

In summary the PhD thesis of Ondřej Mottl is a significant contribution to several aspects of (tropical) ecology. Two chapters have already been published in international journals and I am positive that chapters 2 and 4 also have the potential for strong publications. The thesis convinces with the broad range of questions asked and the comprehensive sampling, even though this prevented a higher spatial replication. The statistical standards are very high, but forward selection (used in chapters 1-3) may potentially lead to spurious inference, for example in multivariate analyses. Compared to the strengths, the weaknesses are minor. In particular, a better incorporation of ecological theory to deduce the hypothesis and explain the findings would have been good. Congratulations to this excellent thesis.

**Questions:**

**Chapter 1:** How do you explain the dominance by a single species in bamboo nests per stratum?

**Chapter 2:** What is driving the elevation effect, considering that the actual elevation gradient in your plot was very small?

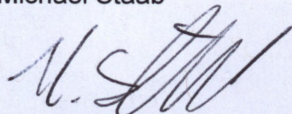
**Chapter 3:** Would you expect different results for leaf litter ants as compared to arboreal ants? If yes, why (or why not)?

**Chapter 4:** Land use was likely different among sites (e.g. managed production forest in CZ vs. natural secondary forest in PNG). Will this affect your conclusions?

Do not hesitate to contact me in case there are questions.

Sincerely,

Dr. Michael Staab





occurring cavities (e.g. in hollow twigs) are smaller than 1 cm. This can also be seen in the data, as small nests had a much higher occupancy rate.

**Chapter 2** is possibly the most comprehensive study on ant mosaics conducted so far, and in my opinion the strongest chapter of the thesis. Here Mr. Mottl clearly demonstrates the existence of ant mosaics in primary lowland forests, which had long been questioned in the literature. The chapter also reveals that individual colony territories can be surprisingly large and identifies a plausible mechanism behind ant mosaics by finding behavioral avoidance of aggressive ant species that is independent of habitat filtering. However, in its current outline, the chapter could benefit from a stronger narrative. The introduction is lengthy and the discussion could be focusing more on the identified mechanisms. Also, the effect of elevation is not explored and a classical temperature (or space)-driven elevation effect is highly unlikely considering the low difference in elevation. In turn, I applaud the exhaustive sampling and the custom-made analytical approach, even though the logic behind the analyses can be made clearer.

**Chapter 3** (published in *Ecosphere*) investigates the influence of secondary succession on arboreal ant communities in montane rain forests. As opposed to findings from lowland rain forests, succession had almost no influence on ant community composition, while ant species richness was higher in primary forest, likely due to the presence of larger trees. I find the results interesting and the explanation via nest site availability and limitation is logical. The strength of this chapter is the detailed data (tree felling) that allow a very fine-grained understanding. Nevertheless, I am left wondering what the results of this rather specialized system and methodological approach can tell us for (tropical) ecology in general.

**Chapter 4** has a wider scope than the other three chapters and incorporates data from the USA and the Czech Republic in addition to data from Papua New Guinea. Mr. Mottl shows that at a local scale the abundance of organisms in one trophic level facilitates the abundance in the next trophic level. I am just not convinced that the chapter shows much more than this. It is a broadly acknowledged pattern that resources in one trophic level allow for the co-occurrence or co-existence of more individuals in a depending trophic level (e.g. plants → herbivores → predators). The segregation argument is in this context not clear to me and appears a bit constructed, at least in the present writing. Considering the relatively low replication (nine plots spread over three sites) I am further skeptical that the latitudinal argument can be made. It is also unclear how the likely different land use between the tropical and temperate sites, which could at least partly explain the results, was accounted for. Nevertheless, I like the idea and approach of this chapter.



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## Review of PhD thesis, Mgr. Ondřej Mottl

The PhD thesis *Spatial structure and community dynamics of arboreal ants in tropical rainforests* by Ondřej Mottl consists of a series of four manuscripts (Chapters 1-4) that are accompanied by a conceptual introduction and a brief synthesizing summary. The thesis focuses mostly on arboreal ants in Papua New Guinean forests. Notably, samples have been collected with more exhaustive sampling methodologies compared to most past and present tropical ant ecology studies, which allows Mr. Mottl to investigate mechanisms on how arboreal ant communities are structured in great detail. This is facilitated by the many different questions addressed and by the use of many complementary state-of-the-art statistical approaches.

The **introduction** gives a sound overview on contemporary tropical ecology and introduces many different aspects in the context of the thesis research. However, I miss a bit a guiding ecological theme (apart from the study taxon and system) that could have been used to structure the introduction. Sometimes central ecological concepts such as “keystone species” and “ecological engineers” are treated too superficial and not always in the appropriate context. Also, the hypotheses and predictions of the research could have been deduced stronger from theory, a weakness that similarly occurs in all chapters. Nevertheless, the aims are clearly formulated and the introduction finely sets the stage for the following topical chapters.

**Chapter 1** (published in *Biotropica*) confirms the pronounced vertical stratification in tropical ant communities that was previously found in many other tropical forests. The novelty of this chapter is that Mr. Mottl demonstrates stronger nest site limitation in the canopy compared to the ground. Also, as it is rightly stressed, the bamboo internode system will be a promising tool for manipulative experiments to translocate entire ant colonies. In my opinion, it would have been good to also use smaller cavity diameters. Many naturally



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**Review of PhD theses of Ondrej Mottl "Spatial structure and community dynamics of arboreal ants in tropical rainforest"**

Understanding major environmental drivers and underlying mechanisms determining organization of communities of organisms is an evergreen question of ecology and PhD thesis of Ondrej Mottl is clearly significant contribution to this effort. The thesis deal with organization of communities of arboreal ants under influence of major ecological drivers such as successional gradient, latitude temperature or forest strata on various spatiotemporal scales. Arboreal ants represent well defined environment which serve as very suitable model to study such principal ecological questions. Author used wide array of methods including manipulation experiment, observation along successional altitudinal or latitudinal gradient. The study use up to data methodologies in data collection and processing. In particular I should highlight that all the papers are based on extremely extensive datasets which were collected in carefully designed extensive field surveys or field manipulation experiments, which were very difficult and demanding to be organized particularly in tropical environment.

This thesis consist from general introduction, two already published papers and two ms in all of which candidate is a first author. This together with detailed description of individual author contribution indicate substantial contribution of candidate to work presented.

I have some comments to introductory and summarizing part of the paper. Introduction provide useful summary to our understanding of arboreal and communities, however I miss subchapter that would introduce more in the arboreal environment as a habitat for ants, what opportunities and challenges this environment brings, how it is structured, how that determine environmental conditions, It would be also nice to mention what is known about changes of this environment about major ecological gradient presented in the thesis. This will be useful not only to better introduce reader to the subject but more importantly it will ultimately prepare ground for more general summary and generalization of major findings presented in this study. Can perhaps candidate bring brief summary of such environmental factors and present them in hierarchical manner in terms of their importance along spatiotemporal scale from local to global factors.

Particularly in overall summary I miss more detailed in depth conclusion and lesson learned from combination of the studies presents, summary in fact represent shorter version summarizing outcome of individual studies rather than synthesis bringing new view of the data described in individual papers. In annotation and future direction there are some broad overall conclusion that species traits and microhabitats are key in scale of individual trees but forest structure and climate are crucial on larger scale. But these ideas in fact deserve substantial elaboration and more detailed presentation, there are many particular question that can be answered such as how the ant traits vary over larger scales, how local and global drivers interact, how climate interact with forest structure etc. Can the candidate present in bit more detail in hierarchical manner major drivers that determine arboreal communities and rank their importance along spatiotemporal scale from local to global factors and made some comments about (potential) interaction between these factors at various spatiotemporal scales.

In chapter one author use innovative approach using artificial nests, founding that smaller nests were used more often than larger nest and the former being more occupied in canopy than and understory than in ground level. From that author conclude that communities is more limited by nesting sites in understory and canopy than in ground layer. I basically agree with that but, cannot also artificial bamboo nest be better proxy for ant nest in canopy than in the ground.

In second paper ants on baits were considered. Many ants however are not able to monopolies baits, do you have some idea about this part of the community

In third paper I found overall results that in secondary succession there is very little changes in community structure extremely interesting. I like explanation it may correspond with species pool namely with number of dominant species which occur in species pool and their traits. This would be worth of more detailed analysis using existing datasets.

In paper four arboreal ant communities along along temperature gradient are formed. This temperature gradient is formed by three temperate sites located along large geographical gradient and six tropical sites located all in PNG in elevation gradient. Do you thing that combination of geographic and latitudinal gradient can affect the results. Or other words if the results may differ if temperature gradient would be constructed by other way.

Another comments to this paper is about temperature itself I assume data used are annual average temperatures, but how these data were collected, they come for climatic stations, or from synoptic stations nearby or these are taken from datalogers in site. It represent average for one year or several years etc. can you please clarify tis. Do you thing that temperature is a major primary driver, or that it affects ant community mainly indirectly by its influence on other factors.

In conclusion I assume PhD thesis of Ondrej Mottl significant contribution to our effort to understood pattern of biological communities and underling drivers that determine them. Candidate clearly show ability to collect tremendous amount of data in systematic and methodically sound way, He also show ability to analyzes and interpret such data and present them in scientific community. Putting that together candidate demonstrate ability for independent scientific work and I have no hesitation to strongly support awarding PhD.

Prof. ing. Mgr Jan Frouz, CSc.