

Oldřich Nedvěd
PřF JU
Branišovská 1760
České Budějovice
Czech Republic

Birmensdorf, September 14, 2017

Dr. Martin M. Gossner, Biologist
Research Unit Forest Dynamics
Phone +41 44 739 25 88, fax +41 44 739 22 15
martin.gossner@wsl.ch



Review of the PhD Thesis

Key factors affecting composition and diversity of saproxylic beetle assemblages

of Dipl. Biol. Matthias Weiss

The PhD thesis aims at increasing the understanding of the distribution of saproxylic beetles across spatial scales, including latitudinal (comparison tropical vs. temperate lowland/montane), altitudinal (temperate lowland/montane) and vertical (fine scale) gradients within forests. In the introduction the candidate further claims the strong need for more mechanistic studies in canopy research to understand observed patterns.

While many studies have concentrated on latitudinal and altitudinal gradients, there is indeed a gap in our knowledge of the fine-scale vertical stratification and the key drivers of and the mechanisms underlying vertical stratification. This is also highly relevant for forest management and nature conservation, because crown structure of single trees as well as vertical structuring of forest stands can be influenced by management, which allows promoting biodiversity by particular management strategies. Thus, the topic of the PhD thesis is scientifically novel with respect to the fine-scale stratification in interaction with different forest types and additionally highly relevant from an applied perspective.

The PhD thesis comprises an introductory paragraph in which the candidate summarizes the state of knowledge and research gaps and three chapters of scientific papers. The candidate is first author of two manuscripts, of which one is published in PLoS ONE and one is not yet published. The candidate further contributed to a manuscript which is published in Forest Ecology and Management. Moreover he is co-author of two further manuscripts in PLoS one and For. Eco. Manage., which are not

part of the thesis. His publication record is thus not outstanding, but solid and acceptable for a PhD candidate.

I greatly appreciate that the candidate accepted the challenge of address an important question related to forest canopies and worked hard to realize this. This clearly has to be considered and valued positively. In the publications the candidate used not only basic statistical analyses, but also more advanced methods, such as 1) the partitioning of beta-diversity into its nestedness and turnover component, which reflects two different phenomena and thus allows a better mechanistic understanding of observed patterns and 2) the recently published framework of Chao and colleagues which allows a more reliable comparisons of diversities among multiple samples. This is highly appreciated and judged positively.

Beside this certainly positive aspects, I have some substantial concerns. In my opinion, the Introduction and the final Discussion are the most important chapters of a PhD thesis, because these are the parts of the thesis which the candidate wrote without the help of the supervisors, co-authors and journal reviewers. These chapters shows whether the candidate 1) has sufficient knowledge of the relevant literature, 2) is able to work and think structured, 3) is able to clearly work out the state of knowledge and the research gaps he aims to bridge with his thesis, 4) is able to formulate clear research questions and hypothesis, 5) is able to bring together the main findings of the different studies and work out the novel findings of his studies on the background of previous knowledge and, 6) is able to draw reliable conclusions with respect to ecological theories and mechanisms as well as forest management and nature conservation.

The Discussion is in particular important because there the candidate should give the answers to the overall questions raised in the introduction and shows whether he was able to bridge the knowledge gaps he worked out in the Introduction. Unfortunately the important Discussion chapter is completely missing, only a very short summary is given. The Introduction summarizes many important aspects and covers most of the relevant literature, but is nevertheless not convincingly structured. The red line of argumentation towards the research questions of the thesis is often missing and the argumentation remains rather unspecific in many aspects. It is often unclear why it is important to study a particular aspect, what are the possible mechanisms etc. The introduction includes many aspects such as deadwood amount, which has unfortunately not been assessed and analysed in any manuscript and some parts of the Introduction are unnecessarily intermingled with methodological aspects that makes it difficult for the reader to get the main point – to mention just a few. Consequently, the candidate has not been capable to convincingly work out the research gaps that he aims to bridge.

The candidate states that canopy research needs to move from observation to mechanism and function, which I fully endorse. Unfortunately, I cannot recognise this direction in any of the manuscripts included. All studies are very much descriptive, showing observed patterns, but the underlying mechanisms remain unclear. The candidate has not measured possible influential factors such as deadwood volume, light availability and structural complexity, which would give at least hints to possible mechanism. Thus the discussions of the individual manuscripts is often rather speculative than data-based. Unfortunately, even the partitioning of beta-diversity into

its components, which gives some indications of possible mechanisms is not discussed sufficiently in the manuscripts.

I don't say that a more mechanistic, still correlative, approach is mandatory, but it would help us to better understand the patterns that we observe in nature. And if directing the Introduction towards the need of more mechanistic studies in forest canopies, I would have expected more than just showing patterns.

In conclusion, the positive aspects of the thesis are that 1) the candidate tackled a topic which is highly relevant but lacks important knowledge and greatly challenges the researcher due to difficult accessibility of forest canopies. 2) he includes most of the relevant literature, and 3) he uses novel not yet commonly used statistical methods. The main negative aspects are 1) the missing Discussion chapter, 2) the structural flaws in the Introduction, 3) unclear methodological aspects. The most serious drawback of the thesis is the missing Discussion chapter, which in my opinion does not allow the acceptance of the thesis, but this might reflect the criteria for PhD thesis at the University of South Bohemia.

Some open questions:

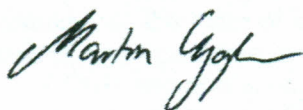
What are in your opinion the mechanisms underlying the stratification that you found in your thesis?

Do you think that seasonal changes among strata might have affected your results, in particular the difference in stratification between tropical and temperate forests?

What is the height of the traps relative to tree height? Is this comparable between forests and sites and might this have influenced your results/observed peaks?

What justifies your assumption that large parts of the forests in Europe would be open naturally, keeping in mind that beech is supposed to be the naturally dominant tree species, which is very competitive, less affected by large herbivores and able to close canopy gaps fast?

Yours sincerely,



Dr. Martin Gossner

Review of Ph.D. thesis:
Key factors affecting composition and diversity of saproxylic beetle assemblages by Matthias Weiss

Ing. Jiří Foit, Ph.D.

Department of Forest Protection and Wildlife Management, Faculty of Forestry and Wood Technology, Mendel University in Brno, Zemědělská 3, 613 00 Brno, Czech Republic; E-mail: abovic@seznam.cz
Department of Mendel University in Brno

The presented Ph.D. thesis was done in University of South Bohemia in České Budějovice Faculty of Science under supervision of Mgr. Lukáš Čížek, Ph.D. The thesis is based on three papers (two published and one prepared as manuscript) that are accompanied with brief review-like introduction. The thesis focuses mainly spatial distribution of saproxylic beetles. However, other key factors affecting species composition and diversity of saproxylic beetle assemblages are mentioned as well.

Overall, the thesis is well arranged and written with only minimal number of typing errors, etc. Introduction part of the thesis is brief, but it is coherent and logically structured. My only reproach is that the content of the 1st and the 3rd subchapter is partly overlapping and duplicate.

The number of publication the thesis is based on is not high, but the present papers are high-quality ones, considerably contributing to our knowledge of the topic. Moreover, the Ph.D. candidate is the first author in two cases. Therefore, I find the present set of publications to be adequate.

The first two papers (namely, Chapter I: Fine-scale vertical stratification of and guild composition of saproxylic beetles in lowland and montane forests: Similar patterns despite low faunal overlap, and Chapter II: Open-grown trees as key habitats for arthropods in temperate woodlands: the diversity composition and conservation value of associated communities) were already published in prestigious journals and went through peer-review process. Therefore, I consider their repetitive reviewing within the thesis review to be redundant. However, some questions regarding results of these studies are mentioned below in a question part.

The third present paper (namely, Chapter III: Saproxylic beetles in temperate and tropical forests – a comparison of vertical stratification patterns) is in a form of manuscript and were not published yet. The manuscript is well prepared and it undoubtedly brings new interesting

findings about patterns of vertical distribution of saproxylic beetles in different types of forests. Comparison of such different ecosystems as tropical and temperate forests is problematic, but, on my opinion, the authors accomplished this task successfully. However, I put several comments here that might improve the manuscript: i) Mean value or range of values of forest height should be mentioned for each forest type in the Methods for better interpretation of results.; ii) page 91, 1st paragraph: As a period of sampling only period from which samples were used for the study should be mention. The information on whole period of trap exposition regardless the samples were used only from its first half, which is mentioned later, is confusing and redundant.; iii) page 93, 1st paragraph: Dissimilarity of each beetle sample was calculated for 72 samples in the case of tropical forest. Is the number correct? Please, specify meaning of beetle sample.; iv) page 94, 1st paragraph: There should be 9,247 beetle “specimens” instead of “species”.; v) page 102, 1st paragraph: On my opinion, argument that proportional decrease of xylophages can be less pronounced due to differences in changes of overall species richness is wrong.; vi) page 103, 1st paragraph: I suggest to put conclusion into separate subchapter.; viii) page 103, 1st paragraph: The statement: “Such data already exists ...” should be supported by a citation.

Conclusion

On my opinion, the present thesis fulfils all requirements for gaining the Ph.D. degree, thus, I suggest the thesis to be defended.

Questions:

- 1) Chapter I: Are there any differences in vagility and activity of canopy and understorey species in general? How this could influence the results of your study?
- 2) Chapter II: How could the distance of solitary trees to each other or to a forest (i.e. isolation of solitary trees) affect saproxylic organism assemblages on the solitary trees? Was this considered in the study?
- 3) Chapter III: Is absolute height above the ground a good measure to compare stratification of beetle fauna in forests? What if the height of the forests differed significantly? Was this the case of the study?

In Brno, 11. 9. 2017


Jiří Foit