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# Macromycetes of the *Stellario-Carpinetum* in the Ińsko Landscape Park (NW Poland) – monitoring studies

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The results of three years' mycological observations, a part of the Czech-Italian-Polish joint project "Mycological monitoring in European oak forests" (P e r i n i, Ł a w r y n o w i c z and F e l l n e r 1995), are presented in the paper.

The Ińsko Landscape Park is the most northerly situated locality investigated in this project. The macrofungi were studied in the *Stellario-Carpinetum* association on two plots (1000 $m^2$ each): I – with *Quercus petraea* and II – with *Qu. robur*. The collection of 229 species (157 saprotrophes and 72 mycorrhizal ones) is the subject of ecological analysis. Among the collected fungi 9 species associated with oak were distinguished as well as 12 threatened species and 1 species new to Poland.

**Key words:** macromycetes, mycological monitoring, oak forests, *Stellario-Carpinetum*.

## INTRODUCTION

Oak forests form one of the Europe's major ecosystems. The present use of these forests as well as their character varies greatly between different parts of the continent. For the last two decades the decline of oak tree-stands has been observed in many countries. It has been also observed in the case of *Quercus robur* and *Qu. petraea*, the forest trees commonly occurring in Poland. Some efforts have been made to elucidate this problem. The oak decline in Poland was initiated primarily by the moisture stress that resulted first from excessive and then insufficient precipitation in the years 1981 and 1982. Prolonged droughts in the vegetative seasons in 1982 and 1983 were also of great importance. Stressed oaks were attacked by fungi, which are considered to be a secondary factor in the mortality of some trees' organs (P r z y b y ł 1995).

On the other hand oak trees are obligatorily ectomycorrhizal. A rapid decrease in ectomycorrhizal fungi and many other macromycetes has become a well-known phenomenon in some parts of Europe for the last years. It can be attributed to the direct and indirect effects of air pollution. It seems that many ectomycorrhizal fungi are very sensitive bioindicators of the disturbance of the forest ectotrophic stability (F e l l n e r 1993).

Mycological studies presented in this paper, being the part of the international programme "Mycological monitoring in European oak forests", were carried out in the forest association *Stellario-Carpinetum* preserved in the Ińsko Landscape Park.

## STUDY AREA

The Ińsko Landscape Park (Fig. 1) was founded in 1981 on the area of 17763 ha to protect the vegetation of natural character, clean water lakes and hilly landscape (J a s n o w s k i and Ć w i k l i ń s k i 1977).

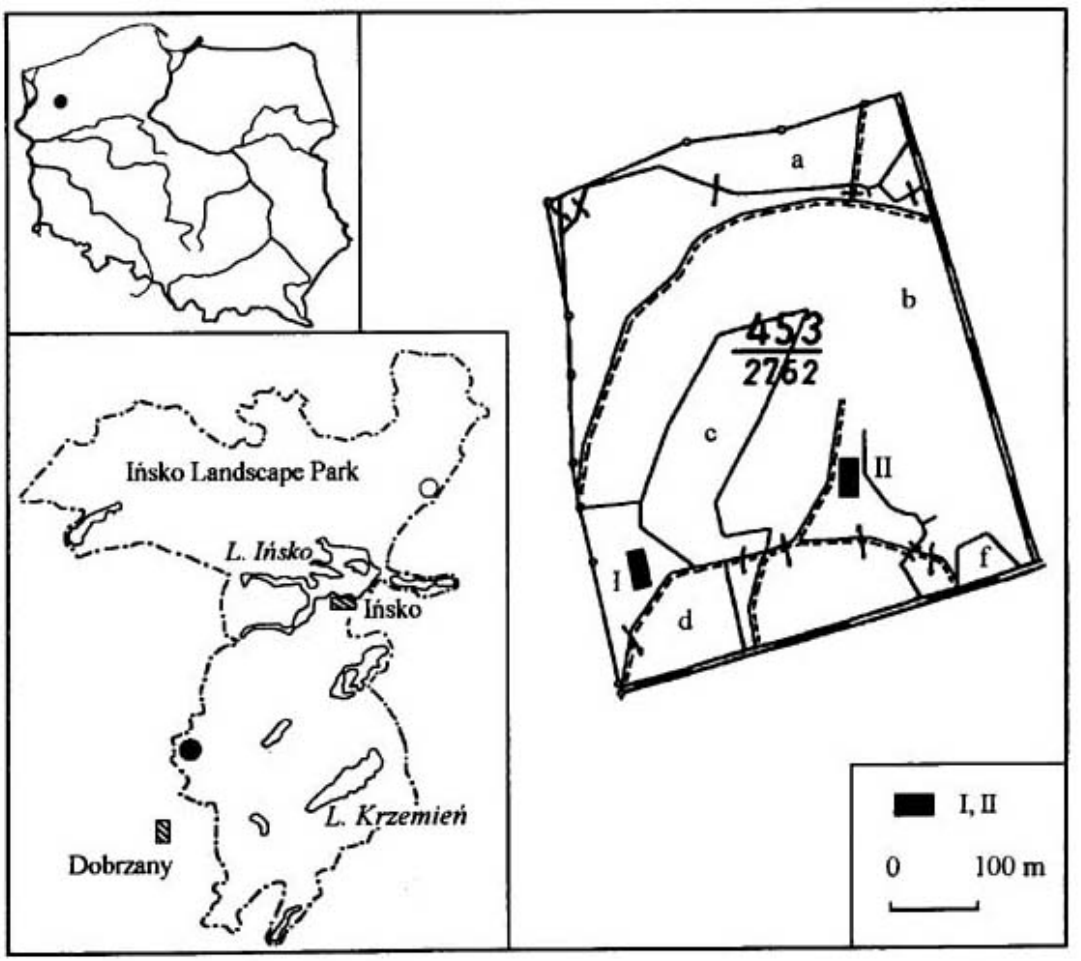


Fig.1. Area of investigations: plot I and plot II. According to Stasińska (1999)

The quaternary deposits, mainly the Pleistocene ones, dominate the geological structure. Pseudopodzolic soils are prevailing with relatively low contribution of podzolic and hydromorphic soils (Prusinkiewicz and Bednarek 1991). More details concerning the investigated area can be found in the paper by Stasińska (1999).

The mean monthly and mean annual temperatures as well as monthly and annual precipitation totals are given in Tables 1 and 2, respectively.

Table 1

Mean monthly and mean annual air temperatures at the meteorological station in Resko [°C]

| Year/ Month | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | I–XII |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994 | 2.3 | −1.9 | 4.0 | 8.7 | 11.7 | 14.7 | 21.4 | 17.9 | 13.4 | 7.1 | 5.4 | 3.0 | 9.0 |
| 1995 | 0.0 | 3.9 | 2.9 | 7.2 | 11.7 | 14.9 | 19.5 | 17.9 | 13.0 | 11.2 | 1.8 | −4.2 | 8.3 |
| 1996 | −3.9 | −4.4 | −1.0 | 7.5 | 11.2 | 15.4 | 15.3 | 18.0 | 10.1 | 9.1 | 4.2 | −3.6 | 6.5 |

Table 2

Monthly and annual precipitation totals at the meteorological station in Resko [mm]

| Year/ Month | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | I–XII |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994 | 129 | 15 | 105 | 29 | 50 | 29 | 9 | 36 | 59 | 43 | 46 | 98 | 648 |
| 1995 | 90 | 62 | 73 | 42 | 58 | 82 | 63 | 96 | 94 | 22 | 51 | 31 | 764 |
| 1996 | 1 | 37 | 13 | 21 | 86 | 71 | 175 | 80 | 78 | 66 | 56 | 16 | 700 |

The vegetation of the Park is differentiated, but the greatest part is covered with forest communities. The most characteristic of the area of the Park are beech and oak forests. Oak-hornbeam forests of the north western part of Poland, representing the association of *Galio sylvatici-Carpinetum* Oberd. 1957, are very interesting from the phytosociological point of view. According to the determination by Jakubowska-Gabara (1996) two variants of the association are to be found in the Park: the one with *Poa nemoralis*, where *Quercus petraea* is the only component of the tree-stand, and the other with *Impatiens noli-tangere*, where *Quercus robur* dominates in the tree-stand (Table 3).

## METHODS

The studies were carried out during three vegetative seasons, from 1994 to 1996, on two permanent plots (each of 1000 $m^2$) established in the Ińsko Landscape Park. The area of each plot was divided into 10 subplots of 100 $m^2$ in order to estimate spatial frequency (SF). The observations on each plot

were repeated in average time intervals of 1–2 months to estimate temporal frequency (TF). Altogether 19 field observations were made. All fruit-bodies were counted for the evaluation of their density (Dcy). All living trees as well as their dead parts: logs, stumps, twigs, etc. were marked on the plots' maps (Fig. 2). To make the study comparable, phytosociological releves were made

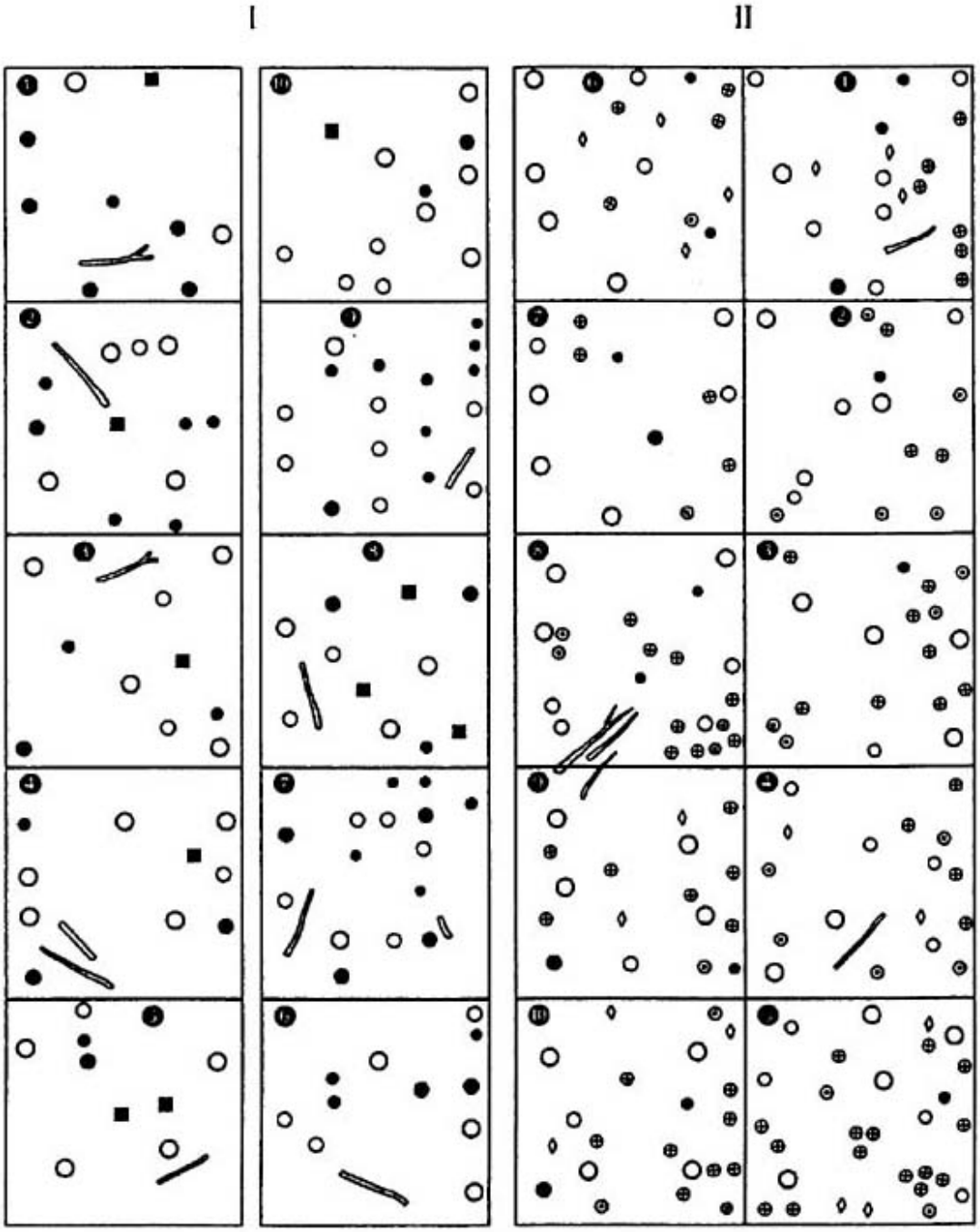


Fig. 2. Structure of the tree stand on the plots I (subplots 1–10) and II (subplots 1–10); ⌀ – *Quercus petraea*; ○ – *Quercus robur*; ● – *Quercus* sp. (dead stumps); ■ – *Pinus sylvestris* (dead stumps); ◊ – *Fagus sylvatica*; ⊙ – *Carpinus betulus*; ⊕ – *Crataegus* sp.

by a professional botanist – Professor J. Jakubowska-Gabara, who described all the monitoring plots in Poland (see Łuszczyński 1998; Skirgiełło 1998; Lisiewska and Połczyńska 1998; Wojewoda, Heinrich and Komorowska 1999).

The index of species was prepared on the basis of collected specimens. For the identification of species as well as a source of nomenclature several papers were used: Dennis (1968), Domański (1972), Domański, Orłoś and Skirgiełło (1973), Wojewoda (1977), Moser (1978), Jülich (1984), Kreisel (1987), Hawksworth, Kirk, Sutton and Pegler (1995).

The mycosociological results from the plot I and II are presented in Tables 4 and 5, respectively.

Fungi are analysed in two main groups – mycorrhizal symbionts and saprotrophes. The present paper is a contribution to the results of the monitoring obtained from the area of Poland. After a publication of the results from the four remaining monitoring plots a summarising paper with conclusions will be published.

## CHARACTERISTICS OF PERMANENT PLOTS

Two permanent observation plots were situated in the southwestern part of the Ińsko Landscape Park, about 3 km to the north of Dobrzany village, in the forest division no. 453 (Fig. 1), Dobrzany Forest Inspectorate.

**Plot I** is a rectangle with the sides of 10 m × 100 m, established in the patch of *Stellario-Carpinetum*, variant with *Poa nemoralis*. It is situated nearby a ground road that separates forest and field, sloping 5° to the west. The plot is characterized by the presence of numerous and varied, mainly oak and pine stumps in different stages of decay as well as a plenty of dead branches and small twigs. The soil pH at the depth of 2–3 cm amounts to 4.87, at the depth of 40 cm – to 4.38.

The tree-stand consists exclusively of *Quercus petraea*, which is present also in the herb layer (Tab. 3). The undergrowth is absent. In the herb layer, which reaches high coverage and is dominated by *Poa nemoralis*, there are also species characteristic of the association – *Stellaria holostea* and the order *Fagetalia sylvaticae*, e.g. *Galium odoratum*, *Millium effusum*, *Viola reichenbachiana*, *Stachys sylvatica* and *Melica uniflora*. The moss layer is absent from most of the subplots; when it is present, it is very poorly developed.

**Plot II** is a rectangle with the sides of 20 m × 50 m, established in the patch of *Stellario-Carpinetum* Oberd. 1957, variant with *Impatiens noli-tangere*. It is situated nearby a forest road in the middle part of the forest division no. 453. As compared with the plot I, plot II is far less abundant in stumps and dead branches (Fig. 2). The soil pH at the depth of 2–3 cm amounts to 5.07, at the depth of 40 cm – 5.33.

Table 3

Floristic composition of the plots I and II in the Ińsko Landscape Park (ILP), Dobrzany forest district, section 453 (Jakubowska-Gabara 1996)

| Association | | *Stellario-Carpinetum* Ober. 1957 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Successive number | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | C |
| Number of plot | | I | I | I | I | I | II | II | II | II | II | o |
| Number of relevé | | 5 | 1 | 2 | 3 | 4 | 1 | 2 | 4 | 5 | 3 | n |
| Area of relevé | $m^2$ | 200 | | | | | | | | | | s |
| Data | | June 1995 | | | | | | | | | | t |
| Density of trees canopy | a % | 80 | 80 | 80 | 70 | 80 | 70 | 70 | 65 | 65 | 65 | a |
| Density of shrubs | b % | — | — | — | — | — | 30 | 40 | 60 | 80 | 80 | n |
| Cover of herb layer | c % | 90 | 85 | 90 | 90 | 95 | 70 | 70 | 40 | 30 | 20 | c |
| Cover of mosses | d % | 5 | — | — | <5 | — | 5 | <5 | 5 | 5 | <5 | y |
| Variant with | | *Poa nemoralis* | | | | | *Impatiens noli-tangere* | | | | | |
| **Trees and shrubs** | | | | | | | | | | | | |
| *Quercus petraea* | a | 5 | 5 | 5 | 4 | 5 | . | . | . | . | . | III |
| | c | + | + | + | + | + | . | . | . | . | . | III |
| *Quercus robur* | a | . | . | . | . | . | 4 | 4 | 4 | 4 | 4 | III |
| | c | . | . | . | . | . | + | + | . | . | . | I |
| *Carpinus betulus* | b | . | . | . | . | . | 2 | 2 | 3 | 2 | 4 | III |
| | c | . | . | 1 | 1 | + | 1 | 2 | 1 | + | + | IV |
| Fagus sylvatica | b | . | . | . | . | . | 2 | . | 1 | 1 | . | II |
| | c | + | + | + | + | + | 1 | + | 1 | . | + | V |
| *Sambucus nigra* | b | . | . | . | . | . | . | . | . | . | + | I |
| | c | + | + | + | . | + | + | + | . | + | + | IV |
| *Sorbus aucuparia* | c | + | + | + | + | + | + | . | . | . | . | III |
| *Crataegus monogyna* | b | . | . | . | . | . | . | 1 | + | . | . | I |
| | c | + | . | . | + | + | . | . | . | . | . | II |
| *Euonymus europaeus* | c | . | . | . | + | + | . | + | + | . | + | III |
| *Crataegus laevigata* | b | . | . | . | . | . | 3 | 2 | 3 | 4 | 3 | III |
| | c | . | . | . | . | . | . | + | + | + | + | II |
| *Rosa canina* | b | . | . | . | . | . | + | . | . | . | . | I |
| | c | . | . | . | . | . | + | + | . | + | . | II |
| *Viburnum opulus* | c | . | . | . | . | . | + | + | + | . | + | II |
| *Prunus avium* | c | + | . | . | + | . | . | + | . | . | + | II |
| *Rhamnus catharticus* | c | . | . | . | + | . | + | . | + | . | . | II |
| *Acer platanoides* | b | . | . | . | . | . | . | . | + | + | I | |
| | c | + | . | . | + | . | . | . | . | . | . | I |
| *Malus* sp. | c | + | + | . | . | . | . | . | . | . | . | I |
| *Acer pseudoplatanus* | b | . | . | . | . | . | . | . | + | . | . | I |
| | c | . | . | + | . | . | . | . | . | . | . | I |
| **Herbs and mosses** | | | | | | | | | | | | |
| **Ch. ass.** | | | | | | | | | | | | |
| *Stellaria holostea* | | + | + | + | 1 | 1 | 1 | 2 | 2 | + | + | V |
| Ch. *Fagetalia sylvaticae* | | | | | | | | | | | | |
| *Galium odoratum* | | + | + | + | + | + | 2 | 2 | 3 | 2 | 2 | V |
| *Milium effusum* | | + | + | + | + | + | + | + | 1 | + | + | V |
| *Viola reichenbachiana* | | . | + | 1 | + | + | + | 1 | + | 1 | 1 | V |
| *Stachys sylvatica* | | + | . | + | + | . | 2 | 1 | 1 | 1 | + | V |
| *Adoxa moschatellina* | | + | + | + | + | . | . | . | + | 1 | + | IV |
| *Carex sylvatica* | | . | . | . | . | . | + | + | + | + | 1 | III |
| *Impatiens noli-tangere* | | . | . | . | . | . | + | + | 1 | 1 | + | III |
| *Eurhynchium angustirete* | | . | . | . | . | . | 1 | + | + | + | + | III |
| *Circaea lutetiana* | | . | . | . | . | . | 1 | 1 | . | 1 | + | II |
| *Ranunculus ficaria* | | + | . | . | . | . | 1 | 1 | . | . | 1 | II |
| *Eurhynchium hians* | | . | . | . | . | . | + | . | 1 | + | . | II |
| *Actaea spicata* | | . | . | . | . | . | + | + | + | . | . | II |
| *Veronica montana* | | . | . | . | . | . | . | . | 1 | + | + | II |
| *Festuca gigantea* | | + | . | . | . | . | 2 | 1 | . | . | . | II |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Atrichum undulatum* | . | . | . | . | . | . | . | + | + | . | II |
| *Melica uniflora* | + | + | + | . | . | . | . | . | . | . | II |
| *Lamiastrum galeobdolon* | . | . | . | . | + | . | . | . | . | . | I |
| *Dryopteris filix-mas* | . | . | . | . | . | . | + | + | . | . | I |
| *Polygonatum multiflorum* | . | . | . | + | . | . | . | . | . | . | I |
| *Scrophularia nodosa* | . | . | . | . | . | + | . | . | . | . | I |
| *Carex remota* | . | . | . | . | . | . | . | . | + | . | I |
| *Epilobium montanum* | . | . | . | . | . | . | + | . | . | . | I |
| Ch. *Querco-Fagetea* | | | | | | | | | | | |
| *Poa nemoralis* | 4 | 5 | 4 | 4 | 5 | + | + | + | + | . | V |
| *Brachypodium sylvaticum* | . | . | . | + | . | 3 | 2 | 1 | + | + | III |
| *Anemone nemorosa* | + | . | . | + | + | . | . | . | . | . | II |
| *Aegopodium podagraria* | . | . | . | . | . | 2 | 1 | . | . | . | I |
| *Epipactis helleborine* | . | . | . | . | . | + | + | . | . | . | I |
| *Ranunculus auricomus* | . | . | . | . | . | . | + | . | . | . | I |
| Others | | | | | | | | | | | |
| *Chaerophyllum temulentum* | + | + | 1 | 1 | 1 | 1 | + | 1 | + | + | V |
| *Urtica dioica* | . | + | + | + | + | 1 | + | + | 1 | + | V |
| *Anthriscus sylvestris* | + | . | + | + | + | + | + | + | + | + | V |
| *Veronica chamaedrys* | + | + | + | + | + | 1 | . | + | . | + | IV |
| *Geum urbanum* | . | . | + | + | . | 2 | 1 | + | 1 | 1 | IV |
| *Geranium robertianum* | . | + | + | + | + | + | + | + | 1 | . | IV |
| *Lapsana communis* | + | + | + | 1 | + | + | + | . | . | . | IV |
| *Moehringia trinervia* | + | + | + | + | + | . | . | + | + | . | IV |
| *Hieracium vulgatum* | + | + | 1 | 1 | + | . | . | . | . | . | III |
| *Galeopsis tetrachit* | . | . | + | + | + | + | + | . | . | + | III |
| *Rubus caesius* | + | . | . | + | + | . | 1 | 1 | . | + | III |
| *Deschampsia caespitosa* | + | . | . | . | . | + | 1 | 1 | + | + | III |
| *Rumex conglomeratus* | . | . | . | . | + | + | + | + | + | . | III |
| *Ajuga reptas* | . | . | . | . | . | 1 | 1 | + | . | + | II |
| *Ranunculus reptans* | + | . | . | . | . | + | + | + | . | . | II |
| *Galium aparine* | + | . | . | + | . | + | . | + | . | . | II |
| *Astragalus glycyphyllos* | + | . | + | + | + | . | . | . | . | . | II |
| *Agrostis capillaris* | + | + | + | + | . | . | . | . | . | . | II |
| *Galeopsis pubescens* | . | 1 | + | + | . | . | . | . | . | . | II |
| *Viola odorata* | + | . | + | . | 1 | . | . | . | . | . | II |
| *Dactylis glomerata* | + | + | . | + | . | + | . | . | . | . | II |
| *Fragaria vesca* | . | + | . | + | . | + | + | . | . | . | I |
| *Myosotis sylvatica* | . | . | . | . | . | + | . | + | + | . | II |
| *Lysimachia nummularia* | + | . | . | . | . | 1 | 1 | . | . | . | II |
| *Oxalis acetosella* | . | . | . | . | . | + | + | . | + | . | II |
| *Rubus idaeus* | . | . | . | . | . | 1 | + | . | . | . | I |
| *Glechoma hederacea* | . | . | . | . | . | + | + | . | . | . | I |
| *Vicia sepium* | . | . | . | . | . | + | + | . | . | . | I |
| *Hieracium sabaudum* | + | . | . | . | + | . | . | . | . | . | I |
| *Dryopteris spinulosa* | . | . | + | . | . | . | + | . | . | . | I |
| *Poa pratensis* | + | + | . | . | . | . | . | . | . | . | I |
| *Taraxacum officinale* | + | + | . | . | . | . | . | . | . | . | I |
| *Festuca rubra* | + | + | . | . | . | . | . | . | . | . | I |
| *Hieracium murorum* | . | . | . | + | 1 | . | . | . | . | . | I |
| *Veronica hederifolia* | . | + | + | . | . | . | . | . | . | . | I |

Morover in releves:
1 — *Holcus mollis* +, *Heracleum sphondylium* +, *Festuca ovina* +, *Trifolium pratense* +, *Galium mollugo* +, *Poa trivialis* +, *Achillea millefolium* +, *Calamagrostis epigeios* +; 2 — *Mycelis muralis* +, *Campanula rotundifolia* +; 3 — *Carex hirta* +, *Veronica officinalis* +; 4 — *Hypochoeris radicata* +; 5 — *Viola canina* +, *Leontodon hispidus* +, *Artemisia vulgaris* +, *Rumex acetosa* +, *Hypericum perforatum* +, *Chelidonium maius* +; 6 — *Stellaria media* +, *Phleum pratense* +, *Ranunculus acris* +; 7 — *Plagiomnium affine* +, *Mentha arvensis* +; 8 — *Agarimonia eupatoria* +; 9 — *Rubus plicatus* +; 10 — *Majanthemum bifolium* +.

The tree-stand consists exclusively of *Quercus robur*. The shrub layer varies on different subplots; it is composed mainly of the undergrowth of hornbeam (*Carpinus betulus*), hawthorn (*Crataegus laevigata*) and beech (*Fagus sylvatica*). The coverage of herb layer varies considerably on different subplots (Tab. 3). Apart from *Impatiens noli-tangere* some other species characteristic of the order *Fagetalia sylvaticae* are present here, e.g. *Galium odoratum*, *Stachys sylvatica*, *Viola reichenbachiana*, *Millium effusum*, *Eurhynchium angustirete* and *Carex sylvatica*. The species characteristic of the class *Querco-Fagetea* can be found as well, e.g. *Brachypodium sylvaticum* and *Poa nemoralis*. The moss layer is poorly developed and never reaches 5% of cover.

## RESULTS

### Mycological analysis of permanent plots

**In the plot I**, situated in the patch of *Stellario-Carpinetum* Oberd. 1957, variant with *Poa nemoralis*, 163 species of macromycetes were found (Tab. 4). Among them 49 were terrestrial mycorrhizal fungi; that makes 30% of the total number of species recorded here. Saprotrophic fungi (114 species – 70% of all macromycetes) grew on humus (28 species), on litter (23 species) and on wood (63 species).

Among terrestrial mycorrhizal fungi the most numerous and frequent were *Lactarius quietus* associated with oak and *Laccaria amethystina*, *L. laccata*, *Inocybe geophylla* and *Xerocomus chrysenteron* – fungi forming mycorrhizae with other deciduous trees. *Boletus edulis* and *Cantharellus cibarius* occurred sporadically. In the group of humicolous saprotrophic fungi *Clavulina rugosa*, *Humaria hemisphaerica* and *Lycoperdon perlatum* prevailed.

Fungi occurring on litter were the group poorest in species. The most abundant were *Collybia dryophila*, *C. peronata*, *Mycena vitilis* and *Psathyrella candoleana*.

Relatively high amount of more or less rotten stumps and fallen branches created good conditions for a development of lignicolous fungi. Oak stumps were most abundantly and frequently inhabited by *Armillaria mellea*, *Hypholoma fasciculare*, *Kuehneromyces mutabilis*, *Mycena galericulata*, *Panellus stipticus*, *Stereum hirsutum* and *Xylaria hypoxylon*. Rotten oak branches were overgrown by *Calocera cornea*, *Dacrymyces stillatus*, *Peniophora quercina* and *Schizopora paradoxa*. Tiny but numerous fruit-bodies of *Colpoma quercina*, *Crepidotus variabilis* and *Nectria cinnabarina* grew on fallen twigs.

Among the species associated with oak, apart from the mentioned above (*Colpoma quercina*, *Lactarius quietus*, *Peniophora quercina*), less frequently were noted: *Ciboria batschiana* and *Hymenoscyphus fructigenus* – on acorns, *Exidia truncata* – on twigs, *Daedalea quercina*, *Hymenochaete rubiginosa* and *Mycena inclinata* – on stumps.

Table 4

Synoptical fungus table of the plot I

Dcy – number of fruit-bodies, SF – spatial frequency, TF – total temporal frequency and MDcv – maximum number of fruit-bodies during one visit on one subplot

| Years | 1994 | | | 1995 | | | 1996 | | | 1994–1996 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of observations | 3 | | | 8 | | | 8 | | | 19 | | | |
| Number of species | 63 | | | 95 | | | 94 | | | 163 | | | |
| | Dcy | SF | TF | Dcy | SF | TF | Dcy | SF | TF | Dcy | MDcv | SF | TF |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| *Agrocybe dura* | 18 | 2 | 1 | . | . | . | . | . | . | 18 | 11 | 2 | 1 |
| *A. paludosa* | 6 | 1 | 1 | 4 | 2 | 2 | . | . | . | 10 | 6 | 2 | 3 |
| *A. praecox* | . | . | . | 2 | 1 | 1 | . | . | . | 2 | 2 | 1 | 1 |
| *Amanita citrina* | . | . | . | . | . | . | 5 | 2 | 1 | 5 | 4 | 2 | 1 |
| *A. pantherina* | . | . | . | 8 | 2 | 1 | . | . | . | 8 | 5 | 2 | 1 |
| *A. phalloides* | . | . | . | 7 | 2 | 3 | 4 | 2 | 2 | 11 | 4 | 2 | 5 |
| *A. rubescens* | . | . | . | 64 | 9 | 4 | 6 | 3 | 3 | 70 | 9 | 10 | 7 |
| *Armillaria mellea* | 41 | 2 | 2 | 140 | 2 | 3 | 10 | 1 | 1 | 191 | 47 | 2 | 6 |
| *Ascocoryne sarcoides* | . | . | . | 28 | 3 | 1 | . | . | . | 28 | 16 | 3 | 1 |
| *Bjerkandera adusta* | . | . | . | . | . | . | 29 | 1 | 3 | 29 | 29 | 3 | 3 |
| *Boletus edulis* | . | . | . | . | . | . | 3 | 2 | 2 | 3 | 2 | 2 | 2 |
| *B. luridus* | . | . | . | 1 | 1 | 1 | . | . | . | 1 | 1 | 1 | 1 |
| *Bovista nigrescens* | . | . | . | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 2 |
| *Calocera cornea* | . | . | . | 80 | 2 | 1 | 100 | 1 | 1 | 180 | 100 | 2 | 2 |
| *C. viscosa* | . | . | . | 7 | 1 | 1 | . | . | . | 7 | 7 | 1 | 1 |
| *Cantharellus cibarius* | . | . | . | 10 | 2 | 2 | . | . | . | 10 | 9 | 2 | 2 |
| *Chlorosplenium versiforme* | . | . | . | 8 | 1 | 1 | . | . | . | 8 | 8 | 1 | 1 |
| *Chondrostereum purpureum* | . | . | . | 10 | 1 | 2 | . | . | . | 10 | 10 | 1 | 2 |
| *Ciboria batschiana* | . | . | . | 10 | 2 | 1 | . | . | . | 10 | 6 | 2 | 1 |
| *Clavulina cinerea* | 19 | 2 | 1 | 24 | 1 | 3 | . | . | . | 43 | 13 | 2 | 4 |
| *C. rugosa* | . | . | . | 69 | 7 | 1 | 331 | 6 | 5 | 400 | 32 | 7 | 6 |
| *Clitocybe bresadoliana* | 1 | 1 | 1 | . | . | . | . | . | . | 1 | 1 | 1 | 1 |
| *C. candicans* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *C. clavipes* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *C. costata* | . | . | . | . | . | . | 20 | 1 | 1 | 20 | 20 | 1 | 1 |

Tab. 4 cont.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. dealbata* | 14 | 1 | 2 | . | . | . | . | . | . | 14 | 8 | 1 | 2 |
| *C. dicolor* | . | . | . | . | . | . | 15 | 3 | 1 | 15 | 6 | 3 | 1 |
| *C. gibba* | . | . | . | 4 | 1 | 1 | 25 | 2 | 1 | 29 | 14 | 2 | 2 |
| *C. inornata* | . | . | . | 33 | 4 | 1 | . | . | . | 33 | 12 | 4 | 1 |
| *C. vibecina* | . | . | . | . | . | . | 10 | 2 | 2 | 10 | 4 | 2 | 2 |
| *Collybia butyracea* var. *asema* | . | . | . | 15 | 3 | 3 | 3 | 2 | 1 | 18 | 4 | 4 | 4 |
| *C. dryophila* | . | . | . | 86 | 8 | 5 | 51 | 7 | 4 | 137 | 8 | 9 | 9 |
| *C. peronata* | 42 | 3 | 3 | 27 | 3 | 3 | 16 | 2 | 2 | 85 | 13 | 4 | 8 |
| *Colpoma quercina* | . | . | . | 72 | 3 | 3 | 440 | 5 | 2 | 512 | 124 | 5 | 5 |
| *Conocybe* sp. 1 | 3 | 1 | 1 | . | . | . | . | . | . | 3 | 3 | 1 | 1 |
| *C.* sp. 2 | 2 | 1 | 1 | . | . | . | . | . | . | 2 | 2 | 1 | 1 |
| *Coprinus disseminatus* | 80 | 1 | 1 | 200 | 1 | 1 | . | . | . | 280 | 200 | 1 | 2 |
| *C. domesticus* | . | . | . | 13 | 2 | 3 | 2 | 1 | 2 | 15 | 5 | 2 | 5 |
| *C. impatiens* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *C. micaceus* | 41 | 1 | 1 | 24 | 1 | 2 | . | . | . | 65 | 41 | 1 | 3 |
| *Cortinarius traganus* | 14 | 1 | 2 | . | . | . | . | . | . | 14 | 12 | 1 | 2 |
| *C. trivialis* | 20 | 2 | 2 | . | . | . | . | . | . | 20 | 10 | 2 | 2 |
| *C.* sp. 1 | 8 | 1 | 1 | . | . | . | . | . | . | 8 | 8 | 1 | 1 |
| *Crepidotus variabilis* | . | . | . | 150 | 8 | 5 | 219 | 5 | 5 | 369 | 65 | 8 | 10 |
| *Crucibulum laeve* | . | . | . | 34 | 2 | 2 | 30 | 1 | 1 | 64 | 30 | 2 | 3 |
| *Cyathus striatus* | . | . | . | . | . | . | 23 | 2 | 2 | 23 | 20 | 2 | 2 |
| *Cystoderma carcharias* | . | . | . | 1 | 1 | 1 | 4 | 1 | 2 | 5 | 2 | 2 | 3 |
| *Dacrymyces stillatus* | 11 | 1 | 1 | 90 | 3 | 3 | 380 | 5 | 5 | 481 | 100 | 6 | 9 |
| *Daedalea quercina* | 1 | 1 | 3 | 2 | 1 | 8 | 2 | 1 | 2 | 2 | 2 | 1 | 13 |
| *Daedaleopsis confragosa* | 4 | 1 | 3 | 5 | 1 | 6 | . | . | . | 9 | 5 | 2 | 9 |
| *Entoloma eulividum* | . | . | . | 4 | 1 | 1 | . | . | . | 4 | 4 | 1 | 1 |
| *E.* sp. 1 | 8 | 1 | 2 | . | . | . | . | . | . | 8 | 6 | 1 | 2 |
| *E.* sp. 2 | . | . | . | . | . | . | . | . | . | 22 | 9 | 2 | 2 |
| *Exidia plana* | . | . | . | . | . | . | 10 | 1 | 1 | 10 | 10 | 1 | 1 |
| *E. glandulosa* | . | . | . | 14 | 2 | 2 | 27 | 1 | 2 | 41 | 17 | 2 | 4 |
| *Gymnopilus spectabilis* | . | . | . | 20 | 1 | 1 | 4 | 1 | 1 | 24 | 20 | 2 | 2 |
| *Hapalopilus nidulans* | . | . | . | . | . | . | 5 | 1 | 1 | 5 | 5 | 1 | 1 |
| *Hebeloma crustuliniforme* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Heterobasidion annosum* | . | . | . | . | . | . | 11 | 2 | 6 | 11 | 10 | 2 | 6 |
| *Hohenbuehelia atrocoerulea* | . | . | . | . | . | . | 12 | 1 | 2 | 12 | 10 | 1 | 2 |
| *Humaria hemisphaerica* | 92 | 5 | 3 | 12 | 1 | 1 | 75 | 4 | 3 | 167 | 19 | 5 | 7 |
| *Hymenochaete rubiginosa* | 3 | 1 | 3 | 30 | 1 | 8 | . | . | . | 33 | 30 | 1 | 11 |
| *Hymenoscyphus fructigenus* | . | . | . | 72 | 3 | 1 | 50 | 1 | 1 | 122 | 50 | 3 | 2 |
| *Hypholoma fasciculare* | 23 | 1 | 2 | 144 | 2 | 2 | 219 | 4 | 5 | 386 | 76 | 4 | 9 |
| *H. sublateritium* | 150 | 4 | 2 | 38 | 1 | 2 | . | . | . | 188 | 35 | 4 | 4 |
| *Hypoxylon rubiginosum* | . | . | . | . | . | . | 270 | 2 | 3 | 270 | 113 | 2 | 3 |
| *Inocybe asterospora* | . | . | . | 39 | 4 | 1 | 3 | 1 | 1 | 42 | 13 | 4 | 2 |
| *I. fastigiata* | . | . | . | 10 | 2 | 2 | 4 | 1 | 2 | 14 | 4 | 2 | 4 |
| *I. geophylla* | 111 | 8 | 3 | 12 | 2 | 2 | . | . | . | 123 | 11 | 8 | 5 |
| *I. geophylla* var. *lilacina* | 15 | 2 | 2 | 8 | 1 | 1 | . | . | . | 23 | 13 | 2 | 3 |
| *I. hirtella* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *I. napipes* | . | . | . | . | . | . | 3 | 1 | 1 | 3 | 3 | 1 | 1 |
| *I.* sp. 1 | 75 | 10 | 2 | . | . | . | . | . | . | 75 | 7 | 10 | 2 |
| *I.* sp. 2 | 20 | 1 | 2 | . | . | . | . | . | . | 20 | 12 | 1 | 2 |
| *Kuehneromyces mutabilis* | 66 | 1 | 1 | 52 | 2 | 2 | 50 | 1 | 1 | 168 | 66 | 2 | 4 |
| *Laccaria amethystina* | 235 | 10 | 3 | 11 | 1 | 2 | 10 | 2 | 2 | 256 | 18 | 10 | 7 |
| *L. laccata* | 156 | 8 | 3 | 25 | 3 | 3 | 137 | 7 | 4 | 318 | 17 | 10 | 10 |
| *L. tortilis* | 36 | 4 | 2 | 8 | 1 | 1 | . | . | . | 44 | 9 | 4 | 3 |
| *Lactarius acerrimus* | . | . | . | 12 | 2 | 1 | . | . | . | 12 | 8 | 2 | 1 |
| *L. camphoratus* | . | . | . | 8 | 1 | 1 | . | . | . | 8 | 8 | 1 | 1 |
| *L. quietus* | 137 | 10 | 3 | 156 | 10 | 6 | 26 | 4 | 3 | 319 | 16 | 10 | 12 |
| *L. rufus* | . | . | . | 36 | 7 | 2 | 20 | 4 | 4 | 56 | 7 | 7 | 6 |
| *L. serifluus* | . | . | . | 22 | 3 | 3 | . | . | . | 22 | 6 | 3 | 3 |
| *L. subdulcis* | 17 | 2 | 2 | 8 | 1 | 1 | . | . | . | 25 | 8 | 3 | 3 |
| *Leotia atrovirens* | . | . | . | 3 | 1 | 1 | . | . | . | 3 | 3 | 1 | 1 |
| *L. lubrica* | . | . | . | 5 | 1 | 1 | . | . | . | 5 | 5 | 1 | 1 |
| *Lepiota castanea* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *Lepista nebularis* | . | . | . | 13 | 3 | 2 | . | . | . | 13 | 5 | 3 | 2 |
| *L. nuda* | . | . | . | 20 | 3 | 3 | 5 | 2 | 1 | 25 | 5 | 3 | 4 |
| *Leptopodia atra* | 8 | 1 | 1 | 4 | 1 | 1 | . | . | . | 12 | 8 | 1 | 2 |
| *Lycogala epidendrum* | . | . | . | . | . | . | 40 | 1 | 1 | 40 | 40 | 1 | 1 |
| *Lycoperdon molle* | . | . | . | . | . | . | 20 | 3 | 1 | 20 | 9 | 3 | 1 |
| *L. perlatum* | . | . | . | 2 | 1 | 1 | 106 | 6 | 4 | 108 | 12 | 6 | 5 |
| *L. pyriforme* | . | . | . | 36 | 1 | 3 | . | . | . | 36 | 12 | 1 | 3 |

Tab. 4 cont.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Macrolepiota procera* | . | . | . | . | . | . | 3 | 2 | 2 | 3 | 2 | 2 | 2 |
| *M. rhacodes* | . | . | . | 1 | 1 | 1 | . | . | . | 1 | 1 | 1 | 1 |
| *Marasmiellus ramealis* | 37 | 2 | 3 | 34 | 4 | 2 | . | . | . | 71 | 16 | 4 | 5 |
| *Marasmius recubans* | . | . | . | 16 | 1 | 1 | . | . | . | 16 | 16 | 1 | 1 |
| *M. rotula* | 41 | 2 | 2 | 8 | 1 | 1 | . | . | . | 49 | 33 | 3 | 3 |
| *Merulius tremellosus* | 2 | 1 | 3 | 4 | 1 | 1 | . | . | . | 6 | 4 | 1 | 4 |
| *Mycena acicula* | 3 | 1 | 1 | 15 | 3 | 3 | . | . | . | 18 | 5 | 3 | 4 |
| *M. galericulata* | . | . | . | 35 | 5 | 2 | 39 | 9 | 2 | 74 | 11 | 9 | 4 |
| *M. galopus* | . | . | . | 12 | 1 | 1 | 1 | 1 | 1 | 13 | 12 | 2 | 2 |
| *M. haematopus* | 52 | 3 | 2 | . | . | . | . | . | . | 52 | 15 | 3 | 2 |
| *M. inclinata* | . | . | . | . | . | . | 3 | 2 | 1 | 3 | 2 | 2 | 1 |
| *M. leucogala* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *M. polygramma* | 21 | 2 | 2 | 16 | 3 | 3 | 7 | 1 | 1 | 44 | 8 | 3 | 6 |
| *M. pura* | . | . | . | . | . | . | 23 | 2 | 2 | 23 | 13 | 2 | 2 |
| *M. vitilis* | 92 | 6 | 3 | 125 | 10 | 8 | 37 | 5 | 6 | 254 | 12 | 10 | 17 |
| *Nectria cinnnabarina* | . | . | . | 45 | 2 | 2 | 330 | 5 | 2 | 375 | 200 | 5 | 4 |
| *Otidea leporina* | 6 | 1 | 1 | . | . | . | . | . | . | 6 | 6 | 1 | 1 |
| *O. onotica* | 28 | 1 | 1 | . | . | . | . | . | . | 28 | 28 | 1 | 1 |
| *Panellus stypticus* | 62 | 3 | 3 | 30 | 1 | 3 | 100 | 2 | 8 | 192 | 70 | 3 | 14 |
| *Paxillus involutus* | 70 | 5 | 2 | . | . | . | 2 | 1 | 1 | 72 | 17 | 5 | 3 |
| *Peniophora incarnata* | . | . | . | 10 | 1 | 3 | . | . | . | 10 | 10 | 1 | 3 |
| *P. laeta* | . | . | . | . | . | . | 18 | 2 | 2 | 18 | 10 | 2 | 2 |
| *P. quercina* | . | . | . | 300 | 8 | 8 | 49 | 3 | 3 | 349 | 25 | 8 | 11 |
| *Peziza badia* | 9 | 1 | 1 | . | . | . | . | . | . | 9 | 9 | 1 | 1 |
| *P.* sp. | 2 | 1 | 1 | . | . | . | . | . | . | 2 | 2 | 1 | 1 |
| *Phlebia radiata* | . | . | . | 10 | 1 | 1 | 30 | 2 | 2 | 40 | 20 | 2 | 3 |
| *Pholiota lenta* | . | . | . | 15 | 4 | 1 | . | . | . | 15 | 5 | 4 | 1 |
| *Pluteus atricapillus* | 6 | 2 | 2 | 3 | 2 | 2 | . | . | . | 9 | 4 | 2 | 4 |
| *P.* sp. | 16 | 3 | 2 | . | . | . | . | . | . | 16 | 6 | 3 | 2 |
| *Polyporus ciliatus* | . | . | . | . | . | . | 17 | 3 | 3 | 17 | 5 | 3 | 3 |
| *Postia caesia* | . | . | . | . | . | . | 3 | 2 | 2 | 3 | 2 | 2 | 2 |
| *Psathyrella candolleana* | 41 | 1 | 1 | 36 | 3 | 2 | . | . | . | 77 | 41 | 3 | 3 |
| *P. hydrophila* | 146 | 1 | 3 | 49 | 1 | 2 | . | . | . | 195 | 90 | 1 | 5 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ramaria* sp. | 2 | 1 | 1 | . | . | . | . | . | . | 2 | 2 | 1 | 1 |
| *Rickenella fibula* | 5 | 1 | 1 | . | . | . | . | . | . | 5 | 5 | 1 | 1 |
| *Rhodophyllus juncinus* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *Russula atropurpurea* | . | . | . | . | . | . | 4 | 1 | 1 | 4 | 4 | 1 | 1 |
| *R. cyanoxantha* | . | . | . | 10 | 2 | 2 | 3 | 2 | 2 | 13 | 8 | 3 | 4 |
| *R. heterophylla* | . | . | . | . | . | . | 2 | 2 | 2 | 2 | 1 | 2 | 2 |
| *R. ochroleuca* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *R. pectinatoides* | . | . | . | . | . | . | 42 | 5 | 3 | 42 | 6 | 5 | 3 |
| *R. versicolor* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *R. vesca* | 22 | 4 | 2 | 4 | 1 | 1 | 5 | 2 | 2 | 31 | 6 | 4 | 5 |
| *R. xerampelina* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *R.* sp. 1 | 32 | 2 | 2 | . | . | . | . | . | . | 32 | 11 | 2 | 2 |
| *R.* sp. 2 | 8 | 1 | 1 | . | . | . | . | . | . | 8 | 8 | 1 | 1 |
| *Schizophyllum commune* | . | . | . | . | . | . | 23 | 1 | 3 | 23 | 10 | 1 | 3 |
| *Schizopora paradoxa* | 38 | 2 | 3 | 48 | 10 | 8 | 15 | 7 | 3 | 101 | 23 | 10 | 14 |
| *Scleroderma areolatum* | . | . | . | . | . | . | 4 | 2 | 2 | 4 | 2 | 2 | 2 |
| *S. bovista* | 9 | 1 | 2 | . | . | . | . | . | . | 9 | 5 | 1 | 2 |
| *S. citrinum* | . | . | . | . | . | . | 2 | 2 | 1 | 2 | 1 | 2 | 1 |
| *S. verrucosum* | 6 | 1 | 1 | 11 | 2 | 3 | 16 | 3 | 2 | 33 | 6 | 3 | 6 |
| *Scutellinia scutellata* | . | . | . | . | . | . | 10 | 1 | 1 | 10 | 10 | 1 | 1 |
| *Skeletocutis* sp. | . | . | . | 2 | 2 | 3 | 2 | 2 | 8 | 2 | 1 | 2 | 11 |
| *Sphaerobolus stellatus* | . | . | . | 31 | 2 | 2 | . | . | . | 31 | 21 | 2 | 2 |
| *Stereum hirsutum* | . | . | . | 32 | 2 | 3 | 301 | 5 | 8 | 333 | 28 | 5 | 11 |
| *S. rugosum* | . | . | . | 2 | 1 | 2 | 40 | 3 | 8 | 42 | 15 | 3 | 10 |
| *Stropharia semiglobata* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *St. squamosa* | . | . | . | 1 | 1 | 1 | . | . | . | 1 | 1 | 1 | 1 |
| *Trametes gibbosa* | . | . | . | . | . | . | 7 | 2 | 4 | 7 | 3 | 2 | 4 |
| *T. hirsuta* | 5 | 1 | 1 | . | . | . | . | . | . | 5 | 5 | 1 | 1 |
| *T. versicolor* | 3 | 1 | 3 | 2 | 1 | 2 | 10 | 1 | 3 | 15 | 10 | 1 | 12 |
| *Trichaptum abietinum* | . | . | . | 36 | 1 | 3 | 50 | 2 | 2 | 86 | 36 | 2 | 5 |
| *Tricholomopsis rutilans* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *Tylopilus felleus* | . | . | . | 3 | 2 | 1 | . | . | . | 3 | 2 | 2 | 1 |
| *Vuilleminia comedens* | . | . | . | . | . | . | 74 | 3 | 8 | 74 | 40 | 3 | 8 |
| *Xerocomus chrysenteron* | 61 | 10 | 2 | 26 | 4 | 3 | 13 | 2 | 2 | 100 | 10 | 10 | 7 |
| *X. subtomentosus* | . | . | . | . | . | . | 5 | 2 | 2 | 5 | 2 | 2 | 2 |
| *Xylaria hypoxylon* | 295 | 6 | 3 | 168 | 3 | 3 | 31 | 2 | 3 | 494 | 37 | 6 | 9 |

The presence of pine in the vicinity of investigated plot as well as the occurrence of rotten stumps of this tree on some of the subplots were the reasons why the species of fungi associated with pine were also observed. They were, among other fungi, *Lactarius rufus*, *Tylopilus felleus*, *Heterobasidion annosum* i *Trichaptum abietinum*.

**In the plot II**, situated in the patch of *Stellario-Carpinetum* Oberd. 1957, variant with *Impatiens noli-tangere*, 154 species of macromycetes were found (Tab. 5). Among them 44 species were mycorrhizal; that makes 28.6% of the total number of species recorded on this plot. The group of saprotrophic fungi amounted to 109 species (71% of the total number of fungi): 23 species grew on humus, 27 species – on litter and 61 species – on wood.

The most numerous and frequent mycorrhizal fungi were *Laccaria amethystina*, *L. laccata*, *Lactarius quietus*, *Inocybe geophylla*, *Scleroderma verrucosum* and *Cortinarius trivialis*. The other species from this group were noted far more rare. Among humicolous saprotrophes the species that dominated in respect of the frequency of its occurrence and number of its fruit-bodies was *Humaria hemisphaerica*.

The group of litter-inhabiting species was the least numerous. Most of the species appeared sporadically, except for *Collybia dryophila* and *Mycena vitilis*, which were noted more frequently and produced high number of fruit-bodies.

The most abundant lignicolous fungi were e.g. *Armillaria mellea*, *Ascocoryne sarcoides*, *Hypholoma fasciculare*, *Mycena galericulata* and *Xylaria hypoxylon* – on stumps; *Calocera cornea*, *Dacrymyces stillatus*, *Peniophora quercina*, *Schizopora paradoxa* – on dead branches; *Crepidotus variabilis* and *Colpoma quercina* – on tiny twigs; *Hymenoscyphus fructigenus* – on acorns.

Among the fungi strongly associated with oak the most numerous were *Colpoma quercina*, *Hymenoscyphus fructigenus*, *Lactarius quietus*, *Peniophora quercina*. More rarely were noted *Exidia truncata*, *Hymenochaete rubiginosa* and *Mycena inclinata*.

## Quantitative and qualitative characteristics of macromycetes

During the research 229 species of macromycetes were found: 1 species of Myxomycota, 28 species of *Ascomycota* and 200 species of *Basidiomycota*. In the material gathered 1 species is new to Poland – *Tomentella subtestacea*, 12 species are threatened (W o j e w o d a and Ł a w r y n o w i c z 1992) and 1 species is protected by law.

The proportion of fungi of particular ecological groups in the patches of *Stellario-Carpinetum* is varied. The most numerous group of macromycetes are saprotrophic fungi – 157 species (68.6% of all determined taxa). Over a half of them, namely 85 species, are lignicolous (37.1% of the total number of taxa found on both plots). Thirty-four taxa are numbered among saprotrophes growing on litter (14.9%) and 38 species (16.6%) – among humicolous

Table 5

Synoptical fungus table of the plot II

Dcy – number of fruit-bodies, SF – spatial frequency, TF – total temporal frequency and MDcv – maximum number of fruit-bodies during one visit on one subplot.

| Years | 1994 | | | 1995 | | | 1996 | | | 1994–1996 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of observations | 3 | | | 8 | | | 8 | | | 19 | | | |
| Number of species | 64 | | | 94 | | | 80 | | | 154 | | | |
| | Dcy | SF | TF | Dcy | SF | TF | Dcy | SF | TF | Dcy | MDcv | SF | TF |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| *Amanita citrina* | 2 | 1 | 1 | 25 | 6 | 3 | . | . | . | 27 | 5 | 6 | 4 |
| *A. fulva* | . | . | . | . | . | . | 2 | 2 | 1 | 2 | 1 | 2 | 1 |
| *A. rubescens* | 1 | 1 | 1 | 18 | 3 | 4 | . | . | . | 19 | 8 | 3 | 5 |
| *Armillaria mellea* | 122 | 3 | 3 | 55 | 1 | 2 | 10 | 1 | 1 | 187 | 45 | 3 | 6 |
| *Ascocoryne sarcoides* | 191 | 3 | 2 | 38 | 3 | 2 | 100 | 1 | 1 | 329 | 100 | 3 | 5 |
| *Calocera cornea* | 98 | 4 | 2 | 20 | 1 | 1 | 100 | 1 | 1 | 218 | 100 | 5 | 4 |
| *Calocybe carnea* | 2 | 1 | 1 | 2 | 1 | 1 | . | . | . | 4 | 2 | 1 | 2 |
| *Clavulina cinerea* | 36 | 2 | 2 | . | . | . | 30 | 1 | 2 | 66 | 20 | 2 | 4 |
| *C. cristata* | . | . | . | 9 | 2 | 1 | . | . | . | 9 | 6 | 2 | 1 |
| *C. rugosa* | . | . | . | 25 | 2 | 2 | 16 | 2 | 2 | 41 | 11 | 2 | 4 |
| *Clitocybe costata* | . | . | . | 4 | 2 | 1 | . | . | . | 4 | 2 | 2 | 1 |
| *C. dicolor* | . | . | . | . | . | . | 4 | 1 | 1 | 4 | 4 | 1 | 1 |
| *C. geotropa* | 8 | 1 | 1 | . | . | . | . | . | . | 8 | 8 | 1 | 1 |
| *C. gibba* | . | . | . | 8 | 2 | 1 | . | . | . | 8 | 6 | 2 | 1 |
| *C. inornata* | . | . | . | 2 | 1 | 1 | . | . | . | 2 | 2 | 1 | 1 |
| *C. vibecina* | . | . | . | . | . | . | 6 | 1 | 1 | 6 | 6 | 1 | 1 |
| *Collybia butyracea* var. *asema* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *C. distorta* | 3 | 1 | 1 | . | . | . | . | . | . | 3 | 3 | 1 | 1 |
| *C. dryophila* | 24 | 4 | 2 | 32 | 4 | 3 | 13 | 3 | 1 | 69 | 7 | 5 | 6 |
| *C. peronata* | . | . | . | 5 | 2 | 1 | 1 | 1 | 1 | 6 | 3 | 2 | 2 |
| *Colpoma quercina* | . | . | . | . | . | . | 140 | 2 | 1 | 140 | 98 | 2 | 2 |
| *Conocybe* sp. | 4 | 1 | 1 | . | . | . | . | . | . | 4 | 4 | 1 | 1 |
| *Coprinus domesticus* | . | . | . | 19 | 4 | 3 | . | . | . | 19 | 4 | 4 | 3 |
| *Cortinarius trivialis* | 34 | 3 | 2 | 28 | 3 | 1 | . | . | . | 62 | 11 | 3 | 3 |

Tab. 5 cont.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C.* sp. 1 | 6 | 1 | 1 | . | . | . | . | . | . | 6 | 6 | 1 | 1 |
| *C.* sp. 2 | 2 | 1 | 1 | . | . | . | . | . | . | 2 | 2 | 1 | 1 |
| *C.* sp. 3 | 4 | 1 | 1 | . | . | . | . | . | . | 4 | 4 | 1 | 1 |
| *Crepidotus variabilis* | 218 | 10 | 3 | 68 | 3 | 3 | 8 | 2 | 2 | 294 | 23 | 10 | 8 |
| *Cylindrobasidium evolvens* | 2 | 1 | 1 | . | . | . | . | . | . | 2 | 2 | 1 | 1 |
| *Dacrymyces stillatus* | 20 | 2 | 1 | 20 | 1 | 1 | 390 | 4 | 6 | 430 | 95 | 5 | 8 |
| *Daedaleopsis confragosa* | 1 | 1 | 1 | 1 | 1 | 1 | . | . | . | 2 | 1 | 2 | 2 |
| *Diatrype disciformis* | . | . | . | . | . | . | 102 | 3 | 2 | 102 | 44 | 3 | 2 |
| *Exidia plana* | . | . | . | 20 | 1 | 1 | 50 | 3 | 3 | 70 | 20 | 4 | 4 |
| *E. glandulosa* | . | . | . | 15 | 2 | 1 | 40 | 2 | 2 | 55 | 20 | 4 | 3 |
| *Fomes fomentarius* | 6 | 3 | 3 | 3 | 1 | 8 | . | . | . | 9 | 3 | 3 | 11 |
| *Hapalopilus nidulans* | . | . | . | 4 | 1 | 1 | . | . | . | 4 | 4 | 1 | 1 |
| *Hebeloma crustuliniforme* | . | . | . | 8 | 1 | 1 | 10 | 1 | 1 | 18 | 10 | 1 | 2 |
| *H.* sp. | 28 | 2 | 1 | . | . | . | . | . | . | 28 | 17 | 2 | 1 |
| *Helvella crispa* | . | . | . | . | . | . | 4 | 2 | 2 | 4 | 2 | 2 | 2 |
| *H. lacunosa* | . | . | . | 7 | 3 | 1 | 3 | 1 | 1 | 10 | 3 | 3 | 2 |
| *Humaria hemisphaerica* | 106 | 4 | 3 | 17 | 2 | 2 | 125 | 4 | 3 | 248 | 27 | 5 | 8 |
| *Hymenochaete rubiginosa* | . | . | . | 8 | 1 | 3 | 60 | 2 | 8 | 68 | 41 | 2 | 11 |
| *Hymenoscyphus fructigenus* | . | . | . | 543 | 10 | 2 | 290 | 10 | 3 | 833 | 56 | 10 | 5 |
| *Hypholoma fasciculare* | 157 | 8 | 2 | 125 | 2 | 2 | 15 | 1 | 2 | 297 | 52 | 8 | 6 |
| *H. sublateritium* | 46 | 1 | 3 | 51 | 1 | 2 | . | . | . | 97 | 30 | 1 | 5 |
| *Hypoxylon fragiforme* | . | . | . | 38 | 2 | 1 | . | . | . | 38 | 21 | 2 | 1 |
| *H. fuscum* | 32 | 1 | 1 | 28 | 1 | 1 | . | . | . | 60 | 32 | 2 | 2 |
| *H. nummularium* | . | . | . | . | . | . | 20 | 2 | 1 | 20 | 14 | 2 | 1 |
| *H. rubiginosum* | . | . | . | . | . | . | 40 | 1 | 1 | 40 | 40 | 1 | 1 |
| *Inocybe asterospora* | . | . | . | 21 | 3 | 2 | 4 | 3 | 1 | 25 | 9 | 3 | 3 |
| *I. fastigiata* | . | . | . | . | . | . | 4 | 2 | 1 | 4 | 2 | 2 | 1 |
| *I. geophylla* | 13 | 2 | 2 | 35 | 4 | 2 | 19 | 3 | 2 | 67 | 8 | 4 | 6 |
| *I. geophylla* var. *lilacina* | . | . | . | 13 | 2 | 1 | 32 | 3 | 2 | 45 | 12 | 3 | 3 |
| *I. godeyi* | . | . | . | 2 | 1 | 1 | . | . | . | 2 | 1 | 1 | 1 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *I. praetervisa* | . | . | . | . | . | . | 4 | 1 | 1 | 4 | 4 | 1 | 1 |
| *I.* sp. 1 | 8 | 1 | 1 | . | . | . | . | . | . | 8 | 8 | 1 | 1 |
| *I.* sp. 2 | 6 | 1 | 1 | . | . | . | . | . | . | 6 | 6 | 1 | 1 |
| *I.* sp. 3 | 5 | 1 | 1 | . | . | . | . | . | . | 5 | 5 | 1 | 1 |
| *Laccaria amethystina* | 187 | 10 | 3 | 28 | 3 | 2 | 44 | 4 | 2 | 259 | 17 | 10 | 7 |
| *L. laccata* | 62 | 7 | 3 | 21 | 4 | 2 | 78 | 6 | 4 | 161 | 15 | 8 | 9 |
| *Lactarius acerrimus* | . | . | . | 5 | 1 | 2 | . | . | . | 5 | 3 | 1 | 2 |
| *L. camphoratus* | . | . | . | 8 | 1 | 1 | . | . | . | 8 | 8 | 1 | 1 |
| *L. fuliginosus* | 6 | 2 | 2 | . | . | . | . | . | . | 6 | 4 | 1 | 1 |
| *L. pyrogalus* | 9 | 2 | 2 | . | . | . | . | . | . | 9 | 5 | 2 | 2 |
| *L. quietus* | 102 | 10 | 3 | 114 | 10 | 4 | . | . | . | 216 | 9 | 10 | 7 |
| *L. rufus* | . | . | . | 18 | 4 | 2 | 2 | 1 | 1 | 20 | 6 | 4 | 3 |
| *L. serifluus* | . | . | . | 12 | 1 | 2 | . | . | . | 12 | 8 | 1 | 2 |
| *Leotia lubrica* | . | . | . | 15 | 2 | 2 | . | . | . | 15 | 7 | 2 | 2 |
| *Lepista nebularis* | . | . | . | 23 | 4 | 2 | . | . | . | 23 | 6 | 4 | 2 |
| *L. nuda* | . | . | . | 6 | 1 | 1 | . | . | . | 6 | 6 | 1 | 1 |
| *Leptopodia atra* | . | . | . | 3 | 1 | 1 | 2 | 1 | 1 | 5 | 3 | 2 | 2 |
| *L. elastica* | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 4 | 2 | 2 | 2 |
| *L. stevensii* | 16 | 1 | 1 | . | . | . | . | . | . | 16 | 16 | 1 | 1 |
| *Lycoperdon molle* | . | . | . | 1 | 1 | 1 | . | . | . | 1 | 1 | 1 | 1 |
| *L. perlatum* | . | . | . | 2 | 1 | 1 | . | . | . | 2 | 2 | 1 | 1 |
| *Macrolepiota rhacodes* | . | . | . | 1 | 1 | 1 | . | . | . | 1 | 1 | 1 | 1 |
| *Marasmiellus ramealis* | 141 | 8 | 2 | 15 | 1 | 1 | . | . | . | 156 | 19 | 8 | 3 |
| *Marasmius recubans* | . | . | . | 5 | 2 | 1 | 50 | 2 | 1 | 55 | 29 | 2 | 2 |
| *M. rotula* | . | . | . | 13 | 3 | 2 | . | . | . | 13 | 5 | 3 | 2 |
| *M. scorodonius* | . | . | . | 4 | 1 | 1 | . | . | . | 4 | 4 | 1 | 1 |
| *Megacollybia platyphylla* | 36 | 5 | 2 | . | . | . | 1 | 1 | 1 | 37 | 11 | 5 | 3 |
| *Melanogaster variegatus* var. *broomeianus* | . | . | . | . | . | . | 5 | 1 | 1 | 5 | 5 | 1 | 1 |
| *Merulius tremellosus* | . | . | . | 5 | 1 | 3 | . | . | . | 5 | 5 | 1 | 3 |
| *Mycena acicula* | 24 | 2 | 1 | . | . | . | 3 | 1 | 1 | 27 | 13 | 3 | 2 |
| *M. alcalina* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *M. filopes* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *M. galericulata* | 157 | 6 | 3 | 25 | 2 | 3 | 6 | 2 | 2 | 188 | 21 | 6 | 8 |

Tab. 5 cont.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *M. galopus* | 2 | 1 | 1 | 10 | 2 | 2 | 9 | 3 | 3 | 21 | 7 | 3 | 6 |
| *M. haematopus* | . | . | . | . | . | . | 10 | 1 | 1 | 10 | 10 | 1 | 1 |
| *M. inclinata* | 31 | 3 | 2 | . | . | . | 3 | 3 | 1 | 34 | 12 | 4 | 3 |
| *M. leptocephala* | . | . | . | . | . | . | 5 | 2 | 1 | 5 | 4 | 2 | 1 |
| *M. leucogala* | . | . | . | . | . | . | 3 | 1 | 1 | 3 | 3 | 1 | 1 |
| *M. polygramma* | 75 | 3 | 3 | 9 | 1 | 1 | 4 | 1 | 1 | 88 | 22 | 3 | 5 |
| *M. pura* | . | . | . | 33 | 8 | 3 | 7 | 2 | 2 | 40 | 7 | 8 | 5 |
| *M. sanguinolenta* | 13 | 3 | 3 | . | . | . | 2 | 1 | 1 | 15 | 8 | 3 | 4 |
| *M. vitilis* | 179 | 10 | 3 | 182 | 10 | 8 | 204 | 10 | 7 | 565 | 15 | 10 | 18 |
| *Nectria cinnnabarina* | . | . | . | . | . | . | 30 | 1 | 1 | 30 | 30 | 1 | 1 |
| *Otidea onotica* | 22 | 2 | 1 | 18 | 2 | 2 | . | . | . | 40 | 13 | 2 | 3 |
| *Panellus stypticus* | 80 | 2 | 3 | . | . | . | . | . | . | 80 | 32 | 2 | 3 |
| *Peniophora laeta* | 6 | 1 | 2 | 4 | 1 | 1 | . | . | . | 10 | 4 | 1 | 3 |
| *P. quercina* | 36 | 2 | 3 | 20 | 2 | 2 | 150 | 5 | 6 | 206 | 37 | 5 | 11 |
| *Peziza badia* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *Phallus impudicus* | . | . | . | 3 | 1 | 1 | . | . | . | 3 | 3 | 1 | 1 |
| *Pholiota lenta* | 6 | 1 | 2 | 4 | 1 | 1 | . | . | . | 10 | 4 | 2 | 3 |
| *Ph. ochrochlora* | 7 | 1 | 1 | . | . | . | . | . | . | 7 | 7 | 1 | 1 |
| *Pluteus atricapillus* | 5 | 3 | 2 | 2 | 1 | 1 | 7 | 4 | 5 | 14 | 3 | 4 | 8 |
| *P. leoninus* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *P.* sp. | 6 | 2 | 1 | . | . | . | . | . | . | 6 | 4 | 2 | 1 |
| *Polyporus brumalis* | 1 | 1 | 1 | . | . | . | . | . | . | 1 | 1 | 1 | 1 |
| *P. ciliatus* | . | . | . | . | . | . | 5 | 2 | 2 | 5 | 3 | 2 | 2 |
| *P. varius* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *Psathyrella candolleana* | . | . | . | 8 | 1 | 1 | . | . | . | 8 | 8 | 1 | 1 |
| *P. gracilis* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *P. hydrophila* | . | . | . | 32 | 1 | 2 | . | . | . | 32 | 17 | 1 | 2 |
| *P. obtusata* | | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *P.* sp. 1 | 2 | 1 | 1 | . | . | . | . | . | . | 2 | 2 | 1 | 1 |
| *P.* sp. 2 | 4 | 1 | 1 | . | . | . | . | . | . | 4 | 4 | 1 | 1 |
| *Resupinatus trichotis* | . | . | . | 20 | 1 | 1 | . | . | . | 20 | 20 | 1 | 1 |
| *Rhodophyllus rhodopolius* | . | . | . | . | . | . | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Russula brunneoviolacea* | 30 | 3 | 2 | . | . | . | . | . | . | 30 | 9 | 3 | 2 |
| *R. cyanoxantha* | . | . | . | 10 | 2 | 2 | 3 | 1 | 1 | 13 | 6 | 3 | 3 |
| *R. delica* | 6 | 2 | 2 | 2 | 1 | 1 | . | . | . | 8 | 4 | 2 | 3 |
| *R. emetica* | . | . | . | 23 | 4 | 2 | 2 | 1 | 1 | 25 | 7 | 4 | 3 |
| *R. foetens* | . | . | . | 11 | 3 | 2 | . | . | . | 11 | 6 | 3 | 2 |
| *R. heterophylla* | . | . | . | 4 | 2 | 1 | . | . | . | 4 | 2 | 2 | 1 |
| *R. nigricans* | . | . | . | 2 | 1 | 1 | . | . | . | 2 | 2 | 1 | 1 |
| *R. vesca* | . | . | . | . | . | . | 10 | 1 | 1 | 10 | 10 | 1 | 1 |
| *R.* sp. 1 | 30 | 3 | 2 | . | . | . | . | . | . | 30 | 9 | 3 | 2 |
| *R.* sp. 2 | 14 | 1 | 2 | . | . | . | . | . | . | 14 | 8 | 1 | 2 |
| *R.* sp. 3 | 2 | 1 | 1 | . | . | . | . | . | . | 2 | 2 | 1 | 1 |
| *Schizopora paradoxa* | . | . | . | 220 | 7 | 8 | 417 | 8 | 8 | 617 | 37 | 10 | 16 |
| *Scleroderma citrinum* | . | . | . | . | . | . | 4 | 1 | 1 | 4 | 4 | 1 | 1 |
| *S. verrucosum* | 15 | 1 | 46 | 7 | 2 | 26 | 5 | 2 | 77 | 9 | 7 | 5 | |
| *Scutellinia scutellata* | . | . | . | 7 | 1 | 1 | 15 | 1 | 1 | 22 | 15 | 2 | 2 |
| *Sphaerobolus stellatus* | . | . | . | 55 | 2 | 2 | . | . | . | 55 | 32 | 2 | 2 |
| *Steccherinum ochraceum* | . | . | . | 10 | 1 | 1 | 10 | 1 | 1 | 20 | 10 | 2 | 2 |
| *Stereum hirsutum* | 4 | 1 | 3 | 42 | 2 | 3 | 50 | 3 | 5 | 96 | 24 | 3 | 11 |
| *S. rugosum* | 1 | 1 | 3 | 12 | 2 | 3 | 12 | 3 | 8 | 25 | 10 | 3 | 14 |
| *Stropharia aeruginosa* | . | . | . | 14 | 3 | 1 | . | . | . | 14 | 6 | 3 | 1 |
| *Tarzetta cupularis* | . | . | . | 17 | 3 | 2 | . | . | . | 17 | 7 | 3 | 2 |
| *Tomentella subtestacea* | . | . | . | 1 | 1 | 1 | . | . | . | 1 | 1 | 1 | 1 |
| *Trametes hirsuta* | . | . | . | 2 | 1 | 2 | . | . | . | 2 | 2 | 1 | 2 |
| *T. versicolor* | . | . | . | 6 | 2 | 2 | 10 | 1 | 3 | 16 | 10 | 2 | 5 |
| *Tremella mesenterica* | . | . | . | 8 | 1 | 1 | . | . | . | 8 | 8 | 1 | 1 |
| *Tricholoma saponaceum* | . | . | . | 7 | 2 | 1 | . | . | . | 7 | 5 | 2 | 1 |
| *Tubaria furfuracea* | . | . | . | 6 | 2 | 2 | 1 | 1 | 1 | 7 | 4 | 3 | 3 |
| *T. pellucida* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *Vuilleminia comedens* | . | . | . | . | . | . | 60 | 5 | 8 | 60 | 29 | 5 | 8 |
| *Xerocomus badius* | . | . | . | 1 | 1 | 1 | . | . | . | 1 | 1 | 1 | 1 |
| *X. chrysenteron* | . | . | . | 12 | 4 | 2 | . | . | . | 12 | 4 | 4 | 2 |
| *Xerula radicata* | . | . | . | 12 | 3 | 3 | 5 | 3 | 2 | 17 | 5 | 4 | 5 |
| *Xylaria carpophila* | . | . | . | . | . | . | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *X. hypoxylon* | 52 | 5 | 3 | 36 | 2 | 2 | 35 | 2 | 2 | 123 | 30 | 5 | 7 |
| *X. polymorpha* | . | . | . | . | . | . | 8 | 1 | 4 | 8 | 8 | 1 | 4 |

saprotrophes. Mycorrhizal species are the second ecological group in respect of the number of taxa. Altogether 72 species were recorded; that makes 31.4% of the total number of fungi.

The qualitative and quantitative analysis of macromycetes occurring on the investigated plots revealed that the greatest numbers of fruit-bodies were produced generally by the species of fungi that have small carpophores (ca. 1 cm). They are, among other fungi, *Ascocoryne sarcoides*, *Calocera cornea*, *Colpoma quercina*, *Crepidotus variabilis*, *Dacrymyces stillatus*, *Humaria hemisphaerica*, *Hymenoscyphus fructigenus* and *Nectria cinnabarina*. Among the species with relatively big fruit-bodies (over 2 cm) the most abundant were e.g. *Clavulina rugosa*, *Hypholoma fasciculare*, *Laccaria amethystina*, *L. laccata*, *Lactarius quietus*, *Mycena vitilis* and *Peniophora quercina*.

There was a group of species common for both plots and occurring on the all subplots: *Laccaria amethystina*, *Lactarius quietus*, *Mycena vitilis* and *Schizopora paradoxa*. *Amanita rubescens*, *Laccaria laccata*, *Xerocomus chrysenteron* and *Inocybe* sp. appeared on the all subplots of the plot I; *Crepidotus variabilis* and *Hymenoscyphus fructigenus* appeared on the all subplots of the plot II. The most frequently observed species had either relatively persistent, annual or perennial fruit-bodies, e.g. *Hymenochaete rubiginosa*, *Peniophora quercina*, *Panellus stipticus*, *Schizopora paradoxa*, *Stereum hirsutum*, *S. rugosum* and *Trametes versicolor* or their fruit-bodies were delicate and impermanent, like in *Hypholoma fasciculare*, *Laccaria amethystina*, *L. laccata*, *Lactarius quietus* and *Mycena vitilis*.

The analysis of species composition of macromycetes occurring on both investigated plots revealed the presence of 9 species associated with oak (3.9% of the total number of recorded taxa). They are as follows: *Ciboria batschiana*, *Daedalea quercina*, *Exidia truncata*, *Hymenochaete rubiginosa*, *Hymenoscyphus fructigenus*, *Lactarius quietus*, *Mycena inclinata* and *Peniophora quercina*. Only one of them – *Lactarius quietus* – is a mycorrhizal species, the others are saprotrophes.

## LIST OF SPECIES

Explanations: trophic groups: M – mycorrhizal fungi, S – saprobic fungi; substrate: l – litter, m – mosses, s – soil, w – wood; the red data book categories: V – vulnerable, R – rare, I – indeterminate; *) – species connected with oak; # – species new to Poland; § – species protected by law in Poland.

***Agrocybe dura*** (Bolt.: Fr.) Sing. – s, S; ***A. paludosa*** (Lge.) Kühn. et Romagn. – s, S, I; ***A. praecox*** (Pers.: Fr.) Fay. – s, S.

***Amanita citrina*** (Shaeff.) Pers. – s, M; ***A. fulva*** (Shaeff.:) Pers. – s, M; ***A. pantherina*** (DC.: Fr.) Krombh. – s, M; ***A. phalloides*** (Vaill.: Fr.) Link – s, M; *A. rubescens* (Pers.: Fr.) S. F. Gray – s, M.

***Armillaria mellea*** (Vahl.: Fr.) Kumm. s. l. – w, S.
***Ascocoryne sarcoides*** (Jacq.: Fr.) Groves et Wilson – w, S.
***Bjerkandera adusta*** (Willd.: Fr.) Karst. – w, S.
***Boletus edulis*** Bull.: Fr. – s, M, V; ***B. luridus*** Schaeff.: Fr. – s, M.
***Bovista nigrescens*** Pers.: Pers. – s, S.
***Calocera cornea*** (Batsch: Fr.) Fr. – w, S; ***C. viscosa*** (Pers.: Fr.) Fr. – w, S.
***Calocybe carnea*** (Bull.: Fr.) Kumm. – l, S.
***Canthrellus cibarius*** Fr. – s, M, I.
***Chlorosplenium versiforme*** (Pers.: Fr.) de Not. – w, S.
***Chondrostereum purpureum*** (Pers.: Fr.) Pouz. – w, S.
* ***Ciboria batschiana*** (Zopf in Zopf et Sydow) Buchw. – w, S.
***Clavulina cinerea*** (Bull.: Fr.) Schroet. – s, S; ***C. cristata*** (Holmsk.: Fr.) Schroet. – s, S; ***C. rugosa*** (Bull.: Fr.) Schroet. – s, S, R.
***Clitocybe bresadoliana*** Sing. – l, S; ***C. candicans*** (Pers.: Fr.) Kumm. – l, S, I; ***C. clavipes*** (Pers.: Fr.) Kumm. – l, S; ***C. costata*** Kühn. et Romagn. – l, S; ***C. dealbata*** (Sow.: Fr.) Kumm. s. Fr. – l, S; ***C. dicolor*** (Pers.) Murr. s. Lge. – l, S; ***C. geotropa*** (Bull.) Quél. – l, S; ***C. gibba*** (Pers.: Fr.) Kumm. – l, S; ***C. inornata*** (Sow.: Fr.) Gill. – l, S; ***C. vibecina*** (Fr.: Fr.) Quél. s. Kuyper – l, S.
***Collybia butyracea*** (Bull.: Fr.) Kumm. var. ***asema*** (Fr.: Fr.) Quél. – l, S; ***C. distorta*** (Fr.) Quél.– l, S; ***C. dryophila*** (Bull.: Fr.) Kumm. – l, S; ***C. peronata*** (Bolt.: Fr.) Kumm. – l, S.
* ***Colpoma quercina*** (Pers.) Wallroth – w, S.
***Coprinus disseminatus*** (Pers.: Fr.) S. F. Gray – w, S; ***C. domesticus*** (Bolt.: Fr.) S. F. Gray – w, S; ***C. impatiens*** (Fr.) Quél. – l, S. ***C. micaceus*** (Bull.: Fr.) Fr. – w, S.
***Cortinarius traganus*** (Fr.: Fr.) Fr. – s, M; ***C. trivialis*** Lge. – s, M.
***Crepidotus variabilis*** (Pers.: Fr.) Kumm. – w, S.
***Crucibulum laeve*** (Huds.) Kambly – w, S.
***Cyathus striatus*** (Huds.) Willd.: Pers. – w, S.
***Cylindrobasidium evolvens*** (Fr.: Fr.) Jül. – w, S.
***Cystoderma carcharias*** (Pers.) Konr. et Maubl. – s, S.
***Dacrymyces stillatus*** Nees: Fr. – w, S.
* ***Daedalea quercina*** (L.) Pers. – w, S.
***Daedaleopsis confragosa*** (Bolt.: Fr.) Schroet. – w, S.
***Diatrype disciformis*** (Hoffm.: Fr.) Fr. – w, S.
***Entoloma eulividum*** Noord. = ***E. lividum*** (Bull.) Quél. – s, M, I.
***Exidia plana*** (Wigg.) Donk – w, S. * ***E. glandulosa*** (Bull.): Fr. = ***E. truncata*** Fr. – w, S.
***Fomes fomentarius*** (L.: Fr.) Fr. – w, S.
***Gymnopilus spectabilis*** (Fr.) Sing. – w, S.
***Hapolopilus nidulans*** (Fr.) Karst. – w, S.
***Hebeloma crustuliniforme*** (Bull.) Quél. – s, M.
***Helvella crispa*** (Scop.): Fr. – s, S; ***H. lacunosa*** Afz.: Fr. – s, S.

***Heterobasidion annosum*** (Fr.) Bref. – w, S.
***Hohenbuehelia atrocoerulea*** (Fr.: Fr.) Sing. – w, S.
***Humaria hemisphaerica*** (Wigg.: Fr.) Fuck. – s, S.
* ***Hymenochaete rubiginosa*** (Dicks.: Fr.) Lév. – w, S.
* ***Hymenoscyphus fructigenus*** (Bull.: Fr.) S. F. Gray – w, S.
***Hypholoma fasciculare*** (Huds.: Fr.) Kumm. – w, S; ***H. sublateritium*** (Fr.) Quél. – w, S.
***Hypoxylon fragiforme*** (Scop.: Fr.) Kickx – w, S; ***H. fuscum*** (Pers.: Fr.) Fr. – w, S; ***H. nummularium*** Buill.: Fr. – w, S; ***H. rubiginosum*** (Pers.: Fr.) Fr. – w, S.
***Inocybe asterospora*** Quél. – s, M; ***I. fastigiata*** (Schaeff.) Quél. – s, M; ***I. geophylla*** (Sow.: Fr.) Kumm. – s, M; ***I. geophylla*** (Sow.: Fr.) Kumm. var. ***lilacina*** Gill. – s, M; ***I. godeyi*** Gill. – s, M, **R**; ***I. hirtella*** Bres. – s, M; ***I. napipes*** Lge. – s, M; ***I. praetervisa*** Quél. – s, M.
***Kuehneromyces mutabilis*** (Schaeff.: Fr.) Sing. et Smith – w, S.
***Laccaria amethystina*** Cke. – s, M; ***L. laccata*** (Scop.: Fr.) Berk. et Br. – s, M; ***L. tortilis*** (Bolt.) Cke. – s, M.
***Lactarius acerrimus*** Britz. – s, M, **R**; ***L. camphoratus*** (Bull.) Fr. – s, M; ***L. fuliginosus*** Fr. – s, M; ***L. pyrogalus*** (Fr.) Fr. – s, M; * ***L. quietus*** (Fr.) Fr. – s, M. ***L. rufus*** (Scop.) Fr. – s, M; ***L. serifluus*** (DC.: Fr.) Fr. – s, M; ***L. subdulcis*** (Bull.: Fr.) S. F. Gray – s, M.
***Leotia lubrica*** Pers. – s, S; ***L. atrovirens*** Pers. – s, S.
***Lepiota castanea*** Quél. – s, S.
***Lepista nebularis*** (Batsch: Fr.) Harmaja – s, S; ***L. nuda*** (Bull.: Fr.) Cke. – s, S.
***Leptopodia atra*** (König: Fr.) Boud. – s, S, **V**; ***L. elastica*** (Bull. ex St. Am.) Boud. – s, S; ***L. stevensii*** (Peck) Le Gal – s, S.
***Lycogala epidendrum*** L. – w, S.
***Lycoperdon molle*** Pers.: Pers. – s, S; ***L. perlatum*** Pers.: Pers. – s, S; ***L. pyriforme*** Schaeff.: Pers. – w, S.
***Macrolepiota procera*** (Scop.: Fr.) Sing. – s, S, **I**; ***M. rhacodes*** (Vitt.) Sing. – s, S, **I**.
***Marasmiellus ramealis*** (Bull.: Fr.) Sing. – w, S.
***Marasmius recubans*** Quél. = ***M. setosus*** (Sow.) Noord. – l, S, **I**; ***M. rotula*** (Scop.: Fr.) Fr. – l, S. ***M. scorodonius*** (Fr.: Fr.) Fr. – l, S.
***Megacollybia platyphylla*** (Pers.: Fr.) Kotl. et Pouz. – w, S.
# ***Melanogaster variegatus*** (Vitt.) Tul. var. ***broomeianus*** (Berk.) Tul. – s, M.
***Merulius tremellosus*** Schrad.: Fr. – w, S.
***Mycena acicula*** (Schaeff.: Fr.) Kumm. – m, s, S; ***M. alcalina*** (Fr.: Fr.) Kumm. – w, S; ***M. filopes*** (Bull.: Fr.) Kumm. – l, S; ***M. galericulata*** (Scop.: Fr.) Quél. – w, S; ***M. galopus*** (Pers.: Fr.) Kumm. – l, S; ***M. haematopus*** (Pers.: Fr.) Kumm. – w, S; ***M. inclinata*** (Fr.) Quél. – w, S; ***M. leptocephala*** (Pers.: Fr.) Gill. – w, S; ***M. leucogala*** (Cke.) Sacc. – l, S; ***M. polygramma*** (Bull.: Fr.) S. F. Gray – w, S; ***M. pura*** (Pers.: Fr.) Kumm. – l, S; ***M. sanguinolenta*** (Alb. et Schw.: Fr.) Kumm. – l, w, S; ***M. vitilis*** (Fr.) Quél. – l, S.

***Nectria cinnnabarina*** (Tode: Fr.) Fr. – w, S.
***Otidea leporina*** (Batsch) Fuck. – s, S; ***O. onotica*** (Pers.) Fuck. – s, S.
***Panellus stypticus*** (Bull.: Fr.) Karst. – w, S.
***Paxillus involutus*** (Batsch: Fr.) Fr. – s, M.
***Peniophora incarnata*** (Pers.: Fr.) Karst. – w, S; ***P. laeta*** (Fr.) Donk – w, S; ***P. quercina*** (Pers.: Fr.) Cke. – w, S.
***Peziza badia*** Pers. – s, S.
§ ***Phallus impudicus*** L.: Pers. – s, S.
***Phlebia radiata*** Fr. – w, S.
***Pholiota lenta*** (Pers.: Fr.) Sing. – l, S; ***Ph. ochrochlora*** (Fr.) Orton – s, S.
***Pluteus atricapillus*** (Batsch) Fay. – w, S; ***P. leoninus*** (Schaeff.: Fr.) Kumm. – w, S.
***Polyporus brumalis*** (Pers.): Fr. – w, S; ***P. ciliatus*** Fr.: Fr. – w, S; ***P. varius*** (Pers.): Fr. – w, S.
***Postia caesia*** (Schrad.: Fr.) Karst. – w, S.
***Psathyrella candolleana*** (Fr.: Fr.) Mre. – l, w, S; ***P. gracilis*** (Fr.) Quél. – l, S; ***P. hydrophila*** (Bull.: Fr.) Mre. – w, S; ***P. obtusata*** (Fr.) Smith – l, S.
***Resupinatus trichotis*** (Pers.) Sing. – w, S.
***Rickenella fibula*** (Bull.: Fr.) Raith. – m, w, S.
***Rhodophyllus juncinus*** Kühn. et Romagn. = ***Entoloma juncinum*** (Kühn. et Romagn.) Noord. – s, S; ***Rh. rhodopolius*** (Fr.) Kumm. = ***E. rhodopolium*** (Fr.) Kumm. – s, S.
***Russula atropurpurea*** (Krombh.) Britz. – s, M; ***R. brunneoviolacea*** Crawsh. – s, M; ***R. cyanoxantha*** (Schaeff.) Fr. – s, M; ***R. delica*** Fr. – s, M; ***R. emetica*** Fr – s, M; ***R. foetens*** (Pers.): Fr. – s, M; ***R. heterophylla*** (Fr.) Fr. – s, M; ***R. nigricans*** (Bull.: Fr.) Fr. – s, M; ***R. ochroleuca*** Pers. – s, M; ***R. pectinatoides*** Peck – s, M; ***R. versicolor*** J. Schäff. – s, M; ***R. vesca*** Fr. – s, M; ***R. xerampelina*** (Schaeff.) Fr. – s, M.
***Schizophyllum commune*** Fr.: Fr. – w, S.
***Schizopora paradoxa*** (Schrad.: Fr.) Donk s. l. – w, S.
***Scleroderma areolatum*** Ehrenb. – s, M; ***S. bovista*** Fr. – s, M; ***S. citrinum*** Pers. – s, M; ***S. verrucosum*** (Bull.): Pers. – s, M.
***Scutellinia scutellata*** (L. ex St. Am.) Lamb. – w, S.
***Sphaerobolus stellatus*** Tode: Pers. – w, S.
***Steccherinum ochraceum*** (Pers.: Fr.) S. F. Gray – w, S.
***Stereum hirsutum*** (Willd.: Fr.) Pers. – w, S; ***S. rugosum*** (Pers.: Fr.) Fr. – w, S.
***Stropharia aeruginosa*** (Curt.: Fr.) Quél. – l, S; ***S. semiglobata*** (Batsch: Fr.) Quél. – l, S; ***S. squamosa*** (Pers.: Fr.) Quél. – s, S, I.
***Tarzetta cupularis*** (L.: Fr.) Lamb. – s, S.
# ***Tomentella subtestacea*** (Bourd. et Galz.) Svr. – w, S; (det. Urmas Kõljalg).
***Trametes gibbosa*** (Pers.: Fr.) Fr. – w, S; ***T. hirsuta*** (Fr.) Pil. – w, S; ***T. versicolor*** (L.: Fr.) Pil. – w, S.
***Tremella mesenterica*** Retz.: Fr. – w, f, P.
***Trichaptum abietinum*** (Dicks.: Fr.) Ryv. – w, S.

***Tricholoma saponaceum*** (Fr.: Fr.) Kumm. – s, M.
***Tricholomopsis rutilans*** (Schaeff.: Fr.) Sing. – w, S.
***Tubaria furfuracea*** (Pers.: Fr.) Gill. – l, S; ***T. pellucida*** (Bull.: Fr.) Gill. s. Lge. – s, S.
***Tylopilus felleus*** (Bull.: Fr.) Karst. – s, M.
***Vuilleminia comedens*** (Nees: Fr.) Mre. – w, S.
***Xerocomus badius*** (Fr.) Kühn.: Gilb. – s, M; ***X. chrysenteron*** (Bull.) Quél. – s, M; ***X. subtomentosus*** (L.: Fr.) Quél. – s, M.
***Xerula radicata*** (Relh.: Fr.) Dörfelt – w, S.
***Xylaria carpophila*** (Pers.) Fr. – w, S; ***X. hypoxylon*** (L.: Fr.) Grev. – w, S; ***X. polymorpha*** (Pers.: Fr.) Grev. – w, S.

## SUMMARY AND CONCLUSIONS

1. Monitoring studies in the patches of *Stellario–Carpinetum* Oberd. 1957 in the Ińsko Landscape Park were carried out in the years 1994–1996. Two permanent plots of 1000 $m^2$ each were established; the plots were divided into 10 subplots, 100 $m^2$ each. Nineteen mycological observations were performed on each plot.
2. In total 229 species of fungi were found: 1 species of *Myxomycota*, 28 species of *Ascomycota* and 200 species of *Basidiomycota*. Among them 1 species is new to Poland (*Tomentella subtestacea*), 12 species are threatened (Wojewoda and Ławrynowicz 1992) and 1 species is protected by law (*Phallus impudicus*).
3. The percentages of fungi of particular ecological groups are as follows:
   a) saprotrophic fungi – 157 species, 68.6% of all the determined taxa; the group includes 85 species of lignicolous saprotrophes, 34 species of litter-inhabiting saprotrophes and 38 species of humicolous saprotrophes;
   b) mycorrhizal fungi – 72 species, 31.4% of the total number of recorded macromycetes.
4. On the permanent plots 9 species of fungi associated with oak (out of 16 known from other studies in Poland) were noted. Two of them: *Lactarius quietus* and *Hymenochaete rubiginosa* were found also during monitoring studies in all investigated regions of Poland (Łuszczyński 1998; Skirgiełło 1998; Lisiewska, Połczyńska 1998; Wojewoda et al. 1999). However, the species *Colpoma quercina* was noted for the first time.
5. Quantitative and qualitative analysis of the collected material revealed that the greatest numbers of fruit-bodies were produced by the species of fungi that have small carpophores, e.g. *Ascocoryne sarcoides*, *Calocera cornea*, *Colpoma quercina*, *Humaria hemisphaerica* and *Hymenoscyphus fructigenus*. Among the species producing relatively big fruit-bodies the most abundant were e.g. *Clavulina rugosa*, *Hypholoma fasciculare*, *Laccaria amethystina*, *Lactarius quietus*, *Mycena vitilis* and *Peniophora quercina* (Tables 4 and 5).

6. The species common for all the subplots of both investigated plots were as follows: *Laccaria amethystina*, *Lactarius quietus*, *Mycena vitilis* and *Schizopora paradoxa*.
7. The species of macromycetes which were most frequently noted during the whole period of studies were characterised either by relatively persistent, annual or perennial fruit-bodies, e.g. *Hymenochaete rubiginosa*, *Peniophora quercina*, *Panellus stipticus*, *Stereum hirsutum*, *S. rugosum* and *Trametes versicolor* or their fruit-bodies were delicate and impermanent but freqently occuring, like in *Hypholoma fasciculare*, *Laccaria amethystina*, *L. laccata*, *Lactarius quietus* and *Mycena vitilis* (Tables 4 and 5).
8. The comparison of the results of monitoring studies carried out in oak-hornbeam forests in different regions of Poland allows the conclusion that the percentage of mycorrhizal fungi in the Ińsko Landscape Park is similar to that found in the Świętokrzyskie Mts. – 31% (Łuszczyński 1998).
9. No essential differences between plots covered by *Quercus petraea* or *Qu. robur* in respect of macromycetes were noted at Ińsko Landscape Park.

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## Macromycetes *Stellario-Carpinetum* w Ińskim Parku Krajobrazowym – badania monitoringowe

Streszczenie

Iński Park Krajobrazowy jest najdalej na północ wysuniętym poligonem badań w ramach międzynarodowego programu "Mycological monitoring in European oak forest". Obserwacje nad udziałem grzybów wielkoowocnikowych w płatach zespołu *Stellario-Carpinetum* Oberd. 1957 prowadzono w latach 1994–1996.

Badaniami objęto dwie stałe powierzchnie (po 1000 $m^2$), podzielone na 10 podpowierzchni (po 100 $m^2$), na których wykonano po 19 obserwacji mikologicznych.

Łącznie stwierdzono 229 gatunków grzybów, w tym 1 gatunek z *Myxomycota*, 28 z *Ascomycota* i 200 z *Basidiomycota*. Wśród wyróżnionych grzybów *Tomentella subtestacea* jest gatunkiem nowym dla Polski, 12 gatunków należy do zagrożonych w Polsce a jeden gatunek, *Phallus impudicus* jest objęty ochroną prawną.

Udział grzybów z poszczególnych grup ekologicznych w płatach *Stellario-Carpinetum* jest zróżnicowany. Najliczniej reprezentowane są grzyby saprotroficzne – 157 gatunków, co stanowi 68,6% wszystkich oznaczonych taksonów. Wśród nich ponad połowa, czyli 85 gatunków to saprotrofy nadrzewne. Do grzybów rozwijających się na ściółce należą 34 gatunki, a do saprotrofów napróchnicznych – 38 gatunków. Grzyby mikoryzowe, których stwierdzono 72 gatunki, stanowią 31,4% ogólnej liczby macromycetes.

Wśród grzybów występujących na obu badanych powierzchniach, 9 gatunków związanych jest z dębem. Wszystkie z wyjątkiem *Colpoma quercina* notowane były również w innych regionach Polski, w których prowadzono badania monitoringowe (Łuszczyński 1998; Skirgiełło 1998; Lisiewska i Połczyńska 1998; Wojewoda i in. 1999).