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A PROJECT ON DISTRIBUTION CHANGES OF LICHENS IN THE CZECH REPUBLIC

Ein Projekt zur Erfassung der Veränderungen der Verbreitung von Flechten in der Tschechischen Republik

by

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Key words: Air pollution, Central Europe, distribution changes, Czech Republic, grid mapping, lichens.

Schlagwörter: Flechten, Luftverunreinigung, Mitteleuropa, Raster-Kartierung, Tschechische Republik, Änderungen der Verbreitung.

Summary: Lichen flora in Central Europe is rapidly changing. However, these distribution changes can be only roughly estimated. A project on comparison of previous distribution of selected lichen species with present data was recently initiated in the Czech Republic. Reconstruction of previous distribution was made using revision of herbaria collections and published data. Distribution changes in selected lichens (species of primaeval forests, species of peat-bogs, species of earlier succession stages, species of mossy boulders) in the Czech Republic are presented and discussed. Some species *(Lobaria scrobiculata, Peltigera leucophlebia, P. venosa)* are missing in the Czech Republic at present, other studied species are rare or vulnerable and they are mostly restricted to the area of the Šumava Mts. Effects of detrimental factors (air pollution, changes in forestry, habitat destruction, agriculture etc.) are discussed.

Zusammenfassung: Die Flechtenflora von Mitteleuropa ändert sich sehr schnell. Diese Änderungen in der Verbreitung kann man jedoch nur sehr grob bestimmen. In der Tschechischen Republik wurde vor kurzer Zeit mit einem Projekt angefangen, das sich mit dem Vergleich der früheren und der heuitigen Verbreitung der ausgewählten Flechtenarten beschäftigt. Die Rekonstruktion der historischen Verbreitung wird aufgrund der Revision der Herbariumbelege und der publizierten Daten reali-

siert. Die Veränderungen in der Verbreitung der ausgewählten Arten (Arten der Urwälder, der Moore, der früheren Sukzession-Stadien, an den moosigen Felsblökken) werden vorgestellt und diskutiert. Einige Arten *(Lobaria scrobiculata, Peltigera leucophlebia, P. venosa)* befinden sich zur Zeit in der Tschechischen Republik im Rückgang, andere Arten sind selten oder bedroht. Die Verbreitung dieser Arten wurde meistens auf das Gebiet des Böhmerwaldes reduziert. Weiter werden die Stress-Faktoren (die Immission, die Veränderungen im Forstwirtschaft, die Vernichtung der Biotope, die Landwirtschaft usw.) diskutiert.

Introduction

Central Europe is a heavily polluted area. Lichens are very susceptible organisms and the lichen flora is rapidly changing (FERRY et al. 1973). Besides air pollution (and environmental acidification as a non direct effect) also changes in forestry (disappearance of old trees, canopy thinning, extensive tree-cutting, monocultural forests inreasing, reduced wood decay, use of heavy machines etc.), agriculture (e.g. use of fertilizers and pesticides), landscape planning (vanishing of biocorridors, e.g. old alleys), tourism (easy access to formerly distant and difficultly accessible localities, trampling, eutrophication of pathways and streams) and destruction of habitats (old solitary trees and alleys, old forest structures, old ore mine slag heaps) are important.

Changes in lichen flora composition and biodiversity are usually summarized in Red lists of threatened lichens which have been published or are in preparation in many countries (CIESLINSKI et al. 1992, CLERC et al. 1992, PIŠÚT 1993, SERUSIAUX 1989, TÜRK & WITTMANN 1986, WIRTH et al. 1996). However, a good knowledge of lichenflora is a prerequisite for these publications. Changes in the Czech Republic lichen flora can be only rougly estimated. The main reason for this (similarly as in other countries) is a temporarily and regionaly uneven lichen survey of this territory. The most intensive lichenofloristical research in the Czech Republic was carried out during the first decades of 20th century, mainly due to activities of KOVÁŘ, ANDERS, HILITZER, KUŤÁK, SUZA, SERVÍT and others. During the second half of this century lichenologists were either interested in taxonomy of various lichen groups (ČERNOHORSKÝ, NÁDVORNÍK) or they focused their interest on territory of Slovakia (VĚZDA, PIŠÚT). Therefore recent data about lichen distribution in the Czech Republic are relatively sparse (LIŠKA 1992). Unfortunately, the last four decades are the period of remarkable environmental changes and lichens disappearance.

Distribution changes in lichens were evaluated in recently published Red Data Book of threatened lichens (LIŠKA & PIŠÚT 1995). However, these results were mainly based on the literary sources. Therefore, more detailed studies (revisions of herbaria, revisions of old localities, intensive field investigation of insufficiently known areas) are necessary. A long term project on evaluation of distribution changes of selected lichen species in the Czech Republic has been initiated (LIŠKA et al., 1997).

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protected areas mainly in border mountains of southern Bohemia. Intensive field research in these localities revealed several species considered as vanished the Czech Republic (in some cases these species were not recently recorded even on the German side of the Šumava Mountains).

Many lichens belong among sensitive and vanishing species in most of European countries (e.g. *Lobaria* sp. div., *Nephroma* sp. div., *Menegazzia terebrata* - cf. WIRTH et al. 1996). In the Czech Republic, several species are missing (or vanished?): *L. scrobiculata* (Fig. 1), *Usnea longissima* (unpublished data), other are found on few isolated relict localities with low chance of long term survival (*L. amplissima* - cf. LIŠKA et al., 1997, *Lopadium disciforme,* unpublished data, *N. bellum* and *N. resupinatum* both cf. LIŠKA et al., 1997, *Ramalina thrausta* - Fig. 2, *Peltigera collina* - Fig. 3). Some inconspicuous species were probably overlooked in past as well as at present, and therefore they are presumably undercollected (*Lopadium disciforme, Pachyphiale fagicola).* Other threatened but immediately not vanishing species are still scattered in the Šumava Mountains (*Alectoria sarmentosa* - Fig. 4, *Evernia divaricata, L. pulmonaria, N. parile* - all cf. LIŠKA et al., 1997). Presence of species of various sensitivity corresponds with degree of forest damage. A good fit has been demonstrated for Lobaria pulmonaria (cf. LIŠKA & PIŠÚT 1990).

Peat-bogs belong among other important and threatened biotopes. We can find lichen species of boreal forests there, including some species regarded as glacial relics. Although these lichens are acidophilous, they are clearly damaged by air pollution and quickly vanishing. *Cetraria sepincola* was formerly rather frequent and abundant species in peat-bogs as well as in subalpine zone (on branches of *Pinus mugo*). At present, it is quite rare and vanished in many areas (cf. LIŠKA et al., 1997). Impact of nitrogen emissions as well as effect of sulphur dioxide are the main reasons for this damage. At present, *Cladonia botrytes* has been found only at one locality, but formerly it was distributed sparsely in other areas of the Czech Republic (Fig. 5). Changes in forestry might be another cause of their decline.

Presence of other lichen species does not directly depend on a higher plant community; microclimatic factors are usually more important. The two studied species were formerly widely distributed (*Peltigera aphthosa* - Fig. 6, *P. leucophlebia* - Fig. 7). The distribution patterns of this species on the area of the Czech Republic are very different. *P. aphthosa* was scattered accross the whole Czech Republic, whereas *P. leucophlebia* was confined to territories with sub-neutral to basic substrata. At present, *P. aphthosa* is known in 3 localities in the Šumava Mountains, whereas *P. leucophlebia* is a missing species. In the Czech Republic, altogether 3 species of *Peltigera* with *Coccomyxa* as a main photobiont and *Nostoc* as a secondary photobiont were recorded. Nitrogen rich immissions together with acid rain (=low pH in combinaton with effect of ammonium) can be detrimental for these species and it could explain their decline (HALLINGBÄCK

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Some species are unable to compete with other plants and therefore they are confined to early succesional stages *(Baeomyces placophyllus, Peltigera lepidophora* - both unpublished data, *P. venosa* - Fig. 8). So, their occurrence can vary in time. There are sensitive and vanishing species in this group too - e.g. *P. venosa.* Although it was rather common species, at present it is missing in the Czech Republic.

High sensitivity of some species can be caused by their presence near the edge of their areal. It concerns mostly oceanic or suboceanic species (e.g. *Baeomyces placophyllus, Lobaria* sp. div., *Nephroma* sp. div., *Peltigera collina)* as well as boreal species *(Cladonia botrytes).*

Conclusions

Distribution changes of lichens in the Czech Republic are profound, involving species of various ecological requirements. Causes of studied lichens decline include e.g. air pollution and environment acidification, eutrophication, modern forestry, habitat destruction etc. Some species (e.g. *Lobaria scrobiculata, Peltigera leucophlebia, P. venosa)* are missing or may be vanished in the Czech Republic. Present records of many species often represent a few isolated localities or individual thalli only. These species have lost their ability to colonize new substrata, therefore the persistence of their substratum (i.e. old tree) is a limiting factor for their survival. That is why many species are in danger of becoming extinct (e.g. *Ramalina thrausta, Lobaria amplissima).* The Šumava Mts. represent the last refuge for many lichen species in the Czech Republic; several species considered to be vanished have been refound there (e.g. *Lobaria amplissima, Peltigera aphthosa, Ramalina thrausta).*

References

CIESLINSKI, S. et al. (1992): Czerwona lista porostów zagrozonych w Polsce. Red list of threatened lichenized fungi in Poland. - In: ZARZYCKI, K. et al.: Lista roslin zagrozonych w Polsce (wyd. 2), Kraków: 57-74.

CLERC, P. et al. (1992): Liste rouge des macrolichens de la Suisse. - Bot. Helv. **102**: 71-83.

FERRY B.W., BADDELEY M. S. & D. L. HAWKSWORTH, Eds. (1973): Air pollution and lichens. - Athlone Press of the University of London.

HALLINGBÄCK, T. & O. KELLNER (1992): Effects of simulated nitrogen rich and acid rain on the nitrogen-fixing lichen *Peltigera aphthosa* (L.) Willd. - New Phytol. **120**: 99-103.

HÉNIKOVÁ, S. ed. (1995): Životní prostředí České republiky. - Ročenka 1995. Ministerstvo životního prostředí, Praha.

LIŠKA, J. (1992): Two hundred years of lichenology in Czechoslovakia. - Bryonora **9**: 20-25.

LIŠKA, J., DĚTINSKÝ, R. & Z. PALICE (1997): Importance of the Šumava Mountains for the biodiversity of lichens in the Czech Republic. - Silva Gabreta **1**: 71-82.

LIŠKA, J. & I. PIŠÚT (1990): Verbreitung der Flechte *Lobaria pulmonaria* (L.) HOFFM. in der Tschechoslowakei. - Biológia **45**: 23-30. Bratislava.

LIŠKA, J. & I. PIŠÚT (1995): Lišajníky. - In: KOTLABA, F. (ed.): Červená kniha ohrozených a vzácnych druhov rastlín a živočíchov SR a ČR 4 (Sinice a riasy, huby, lišajniky, machorasty). - Príroda, Bratislava: 120-156.

MOLDAN, B., ed. (1990): Životní prostředí České republiky. - Academia, Praha.

PIŠÚT, I. (1993): List of extinct, missing and threatened lichens in Slovakia - the second draft. - Biológia **48**: 19-26. Bratislava.

SERUSIAUX, E. (1989): Liste rouge de macrolichens dans la Communaute Europeenne. - Centre de Recherches sur les Lichens, Département de Botanique, Liege.

TÜRK, R. & H. WITTMANN (1986): Flechten (Lichenes) Österreichs. - In: NIKLFELD, H. et al.: Rote Listen gefährdeter Pflanzen Österreichs. - Wien: 164-176.

WIRTH, V. & H. OBERHOLLENZER eds. (1990): Lichen mapping in Europe. - Stuttgart. Beitr. Naturk., Ser. A, **456**: 1-199.

WIRTH, V., et al. (1996): Rote Liste der Flechten (Lichenes) der Bundesrepublik Deutschland. - Schr.-R. f. Vegetationskde. **28**: 307-36.

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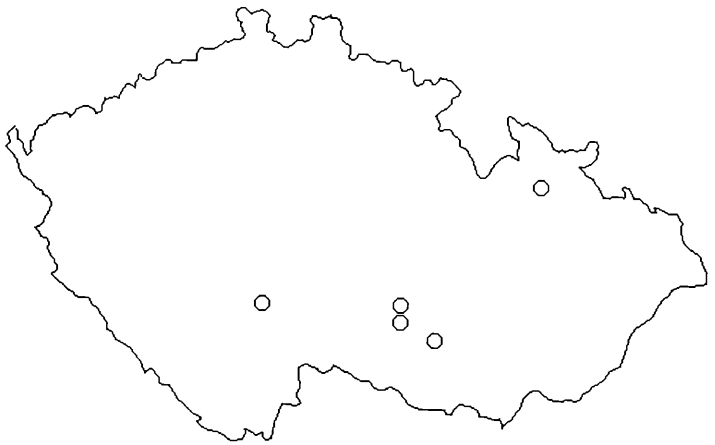


Fig. 1: Changes in the distribution of *Lobaria scrobiculata* in the Czech Republic.

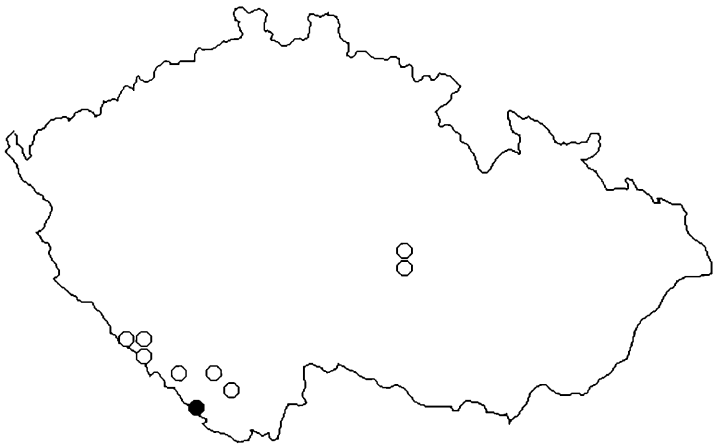


Fig. 2: Changes in the distribution of *Ramalina thrausta* in the Czech Republic.

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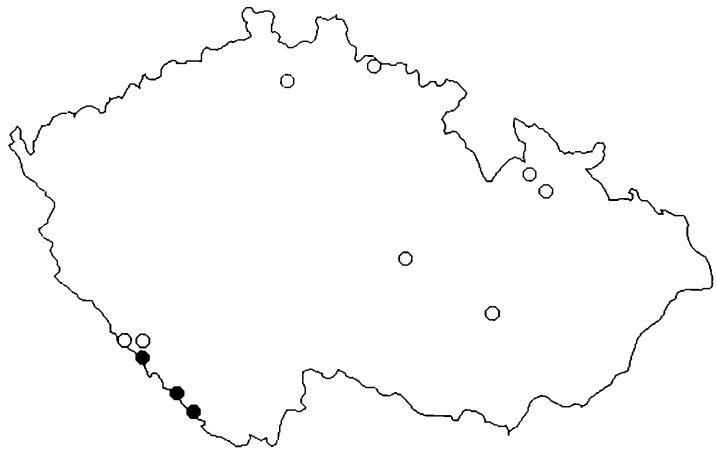


Fig. 3: Changes in the distribution of *Peltigera collina* in the Czech Republic.

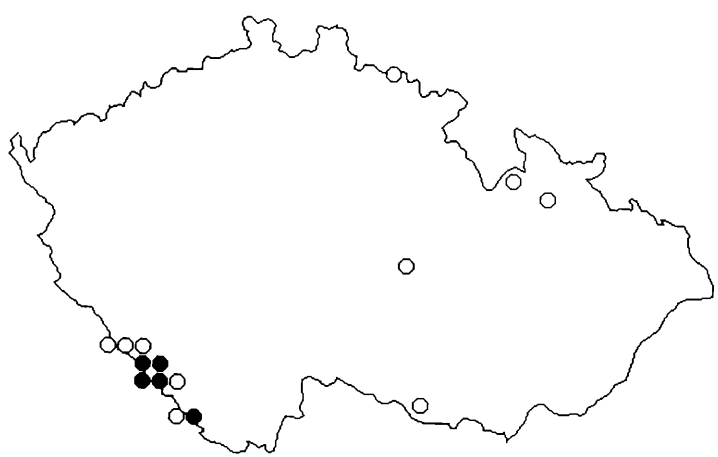


Fig. 4: Changes in the distribution of *Alectoria sarmentosa* in the Czech Republic.

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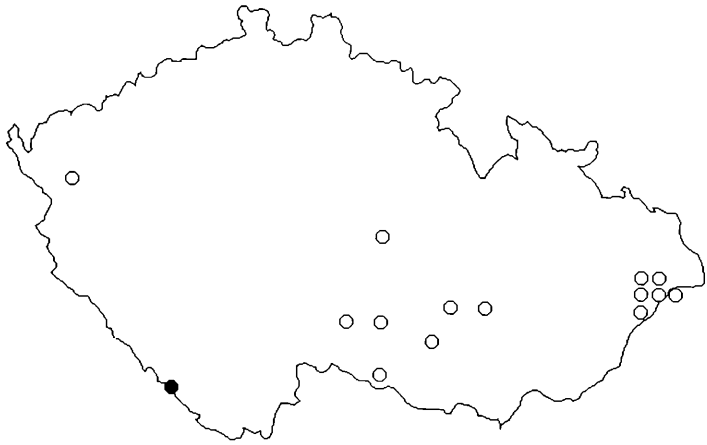


Fig. 5: Changes in the distribution of *Cladonia botrytes* in the Czech Republic.

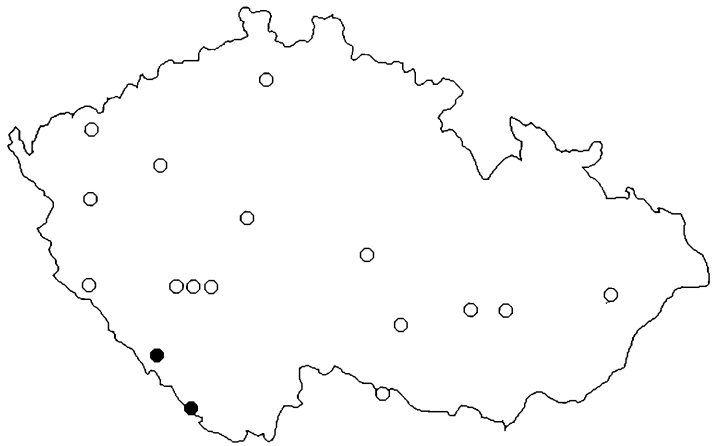


Fig. 6: Changes in the distribution of *Peltigera aphthosa* in the Czech Republic.

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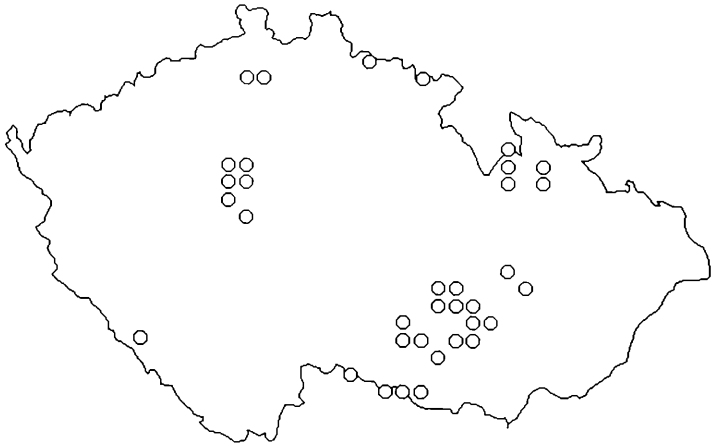


Fig. 7: Changes in the distribution of *Peltigera leucophlebia* in the Czech Republic.

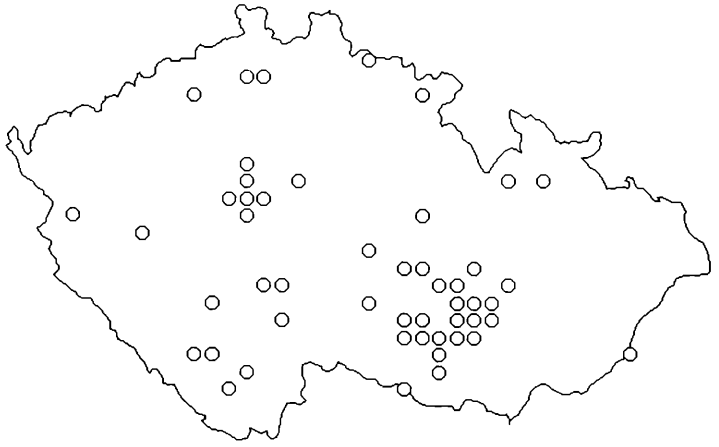


Fig. 8: Changes in the distribution of *Peltigera venosa* in the Czech Republic.

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