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MYCOLOGICAL RELATIONSHIPS IN LOWLAND ACIDOPHILOUS BEECH FOREST (*LUZULO PILOSAE-FAGETUM*) IN THE PUSZCZA WKRZAŃSKA FOREST (NW POLAND)*

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Abstract. The paper describes the mycobiota of lowland acidophilous forest (*Luzulo pilosae-Fagetum*) in the Puszcza Wkrzańska forest, northwest Poland. The mycobiota comprises 301 macromycete species. Lignicolous fungi dominate. The relatively small contribution of mycorrhizal fungi indicates disturbed ecological relationships in the forest complex. Forty-two fungal species red-listed in Poland and nine protected fungal species occur in *Luzulo pilosae-Fagetum*. These results are part of research applying the mycosociological method in forest communities of the Puszcza Wkrzańska forest between 2002 and 2009. The mycobiota of *Luzulo pilosae-Fagetum* in the Puszcza Wkrzańska forest is compared with that of *Luzulo pilosae-Fagetum* within its range limits in Poland.

Key words: macromycetes, mycobiota, mycocoenology, bioecological groups, lowland acidophilous beech forest, *Luzulo pilosae-Fagetum*, Puszcza Wkrzańska forest, Poland

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INTRODUCTION

The Polish part of the Puszcza Wkrzańska forest covers *ca* 340 km^2 and forms the eastern part of a large forest complex covering *ca* 1550 km^2 in total on the Polish/German border (Zaręba 1986). It is bounded by the Polish national border to the west, the Zalew Szczeciński lagoon to the north, the Oder valley to the east and the Szczecin city limits and Szczecin–Dobra Road to the south.

The Puszcza Wkrzańska forest covers the Równina Wkrzańska plain and the northern part of the Wzgórza Szczecińskie hills on the Pobrzeże Szczecińskie coast (Kondracki 2002). The plain is formed by coarse sands, and ranges in elevation from 10–20 m a.s.l. to 40 m a.s.l. on dunes. The Wzgórza Szczecińskie hills are built of moraine deposits, Tertiary clays and sands, and reach 130 m (Borówka 2002). Multi-age *Leucobryo-Pinetum* and *Querco roboris-Pinetum* forests dominate on the plain, while deciduous and mixed tree stands of *Luzulo pilosae-Fagetum* and *Fago-Quercetum petraeae* phytocoenoses dominate on moraine hills. Terrain depressions, which occur throughout the study area, are overgrown by the following associations: *Ribeso nigri-Alnetum*, *Betulo pendulae-Quercetum roboris*, *Fraxino-Alnetum* and *Vaccinio uliginosi-Betuletum pubescentis.* The forests belong to the Trzebież forest inspectorate.

The vegetation of the Puszcza Wkrzańska forest is poorly known. The vegetation of the Świdwie Ornithological Reserve (Bacieczko & Kowalski 1993; Kowalski & Bacieczko 1993) and the vegetation of peat bogs (Jasnowski 1962) have largely been studied. Only five common macromycete species recorded in the Puszcza Wkrzańska forest during studies of poplar mycotrophy (Dominik & Ihnatowicz 1979) were known before this mycological research began. Preliminary results of long-term studies begun in 2002 were presented at the 53rd Conference of the Polish Botanical Society (Friedrich 2004). Data on the occurrence and distribution of 86 threatened

* This paper is dedicated to Professor Tomasz Majewski on the occasion of his 70th birthday.

and protected macromycete species in the Puszcza Wkrzańska forest were subsequently published (Friedrich 2006). Here I describe the mycobiota of lowland acidophilous beech forest. The results of observations in other forest communities within the Puszcza Wkrzańska forest will be published separately. The mycology of areas surrounding the Puszcza Wkrzańska forest has been studied relatively well (e.g., Friedrich 1984, 1985, 1987a, b, 1997; Friedrich & Orzechowska 2002).

The mycobiota of *Luzulo pilosae-Fagetum* has so far been examined in seven regions scattered across its range in Poland, which extends over the moraine area in western Poland and the belt of uplands in central and southern Poland. Those areas are the Cisy w Czarnem Reserve in the Pojezierze Południowopomorskie lakeland (Lisiewska & Marach 2002), the Puszcza Goleniowska forest on the Pobrzeże Szczecińskie coast (Friedrich 1984, 1985, 1987a), Cedynia and Ińsko Landscape Park in the Pojezierze Zachodniopomorskie lakeland (Friedrich 1994; Stasińska 1999), Goździk siny w Grzybnie Reserve in the Pradolina Warciańsko-Odrzańska ice-marginal valley (Lisiewska & Filisiewicz 2006), Parkowe Reserve and Sokole Góry Reserve in the Wyżyna Krakowsko-Częstochowska upland (Adamczyk 1996), and Chełmowa Góra in the Wyżyna Kielecka upland (Łuszczyński 2007).

Material and methods

Macromycetes of the Puszcza Wkrzańska forest were examined between 2002 and 2009. Systematic mycosociological investigations of beech forests were carried out at 10 permanent research plots and 12 additional (sporadic) plots, 400 m^2 each: 24 standard mycological observations at each permanent plot over four years, and one or two observations at additional plots. When possible, weather conditions favorable for fructification of fungi were considered in setting the observation dates. The vegetation of each plot was described with a phytosociological relevé. All fungal species were listed during each mycological observation. Fruiting abundance of fungi was assessed on the Moser scale (1949). Substrate type was also identified. The species are arranged by substrate type and the number of records is given in Table 1. The number of years in which fresh fruitbodies were recorded is also given for fungi producing permanent fruitbodies (species marked 'x' in Table 1). Although usually reported, for technical reasons the fruiting abundance of fungi is omitted. It should be noted, however, that it does not play a major role as an indicator of the relationship between a fungus and the plant community, which is determined primarily by the constancy and fidelity of a species in relation to the phytocoenosis. The spatial frequency (constancy), that is, the contribution of plots at which a species was recorded in relation to all research plots, is also given in the table. Frequency is expressed in five classes (grades), calculated separately for permanent plots and additional plots as well as in total for both plot types.

The mycobiota of *Luzulo pilosae-Fagetum* in the Puszcza Wkrzańska forest was compared to the mycobiota of *Luzulo pilosae-Fagetum* within its range limit in Poland. The coefficient of similarity between the mycobiotas of beech forests in individual regions was calculated with the Sørensen formula. The rearranged similarity matrices are represented as Czekanowski trellis diagrams.

Basidiomycetes nomenclature follows Wojewoda (2003), Crous *et al.* (2004), Legon *et al.* (2005), Knudsen and Vesterholt (2008), and Ascomycetes nomenclature follows Hansen and Knudsen (2000) and Chmiel (2006). For plants, nomenclature follows Mirek *et al.* (2002) and Ochyra *et al.* (2003), and for plant communities Matuszkiewicz (2001). The research plot locations were mapped in a study on threatened macromycetes in the Puszcza Wkrzańska forest (Friedrich 2006).

Vegetation features

The flora of the phytocoenoses, classified as lowland acidophilous beech forest *Luzulo pilosae-Fagetum*, consists of 53 vascular plant species and 9 bryophyte species. The number of plant species in individual patches ranges from 9 to 25. The upper canopy layer of the tree stand is formed by *Fagus sylvatica*; crown density is 60–100%. *Quercus petraea* (up to 10%) and individual specimens of *Pinus sylvestris*, *Quercus robur*, *Betula pendula* and *Picea abies* occur as admixture in a few phytocoenoses. Undergrowth is absent or is formed by individual specimens of *Frangula alnus*, *Sorbus aucuparia*, *Padus serotina* and *Picea abies*. Field layer cover is up to 20%. It consists mainly of indicator species of the association *Luzulo pilosae-Fagetum* (*Luzula pilosa*, *Carex pilulifera*, *Trientalis europaea*) and higher syntaxa (*Deschampsia*

Table 1. Macromycetes of lowland acidophilous beech forest in the Puszcza Wkrzańska forest. Do. – Dobra, Ma. – Mazańczyce, My. – Myślibórz, Pi. – Pienice, Po. – Podymin, Si. – Siedlice, Ta. – Tatynia, Tu. – Tusznica, Za. – Zalesie.

Number	1	2	3	4	5	6	7	8	9	10	Frequency 1–10	11	12	13	14	15	16	17	18	19	20	21	22	Frequency 11–22	Frequency 1–22
Plots	permanent											sporadic													
Number of plot	11	67	58	55	45	35	24	42	15	87		86	79	78	12	16	72	69	68	63	56	44	27		
Forest district	Tu.	Si.	Za.	Po.	Ta.	Ma.	Pi.	Pi.	Tu.	Si.		My.	Do.	Po.	Tu.	My.	Si.	Si.	Si.	My.	Za.	Ta.	Pi.		
Forest division	516	827	490	444	667	270	89	83	543	829		260	693	342	542	260	801	807	826	299	492	666	119		
Number of observations	24	24	24	24	24	24	24	24	24	24		2	2	2	2	2	1	1	1	1	1	1	1		
Number of species	89	96	86	93	110	86	102	91	79	74		36	32	35	29	26	24	30	22	19	16	15	22		
MYCORRHIZAL FUNGI																									
Xerocomus chrysenteron (Bull.) Quél.	5	3	4	6	3	2	4	5	1	7	V	.	+	+	.	+	+	+	.	.	.	+	.	III	IV
Laccaria amethystea (Bull.) Murrill	4	9	3	6	4	4	5	2	2	2	V	+	+	+	+	.	.	.	.	.	.	.	.	II	IV
Amanita citrina (Schaeff.) Pers.	4	4	3	6	4	6	2	5	2	4	V	+	+	.	+	.	.	.	.	.	.	.	.	II	III
Lactarius blennius (Fr.: Fr.) Fr.	8		2	2	2	1	5	3	1	4	V	.	.	.	.	.	.	+	.	.	.	.	+	I	III
Russula mairei Singer	3	3	1	1	2	4	3	6	1	.	V	.	.	.	.	.	.	.	.	.	.	.	.	.	III
Russula fellea (Fr.: Fr.) Fr.	2	3	6	4	2	3	2	.	3	.	IV	.	.	+	+	.	+	+	.	.	.	.	.	II	III
Scleroderma citrinum Pers.	1	2	.	.	4	3	1	1	3	4	IV	+	+	.	.	.	.	.	.	+	.	.	.	II	III
Laccaria laccata (Scop.: Fr.) Berk. & Broome	3	.	3	2	2	2	.	.	1	2	IV	+	.	.	.	+	.	.	.	.	.	.	.	I	III
Russula cyanoxantha (Schaeff.) Fr.	1	1	2	5	2	4	.	3	.	.	IV	.	.	.	.	.	.	+	.	.	.	.	.	I	II
Lactarius subdulcis (Bull.: Fr.) Gray	3	3	.	6	2	2	2	1	.	.	IV	.	.	.	.	.	.	.	.	+	.	.	.	I	II
Lactarius vellereus (Fr.) Fr.	.	1	2	2	.	.	2	2	1	3	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Xerocomus badius (Fr.: Fr.) Kühner *ex* Gilbert	1	.	1	2	2	1	2	2	1	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Paxillus involutus (Batsch.: Fr.) Fr. *s.l.*	.	4	1	.	6	1	2	.	.	.	III	.	.	.	.	+	.	.	.	.	.	+	.	I	II
Lactarius camphoratus Fr.	.	1	.	2	.	.	2	1	2	.	III	.	.	.	.	.	.	.	.	+	+	.	.	I	II
Hygrophorus eburneus (Bull.: Fr.) Fr.	3	2	.	2	.	.	.	1	2	.	III	.	+	.	.	.	.	.	.	.	.	.	.	I	II
Cortinarius alboviolaceus (Pers.: Fr.) Fr.	1	.	.	2	.	2	.	2	.	1	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Cortinarius cinnabarinus Fr.	.	.	1	.	1	1	.	2	1	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Russula nigricans (Bull.: Fr.) Fr.	1	.	.	1	.	2	.	3	.	2	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Russula foetens (Pers.: Fr.) Fr.	.	.	1	2	.	.	.	.	.	3	II	+	.	.	.	.	.	.	.	.	.	.	+	I	II
Lactarius piperatus (L.: Fr.) Gray	.	.	.	2	.	2	.	3	.	.	II	.	.	+	.	.	.	.	.	.	.	.	.	I	I
Boletus edulis Bull.: Fr.	2	.	3	2	.	.	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Scleroderma areolatum Ehrenb.	1	.	1	.	.	.	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Cantharellus tubiformis Bull.: Fr.	2	.	.	1	.	.	3	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Tricholoma sulphureum (Bull.: Fr.) P. Kumm.	1	.	.	.	.	.	2	.	2	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Inocybe napipes J. E. Lange	.	1	.	.	1	1	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I

(cont.)

Table 1. *Continued.*

Number	1	2	3	4	5	6	7	8	9	10	F	11	12	13	14	15	16	17	18	19	20	21	22	F	F
Lactarius quietus (Fr.) Fr.	.	.	2	.	3	.	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Amanita porphyria (Alb. & Schwein.: Fr.) Mladý	.	.	.	.	.	.	.	1	2	2	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Amanita rubescens (Pers.: Fr.) Gray	.	1	.	1	.	.	.	.	.	.	I	.	.	.	.	.	.	+	.	.	.	.	.	I	I
Lactarius aurantiacus (Pers.: Fr.) Gray	.	.	.	1	.	4	.	.	.	.	I	.	.	.	.	+	.	.	.	.	.	.	.	I	I
Craterellus cornucopioides (L.: Fr.) Pers.	.	.	1	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	+	.	I	I
Russula aurea Pers.	.	.	1	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	+	.	I	I
Inocybe geophylla (Fr.: Fr.) P. Kumm. var. *geophylla*	.	.	.	.	.	1	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	+	.	I	I
Russula alutacea (Pers.: Fr.) Fr.	.	.	.	.	1	.	.	.	.	.	I	.	.	.	.	.	.	+	.	.	.	.	.	I	I
Geastrum fimbriatum Fr.	.	.	.	.	1	.	.	.	.	.	I	.	.	.	.	.	.	.	+	.	.	.	.	I	I
Lactarius uvidus (Fr.: Fr.) Fr.	.	.	.	.	.	.	.	1	.	.	I	.	.	.	.	.	.	.	.		+	.	.	I	I
Boletus luridus Schaeff.: Fr.	2	.	.	1	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Russula ochroleuca (Pers.) Fr.	.	1	.	.	1	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Russula olivacea (Schaeff.) Fr.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	+	I	I
Tricholoma ustale (Fr.: Fr.) P. Kumm.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	I	I
Amanita phalloides (Vaill.: Fr.) Link	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	I	I
Cortinarius torvus (Fr.: Fr.) Fr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	I	I
Boletus luridiformis Rostk.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	I	I
Xerocomus subtomentosus (L.: Fr.) Quél. var. *subtomentosus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	I	I
HUMICOLOUS FUNGI																									
Phallus impudicus L.: Pers.	6	1	5	.	3	1	4	6	.	.	IV	.	+	+	.	+	.	.	.	+	.	.	.	II	III
Lycoperdon perlatum Pers.: Pers.	5	1	1	3	1	.	.	2	.	2	IV	.	+	.	.	.	.	.	.	.	.	.	.	I	II
Lyophyllum decastes (Fr.: Fr.) Singer	.	.	1	1	.	.	.	2	1	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Psathyrella conopilus (Fr.: Fr.) A. Pearson & Dennis	.	2	.	3	.	.	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Lycoperdon nigrescens (Pers.: Pers.) Pers.	.	.	.	2	1	.	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Coprinopsis picacea (Bull.) Redhead, Vilgalys & Moncalvo	.	2	2	.	.	.	.	.	.	.	I	.	.	.	.	+	.	.	.	.	.	.	.	I	I
Conocybe pilosella (Pers.: Fr.) Kühner	.	.	1	.	.	.	.	.	1	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Lycoperdon molle Pers.	.	.	.	1	.	.	.	.	.	.	I	.	+	.	.	.	.	.	.	.	.	.	.	I	I
Chlorophyllum rhacodes (Vittad.) Vellinga	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	I	I
Coprinus plicatilis (M. A. Curtis: Fr.) Fr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	I	I
Agrocybe praecox (Pers.: Fr.) P. Kumm.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	I	I

LITTER-INHABITING FUNGI																								
Mycena vitilis (Fr.) Quél.	5	4	3	1	2	4	3	4	1	5	V	+	.	+	+	+	.	+	.	.	.	.	+	III	IV
Rhodocollybia butyracea (Bull.: Fr.) Lennox for. *asema*	3	4	7	4	4	6	3	3	9	4	V	+	+	.	+	.	.	.	+	.	.	.	.	II	IV
Mycena pura (Pers.: Fr.) P. Kumm.	2	7	2	3	2	2	3	5		2	V	.	.	+	+	.	.	.	.	.	.	.	+	II	III
Stropharia aeruginosa (Curtis: Fr.) Quél.	2	4	1	4	3	6	2	1	5	2	V	.	.	+	+	.	.	.	.	.	.	.	.	I	III
Gymnopus peronatus (Bolt.: Fr.) Antonín, Halling & Noordel.	2	8	4	5	.	6	3	7	4	9	V	+	.	.	.	.	.	+	.	.	.	.	.	I	III
Lachnum virgineum (Batsch: Fr.) P. Karst.	2	3	4	1	2	1	2	1	1	2	V	.	.	.	.	.	.	.	.	.	.	.	.	.	III
Xylaria carpophila (Pers.: Fr.) Fr.	3	4	.	4	.	3	4	2	1	4	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Mycena filopes (Bull.: Fr.) P. Kumm.	2	1	.	1	3	2	2	1	1	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Psathyrella fusca (Schum.) Pears.	.	.	1	2	1	2	3	1	2	.	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Gymnopus dryophilus (Bull.: Fr.) Murrill	2	4	1	2	.	2	1	3	.	.	IV	.	.	.	.	.	.	.	+	.	.	.	.	I	II
Mycena capillaris (Schum.: Fr.) P. Kumm.	.	3	2	.	3	1	3	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	+	I	II
Mycena galopus (Pers.: Fr.) P. Kumm.	.	2	1	.	.	.	2	.	2	1	III	+	.	.	.	.	.	.	.	.	.	.	.	I	II
Mycena rosea (Bull.) Gramberg	1	2	.	1	1	.	2	.	.	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Mycena sanguinolenta (Alb. & Schwein.: Fr.) P. Kumm.	2	.	1	1	.	3	.	.	4	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Clitocybe nebularis (Batsch: Fr.) P. Kumm.	4	.	.	3	.	.	5	2	2	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Clitocybe phyllophila (Fr.) P. Kumm.	3	.	.	4	.	.	5	.	1	1	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Hymenoscyphus fructigenus (Bull.: Fr.) Gray	.	1	.	1	.	.	2	1	.	1	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Marasmius epiphyllus (Pers.: Fr.) Fr.	.	2	.	.	1	1	.	3	.	2	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Flammulaster carpophilus (Fr.) Earle	.	.	.	3	2	.	1	.	1	1	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Mycena pelianthina (Fr.) Quél.	.	.	.	.	3	.	3	.	2	.	II	.	.	+	.	.	.	.	.	+	.	.	.	I	II
Gymnopus confluens (Pers.: Fr.) Antonín, Halling & Noordel.	.	.	.	.	.	.	5	3	.	1	II	.	.	.	.	.	.	+	.	.	+	.	.	I	II
Lachnum fuscescens (Pers.: Fr.) P. Karst. var. *fagicola* (W. Phillips) Dennis	2	.	.	.	1	1	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Mycena amicta (Fr.) Quél.	.	1	.	.	.	2	1	1	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Hygrophoropsis aurantiaca (Wulf.: Fr.) J. Schröt.	2	.	.	.	3	.	.	1	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Rhodocollybia butyracea (Bull.: Fr.) Lennox for. *butyracea*	2	.	.	.	1	.	.	2	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Stropharia caerulea Kreisel	.	1	.	2	.	.	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Clitocybe hydrogramma (Bull.: Fr.) P. Kumm.	.	.	1	2	.	.	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Marasmius setosus (Sowerby) Noordel.	.	.	1	.	.	2	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Gymnopus fuscopurpureus (Pers.: Fr.) Antonín, Halling & Noordel.	.	.	.	.	.	1	1	.	1	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I

(cont.)

Table 1. *Continued.*

Successive number	1	2	3	4	5	6	7	8	9	10	F	11	12	13	14	15	16	17	18	19	20	21	22	F	F
Auriscalpium vulgare Gray	.	2	.	.	3	.	.	.	.	.	I	.	.	.	.	.	.	.	+	+	.	.	.	I	I
Mycena epipterygia (Scop.: Fr.) Gray var. *epipterygia*	2	.	.	.	.	.	.	.	1	.	I	.	.	.	+	.	.	.	.	.	.	.	.	I	I
Clitocybe gibba (Pers.: Fr.) P. Kumm.	.	.	.	.	.	.	.	1	2	.	I	.	.	.	.	.	.	+	.	.	.	.	.	I	I
Mycena stylobates (Pers.: Fr.) P. Kumm.	.	1	.	.	.	.	.	.	.	.	I	.	.	.	.	.	+	.	.	.	+	.	.	I	I
Galerina hypnorum (Schrank: Fr.) Kühner	.	1	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	+	.	.	.	I	I
Lepista nuda (Bull.: Fr.) Cooke	.	.	.	.	.	1	.	.	.	.	I	.	.	+	.	.	.	.	.	.	.	.	.	I	I
Tubaria pellucida (Bull.: Fr.) Gillet	.	.	.	.	.	1	.	.	.	.	I	.	.	+	.	.	.	.	.	.	.	.	.	I	I
Rickenella fibula (Bull.: Fr.) Raith.	1	.	1	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Mycena galopus var. *leucogala* (Cooke) J. E. Lange	1	.	.	.	.	.	.	.	1	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Stropharia squamosa (Pers.) Quél.	.	2	.	.	3	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Cystoderma amiantinum (Scop.: Fr.) Fayod	.	2	.	.	2	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Baeospora myosura (Fr.: Fr.) Singer	.	2	.	.	1	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Lepista flaccida (Sowerby: Fr.) Pat.	.	1	.	.	1	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Hymenoscyphus fagineus (Pers.: Fr.) Dennis	.	1	.	.	.	.	1	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Clitocybe candicans (Pers.: Fr.) P. Kumm.	.	.	.	.	.	2	3	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Collybia cirrhata (Pers.) Quél.	.	.	.	.	.	.	.	1	1	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Tubaria furfuracea (Pers.: Fr.) Gillet	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	I	I
Lepiota clypeolaria (Bull.: Fr.) P. Kumm.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	I	I
Clitocybe odora (Bull.: Fr.) Kummer	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	I	I
LIGNICOLOUS FUNGI																									
Fomes fomentarius (L.: Fr.) Kickx	4x	3x	4x	4x	4x	4x	4x	2x	3x	2x	V	+	+	+	+	+	+	+	.	.	+	.	+	IV	V
Stereum hirsutum (Willd.: Fr.) Gray	4x	3x	4x	3x	4x	2x	3x	4x	2x	3x	V	+	.	+	+	.	+	+	+	.	+	+	.	IV	V
Xylaria hypoxylon (L.) Grev.	4x	3x	3x	3x	2x	3x	1x	1x	2x	3x	V	+	+	+	+	+	.	.	.	+	.	.	.	III	IV
Exidia plana (Wiggers) Donk	8	4	9	4	4	5	4	7	6	9	V	+	.	+	+	+	+	.	.	.	.	.	.	III	IV
Pluteus cervinus (Schaeff.) P. Kumm.	2	1	2	2	5	4	.	1	1	2	V	+	+	+	+	.	.	.	.	.	.	+	+	III	IV
Bjerkandera adusta (Willd.: Fr.) P. Karst.	4x	2x	3x	3x	4x	3x	2x	2x	.	4x	V	.	+	+	+	+	.	+	.	.	.	.	.	III	IV
Trametes versicolor (L.: Fr.) Pilát	4x	4x	3x	3x	4x	3x	2x	.	2x	1x	V	+	+	+	.	+	.	.	+	.	.	.	.	III	IV
Ganoderma applanatum (Pers.) Pat.	4x	4x	3x	4x	4x	3x	2x	4x	3x	2x	V	.	+	.	.	+	+	+	.	.	.	.	.	II	IV
Mycena galericulata (Scop.: Fr.) Gray	2	5	3	2	4	2	.	2	3	6	V	.	.	+	+	.	.	.	+	.	.	.	.	II	III
Hypholoma fasciculare (Huds.) P. Kumm.	4	4	6	4	3	3	7	2	2	.	V	.	+	.	+	.	.	.	+	.	.	.	+	II	III
Xerula radicata (Relh.: Fr.) Dörfelt	1	.	1	2	4	2	6	1	4	8	V	.	+	+	+	.	.	.	.	.	.	.	.	II	III
Trametes gibbosa (Pers.: Fr.) Fr.	3x	.	3x	4x	4x	3x	2x	2x	2x	4x	V	.	.	+	+	.	+	.	.	.	.	.	.	II	III

Psathyrella piluliformis (Bull.: Fr.) P. D. Orton	3	5	2	2	4	3	1	.	2	5	V	+	.	+	.	.	.	.	.	.	.	.	.	I	III
Marasmius alliaceus (Jacq.: Fr.) Fr.	2	1	2	6	3	.	2	4	3	2	V	.	+	+	.	.	.	.	.	.	.	.	.	I	III
Pholiota lenta (Pers.: Fr.) Singer	2	1	5	2	4	1	4	2	2	.	V	.	+	.	.	.	.	.	.	.	.	.	.	I	III
Dacryomyces stillatus Nees: Fr.	3	3	.	.	4	1	2	2	3	2	IV	+	+	.	+	.	.	.	.	.	.	+	.	II	III
Hypoxylon fragiforme (Pers.: Fr.) J. Kickx	4x	.	4x	2x	3x	2x	2x	2x	.	2x	IV	+	+	.	.	.	+	+	.	.	.	.	.	II	III
Megacollybia platyphylla (Pers.: Fr.) Kotl. & Pouzar	.	6	1	4	1	2	1	3	7	.	IV	.	.	+	.	+	.	.	.	+	.	.	+	II	III
Polyporus varius (Pers.): Fr.	4	3	1	2	2	.	.	4	.	3	IV	.	.	+	.	.	.	+	.	+	.	.	.	II	III
Calocera cornea (Batsch: Fr.) Fr.	3	.	3	.	4	1	.	2	4	3	IV	.	.	.	+	.	.	+	+	.	.	.	.	II	III
Meripilus giganteus (Pers.: Fr.) P. Karst.	.	4	2	2	3	2	.	1	2	.	IV	.	.	+	.	.	+	.	.	+	.	.	.	II	III
Hyphodontia paradoxa (Schrad.: Fr.) E. Langer & Vesterholt *s.str.*	2x	1x	2x	2x	1x	1x	1x	1x	.	1x	IV	.	.	+	.	.	.	.	.	.	.	.	.	I	III
Armillaria ostoyae (Romagn.) Herink	3	2	2	.	2	.	1	1	4	4	IV	+	.	.	+	.	.	.	.	.	.	.	.	I	III
Mycena polygramma (Bull.: Fr.) Gray	2	1	2	5	2	.	1	2	.	.	IV	.	+	.	.	.	.	.	.	.	.	.	.	I	II
Trametes hirsuta (Wulf.: Fr.) Pilát	3x	2x	1x	.	2x	.	.	2x	1x	3x	IV	.	+	.	.	.	.	.	.	.	.	.	.	I	II
Crepidotus mollis (Schaeff.: Fr.) Staude	.	1	.	1	2	1	.	2	2	1	IV	.	.	.	.	.	.	.	.	.	.	.	+	I	II
Inonotus nodulosus (Fr.) P. Karst.	2x	.	1x	2x	.	.	2x	3x	1x	1x	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Fomitopsis pinicola (Swartz: Fr.) P. Karst.	.	1x	2x	4x	.	2x	.	2x	2x	3x	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Phlebia radiata Fr.	3x	.	.	.	.	4x	2x	2x	4x	.	III	.	+	+	+	.	.	.	.	.	.	.	.	II	II
Pholiota mutabilis (Scop.: Fr.) P. Kumm.	.	1	1	1	.	.	1	.	.	2	III	+	.	+	.	.	.	.	.	.	.	.	.	I	II
Polyporus ciliatus Fr.: Fr.	.	2	4	1	.	.	.	3	1	.	III	.	+	.	+	.	.	.	.	.	.	.	.	I	II
Schizophyllum commune Fr.: Fr.	1	.	.	2	.	.	.	1	5	3	III	.	+	.	+	.	.	.	.	.	.	.	.	I	II
Bisporella citrina (Batsch: Fr.) Korf & S. E. Carp.	2	.	3	2	3	.	4	.	.	.	III	+	.	.	.	.	.	.	.	.	.	.	.	I	II
Xylaria polymorpha (Pers.) Grev.	4x	.	1x	.	4x	.	.	2x	.	4x	III	.	.	.	.	.	+	.	.	.	.	.	.	I	II
Datronia mollis (Sommerf.: Fr.) Donk	1x	.	.	.	2x	.	.	1x	2x	3x	III	.	.	.	.	+	.	.	.	.	.	.	.	I	II
Oudemansiella mucida (Schrad.: Fr.) Höhn.	.	2	.	3	3	3	2	.	.	.	III	.	+	.	.	.	.	.	.	.	.	.	.	I	II
Nectria cinnabarina (Tode: Fr.) Fr.	.	5	.	2	1	.	3	.	.	4	III	.	.	.	.	.	.	.	+	.	.	.	.	I	II
Hymenochaete rubiginosa (Schrad.: Fr.) Lév.	.	.	2x	.	2x	.	1x	1x	.	1x	III	.	.	.	.	.	.	.	.	.	+	.	.	I	II
Mycena crocata (Schrad.: Fr.) P. Kumm.	2	3	2	.	.	3	.	.	.	2	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Galerina marginata (Batsch) Kühner	1	.	3	.	.	2	.	1	1	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Psilocybe lateritia (Schaeff.: Fr.) Noordel.	1	.	2	.	.	1	.	.	3	2	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Psilocybe capnoides (Fr.: Fr.) Noordel.	3	.	.	.	3	2	.	2	1	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Ustulina deusta (Hoffm.: Fr.) Lind	.	.	1x	.	1x	.	.	2x	1x	4x	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Pholiota aurivella (Batsch: Fr.) P. Kumm.	.	.	2	.	.	3	4	5	1	.	III	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Stereum subtomenosum Pouzar	4x	.	.	.	.	3x	.	.	3x	.	II	.	.	.	.	.	.	.	+	.	.	+	+	II	II
Xylaria longipes Nitschke	.	3x	.	.	1x	.	.	.	2x	.	II	.	.	+	.	+	.	.	.	.	.	.	+	II	II

(cont.)

Table 1. *Continued.*

Number	1	2	3	4	5	6	7	8	9	10	F	11	12	13	14	15	16	17	18	19	20	21	22	F	F
Hericium coralloides (Scop.: Fr.) Pers.	.	.	1	.	.	1	.	.	.	1	II	.	.	+	.	+	.	.	.	+	.	.	.	II	II
Calocera viscosa (Pers.: Fr.) Fr.	.	2	.	.	2	1	1	.	.	.	II	.	.	.	.	.	+	.	+	.	.	.	.	I	II
Sarcomyxa serotina (Pers.) P. Karst	2	3	.	.	.	.	.	.	1	.	II	+	.	.	+	.	.	.	.	.	.	.	.	I	II
Flammulina velutipes (M. A. Curtis: Fr.) Singer	1	.	.	.	.	.	.	1	1	.	II	.	.	+	+	.	.	.	.	.	.	.	.	I	II
Ascocoryne sarcoides (Jacq.: Fr.) Groves & Wilson	1	.	.	2	.	.	.	.	.	3	II	+	.	.	.	.	.	.	.	.	.	.	.	I	I
Phlebia tremellosa (Schrad.: Fr.) Nakasone & Burds.	5	.	.	.	.	4	.	.	.	3	II	+	.	.	.	.	.	.	.	.	.	.	.	I	I
Coprinus micaceus (Bull.: Fr.) Fr.	2	.	.	2	.	.	.	.	.	1	II	.	.	.	.	.	.	.	.	.	.	.	+	I	I
Ascocoryne cylichnium (Tul.) Korf	1	.	.	.	.	2	.	3	.	.	II	.	.	.	+	.	.	.	.	.	.	.	.	I	I
Coprinus disseminatus (Pers.: Fr.) Quél.	.	.	.	.	.	1	.	2	.	2	II	.	.	.	.	+	.	.	.	.	.	.	.	I	I
Panellus stypticus (Bull.: Fr.) P. Karst.	.	.	.	2	.	4	.	.	7	.	II		.	.	.	.	.	+	.	.	.	.	.	I	I
Vuilleminia comedens (Ness: Fr.) Maire	.	.	.	3x	.	.	2x	.	.	2x	II	.	.	+	.	.	.	.	.	.	.	.	.	I	I
Crepidotus versutus (Peck) Sacc.	1	2	.	2	.	2	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Polyporus brumalis (Pers.): Fr.	4	.	1	.	.	.	3	.	.	2	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Rhodocollybia maculata (Alb. & Schwein.: Fr.) Singer	1	.	1	.	1	.	.	1	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Mycena maculata P. Karst.	.	.	2	.	4	.	2	1	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Ramaria stricta (Pers.: Fr.) Quél.	1	.	.	1	.	.	.	1	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Polyporus melanopus (Pers.): Fr.	2	.	.	.	.	.	1	.	.	1	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Crepidotus variabilis (Pers.: Fr.) P. Kumm.	1	.	.	.	.	.	2	.	2	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Lentinellus cochleatus (Pers.: Fr.) P. Karst.	.	1	4	.	.	.	.	2	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Lenzites betulinus (L.: Fr.) Fr.	.	2x	1x	.	.	.	.	1x	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Cudoniella acicularis (Bull.: Fr.) J. Schröt.	.	2	.	.	3	.	.	1	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Resupinatus trichotis (Pers.) Singer	.	1	.	.	1	.	.	.	1	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Coprinus silvaticus Peck	.	1	.	.	.	.	2	.	2	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Phellinus nigricans (Fr.) P. Karst. *sensu* Černy, Vampola (1993), *non sensu* P. Karst.	.	1x	.	.	.	.	.	2x	.	4x	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Pluteus cinereofuscus J. E. Lange	.	.	1	1	1	.	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Stereum gausapatum (Fr.) Fr.	.	.	2x	.	3x	.	3x	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Exidia glandulosa (Bull.): Fr.	.	.	3	.	1	.	3	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Mycena inclinata (Fr.) Quél.	.	.	1	.	1	.	1	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Laetiporus sulphureus (Bull.: Fr.) Murrill	.	.	.	1x	1x	.	1x	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Pluteus salicinus (Pers.: Fr.) P. Kumm.	.	.	.	.	1	.	.	.	1	1	II	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Heterobasidion annosum (Fr.) Bref. *s.l.*	.	1x	.	.	2x	.	.	.	.	.	I	.	.	.	.	.	.	+	+	.	.	.	+	II	II

Oligoporus caesius (Schrad.: Fr.) Gilbertson & Ryvarden	.	2x	.	.	3x	.	.	.	.	.	I	.	.	.	.	.	.	+	+	.	.	.	.	I	II
Mycena haematopus (Pers.: Fr.) P. Kumm. var. *haematopus*	.	.	.	1	.	.	.	.	.	.	I	+	+	.	.	.	.	.	.	.	.	+	.	II	I
Lycoperdon pyriforme Schaeff.: Pers.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	+	.	II	I
Trichaptum abietinum (Dicks.: Fr.) Ryvarden	.	1x	.	2x	.	.	.	.	.	.	I	+	.	.	.	.	.	+	.	.	.	.	.	I	I
Mycena stipata Maas Geest. & Schwöb.	.	2	.	.	1	.	.	.	.	.	I	.	.	.	+	.	.	.	.	.	.	.	.	I	I
Daedalea quercina (L.: Fr.) Pers.	.	.	3x	.	.	.	4x	.	.	.	I	.	.	.	.	.	.	.	.	.	+	.	.	I	I
Pleurotus ostreatus (Jacq.: Fr.) P. Kumm.	1	.	.	.	.	.	.	.	.	.	I	+	+	.	.	.	.	.	.	.	.	.	.	I	I
Pluteus leoninus (Schaeff.: Fr.) P. Kumm.	.	.	.	.	.	.	1	.	.	.	I	+	.	.	.	.	.	+	.	.	.	.	.	I	I
Tremella mesenterica Retz.: Fr.	1	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	+	.	.	.	.	.	.	I	I
Paxillus panuoides (Fr.: Fr.) Fr.	.	1	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	+	.	.	.	.	I	I
Phlebiopsis gigantea (Fr.) Jülich	.	.	.	.	4x	.	.	.	.	.	I	+	.	.	.	.	.	.	.	.	.	.	.	I	I
Pycnoporus cinnabarinus (Jacq.: Fr.) P. Karst.	.	.	.	.	.	.	2x	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	+	I	I
Mycena tintinabulum (Fr.) Quél.	.	.	.	.	.	.	1	.	.	.	I	+	.	.	.	.	.	.	.	.	.	.	.	I	I
Ascotremella faginea (Peck) Seaver	.	.	.	.	.	.	.	.	.	1	I	.	.	.	.	.	.	+	.	.	.	.	.	I	I
Peniophora incarnata (Pers.: Fr.) P. Karst.	2x	.	.	.	.	.	.	3x	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Daldinia concentrica (Bolton: Fr.) Ces. & De Not.	.	1	.	.	1	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Mollisia ligni (Desm.) P. Karst.	.	2	.	.	.	.	1	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Cudoniella clavus (Alb. & Schwein.: Fr.) Dennis	.	.	2	.	1	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Armillaria lutea Gillet	.	.	.	2	3	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Phellinus robustus (P. Karst.) Bourdot & Galzin	.	.	.	.	4x	.	3x	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Ischnoderma resinosum (Fr.) P. Karst.	.	.	.	.	1x	.	1x	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Polyporus squamosus (Huds.): Fr.	.	.	.	.	4	.	.	.	3	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Chondrostereum purpureum (Schum.: Fr.) Pouzar	.	.	.	.	.	3x	.	1x	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Postia alni Niemelä & Vampola	.	.	.	.	.	1x	.	.	.	1x	I	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Marasmius rotula (Scop.: Fr.) Fr.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	I	I

SPORADIC SPECIES

MYCORRHIZAL FUNGI: *Entoloma nitidum* Quél. 2(1), *Cortinarius flexipes* (Pers.: Fr.) Fr. 2(1), *C. traganus* (Fr.: Fr.) Fr. 4(1), *C. brunneus* (Pers.: Fr.) Fr. 4(1), *C. decipiens* (Pers.: Fr.) Fr. 5(1), *Inocybe asterospora* Quél. 5(1), *Thelephora terrestris* Ehr. *ex* Willd.: Fr. 5(2), *Russula virescens* (Schaeff.) Fr. 6(1), *Amanita excelsa* Bertillon 6(1), *A. fulva* (Schaeff.) Pers. 7(1), *Xerocomus impolitus* (Fr.) Quél. 7(1), *Entoloma juncinum* (Kühner. & Romagn.) Noordel. 7(1), *Hygrophorus penarius* Fr. 7(1), *Xerocomus rubellus* (Krombh.) Quél. 7(1), *Tricholoma album* (Schaeff.: Fr.) P. Kumm. 12, *Cortinarius anomalus* (Fr.: Fr.) Fr. 16, *Inocybe lanuginosa* (Bull.: Fr.) P. Kumm. 16, *Lactarius fuliginosus* (Fr.) Fr. 16, *L. volemus* (Fr.) Fr. 16, *Geastrum rufescens* Pers.: Pers. 17, *G. triplex* Jungh. 17, *Lactarius pallidus* (Pers.: Fr.) Fr. 17, *L. chrysorrheus* Fr. 18, *Russula vesca* Fr. 18, *Tricholoma scalpturatum* (Fr.) Quél. *s.l.* 18, *Cortinarius delibutus* Fr. 19, *Amanita virosa* (Fr.) Bertillon 20, *Russula delica* Fr. 20, *Inocybe fastigiata* (Schaeff.) Quél. 22.

HUMICOLOUS FUNGI: *Lycoperdon umbrinum* Pers.: Pers. 2(1), *Conocybe rickeniana* Singer *ex* P. D. Orton 4(1), *Phallus impudicus* var. *pseudoduplicatus* O. Andersson 4(1), *Volvariella gloiocephala* (DC.: Fr.) Boekh. & End. 8(1), *Pseudoclitocybe cyathiformis* (Bull.: Fr.) Singer 10(1), *Mutinus caninus* (Huds.: Pers.) Fr. 15, *Helvella lacunosa* Afzel.:

Table 1. *Continued.*

Fr. 15, *Helvella crispa* Scop.: Fr. 16, *Peziza repanda* Pers.: Fr. 17, *Tarzetta catinus* (Holmsk.: Fr.) Korf & J. Rogers 17, *Humaria hemisphaerica* (F. H. Wigg.: Fr.) Fuckel 18, *Lyophyllum fumosum* (Pers.: Fr.) P. D. Orton 19, *Macrolepiota procera* (Scop.: Fr.) Singer 20.

LITTER-INHABITING FUNGI: *Mycena vulgaris* (Pers.: Fr.) P. Kumm. 2(1), *Rhodocollybia prolixa* (Hornem.: Fr.) Antonín & Noordel. var. *distorta* (Fr.) Antonín, Halling & Noordel. 2(1), *Marasmiellus ramealis* (Bull.: Fr.) Singer 3(1), *Mycena aetitis* (Fr.) Quél. 4(2), *Lepista personata* (Fr.: Fr.) Cooke 4(1), *Clitocybe fragrans* (With.: Fr.) P. Kumm. 5(2), *Strobilurus esculentus* (Wulf.: Fr.) Singer 5(2), *S. tenacellus* (Pers.: Fr.) Singer 5(3), *Mycena metata* (Fr.) P. Kumm. 5(1), *M. cinerella* (P. Karst.) P. Karst. 6(2), *Psathyrella gracilis* (Fr.: Fr.) Quél. 6(1), *Clitocybe metachroa* (Fr.) P. Kumm. 7(1), *Marasmius wynnei* Berk & Broome 8(2), *Marasmiellus foetidus* (Sowerby: Fr.) Antonín, Halling & Noordel. 8(1), *Psilocybe semiglobata* (Batsch: Fr.) Noordel. 9(1), *Galerina pumila* (Pers.: Fr.) Singer 15, *Cyathus striatus* (Huds.) Willd.: Pers. 17.

LIGNICOLOUS FUNGI: *Auricularia auricula-judae* (Bull.: Fr.) Wettst. 2(2), *Stereum sanguinolentum* (Alb. & Schwein.: Fr.) Fr. 2(2x), *Tricholomopsis rutilans* (Schaeff.: Fr.) Singer 2(1), *Polyporus alveolaris* (DC.: Fr.) Bondartsev & Singer 4(1), *Fistulina hepatica* (Schaeff.): Fr. 5(3), *Mycena niveipes* Murrill 5(2), *M. purpureofusca* (Peck) Sacc. 5(3), *Phellinus ferruginosus* (Schrad.: Fr.) Pat. 5(1x), *Psathyrella candolleana* (Fr.: Fr.) Maire 5(1), *Trichaptum biforme* (Fr.) Ryvarden 5(1x), *Daedaleopsis confragosa* (Bolt.: Fr.) J. Schröt. 6(3x), *Piptoporus betulinus* (Bull.: Fr.) P. Karst. 6(4x), *Exidia villosa* Nefuhof 7(1), *Ganoderma lucidum* (M. A. Curtis: Fr.) P. Karst. 7(1x), *Mollisia cinerea* (Batsch: Fr.) P. Karst. 7(1), *Sparassis brevipes* Krombh. 7(1), *Basidioradulum radula* (Fr.: Fr.) Nobles 10(1x), *Hyphodontia sambuci* (Pers.: Fr.) Erikss. 10(1x), *Mycena hiemalis* (Osbeck: Fr.) Quél. 10(1), *Polyporus badius* (Pers.) Schwein. 10(1), *Trichaptum fuscoviolaceum* (Ehrenb.: Fr.) Ryvarden 11, *Trechispora farinacea* (Pers.: Fr.) Liberta 14, *Exidia thuretiana* (Lév.) Fr. 15, *Pholiota squarrosa* (Weigel: Fr.) P. Kumm. 15, *Pluteus atromarginatus* (Singer) Kühner 15, *Trametes pubescens* (Schumach.: Fr.) Pilát 15, *Tremella foliacea* Pers. 15, *Inonotus radiatus* (Sowerby: Fr.) P. Karst. 16, *Mycena haematopus* (Pers.: Fr.) P. Kumm. var. *marginata* J. E. Lange 16, *Peniophora laeta* (Fr.) Donk 18, *Auricularia mesenterica* (Dick.: Fr.) Pers. 19, *Steccherinum ochraceum* (Pers.) Gray 19, *Pluteus plautus* (Weinm.) Gillet 19, *Porostereum spadiceum* (Pers.: Fr.) Hjortstam & Ryvarden 20, *Mycena viridimarginata* P. Karst. 21, *Pleurotus dryinus* (Pers.: Fr.) P. Kumm. 21, *Galerina triscopa* (Fr.) Kühner 22, *Pluteus pellitus* (Pers.: Fr.) P. Kumm. 22.

flexuosa, *Melica uniflora*, *Dryopteris filix-mas*, *Galeobdolon luteum*, *Galium odoratum*, *Milium effusum*, *Polygonatum multiflorum*, *Scrophularia nodosa*, *Stachys sylvatica*, *Viola reichenbachiana*, *Carex remota*). Higher constancy is observed for the following accompanying species: *Dryopteris carthusiana*, *Oxalis acetosella*, *Maianthemum bifolium*, *Mycelis muralis* and *Calamagrostis arundinacea.* The moss layer cover is very low. The moss layer is mostly formed by differential species of the suballiance *Luzulo-Fagenion* (*Hypnum cupressiforme*, *Mnium hornum*, *Dicranella heteromalla*) and the order *Fagetalia sylvaticae* (*Atrichum undulatum*). A thick litter layer consisting of poorly decomposed leaves, beech cupules and small twigs is recorded in the phytocoenoses. Large amounts of dead wood at different stages of decomposition (from initial to terminal), such as stumps, overturned trunks and fallen beech branches, occur on all the plots.

RESULTS AND DISCUSSION

A total of 301 macromycete species distributed in 118 genera constitute the mycobiota of *Luzulo pilosae-Fagetum* in the Puszcza Wkrzańska forest. The highest numbers of species were recorded in the following genera: *Mycena* (29 species), *Lactarius* and *Russula* (12 each), *Cortinarius* (9) and *Clitocybe* (8).

The number of species ranged from 74 to 110 at individual permanent plots and from 15 to 36 at additional plots. A total of 244 species (81% of the mycobiota in the beech forests) were recorded at permanent plots and 163 species (54%) at additional plots; 106 (35% of the mycobiota of the beech forests) occurred in both plot types. Species exclusive to permanent plots formed 46% of the total mycobiota; 19% were exclusive to additional plots. As the latter figure shows, observations at additional plots supplement our mycological data in an important way.

The frequency distribution for permanent plots is I > II > III > IV = V, consistent with Raunkiaer's law of frequency. Only the IV–V ratio diverges from the law (should be IV < V). Twenty percent of the species fell in the highest frequency classes

(V and IV), 12% in class III, and 43% in class I; half the latter were recorded at only one plot. If the results for both types of plots are considered, only 4% of the total mycobiota (12 species) occurred in classes IV and V, and as many as 207 species (69%) occurred in class I; *ca* 32% of all species occurred at only one plot, often once, indicating fungal specificity. The mean contribution of these fungi in other regions is *ca* 40%.

A total of 96 terricolous fungal species, 65 litter-inhabiting and moss-inhabiting species, and 140 lignicolous fungal species were collected at the plots.

Terricolous fungi, that is, symbiotic fungi and humicolous saprotrophs, constitute 32% of the mycobiota of the beech forest. The ratio of number of terricolous fungal species to herbaceous plant species is 2.3:1. The number of all fungal species, however, exceeds the number of all plant species almost fivefold (4.9:1).

The contribution of mycorrhizal fungi to the mycobiota of *Luzulo pilosae-Fagetum* of the Puszcza Wkrzańska forest is 24%, lower than their mean contribution to the mycobiota of beech forests examined in other parts of Poland (28%). It ranges from 18% in the Puszcza Goleniowska forest to 44% in the Wyżyna Kielecka upland (Fig. 1). The small contribution of ectomycorrhizal fungi in the Puszcza Wkrzańska forest and Puszcza Goleniowska forest is most probably due to the influence of the chemical plant in the town of Police, located 4 to 17 km from the research plots. According to Fellner (1993), a more than 40% contribution of mycorrhizal fungi to the mycobiota indicates strong disturbance of the forest biocoenosis, caused mostly by increased air pollution.

Among the terricolous fungi, mycorrhizal fungi, most closely associated with the vegetation, constitute 75%. High frequency (classes V and IV) was recorded for 12 species. Of these, *Russula mairei* and *Lactarius blennius*, species forming obligatory symbiotic relationships with beech, are especially noteworthy. The following species can be classified as fungi for which beech is the main phytosymbiont in the study area: *Amanita excelsa*, *A. fulva*, *Boletus luridus*, *Cortinarius alboviolaceus*, *Craterellus cornucopioides*, *Hygrophorus eburneus*, *Lactarius fuliginosus*, *L. pallidus*, *Russula aurea*, *R. olivacea*, *R. vesca*, *R. virescens* and *Tricholoma ustale*. *Amanita citrina*, *Laccaria amethystea*, *L. laccata*, *Lactarius subdulcis*, *L. vellereus*, *Russula cyanoxantha*, *R. fellea* and *Xerocomus chrysenteron* are constant or frequent taxa (class V or IV) with a broader occurrence range.

Of the humicolous fungi, *Phallus impudicus* and *Lycoperdon perlatum* are common species in beech forests, occurring in the majority of plots. Almost all the other species were observed at only one or two plots. The low frequency of humicolous fungal species is most probably due to the presence of a thick layer of poorly decomposed litter lying in the area, which does not favor their development.

Litter-inhibiting fungi constitute over 20% of the mycobiota of *Luzulo pilosae-Fagetum*. High

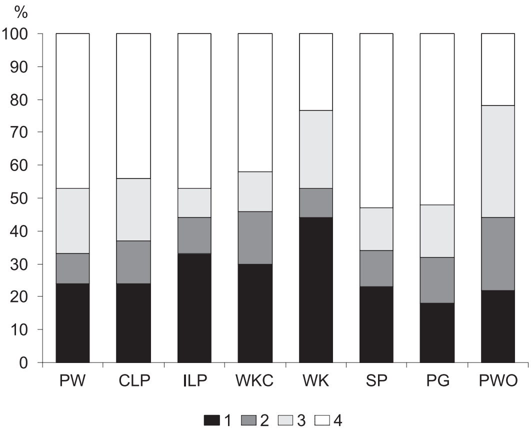

Fig. 1. Contribution of bioecological groups of macromycetes to the mycobiota of *Luzulo pilosae-Fagetum* in Poland. 1 – mycorrhizal fungi, 2 – humicolous fungi, 3 – litter-inhabiting fungi, 4 – lignicolous fungi; PW – Puszcza Wkrzańska forest on the Pobrzeże Szczecińskie coast, CLP – Cedynia Landscape Park in the Pojezierze Zachodniopomorskie lakeland (Friedrich 1994), ILP – Ińsko Landscape Park in the Pojezierze Zachodniopomorskie lakeland (Stasińska 1999), WKC – Parkowe Reserve and Sokole Góry Reserve in the Wyżyna Krakowsko-Częstochowska upland (Adamczyk 1996), WK – Chełmowa Góra in the Wyżyna Kielecka upland (Łuszczyński 2007), SP – Cisy w Czarnem Reserve in the Pojezierze Południowopomorskie lakeland (Lisiewska & Marach 2002), PG – Puszcza Goleniowska forest on the Pobrzeże Szczecińskie coast (Friedrich 1985a), PWO – Goździk siny w Grzybnie Reserve in the Pradolina Warciańsko-Odrzańska ice-marginal valley (Lisiewska & Filisiewicz 2006).

amounts of litter create good conditions for the development of these fungi, 19 species of which were observed at 5–10 permanent plots (frequency classes III–V). The most important taxa are fungi closely associated with beech. *Lachnum virgineum* and *Xylaria carpophila* often occurred on beech cupules, *Lachnum fuscescens* var. *fagicola* and *Hymenoscyphus fagineus* less frequently. *Mycena capillaris*, *M. pelianthina* and *Flammulaster carpophilus* were recorded on fallen leaves. High frequency was recorded for weakly selective fungi such as *Mycena vitilis*, *M. pura*, *M. filopes*, *Gymnopus dryophilus*, *Psathyrella fusca*, *Stropharia aeruginosa* and *Rhodocollybia butyracea* var. *asema*.

Lignicolous fungi developing on fallen branches, logs, stumps and trunks make the highest contribution (46%) to the mycobiota of *Luzulo pilosae-Fagetum*. *Marasmius alliaceus*, *Mycena crocata*, *Oudemansiella mucida*, *Meripilus giganteus*, *Xerula radicata* and *Hypoxylon fragiforme* were collected exclusively on beech wood. *Fomes fomentarius*, *Stereum hirsutum*, *Xylaria hypoxylon*, *Exidia plana*, *Pluteus cervinus*, *Bjerkandera adusta*, *Trametes versicolor*, *Ganoderma appanatum*, *Mycena galericulata*, *Hypholoma fasciculare*, *Xerula radicata*, *Trametes gibbosa*, *Psathyrella piluliformis*, *Marasmius alliaceus* and *Pholiota lenta* were the most common species (frequency class V). Lignicolous fungi comprise a large group of fungi with broad ecological spectra, growing in many forest communities. A few parasitic fungi such as *Fomitopsis piniola* and *Flammulina velutipes* are facultative parasites, which occurred mostly as saprotrophs and did not pose a threat to the tree stands.

Both fungi closely associated with beech, which dominates in the tree stand, and fungi with a higher contribution and having a broader occurrence range, were observed in all the groups. The presence of even single pines, oaks, birches and spruces in the beech forest was accompanied by the occurrence of fungi associated with these tree species. This increases the biodiversity of plant patches but disturbs the composition of the mycobiota characteristic of *Luzulo pilosae-Fagetum*. For example, the presence of pine, which grows at many plots, results in the presence of fungi closely associated with it, such as *Scleroderma citrinum*, *Xerocomus badius*, *Amanita porphyria*, *Russula ochroleuca*, *Cortinarius flexipes*, *C. traganus*, *Auriscalpium vulgare*, *Baeospora myosura*, *Strobilurus tenacellus*, *Trichaptum abietinum* and *Pluteus atromarginatus.* Species such as *Lactarius quietus*, *L. chrysorrheus*, *Mycena inclinata*, *Fistulina hepatica*, *Phellinus robustus*, *Stereum gausapatum*, *Daedalea quercina* and *Hymenochaete rubiginosa* penetrate the mycobiota of the beech phytocoenoses together with oak.

Species of fungi known from different beech forest communities, including species characteristic of beech forests belonging to the alliance *Fagion silvaticae* (Lisiewska 1974), occur in the mycobiota of *Luzulo pilosae-Fagetum*. These are *Marasmius alliaceus*, *Inonotus nodulosus*, *Oudemansiella mucida*, *Mycena crocata*, *Hericium coralloides*, *Pycnoporus cinnabarinus*, *Boletus luridiformis*, *B. luridus*, *Tricholoma ustale*, *Helvella crispa* and *Tubaria pellucida.*

The contribution of bioecological groups in the mycobiotas of lowland acidophilous beech forests in other regions of Poland varies (Fig. 1), ranging from 32% in the Puszcza Goleniowska forest (Friedrich 1985) to 53% in the Wyżyna Kielecka upland (Łuszczyński 2007) for terricolous fungi. Litter-inhabiting fungi range from 9% of the mycobiota of beech forests in the Ińsko Landscape Park (Stasińska 1999) to 34% in the Pradolina Warciańsko-Odrzańska ice-marginal valley (Lisiewska & Filisiewicz 2006). Lignicolous fungi range from 22% in the Pradolina Warciańsko-Odrzańska ice-marginal valley (Lisiewska & Filisiewicz 2006) to 53% in the Pojezierze Południowopomorskie lakeland (Lisiewska & Marach 2002). The differentiation of the contribution of individual bioecological groups in the mycobiota of these regions is influenced by ecological and climatic conditions as well as differences in the number of research plots (from 1 to 13), length of study periods (2–7 years), number of observations (30–550) and range of systematic groups of fungi investigated. The mean values of these contribution measures for all the study regions are 41% for terricolous fungi, 18% for litter-inhabiting fungi, and 41% for lignicolous fungi. With the exception of the group of terricolous fungi, these values are similar to the contribution of the ecological groups in the beech forest mycobiota of the Puszcza Wkrzańska forest. The contributions of symbiotic fungi are also similar (24% for Puszcza Wkrzańska forest; 28% for all study regions).

Between 58% and 73% of the species occur both in the mycobiota of the Puszcza Wkrzańska forest and in the mycobiota of beech forests in other regions (Fig. 2). The Puszcza Goleniowska forest is the only exception; 90% of the species are the same in the mycobiota of the Puszcza Goleniowska forest and the Puszcza Wkrzańska forest. This is due to their similar physiography and close proximity. The two forests are 20 km apart, similar to the distance between the farthest-apart research plots in the Puszcza Wkrzańska forest. The mycobiota of the Puszcza Wkrzańska forest contains 24% of the exclusive species recorded in the total mycobiota of all the study regions. On the other hand, the share of exclusive species at individual sites in relation to the Puszcza Wkrzańska forest ranges from 27% in the Pradolina Warciańsko-Odrzańska ice-marginal valley to 42% in the Wyżyna Kielecka upland. Similarity is greatest between the mycobiota of the beech forests on the Pobrzeże Szczecińskie coast (Puszcza Wkrzańska

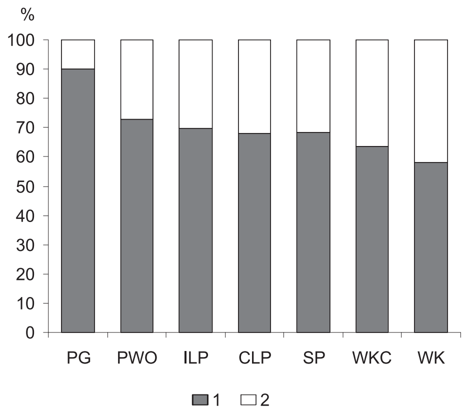

Fig. 2. Contribution of the same species and exclusive species in the mycobiota of beech forests in various regions in relation to the Puszcza Wkrzańska forest. 1 – same species, 2 – exclusive species; region codes as in Figure 1.

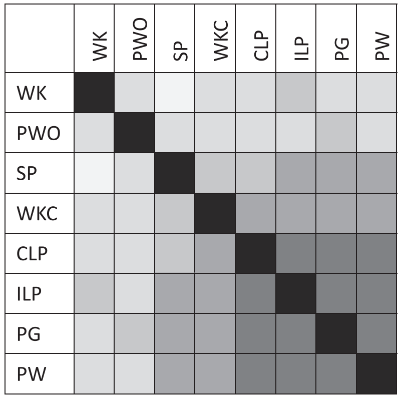

Fig. 3. Similarity of mycobiota of *Luzulo pilosae-Fagetum* in various regions of Poland. 0.1–0.6 – similarity coefficient; region codes as in Figure 1.

forest and Puszcza Goleniowska forest) and the Pojezierze Zachodniopomorskie lakeland (Cedynia and Ińsko Landscape Park), less between the Wyżyna Krakowsko-Częstochowska upland and Pojezierze Południowopomorskie lakeland, and least between the Pradolina Warciańsko-Odrzańska ice-marginal valley and the Wyżyna Kielecka upland (Fig. 3).

Roughly 530 macromycete species, including the species reported in this study, have been recorded in *Luzulo pilosae-Fagetum* within the range limits in Poland.

Good conditions for the development of 42 species threatened (Wojewoda & Ławrynowicz 2006) and protected in Poland (Anonymous 2004) are observed in the mycobiota of *Luzulo pilosae-Fagetum* in the Puszcza Wkrzańska forest. Eight endangered (E) species, nine vulnerable (V) species, 18 rare (R) species and five indeterminate threat-status species (I) were recorded. Seven of the nine protected species also are listed in different threat categories.

References

Adamczyk J. 1996. Les champignons supérieurs des hętraies du nord du plateau de Częstochowa (Pologne Méridionale). *Lejeunia* **150**: 1–84.

Anonymous 2004. [Regulation of the Ministry of the Environment 2004]. Rozporządzenie Ministra Środowiska z dnia 9 lipca 2004 r. w sprawie gatunków dziko występujących grzybów objętych ochroną. *Dziennik Ustaw* Nr 168, poz. 1765.

Bacieczko W. & Kowalski W. 1993. Water and rush vegetation in the faunistic nature reserve 'Jezioro Świdwie' near Szczecin. *Zeszyty Naukowe Akademii Rolniczej w Szczecinie* 155, *Seria Przyrodnicza*, *Rolnictwo* **54**: 125–142 (in Polish with English summary).

Borówka R. 2002. Środowisko geograficzne. In: R. Borówka, S. Friedrich, T. Heese & J. Jasnowska (eds), *Przyroda Pomorza Zachodniego*, pp. 6–105. Oficyna In Plus, Szczecin.

Chmiel M. A. 2006. Checklist of Polish larger Ascomycetes. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

Crous P. W., Gams W., Stalpers J. A., Robert V. & Stegehuis G. 2004. MycoBank: an online initiative to launch mycology into the 21st century. *Stud. Mycol.* **50**: 19–22.

Dominik T. & Ihnatowicz A. 1979. Untersuchungen über den mycotrophismus der pappeln in versuchsplantagen des Forstlichen Forschungsinstituts in der Wojewodschaft Szczecin. *Prace Inst. Badawczego Leśn*. **544**: 67–112 (in Polish with German and Russian summary).

Fellner R. 1993. Air pollution and mycorrhizal fungi in central Europe. In: D. N. Pegler, L. Body, B. Ing & P. M. Kirk (eds), *Fungi of Europe: investigation*, *recording and conservation*, pp. 239–250. Royal Botanic Gardens, Kew.

Friedrich S. 1984. Mycoflora of Goleniowska Woods. *Acta Mycol*. **20**(2): 173–208 (in Polish with English summary).

Friedrich S. 1985. Macromycetes in the plant associations of the Goleniowska Woods. *Acta Mycol*. **21**(1): 43–76 (in Polish with English summary).

Friedrich S. 1987a. Ecological and phenological characteristics of macromycetes of the Goleniowska Woods. *Acta Mycol*. **21**(2; 1985): 143–164 (in Polish with English summary).

Friedrich S. 1987b. Macromycetes of Szczecin city. *Badan. Fizjogr. Polsk. Zachodn.*, *B* **38**: 5–26 (in Polish with English summary).

Friedrich S. 1994. Sociological-ecological characterization of mycoflora of forest communities in the Cedyński Landscape Park. *Rozprawy Akademii Rolniczej*, *Szczecin* **161**: 1–100 & 28 tabs (in Polish with English summary).

Friedrich S. 1997. Macromycetes of the proposed nature reserve Wilcze Uroczysko-Olszanka in the Odra estuary. *Acta Mycol*. **32**(2): 239–255.

Friedrich S. 2004. Preliminary research results of macromycetes in Wkrzańska Primeval Forest. In: E. Jendrzejczak (ed.), *Przyroda Polski w europejskim dziedzictwie dóbr natury*. *Materiały 53 Zjazdu PTB, Toruń – Bydgoszcz*, pp. 133–134. Polskie Towarzystwo Botaniczne, Wydawnictwo Uczelniane Akademii Techniczno-Rolniczej w Bydgoszczy, Toruń – Bydgoszcz.

Friedrich S. 2006. Threatened and protected macromycetes in the Wkrzańska Forest. *Acta Mycol*. **41**(2): 229–240.

Friedrich S. & Orzechowska M. 2002. Macromycetes in the urban environment of Szczecin. *Badan. Fizjogr. Polsk. Zachodn.*, *B* **51**: 7–30 (in Polish with English summary).

Hansen L. & Knudsen H. (eds) 2000. Nordic Macromycetes. **1**. Ascomycetes. Nordsvamp, Copenhagen.

Jasnowski M. 1962. Vegetation und Pflanzenwelt der Moore des Stettiner Gebietes. *Szczecińskie Towarzystwo Naukowe*, *Wydział Nauk Przyrodniczo-Rolniczych* **10**: 1–340 (in Polish with German summary).

Knudsen H. & Vesterholt J. 2008. Funga Nordica. Agaricoid, boletoid and cyphelloid genera. Nordsvamp, C/o Botanical Museum, Copenhagen.

Kondracki J. 2002. Geografia regionalna Polski. Państwowe Wydawnictwo Naukowe, Warszawa.

Kowalski W. & Bacieczko W. 1993. Geobotanical characteristic of the 'Jezioro Świdwie' faunistic nature reserve. *Zeszyty Naukowe Akademii Rolniczej w Szczecinie* 155, *Seria Przyrodnicza*, *Rolnictwo* **54**: 97–124 (in Polish with English summary).

Legon N. W., Henrici A., Roberts P. J. & Watling R. 2005. Checklist of the British & Irish Basidiomycota. Royal Botanic Garden, Kew.

Lisiewska M. 1974. Macromycetes of beech forests within the eastern part of the *Fagus* area in Europe. *Acta Mycol.* **10**(1): 3–72.

Lisiewska M. & Filisiewicz J. 2006. Mycocoenological differentiation of forest communities in the nature reserve 'Goździk siny w Grzybnie' (Central Wielkopolska). *Badan. Fizjogr. Polsk. Zachodn.*, *B* **55**: 7–28 (in Polish with English summary).

Lisiewska M. & Marach A. 2002. Macrofungi of the acidophilous beech forest *Deschampsio flexuosa-Fagetum* in the reserve 'Cisy w Czarnem' (Pomerania). *Badan. Fizjogr. Polsk. Zachodn.*, *B* **51**: 31–54 (in Polish with English summary).

Łuszczyński J. 2007. Diversity of Basidiomycetes in various ecosystems of the Góry Świętokrzyskie Mts. *Monogr. Bot.* **97**: 1–218.

Matuszkiewicz W. 2001. Przewodnik do oznaczania zbiorowiska roślinnych Polski. Państwowe Wydawnictwo Naukowe, Warszawa.

Mirek Z., Piękoś-Mirkowa H., Zając A. & Zając M. 2002. Flowering plants and pteridophytes of Poland. A checklist. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

Moser M. 1949. Untersuchungen über den Einfluss von

Waldbränden auf die Pilzvegetation I. *Sydowia* **3**(1/6): 336–383.

OCHYRA R., ŻARNOWIEC J. & BEDNAREK-OCHYRA H. 2003. Census catalogue of Polish mosses. Polish Academy of Sciences, Institute of Botany, Kraków.

STASIŃSKA M. 1999. Macromycetes in forest communities of the Ińsko Landscape Park (NW Poland). *Acta Mycol.* **34**(1): 125–168.

WOJEWODA W. 2003. Checklist of Polish larger Basidiomycetes. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

WOJEWODA W. & ŁAWRYNOWICZ M. 2006. Red list of the macrofungi in Poland. In: Z. MIREK, K. ZARZYCKI, W. WOJEWODA & Z. SZELĄG (eds), *List of plants and fungi in Poland*, pp. 53–70. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

ZARĘBA R. 1986. Puszcze, bory i lasy Polski. Państwowe Wydawnictwo Rolnicze i Leśne, Warszawa.

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