

## Supervisor assessment of Ph.D. thesis by Ondřej Mottl

### *'Spatial structure and community dynamics of arboreal ants in tropical rainforests'.*

Ondřej Mottl is my second phd student, but he started to work with me as his supervisor already during his Masters. He is an enthusiastic, hard-working and motivated person. So much so, that even the sorting of thousands of ants for his Masters, based on already collected material from a New Guinea, and hence representing task without live insects and field work, did not deter him. In the contrary, he had decided to pursue his PhD degree with myself and prof. Vojtěch Novotný. His decision to make his Masters interest on New Guinea montane ants was successful, and I am sure that his journey to PhD degree, where he used tree-dwelling ant ecology as model, will be as well. I was happy to observe the change in Ondřej from an undergraduate student with little experience in community ecology and no experience with large datasets, to an experienced young researcher capable of designing his own databases, connecting large data matrices and running null models on them. He has shown that he can conceive his own projects based on original ideas, realise them in the field, and later draft manuscripts with advanced analyses and models in R. His particular strengths - demonstrated by results of this thesis - are in his ability to conduct extreme field work and sophisticated computer analyses, a rather rare combination among young ecologists.

In total, he spent nine months in the remote rainforests of New Guinea and Cameroon, and an additional few months in temperate forests of U.S.A. and Australia, as well as uncounted months at the microscope and computer screen during his studies. He also spent significant time in discussions and work with his supervisors. Despite this, the thesis took only a bit over four years to complete, making him among our most efficient students. I would say, sometimes he was almost too quick, as it put extra pressure on his supervisor to respond equally quickly to his progress! However, that pressure was definitely worth it and the collaboration between myself and Ondřej has been truly mutualistic, as appropriate for "ant-people". Hence, I am very happy about the past years working with him, and with the final thesis product. Aside from the thesis itself, Ondřej co-created a collaborative lab environment, helping colleagues with analyses and ideas and receiving help from others in return. His optimism along with a healthy pragmatism helped to cheer many students during their work. His presentation skills won him several prizes at University seminars and at student conferences.

The topics presented in the thesis are broad. The main connection line running through the chapters is arboreal ant ecology and studying of the communities in whole forest plots rather than individual trees. Even so, every chapter is quite different in its questions, scope and methods, demonstrating the broad interests and skills of the candidate. The thesis itself consists of **four chapters**, and Ondřej is a leading author on all of them. Two chapters are already published in the good ecological journals.

**In chapter I**, I inspired Ondřej to conduct a pilot experiment with bamboo nests, exposed across different forest strata, and to attempt their translocation. This "side-project", designed together during his stay in PNG forests via our skypes between Nagada field station and Czech Republic, was quite ambitious given the risk of failure (perhaps surprisingly no one has attempted to move ant nests in tropical forests before). Luckily, the idea worked, as a successful publication in *Biotropica* demonstrates. I am especially happy about the fact that the original plan for a smaller methods study has grown in the hands of Ondřej into a broader paper on the effects of nest site limitation and stratification on the ants.

**In Chapter II**, Ondřej decided to conduct another experiment based on his idea to disentangle the topic of "*ant mosaic theory*", i.e. to see, if in New Guinea primary forests are ants spatially non-randomly distributed, and if so, what drives such pattern. The risk of this project was even greater than in the above, as Ondřej did not know in advance if there could be just one or two dominant ant species, or many, when monitoring the largest trees within a 9-ha of forest. I remember that Vojtěch had asked us before the field work, if this topic was an interesting enough and what were our best

expectation. A good worry, as the amount of work was tremendous to achieve the goal: Ondřej with his PNG colleagues had monitored with lines, shot by a catapult, 225 trees with over a thousand baits. Eventually, the data showed very interesting negative co-occurrence patterns that matched behavioural experiments on aggression-levels between species. I think there is now no regret to pay the “risky” research. Furthermore, Ondřej created a novel algorithm for testing the differences in mosaic pattern from random, by shifting whole colony canopy territories in space.

**In Chapter III**, Ondřej demonstrated the effects of various parameters of vegetation that change during secondary succession on canopy ant communities. To our surprise, he found relatively low effects of the succession on montane ant assemblages, which contrasted with many studies of our team and others from lowland forest areas. Despite being the first such work done at the level of ant nests and forest plots in the montane ecosystem, there was a long journey to publish the results due to “insignificant successional impacts”. However, Ondřej did not give up after some failures, and eventually the study was published in *Ecosphere*. Although this chapter built upon the previous Master thesis in Czech, it reanalysed the data using rarefaction modelling, and it is thus a coherent contribution to this thesis.

**Chapter IV** moves from studies on New Guinea ants at local scales to global patterns of ant and other arthropods along a latitudinal gradient. Ondřej explored the question, whether “are insect guilds spatially segregated in tree canopies, or not?” He compiled a large dataset, with help of many colleagues, from our long-term projects, using the tree-felling approach as in the previous chapter, but this time capitalising on insect abundances and the forest plots in Virginia, Czech Republic and PNG. While these data took over a decade to collect, it was enough time for Ondřej to build an interesting manuscript just in his last year of PhD. With a current narrative about insect population decline, we know surprisingly little about natural insect abundances as opposed to species diversity, and this study is an important contribution to the topic.

In summary, in my opinion, Ondřej Mottl has demonstrated in this work the ability to conceive independent research, and is therefore clearly a suitable candidate to defend this thesis, and be awarded his Ph.D.



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