



Bundesforschungs- und Ausbildungszentrum für Wald, Naturgefahren und Landschaft

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Review of the habilitation of Mgr. Ondřej Koukol, Ph.D., title: „Linking biodiversity and ecology of fungi from pine and spruce needles“

The present habilitation thesis summarizes research dedicated to fungi colonizing needles of the conifer genera *Pinus* and *Picea*. The thesis merges, as the author states, results published in 16 papers (added to the habilitation), as well as one monography, which I however miss in the samples added. Main items of the work are the research on biodiversity of fungal endophytes of the two host genera on the one hand and the roles of these fungi on the other.

Generally, work with endophytic fungi requires more sophisticated approaches than studies on pathogenic species, which may explain, why research on this group of fungi is considerably younger than classical pathology. Consequently knowledge on endophytes is generally less advanced showing lacks especially regarding ecology of endophytic species and interactions among species as well as between species and their environment. Furthermore, studies have been limited to few host tree genera leaving many others untreated. The present work is concentrating on those genera, where basic studies have been done already, *Pinus* and *Picea*. The aim was to forge a bridge between knowledge on diversity of fungal species in living needles, over the species in needles in the litter, physiological aspects of decomposition and nutrient transformation up to interactions with other litter organisms. Though the results seem quite heterogenous, according to my opinion the construction of these bridges succeeded for the „ecosystems“ *Pinus* and *Picea*.

In the studies on diversity the author compared the endophytes with those fungi that can be found in the litter. Furthermore, focusing especially on rare and cryptic endophytic species he demonstrated how classical taxonomic concepts separating species based on fungal morphology differ from molecular ones resulting by contrast in different lineages. The third part was dedicated to studies of decomposition by fungi in the litter and the role of particular species in nutrient transformation.

Finally, the forth block of papers represents the attempts to identify the interactions between litter decomposing fungi and other organisms.

As an introduction to the linking of the results of the papers dealing with biodiversity of pine and spruce needle fungi the author gives a short but dense overview on history of mycofloristic research of pines and spruces, which contains main literature references on this subject. In the four biodiversity papers the (still existing) dilemma between classical morphological and molecular taxonomical methods is well demonstrated proving however, that linking the two is still pending. That differences in fungal diversity are probably related (apart from the dilemma stated above) to a few climatic factors (temperature, precipitation, snow coverage) is demonstrated as well. However, I think that there are further studies needed to elucidate these interactions completely. (This can be illustrated by statements as „That may have been caused by the microclimatic conditions or competition with other fungal species“ in the discussion part in Paper II).

Remark: in the habilitation summary, the conclusion on effects of the mountain climate on the biodiversity is referred to paper I. I definitely missed this section in paper I.

In total, the conclusions on the reasons of differences in biodiversity represented in this part are ambitiously supported by numerous citations of similar findings from various studies. When results were lacking for *Pinus* and *Picea*, results of studies on other fungi and/or other hosts were taken. Though the attempts to explain contradictory results are enthusiastic, the whole reflects the still existing uncertainties in distinct principles of the reasons for differences in biodiversity of fungal communities in the needles. However, I am obliged to state, that this opinion derives from my position in practice-related research (which always requires more simple and clear statements!).

Regarding the second and third part (rare and cryptic species/ decomposition and nutrient transformation), I have no comments and remarks. These parts are clear and exhaustively summarizing the findings shown in the papers.

The last part, interactions with other organisms, contrasts to the others, esp. to the first part, by the more limited knowledge in literature. Thus for me this is a very interesting field and should give a rise to more intense research in future!

To summarize, this habilitation thesis represents in my opinion a mirror of a life dedicated to research well apt as a basis for the establishment of a productive research unit.

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