4.3 Species composition and diversity of lichens and bryophytes in synanthropic biological soil crust

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INTRODUCTION

This chapter contains the results of repeated investigation of terricolous lichens and bryophytes growing in permanent sampling plots in sedimentation basin Chvaletice and in the area of former military airport Ralsko. The comparison between lichen and bryophyte floras of these localities is provided.

MATERIALS AND METHODS

Terricolous lichens and bryophytes associated with biological soil crusts (growing on soil and plant debris) were investigated in the years 2005–2007 on permanent sampling squares in localities of the Chvaletice sedimentation basin (16 squares grouped in 4 quaternion – CH1A to CH4D) and Ralsko airport (12 squares grouped in 3 quaternion – R1A to R3D). The lichens were determined in the field as well as in the laboratory using routine lichenological methods. Two related taxa *Cladonia rei* and *C. subulata* were not distinguished in this investigation, the designation *Cladonia subulata* s.l. was used. The cover was estimated more accurately only by the species with conspicious thallus (*Cladonia, Peltigera, Placynthiella*, etc.). The bryophytes were determined in the field only due to their low number and no problems with the determination.

For determination of collected specimens of lichens the works of Coppins (1983, 1987), Giralt et al. (1993), Purvis et al. (1992), Tønsberg (1992), Wirth (1995) and other taxonomic publications have been used. The nomenclature of lichens follows Santesson et al. (2004) or respective works included in references. The nomenclature of bryophytes follows Kučera & Váňa (2005). All collected specimens have been deposited in the PL (lichens and bryophytes) and PRC (bryophytes).

RESULTS AND DISCUSSION

A total of 24 lichen taxa were recorded in sampling squares in two investigated localities (Table 4.3.1). Comparing the species richness of both the localities, Ralsko has obviously less taxa than Chvaletice (22/40), however, in sampling sites similar number of species were found (16/13). (The number of lichens observed in 12 sampling squares in

Table 4.3.1 The list of species recorded in sampling square
during the years 2005–2007: Abb the abbreviations of specie
names, 1 – Chvaletice sedimentation basins, 2 – Ralsko airport.

	Abb.	1	2	
lichens				
Bacidina sp.	Bacsp	+		
Cetraria aculeata	Cetac		+	
Cladonia cervicornis	Clcer		+	
Cladonia chlorophaea	Clchl	+	+	
Cladonia coccifera	Clcoc	+	+	
Cladonia coniocraea	Clcon	+		
Cladonia furcata	Clfur		+	
Cladonia gracilis	Clgrac		+	
Cladonia macilenta	Clmac	+	+	
Cladonia pyxidata	СІрух		+	
Cladonia ramulosa	Clram		+	
Cladonia subulata s.l.	Clsub s.l.	+	+	
Diploschistes muscorum	Dimus	+		
Micarea denigrata	Mic sp	+		
Micarea sp.	Micden	+		
Peltigera didactyla	Pedid	+		
Placynthiella dasaea	Pldas		+	
Placynthiella icmalea	Plicm		+	
Placynthiella oligotropha	Ploli		+	
Placynthiella uliginosa	Pluli		+	
Thelocarpon sp.	Thesp	+		
Thrombium epigaeum	Threp	+		
Trapeliopsis granulosa	Trgra		+	
Vezdaea acicularis	Vezac	+	+	
bryophytes				
Cephaloziella divaricata	Cediv		+	
Cephaloziella hampeana	Ceham	+		
Ceratodon purpureus	Cerpur	+		
Polytrichum juniperinum	Pojun		+	
Polytrichum piliferum	Popil		+	

Ralsko represents 69,5% of total lichen flora in the locality, however, in the Chvaletice sedimentation basin it is only 32.5% for 16 squares. Simultaneously, 9 species (from 16) were found in more then 75% of investigated squares in Ral-

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Fig. 4.3.1 CCA ordination diagram showing the relationship among species and localities (black square, C – Chvaletice, R – Ralsko; triangle, italic – lichens; black circle, bold italic – bryophytes; the abbreviations of species names are included in Table 4.3.1).

sko, however, only 4 species (from 13) in Chvaletice. These divergences are probably related to the differences in character of each locality. The Chvaletice sedimentation basin is a larger and more diversified area compared with the smaller and relatively homogenous area in Ralsko (in Chvaletice, there occur more types of small-scale areas of different substrates and microclima).

The species diversity of bryophytes on permanent sampling squares – compared with lichens – is distinctly lower: only 3 bryophytes have been collected in Ralsko (2 mosses and 1 liverwort) and 2 bryophytes in Chvaletice (1 moss and 1 liverwort). Range of cover was very wide: between 0–90%!

Species composition of lichen and bryophyte flora in both the localities distinctly differed at first sight. This observation was confirmed by the CCA analysis, which significantly differentiated both localities on the basis of both floras (p-value 0.002, Fig. 4.3.1).

The same sampling sites were investigated over three years (2005–2007) as was any change in species composition. The CCA analysis shows the distinct changes of species composition during the three years (with localities and effect of disturbance using as covariates: for lichens only p-value = 0.032, for bryophytes only p = 0.004, for lichens and bryophytes together p = 0.012). However, these changes are not related with the disturbance experiment done in 2005 in half the sampling squares (the CCA analysis did not confirm the effect of disturbance, p-value = 0.73). We did not observe any other influence except executed disturbance in sampling sites, which could induce the changes in species composition. Thus, the community of pioneer species occurring in both localities is evidently able to change itselfs relative quickly (during 2 years). Probably the changes could be influenced by a variety of environmental factors, headed by climatical differences over separate years (e.g., increase of microlichens in more humid years). The ability of lichens and bryophytes to form on mechanically disturbed squares analogous with communities on natural squares over a relatively short time shows a very strong effort to regenerate from rests of thalluses as well as capabillity to spread from surroundings, especially by vegetative way.

CONCLUSIONS

Lichen and bryophyte communities forming biological soil crusts were investigated in sampling squares delimited in the Chvaletice sedimentation basin and the former military airport near Ralsko. The lichen and bryophyte flora distinctly differ between the two localities. The sandy area near the runway in Ralsko airport was detected more homogenous in term of lichen species composition than the Chvaletice basin – in sampling squares (in total 12 m²) was found almost 70% of total lichen flora in locality comparing with 32.5% in Chvaletice. This phenomenon is probably related with higher substrate and microclimatical diversity in the Chvaletice sedimentation basin. We observed distinct changes of species composition in the sampling sites during three years, which show the ability of pioneer cryptogamic community to change itself relatively fast without any apparent change of conditions in the habitat.