Stuttgarter Beitr. Naturk.	Ser. A	Nr. 456	59–65	Stuttgart, 31. 12. 1990

Lichen Mapping in the Budapest Agglomeration Area (Hungary)

By Edit Farkas, Vácrátót

With 5 figures

1. Introduction

During the last years several lichen atlases of various areas of Europe, mainly from England, Austria, Germany and Poland have been issued (Seaward & Hitch 1982, Türk & Wittmann 1984, Wirth 1987, Cieśliński & Tobolewski 1988). Also valuable papers have been published from other countries of Europe (e. g. Czechoslovakia, France, Spain, The Netherlands). Yet in Hungary just a few papers have been published dealing with this topic; especially air pollution lichen maps were prepared.

At first the lichen map of Debrecen, East Hungary, was prepared by Felföldy (1942). Only ten years ago Gallé (1979) published the lichen map of Szeged, South Hungary, in his last paper before his death. Actually Sernander's (1926) zones were established in both of these cities in the countryside of Hungary.

2. Lichen mapping in Budapest

Our lichen mapping studies were started in Budapest in 1979 (Farkas 1982; Verseghy & Farkas 1984; Farkas et al. 1985). More than 1000 specimens have been collected from 55 sites in Budapest by L. Lökös and the author. The specimens were identified by our tutor, Dr. K. Verseghy.

Four zones of lichen distribution were recognized on the basis of epiphytic lichens. Species occurring in an inner zone are also present in all outer zones (Fig. 1).

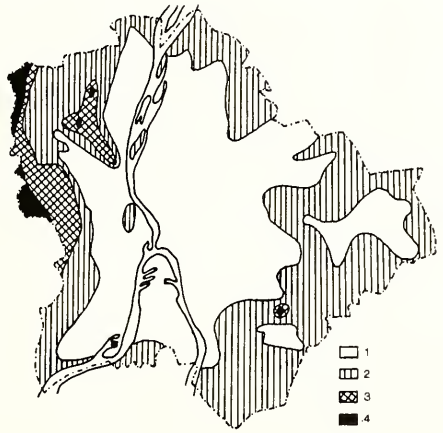
Zone 1: Desert zone

The built-up area of Budapest is in fact a lichen desert without any epiphytic lichens. The boundary of this zone corresponds approximately to the boundary of built-up areas. There was only a small portion of the built-up area, northern Buda, in which lichens were found. Recently we could find some small thalli of *Lecanora hagenii* and *Scoliciosporum chlorococcum* in this zone.

Zones 2 and 3: Struggle zones

Two struggle zones are situated in the outer areas of Budapest. Lichens are present but only a few characteristic species occur. The most resistant crustose epiphytic lichen species, *Scoliciosporum chlorococcum, Lecanora conizaeoides, L. varia* and *Buellia punctata* are recorded in both struggle zones. We found only little thalli (1–2 cm^2) of the foliose lichens, *Hypogymnia physodes* and *Parmelia sulcata*.

We established an inner and an outer struggle zone on the basis of the occurrence of various *Lecanora* species.



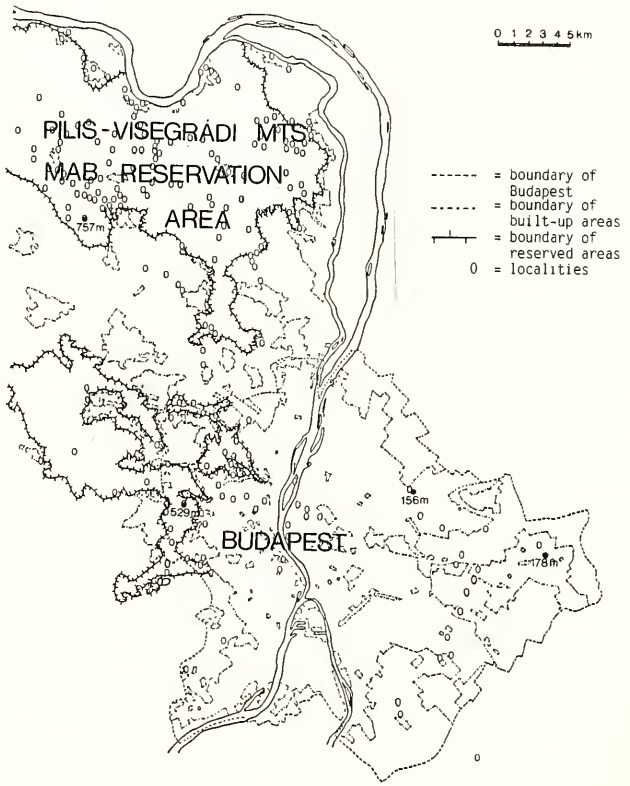


Fig. 1. (left) The air pollution zones of Budapest established on the basis of epiphytic lichen distribution. – *1* = desert zone, *2* = inner struggle zone, *3* = outer struggle zone, *4* = normal zone (Farkas 1982).

Fig. 2. (right) The investigated area of the Budapest agglomeration.

Zone 4: Normal zone

This is the zone where a more or less natural lichen flora is found. Its area is restricted to a small part of Buda near the western boundary of Budapest. The boundary of the normal zone is determined by the presence of *Parmelia glabratula*.

The most frequent epilithic species of Budapest are *Lecanora muralis, L. dispersa* and *Candelariella vitellina*.

3. Lichen mapping in the Pilis and Visegrádi Mountains

In 1982 research was continued in the Pilis and Visegrádi Mts. NW of Budapest where also a MAB reservation area was established by UNESCO in 1981 (Farkas 1988, 1990, in prep.; Farkas & Lökös in prep.; Farkas & Pátkai in press). It is a typical area of the temperate zone forests covered mainly by *Quercus, Carpinus* and *Fagus* forests. Quercetum petraeae-cerris and Querco petraeae-Carpinetum are zonal vegetation types. The various types of Fagetum occur only extrazonally on northern and north-eastern steep slopes. This woodland is not far from our capital and frequently visited by tourists (Fig. 2).

The area consists of a south-western calcareous rocky part, geologically belonging to the Transdanubian Mts. and a north-eastern siliceous rocky part belonging to the Northern Mts. It mainly consists of andesite and andesitic tuffs. The highest point, the peak Pilis (757 m.s.m.) can be found in the calcareous area.

Until 1988 we had visited 148 localities of the Pilis and Visegrádi Mts. where we collected almost 2000 specimens. We identified and mapped 214 lichen species from various substrata. L. Lökös (Budapest) identified the majority of the *Cladonia, Parmelia* and *Physcia* species. Dr. A. Vězda (Brno) revised our identifications and helped with the most difficult taxa.

Thirteen species are new to Hungary: *Acrocordia cavata* (Ach.) Harris, *Arthopyrenia saxicola* Massal., *Aspicilia excavata* Thor & Timdal (Thor 1988), *Bacidia subincompta* (Nyl.) Arnold, *Biatorella ochrophora* (Nyl.) Arnold, *Caloplaca inconnexa* (Nyl.) Zahlbr., *Cliostomum corrugatum* (Ach.) Fr., *Lecidella timidula* (Th. Fr. & Almq. ex Th. Fr.) R. Sant. comb. inval., *Micarea lithinella* (Nyl.) Hedl., *Rinodina calcarea* (Arnold) Arnold, *R. confragosa* (Ach.) Koerber, *Sarcogyne privigna* (Ach.) Massal., *Strangospora pinicola* (Massal.) Koerber.

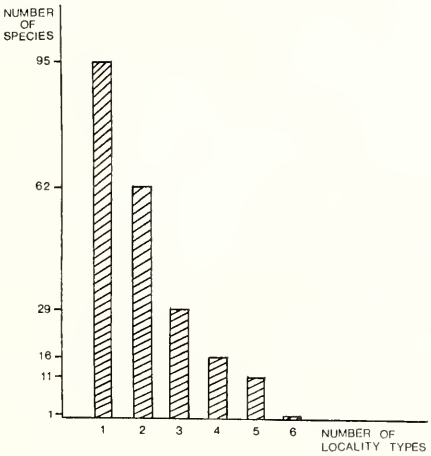
The most frequent species (number of localities in parentheses) are *Lecanora conizaeoides* (120), *Hypogymnia physodes* (98), *Scoliciosporum chlorococcum* (93), *Buellia punctata* (77), *Parmelia sulcata* (70), *P. glabratula* (64).

On the distribution maps we indicated 6 locality types by different marks (see Fig. 4).

One species, *Scoliciosporum chlorococcum*, was collected in all the six locality types (Fig. 3). Eleven species (*Buellia punctata, Candelariella vitellina, Cladonia coniocraea, C. fimbriata, Hypogymnia physodes, Lecanora conizaeoides, L. hagenii, L. muralis, Lepraria incana, Parmelia glabratula, P. sulcata*) were found in five different locality types. The distribution maps provide a bioindication of air pollution. An example is the distribution map of *Lecanora conizaeoides* (Fig. 4).

4. Possibilities of lichen mapping in Hungary

The lichen floristic data collected for air pollution mapping of the Budapest agglomeration area and the MAB reservation area form a good basis to start grid mapping



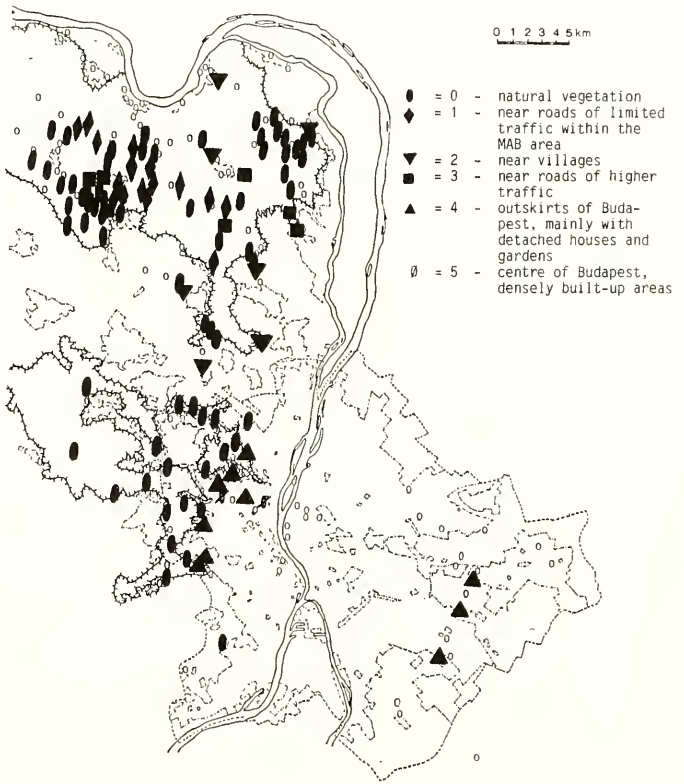


Fig. 3. (left) The correlation between the number of species and the number of locality types.
Fig. 4. (right) The distribution map of *Lecanora conizaeoides* in Budapest, in the Pilis and Visegrádi Mountains.

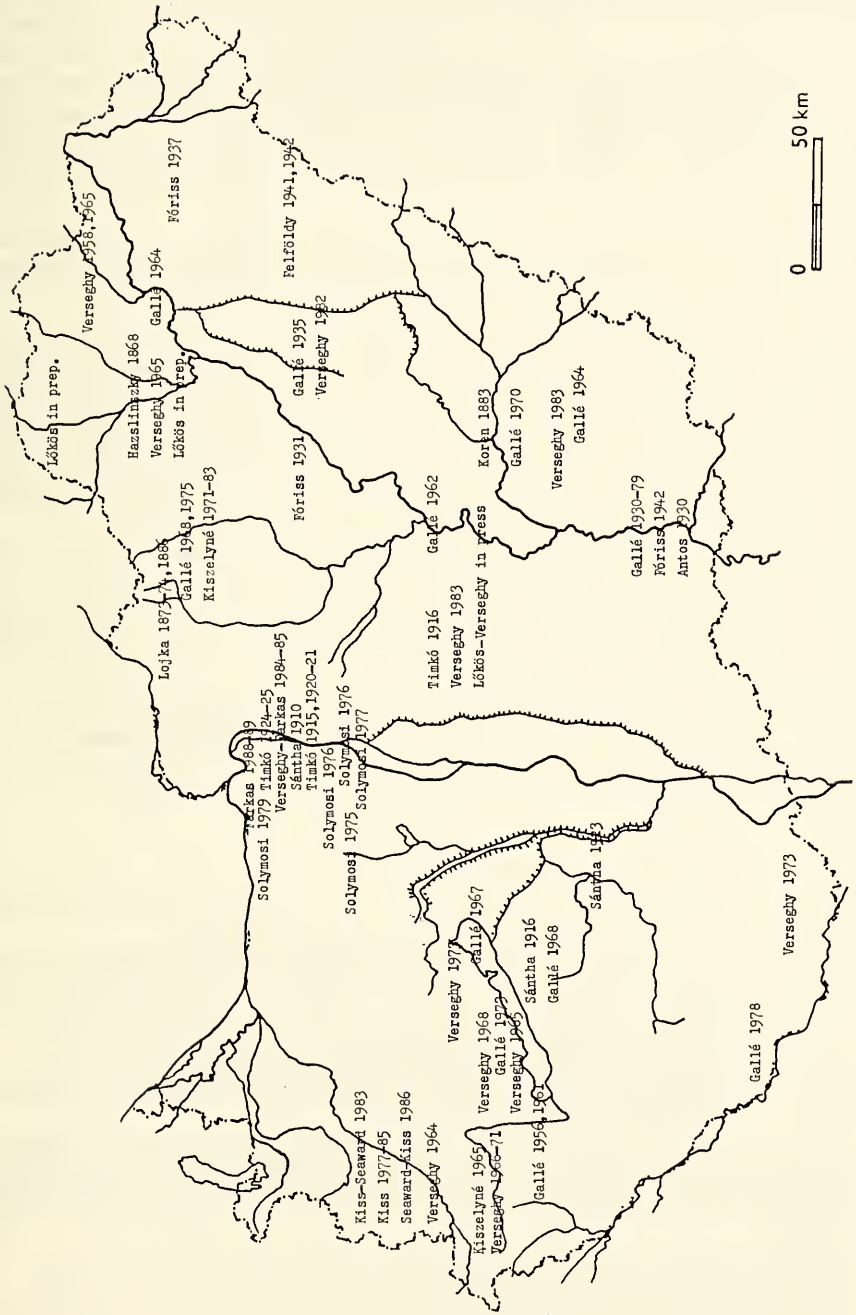


Fig. 5. Areas in Hungary studied in lichenological papers.

of the recent Hungarian lichen flora. Beyond these data, there are quite a few lichenological papers of the last c. 100 years on floristic data of smaller or larger areas of Hungary. They were published by the following authors: K. Antos, Á. Boros, F. Fóriss, L. Gallé, V. Gyelnik, F. Hazslinszky, T. Kiss, A. Kiszelyné, I. Koren, A. Pokorny, L. Sántha, P. Solymosi, Ö. Szatala, Gy. Timkó and K. Verseghy. The place here is not sufficient to present all of their publications, but references on Fig. 5 indicate the areas from which floristic papers have been published. In case of some papers (e. g. Gyelnik 1926, 1928; Szatala 1925–30) listing data from very different sites throughout the country, it was impossible to place them on the map.

Recently Verseghy (in press) has prepared the "Handbook of the Hungarian Lichen Flora" which contains also distribution data of the appr. 700 species including mainly the data of the Lichen Herbarium at BP.

Research of the Hungarian Natural History Museum (Budapest) has concentrated on the fauna and flora of the National Parks since 1972. Lichen floristic data of Hortobágy Nat. Park. were published by Verseghy (1982). Lökös and Verseghy just recently have prepared the manuscript on the lichen flora of Kiskunság N. P. using also the grid reference numbers of the system of the Central European Flora project (Niklfeld 1971). Similar papers are in preparation on the flora of Bükk N. P. and Aggtelek N. P. completed by the recent collections (Lökös in prep.).

There are different programs for mapping the Hungarian vascular flora (Borhidi 1984): The mapping grids of the Flora Europaea System using 52 basic squares of 50 km x 50 km and that of the Central European Flora project using 735 basic grids of about 10 km x 11 km. There is quite a good coincidence between the two grid systems (see Fig. 1 in Borhidi 1984).

The available data could enable us to begin with grid mapping of the Hungarian lichen flora. Since the increasing level of air pollution has a large influence on the lichens, the field work for mapping should be carried out before the sensitive species have entirely disappeared.

5. Literature

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Author's address:
EDIT FARKAS, Institute of Ecology and Botany of the Hungarian Academy of Sciences, Vácrátót, H-2163, Hungary.