

## Working plan of the research funded by the Visegrad Scholarship Program

Applicant: **Jan Vondrák**

Research topic: **Rare parasitic lichens in alpine habitats as global climate change early indicators: their phylogeny, host specificity and phenotype characters.**

### Brief introduction

"Lichenicolous lichen" is an interesting phenomenon that has been largely investigated since 1950's (e.g. Beck 2000; de los Ríos et al. 2002; Hafellner & Poelt 1980; Poelt 1958, 1962, 1980; Poelt & Doppelbauer 1956; Persoh & Rambold 2002; Rambold & Triebel 1992; Zhurbenko 2008). Lichenicolous growth as an ecological strategy in lichens is often attended by thallus simplification (Poelt 1987) which results in scarcity of phenotypic characters. In this respect, some parasitic lichen species are described by unconvincing ascocarp/ascospore characters and by their specificity to particular hosts.

Relationships between host lichens and their lichenicolous lichens are more frequently formed in extreme than in benign habitats. For instance, Steiner & Poelt (1987) reported three lichenicolous lichens on a single aridicolous, Central Asian species. Arctic and alpine habitats harbour particularly high number of lichenicolous lichens. Many of them are certainly rare; some parasitic lichens described from European and Asian mountains are so far known from one or few sites. Explicit examples are lichenicolous *Caloplaca* species known from Himalaya Mts (Poelt & Hinteregger 1993). Investigation of such rare arctic and alpine lichens is well reasonable in terms of current climatic changes and global warming, as they may become even scarcer and geographically restricted in the future.

In this project, I will focus in taxa of the *Caloplaca epithallina*-like phenotype having strongly reduced thallus and rust-red apothecia. Two species have been so far described; *Caloplaca epithallina* Lyngby and *C. magni-filii* Poelt. Both taxa have arctic-alpine distribution in Europe and the former occurs additionally in continental mountains of the Middle East and western North America. While *C. magni-filii* is considered host specific, growing only on *Miriquidica nigroleprosa* (Vain.) Hertel & Rambold (Poelt 1958), *C. epithallina* is lichenicolous on various hosts (Poelt 1985). According to my experiences, populations of *C. magni-filii* appearance also occur on other hosts, e.g. *Orphniospora moriopsis* (A. Massal.) D. Hawksw. I have also observed that populations of *C. epithallina* from continental areas of the world are obviously less host specific and grow on different host spectra than the alpine populations from Europe.

### Questions to be solved

1. Do the taxa of the *Caloplaca epithallina*-like phenotype form a homogeneous group?
2. Which phylogenetic lineages appear within the group and do they reflect the traditional species concept?
3. How are particular lineages host specific and what are their phenotypic characters?



4. Which lineages are potentially most susceptible to climate changes (rare, geographically and ecologically restricted, strongly host specific, etc.)?

### Brief methodology

Part of the lichen material was collected during excursions to North American mountains and to the Near East. Arctic material will be asked at Scandinavian and Russian colleagues. Material from the Carpathians and the Alps will be collected in 2011. DNA sequence data will be the main tool for solving project questions. Two loci, ITS (e.g. Pengfey et al. 2007; suitably variable on species level in this group) and MCM7 (Schmitt et al. 2009; we expect suitable variability) will be sequenced for molecular analyses. Molecular lab work will be performed at the inviting institution (<http://www.ibot.sav.sk/mollab.htm>), sequencing at the Faculty of Sciences in Bratislava (consortium BITCET).

Lineages revealed by molecular analyses will be phenotypically appraised and their host specificity will be studied. Phenotype characters will be investigated by stereomicroscopy and light microscopy; general methods will be adopted from Vondrák et al. (2009). Secondary metabolite composition as a part of phenotype will be investigated by HPLC chromatography (for details see Søchting 1997). In the last step, we will get together molecular and phenotypic data to make up the new taxonomy of *Caloplaca epithallina*-like taxa.

**Time schedule** (×× - intensive research, × - preliminary or additional work)

	October - December 2011	January - March 2012	April - July 2012
getting together and sorting lichen material	××		
obtaining sequence data	××	×	
Sequence alignment and data analyses		××	×
Morphological and anatomical appraisal	×	××	×
Data synthesis		×	××
Paper preparation			××

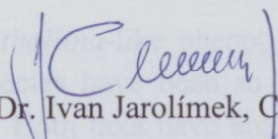
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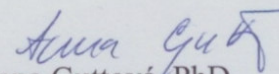


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