, as a primary driver in bryophyte desiccation, cannot be compared in terms of importance with the desiccation tolerance. These are different strategies – desiccation tolerance is a biochemical adaptation of how to cope with stress, while strategies that can include VPD are rather avoidant in nature. How can the moss participate in controlling the VPD, i.e. its own desiccation rate?

I admit that I am not in a position to critically assess the Paper 3. I appreciate the complexity of the myClim package. Anyway, I am curious about the calibration of soil moisture data. The need for calibration of soil sensors is often neglected by researchers. Would it be possible to recalibrate any soil moisture data (i.e., from any logger) that are expressed as VWC? Has the experience of processing data from different instruments brought potential recommendations towards their manufacturers?

Although Paper 4 is, again, rather of a technical nature, it also includes several data analyses and case studies, including the modelling of species distribution that has been already verified in the field. I am not sure whether the recorded high species diversity in protected areas is partly an artefact of more frequent visits by professionals making the inventories required by management plans. How about linking the recently expanding finds databases (linked to smartphone apps) with DaLiBor? Is there a chance that all the specialized databases will be merged or mirrored in a single robust national or even higher-level database?

Here are some minor and technical comments: 2–3 significant digits are fine, 6 are highly redundant, but just 1 (as in the case of 0.2) is insufficient (Paper 1, Table 1). The rate of VWC loss after rains is ambiguously explained. I hesitate to accept that bryophytes can be photosynthetically active down to $-10\text{ }^{\circ}\text{C}$; the reference cited in the general introduction seems to me to be misinterpreted. "Atmospheric VPD increases exponentially with rising temperatures" – it would be great if this clear explanation was provided in the general introduction or in the introduction of this article.

In his thesis, as well as by his overall publication record, Matěj proves that he has established a broad foundation as a scientist. The thesis clearly meets the requirements for a PhD dissertation, and therefore, I hereby recommend it for defence.

České Budějovice, 21 November 2024

Tomáš Hájek