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MAŁGORZATA STASIŃSKA

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Łódź

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ABSTRACT

Małgorzata Stasińska. *Macrofungi of raised and transitional bogs of Pomerania.* Monogr. Bot., Vol. 101, pp. 142, 2011.

The mycology of peatlands, with their specific plant communities and numerous rare plant species, has been underexplored and is poorly recognized. The main objectives of this study were to identify the species richness and diversity of macromycetes in raised and transitional bogs of Pomerania and to establish correlations between macroscopic fungi and peatland communities occurring in the area in view of environmental conditions. Investigations spanning a period of ten years were conducted at 134 sites (71 raised and 63 transitional bogs) in eight non-forest peatland communities (*Caricetum lasiocarpae, Caricetum limosae*, *Caricetum rostratae*, *Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae*, *Erico-Sphagnetum medii*, *Sphagnetum magellanici*, and the *Eriophorum vaginatum-Sphagnum fallax* community) and two forest communities (*Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis*) in which 108 permanent observation plots were established for detailed examinations.

A total of 191 macromycete species were recorded in the peatlands. The smallest number of species was recorded in *Rhynchosporetum albae* (12 species) and *Caricetum rostratae* (15 species). Phytocoenoses richest in fungi were *Vaccinio uliginosi-Pinetum* (102 species) and *Vaccinio uliginosi-Betuletum pubescentis* (121 species). The number of macromycete species recorded in individual peatland communities depends on the community type and is not conditioned by the number of observations and the number and the total area of permanent plots. Five mycosociologico-ecological groups of macroscopic fungi were distinguished based on numerical analyses. Four groups comprise species of fungi associated with a specific phytocoenosis or a group of phytocoenoses. One group consists of fungi with a broader ecological scale. The majority of environmental variables representing the substrate's chemical properties, humidity and pH show a statistically significant influence on the diversity of macroscopic fungi species in the peatland communities. Cartogram maps of the distribution of 21 species of peatland fungi are included and geographico-ecological features of the species are briefly described.

Key words: macromycetes, mycocoenoses, distribution, transitional and raised bogs, mires, peatlands, NW Poland.

1. INTRODUCTION

The orographic, soil and climatic differentiation of Pomerania creates conditions favourable for the development of a range of ecosystems. Specific plant communities and a variety of rare species of plants and macroscopic fungi make local peatland ecosystems especially interesting. Nearly all forms and types of peatlands (vast fens, transitional bogs and the largest raised bogs in Poland) occurring in lowland Central Europe are concentrated in Pomerania (Czubiński 1950; Jasnowski 1962a; Jasnowski *et al.* 1968; Jasnowska & Jasnowski 1977, 1981; Herbichowa 1979, 1998a, b, 2004a, b; Wołejko 2000; Herbich & Herbichowa 2002; Tobolski 2003; Herbichowa & Herbich 2009). The vegetation cover of Pomeranian peatlands, in particular raised and transitional peatlands, is preserved quite well in comparison with other regions in Poland although unfavourable events leading to the disappearance or impoverishment of the flora and peatland communities have also been taking place here (Jasnowski *et al.* 1968; Jasnowski 1972; Jasnowska & Jasnowski 1977; Herbichowa 1976, 1999; Herbichowa & Jąkalska 1985; Herbich & Herbichowa 2002; Herbichowa *et al.* 2007; Budyś 2008).

Macroscopic fungi are important structural and functional elements of peatland ecosystems. As heterotrophic organisms, they enter a range of relationships with plants thus directly or indirectly influencing the formation and functioning of phytocoenoses. Due to high ecological specialization many species or groups of fungi can serve as markers to characterize ecologically different plant species. They can also be indicators of changes occurring in the natural environment. Fungi are valuable diagnostic elements in defining and distinguishing plant communities and in the syntaxonomic classification. They depend on the entirety of ecological conditions in a phytocoenosis (Kornaś 1957; Lisiewska 1974; Bresinsky *et al.* 1995; Bujakiewicz 1982, 2008; Chlebicki 2002; Ławrynowicz *et al.* 2004; Ławrynowicz & Mułenko 2008).

The recognition of macromycetes in peatland ecosystems is insufficient as they have rarely been included in wetland studies. Few studies deal with the occurrence of macroscopic fungi of raised and transitional bogs in Europe. Investigations were conducted in the Swiss Jura by Favre (1948), in Denmark by Lange (1948), in the former Czechoslovakia by Kotlaba (1953) and Pilát (1969), in northern Germany by Kreisel (1954, 1961a), in Finland by Salo (1979, 1993), and in the Apennines in Italy by Perini *et al.* (2002). With the exception of some studies (Bujakiewicz & Fiklewicz 1963; Fiklewicz-Sobstyl 1965; Friedrich 1997; Stasińska & Sotek 2003, 2004a; Ślusarczyk 2004, 2007), the biota of macroscopic fungi of raised and transitional bogs in Poland has not been the main subject of examinations and was only one of the aspects of broader projects (Nespiak 1959; Bujakiewicz 1975, 1981, 1986; Lisiewska 1978, 1979; Bujakiewicz & Lisiewska 1983; Friedrich 1984, 1985/1986, 1985/1987, 1994; Flisińska 1987/1988, 2000; Łuszczyński 2001, 2007). Therefore not all peatland phytocoenoses have been equally and uniformly studied (Ławrynowicz *et al.* 2004). *Vaccinio uliginosi-Pinetum* is the best mycologically recognized forest peatland community to date. Systematic mycosociological observations have been conducted in the Białowieża National Park (Nespiak 1959), Wielkopolska (Fiklewicz-Sobstyl 1965; Kałucka 1995), the Góry Świętokrzyskie Mts (Lisiewska

1978; ŁUSZCZYŃSKI 2007), Pomerania (BUJAKIEWICZ 1986; FRIEDRICH 1984, 1997), and the Pojezierze Łęczyńsko-Włodawskie Lakeland (FLISIŃSKA 1987/1988). Data on macroscopic fungi in *Vaccinio uliginosi-Pinetum* have been collected in the vicinity of Głowno (RUDNICKA-JEZIERSKA 1963), the Chrzanów Region and Jaworzno (WOJEWODA 1973, 1979, 1981), and the Kotlina Sandomierska Basin (FLISIŃSKA 1997, 2000). The knowledge of *Vaccinio uliginosi-Betuletum pubescentis* is considerably poorer than that of *Vaccinio uliginosi-Pinetum*. Mycosociological observations in patches of *Vaccinio uliginosi-Betuletum pubescentis* have been conducted in the Puszcza Goleniowska Forest (FRIEDRICH 1985/1986; STASIŃSKA & SOTEK 2003), the Słowiński National Park (BUJAKIEWICZ 1986), and the proposed Wilcze Uroczysko Olszanka reserve (FRIEDRICH 1997). *Sphagnetum magellanici* is the best mycologically recognized non-forest peatland community. Research into the occurrence of macromycetes in *Sphagnetum magellanici* has been conducted in several regions of Poland: north Wielkopolska (FIKLEWICZ-SOBSTYL 1965), Babia Góra Mt. (BUJAKIEWICZ 1981), the Pojezierze Łęczyńsko-Włodawskie Lakeland (FLISIŃSKA 1987/1988), and the Góry Świętokrzyskie Mts (ŁUSZCZYŃSKI 2007). Mycosociological observations have also been carried out in *Sphagnetum magellanici pinetosum* in the Białowieża National Park (NESPIAK 1959) and in Pomerania: in the Puszcza Goleniowska Forest (FRIEDRICH 1985/1986) and the Cedynia Landscape Park (FRIEDRICH 1994). Macroscopic fungi have also been investigated in *Caricetum limosae* in the Pojezierze Łęczyńsko-Włodawskie lakeland (FLISIŃSKA 1987/1988) and some regions in Pomerania (STASIŃSKA & SOTEK 2003, 2004a) and in *Caricetum lasiocarpae*, *Eriophoro angustifolii-Sphagnetum recurvi, Rhynchosporetum albae*, and the community *Eriophorum vaginatum-Sphagnum fallax* in some areas in Pomerania (STASIŃSKA & SOTEK 2003, 2004a) and in the Pojezierze Lubuskie Lakeland (ŚLUSARCZYK 2004, 2007).

The actual and accurate distribution of individual species of macroscopic fungi is also problematic and can be viewed either locally in selected areas or nationally and regionally worldwide. Although atlases of the ranges of fungi have been developed in some countries, for instance in Germany (KRIEGLSTEINER 1991a, b, 1993), Estonia (PARMASTO 1999) and Poland (WOJEWODA 2000), the distribution of fungi has not been investigated in detail in many parts of the world. Full data on the distribution of the majority of macroscopic fungi are lacking in Poland. This is caused partly by poor mycological recognition of many regions, including Pomerania (WOJEWODA 2003). Regional atlases of the distribution of fungi are to date available for two areas: the Białowieża National Park (FALIŃSKI & MUŁENKO 1997) and the Lublin region (FLISIŃSKA 2004). Distribution maps comprising entire Poland have been developed only for several species of macromycetes such as *Bovista paludosa* (WOJEWODA 2002), *Galerina paludosa* and *Suillus flavidus* (SKIRGIEŁŁO 1972, 1984/1986) growing in peatland ecosystems, or they are limited to one region (BUJAKIEWICZ 1997; FLISIŃSKA 2004).

These open issues or challenges were an inspiration to undertake research into macroscopic fungi of peatland ecosystems in Pomerania. The main objectives of this study was to investigate and explore the species richness and diversity of macroscopic fungi of raised and transitional bogs in Pomerania and to identify correlations between macroscopic fungi and peatland communities occurring in the study area against environmental conditions. Auxiliary aims designed to help implement the main objectives were:

- to investigate macromycete species in selected forest and non-forest peatland communities,
- to identify the biota of macroscopic fungi in raised and transitional bogs,

– to determine mycocoenological relationships in selected forest and non-forest peatland communities,
– to attempt to determine the indicator value of fungi and to distinguish groups of diagnostic species of individual phytocoenoses or groups of phytocoenoses,
– to determine the contribution and the role of bioecological groups of fungi in forest and non-forest peatland communities in the study area,
– to describe the influence of selected environmental factors on the occurrence of peatland fungi and their species diversity,
– to recognize the distribution of selected species of peatland fungi.

The ecology and geography of species of fungi are also characterized in this study. Cartograms of their distribution in Pomerania are mapped.

2. STUDY AREA

Location and borders. Pomerania is a historical region in present-day northeast Germany and northwest Poland. Investigations were conducted in its Polish part located between 14°07'27" and 18°56'51" E and 52°34'51" and 54°50'09" N covering 52 000 km^2 (1/8 of the total area of Poland). The study area is bordered by the Baltic Sea coastline in the north and the Warta and Noteć rivers together with the Kanał Notecki Channel in the south. The western border is delimited by the Polish/German border which runs along the main riverbed of the Oder between Kostrzyn and Gryfino and the dry land further northwards, crosses the Zalew Szczeciński Lagoon and ends on the northern edge of the Uznam Island, ca 5 km west of the Świna estuary where the river flows into the Baltic Sea. The Vistula is the eastern border (Augustowski 1977) (Fig. 1). The term Pomerania will be used in this study to refer to the area within the Polish borders.

In the physical-geographic division by Kondracki (2002), Pomerania is located in 49 mesoregions belonging to three macroregions in the subprovince of the Pobrzeża Południowobałtyckie Coasts: Pobrzeże Szczecińskie, Pobrzeże Koszalińskie and Pobrzeże Gdańskie Coasts, and 5 macroregions in the subprovince of the Pojezierza Południowobałtyckie Lakelands: Pojezierze Zachodniopomorskie, Pojezierze Wschodniopomorskie and Pojezierze Południowopomorskie Lakelands, Pradolina Toruńsko-Eberswaldzka Proglacial Valley, and the Lower Vistula Valley.

In the geobotanical classification of Poland by Szafer (1977), Pomerania belongs to the Dział Bałtycki Division, Poddział Pas Równin Przymorskich and Wysoczyzn Pomorskich Subdivision [Baltic Division; Coastal Plains and Pomeranian Highlands Belt Subdivision], Poddział Pas Wielkich Dolin Subdivide [Great Valleys Belt Subdivision] – a small, southern part of the region. According to a recent geobotanical regionalization of Poland by J.M. Matuszkiewicz (2008), the study area belongs to the Central European Province, two subprovinces: Południowobałtycka Subprovince and Środkowoeuropejska Właściwa Subprovince [South Baltic and Proper Central European Subprovinces], and three divides: Dział Pomorski, Dział Brandenbursko-Wielkopolski and Dział Mazowiecko-Poleski [Pomeranian, Brandenburgian and Greater Poland, and Mazovian and Polesye Divides].

Geological structure, lie of the land and soil topography. The geological structure, lie of the land and soil topography in Pomerania were directly and indirectly shaped by the Scandinavian ice sheet during the last Baltic glacial period. Postglacial landforms create

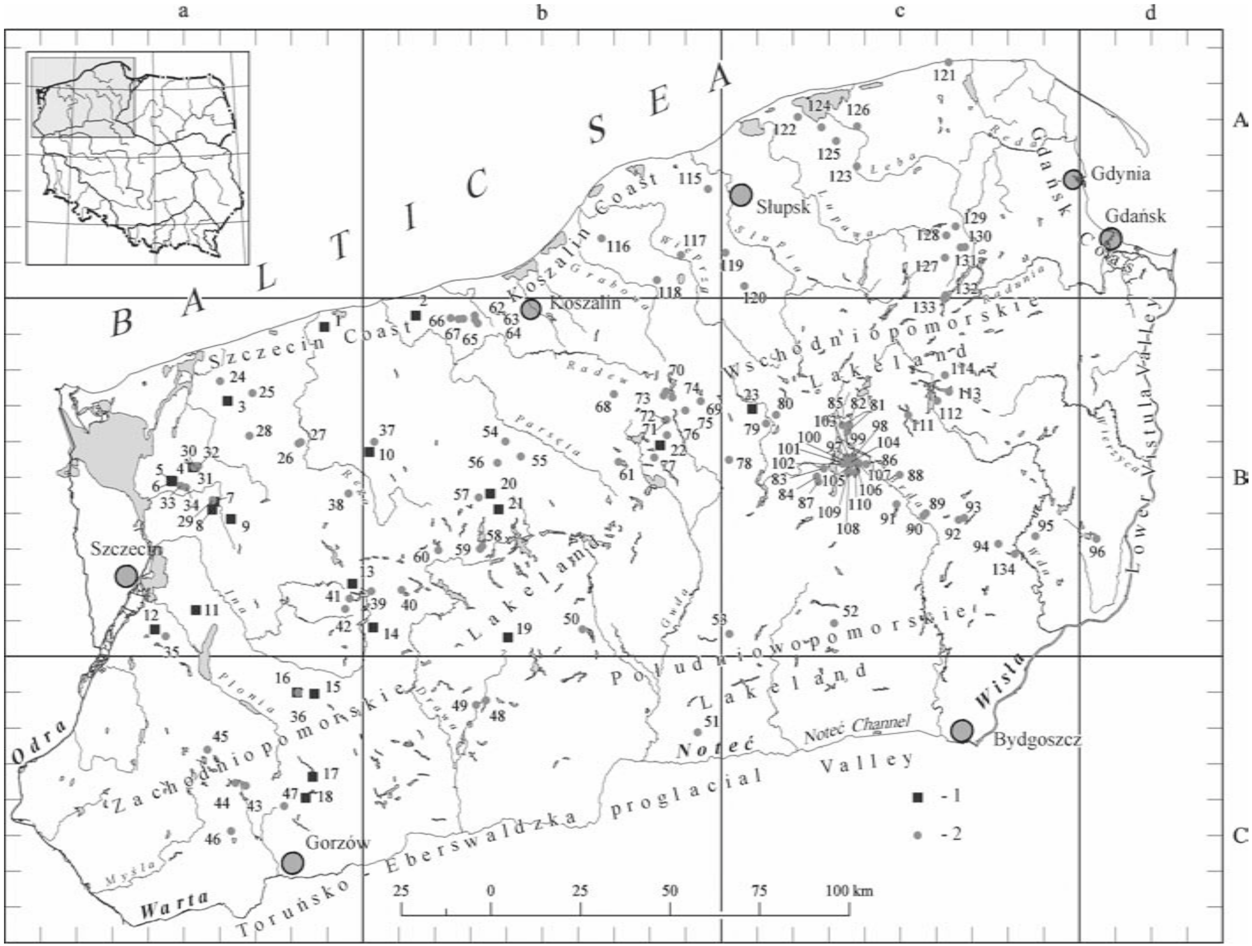


Fig. 1. The location of peatlands in Pomerania (the peatland number in the figure corresponds to its number in Table 1): 1 – raised and transitional bogs with permanent research plots, 2 – other raised and transitional bogs.

belts and characteristic zones of outwash sands, the end moraine and the ground moraine. Quaternary formations dominate in the geological structure. These are mostly Pleistocene or Holocene formations in valleys and lake basins which form a dense cover and reach considerable thickness in places. Diluvial formations: boulder clay forming the end and ground moraines, prevail. Sands and gravels of water-glacial deposits (sandar) accompany them (Augustowski 1977; Karczewski 1985; Aleksandrowicz 1999).

The contemporary lie of the land comprises morphological forms developed during the Baltic glacial period that have persisted in their general form until today. Bar-shaped and domed hillocks of the end moraine with a maximum height of 167 m near Cedynia, 250 m in Bytów and Miastko and 329 m around Kartuzy (Wieżyca) are characteristic elements of the landscape. Deep, fluvioglacial lakes, peated valleys and marshes are scattered among them. Elongated, lake-water-filled troughs, such as lakes Charzykowskie, Drawsko and Woświn, are also typical components. Landscape areas of the ground moraine and sandur fields are less varied although they are also defined by a hilly relief featuring numerous endorheic depressions (Aleksandrowicz 1999; Gilewska 1999).

Brown forest-brown soils (surface and leached) and lessive soils, formed from loam sands and light moraine clay loams, podzol-rusty soils, podzol soils and in places podzols developed from weakly loam and loam sands of different podogenesis occur mostly throughout Pomerania. Marshy soils, paludified soils, and post-marshy soils formed from peats and alluvial soils occur in terrain depressions, basins, lake basins and river valleys scattered in the area (Prusinkiewicz & Bednarek 1999; Wicik 2006).

Hydrography. A watershed that separates the rivers belonging to the Oder and the Vistula river basins from those flowing directly into the Baltic Sea runs across the central part of Pomerania along the bar of the end moraine. The Drawa, Gwda, Ina, Brda, Wda and Wierzyca are the largest rivers in the south of the region, with the Rega, Parsęta, Wieprza, Słupia and Łeba being the largest rivers in the north. Lakes are dominant hydrographic elements. Ribbon lakes which are long, narrow and deep, often with steep slopes and varied bottom structures, prevail. Lakes Charzykowskie, Drawsko, Miedwie, Wielimie, Wdzydze and Żarnowieckie are some of the largest lakes. A range of wetlands, such as peatlands or mud and silt ecosystems occurring numerously in the area, considerably affect water relationships in Pomerania (Bajkiewicz-Grabowska 2006; Gutry-Korycka 2006; Woronko & Lenartowicz 2006).

Climate. Variable climatic conditions recorded in Pomerania are determined by the proximity of the Baltic Sea and the location in the zone of influences of the oceanic climate. Consequently the oceanic climate is observed in the north and southwest of the region while the continental climate is recorded in its south-eastern part (Woś 1999). As well as the lie of the land, masses of polar-marine and arctic-marine air inflowing from the Atlantic Ocean and moving inland have an important impact on climatic conditions in Pomerania. They have a warming influence on the climate in winter and cooling in summer. They also influence a considerable spatial amplitude of annual precipitation and air temperature sums. The mean annual precipitation sum is 550-600 mm in the western and southern part, and 650-700 mm in the north-eastern part. The mean annual air temperature is 8.5°C in the western part and 7.5°C in the eastern part of the region. The duration of the vegetative season ranges from 180 to 190 days in the east and up to 220-230 days in the west (Koźmiński & Michalska 2001; Borówka 2002; Koźmiński *et al.* 2007). The microclimatic variability which mostly depends on the lie of the land and the vegetation cover also contributes to the regional diversity of climatic conditions. Relatively considerable microclimatic changes occur in lakelands where the relief is especially varied and diversified (Borówka 2002).

Peatlands. Peatland ecosystems are traditionally divided into fens, transitional bogs and raised bogs depending on water and nutrient supply (Pawłowski & Zarzycki 1977; Ilnicki 2002). Nearly all peatland forms and types typical of lowland areas of Central Europe are recorded in Pomerania, where Poland's peatlands are highly concentrated. They cover vast areas of fens, Poland's largest raised bogs, so-called Baltic raised mires (cupola raised mires), spring mires and calcareous fens (Jasnowski 1962a, 1990; Jasnowski *et al.* 1968; Jasnowski *et al.* 1972; Herbichowa 1979, 1998a, b, 2004a, b; Jasnowska & Jasnowski 1981; Gos & Herbichowa 1991; Wołejko 2000; Ilnicki 2002; Tobolski 2003; Herbichowa *et al.* 2007; Budyś 2008; Herbich & Ciechanowski 2009). Fens develop in post-lake basins and valleys of slow-flowing rivers and streams. The largest areas of fens in Pomerania are recorded in, for instance, the Oder, Łeba, Łupawa, Noteć, Płonia, Reda and Rega river valleys as well as by Lakes Dąbie and Miedwie. Raised bogs mostly occur in watershed areas, also in valley and proglacial valley depressions. The largest, Baltic raised bogs (cupola raised bogs), usually develop in coastal Pomerania, where they reach the southern limit of their continuous range. Small peatlands, so-called basin bogs, recorded in post-dead ice endorheic thaw-out depressions occurring especially numerously in the Pojezierze Bytowskie Lakeland are considerably more numerous. Transitional bogs occur in young glacial areas, both outwash and moraine, and rarely cover larger areas. They are often an intermediate stage in the fen conversion process into raised bogs and can also form when water bodies overgrow with vegetation. They are most numerous in the Bory Tucholskie Forest, Równina Charzykowska Plain, Pojezierze Bytowskie and Pojezierze Drawskie Lakelands (Czubiński 1950; Jasnowski 1962a; Jasnowska & Jasnowski 1981; Herbichowa 1998a, 2004a, b; Pawlaczyk *et al.* 2001; Ilnicki 2002; Tobolski 2003; Herbichowa & Potocka 2004; Herbichowa *et al.* 2007). At present fens cover an area of 325 908 ha in Pomerania, raised bogs – 19 000 ha, and transitional bogs – 36 144 ha (IMUZ 2006).

Vegetation of raised and transitional bogs. The habitat diversity of the ecosystems in the study area is reflected in the considerable variety of peatland plant communities. The systematics of peatland communities in Poland needs a critical revision and a new comprehensive investigation (Jasnowska & Jasnowski 1983a; Matuszkiewicz W. 2001; Kucharski *et al*. 2001; Herbichowa 2004a). In the traditional approach temporarily in use (Matuszkiewicz W. 2001), the majority of communities occurring in Pomerania in the peatland types studied here belong to two classes: *Oxycocco-Sphagnetea* and *Scheuchzerio-Caricetea nigrae*, order *Scheuchzerietalia palustris* (Matuszkiewicz W. 2001; Herbich & Herbichowa 2002). Some forest communities of the class *Vaccinio-Piceetea* also occur in raised and transitional bogs (Matuszkiewicz W. 2001; Herbich & Herbichowa 2002; Matuszkiewicz J.M. 2007).

The syntaxonomic position of plant communities occurring in Pomerania in the study peatlands is as follows (Matuszkiewicz W. 2001):

Cl. *Scheuchzerio-Caricetea nigrae* (Nordh. 1937) R. Tx. 1937
- O. *Scheuchzerietalia palustris* Nordh. 1937
  - All. *Rhynchosporion albae* Koch 1926
    - *Caricetum limosae* Br.-Bl. 1921
    - *Rhynchosporetum albae* Koch 1926

Eriophoro angustifolii-Sphagnetum recurvi M. Jasn., J. Jasn. et S. Mark. 1968
All. *Caricion lasiocarpae* Vanden Bergh. ap. Lebrun *et al.* 1949
Caricetum lasiocarpae Koch 1926
Caricetum rostratae Rübel 1912 ex Osvald 1923 em. Dierss. 1982 [= *Sphagno-Caricetum rostratae* Steff. 1931 em. Dierss. 1982]
Caricetum diandrae Jon. 1932 em. Oberd. 1957
Caricetum chordorrhizae Paul et Lutz 1941
Caricetum heleonastes (Paul et Lutz 1941) Oberd. 1957
Cl. *Oxycocco-Sphagnetea* Br.-Bl. et R. Tx. 1943
O. *Sphagno-Ericetalia* Br.-Bl. 1948 em. Moore (1964) 1968
All. *Ericion tetralicis* Schwick. 1933
Ericetum tetralicis R. Tx. 1937
O. *Sphagnetalia magellanici* (Pawł. 1928) Moore (1964) 1968
All. *Sphagnion magellanici* Kästner et Flössner 1933 em. Dierss. 1975
Erico-Sphagnetum medii (Schwick. 1933) Moore 1968
Sphagnetum magellanici (Malc. 1929) Kästner et Flössner 1933
Ledo-Sphagnetum magellanici Sukopp 1959 em. Neuhäusl 1969
Community *Eriophorum vaginatum-Sphagnum fallax* Hueck 1928 pro ass.
Cl. *Vaccinio-Piceetea* Br.-Bl. in Br.-Bl. *et al.* 1939
O. *Piceetalia abietis* Pawł. in Pawł. *et al.* 1928
All. *Dicrano-Pinion* W. Mat. 1962
Vaccinio uliginosi-Pinetum Kleist 1929
Vaccinio uliginosi-Betuletum pubescentis Libbert 1933

The vegetation of transitional bogs is floristically diversified. It has a two-level structure consisting of the herb layer and the moss layer. These are usually extremely floristically poor phytocoenoses that form flat carpet open bogs, moss vegetation or sedge vegetation dominated by one to two herbaceous plant species and one to two moss species. Phytocoenoses of the class *Scheuchzerio-Caricetea nigrae*, order *Scheuchzerietalia palustris*, are typical of transitional bogs (Dierssen 1982; Jasnowska & Jasnowski 1983b, c; Herbich & Herbichowa 2002; Herbichowa 2004a).

Caricetum limosae occurs on wet habitats on acid peats. The community is typical of transitional bogs and also occurs in water-logged hollows in raised bogs. It is a component of floating quagmires on overgrowing dystrophic and oligotrophic lakes. The community is widespread in peatland areas not only in Pomerania but also in other parts of Poland (Jasnowski 1962a; Jasnowski *et al.* 1968; Matuszkiewicz W. 2001).

Rhynchosporetum albae occurs in wet peatland depressions, sometimes on exposed peat, and is widespread where raised bogs occur. In Pomerania, patches of the community develop not only in peatland hollows and depressions but also on the banks of dystrophic lakes and sporadically in disused excavation pits (Jasnowski 1962a; Jasnowski *et al.* 1968; Matuszkiewicz W. 2001; Pawlaczyk *et al.* 2001).

Eriophoro angustifolii-Sphagnetum recurvi develops in permanently strongly hydrated sites. It occurs in peatland depressions as well as on the banks of dystrophic lakes and in overgrowing post-peat pits. The community is widespread in Pomerania (Jasnowski *et al.* 1968; Brzeg *et al.* 1996; Pawlaczyk *et al.* 2001).

Caricetum lasiocarpae is floristically and ecologically diversified. It occurs on oligo- and mesotrophic habitats, in endorheic periodically flooded terrain depressions, and often forms sods or coatings floating on the surface of overgrowing dystrophic lakes. *Caricetum lasiocarpae* is known from numerous localities in Pomerania (Jasnowski 1962a; Jasnowska & Jasnowski 1983c; Kucharski *et al.* 2001; Matuszkiewicz W. 2001; Herbichowa 2004a).

Caricetum rostratae is a common and widespread peatland community in Pomerania. It occurs in sites with a high water level, mostly on the banks of overgrowing lakes, on the margins of peatlands and in overgrowing ditches and disused pits (Jasnowska & Jasnowski 1983c; Brzeg *et al.* 1995, 1996; Herbichowa 2004a).

Caricetum diandrae is a fairly rare community with a boreal range. It occurs for instance in post-lake peat bogs. It develops in permanently waterlogged areas, on weakly distributed peats, exceptionally on gyttja (Jasnowski 1962a; Jasnowska & Jasnowski 1983c; Matuszkiewicz W. 2001).

Caricetum chordorrhizae is a continental-boreal community. It mainly occurs in northeast Poland. It is rare in Pomerania, known from a few localities (Wołejko 1983; Matuszkiewicz W. 2001; Herbichowa 2004a).

Caricetum heleonastes is a poorly recognized community that occurs very rarely in Pomerania (Matuszkiewicz W. 2001).

Treeless moss phytocoenoses poor in species, consisting of two basic structural elements, hummocks and hollows, are typical of raised bogs. Hummock phytocoenoses include *Erico-Sphagnetum medii, Sphagnetum magellanici*, and the community *Eriophorum vaginatum-Sphagnum fallax*. Hollow vegetation is represented by such communities as *Caricetum limosae* and *Rhynchosporetum albae* (Dierssen 1982; Jasnowska & Jasnowski 1983b, d; Matuszkiewicz W. 2001; Herbich & Herbichowa 2002; Herbichowa 2004b; Herbichowa & Potocka 2004).

Ericetum tetralicis is a very rare community that reaches the absolute eastern limit of its range in Poland. It represents wet heaths with *Erica tetralix*. The community is floristically impoverished in comparison with its typical Western European forms. It occurs in areas influenced by the Atlantic climate, in the belt of coastal dunes in interdunal depressions and on the margins of raised bogs or in spatial complexes of peat excavation pits. It is recorded for instance in the eastern part of the Pobrzeże Kaszubskie coast and near Kołobrzeg (Jasnowski 1962a; Matuszkiewicz W. 2001; Herbichowa 1979, 2004c).

Erico-Sphagnetum medii is widespread primarily in the Western and Central European lowland within the Atlantic climate. Like *Ericetum tetralicis*, this community reaches the eastern limit of its range. It occurs in the coastal zone in Pomerania. The community is characteristic of raised bogs with *Erica tetralix* and is rare in Poland (Jasnowski 1962b; Brzeg *et al.* 1995; Matuszkiewicz W. 2001; Herbichowa 2004b; Herbichowa & Potocka 2004).

Sphagnetum magellanici is one of the most commonly recorded raised-bog communities in Pomerania and develops as different sub-communities depending on habitat conditions (Jasnowski 1962a; Jasnowski *et al.* 1968; Jasnowska & Jasnowski 1983d; Herbichowa 2004b).

Ledo-Sphagnetum magellanici is a community of continental raised bogs. It occurs at lowland sites in northeast Central Europe and Eastern Europe. The western range limit is not fully known, nor is its actual distribution in Pomerania and other regions in Poland (Matuszkiewicz W. 2001; Herbichowa 2004b).

Eriophorum vaginatum-Sphagnum fallax community is widespread in Pomerania, especially in the Baltic coastal belt. Only a few patches of this community are natural while the majority developed as a result of dehydration of other peat-moss bogs (Jasnowski *et al.* 1968; Pawlaczyk *et al.* 2001; Herbichowa 2004b).

Peat forest communities, *Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis*, also occur in the peatlands in the study area (Matuszkiewicz W. 2001; Matuszkiewicz J.M. 2007).

Vaccinio uliginosi-Pinetum occurs mostly in the lakeland belt. It usually develops in local endorheic depressions filled with raised peat or is part of vast peatland areas. It overgrows slopes of peatland cupolas in living raised bogs while it can occupy entire surfaces of raised bogs with water deficit, being the final stage of the succession continuum. *Vaccinio uliginosi-Pinetum* occurs in sites with a very high level of stagnating precipitation groundwater. It develops on the substrate of strongly acid, oligotrophic raised peat, on peat gley or peaty gley soils (Herbichowa *et al.* 2004; Matuszkiewicz J.M. 2007).

Vaccinio uliginosi-Betuletum pubescentis is an Atlantic community and occurs mostly in northwest Europe. It reaches the eastern limit of its geographic range in Poland. The belt of the Pobrzeża Południowobałtyckie Coasts and the Pojezierza Południowobałtyckie Lakelands is its main occurrence sites. Patches of *Vaccinio uliginosi-Betuletum pubescentis* usually develop in endorheic high watertable terrain depressions, in areas of the sandy-loam ground moraine. They develop on fairly shallow, mesotrophic, acid transitional bogs, on stagnogley-type acid soils. *Vaccinio uliginosi-Betuletum pubescentis* can also occur on the margins of raised bogs (Herbichowa *et al.* 2004; Matuszkiewicz J.M. 2007).

3. MATERIAL AND METHODS

Macroscopic fungi (macromycetes), that is fungi producing fruit bodies or stromata visible with the unaided eye and reaching the size of over 1 mm, were investigated in this study. Macroscopic fungi of raised and transitional bogs were examined at 134 sites (71 raised bogs and 63 transitional bogs) in Pomerania in the period between 1999 and 2009 (Fig. 1 & Tab. 1).

Table 1
A list of study peatlands

*nature reserve; **peatland type: T – transitional bog, R – raised bog, based on a range of sources such as Jasnowska & Jasnowski (1983e), Jasnowski (1990), Banaś *et al.* (2004), Żurek (2006) and Herbichowa *et al.* (2007).

No. on Figure 1	Peatland name (abbreviation)	Location	Geographic co-ordinates	ATPOL grid square	Mesoregion	Peatland type**	Plot no.
Peatbogs investigated with the research plot method and the route method							
1	Roby* (Rob)	0.2 km SE of Roby	54°06'N 15°18'E	Ba 0811	Wybrzeże Trzebiatowskie Coast	R	Rob3, Rob4
2	Stramniczka* (Str)	8 km SE of Kołobrzeg; S of Stramniczka	54°09 N 15°42'E	Bb 0100	Równina Białogardzka Plain	R	Str1, Str1A
3	Chomino (Ch)	2 km SW of Chomino	53°54'N 14°55'E	Ba 2610	Równina Gryficka Plain	T	Ch1, Ch2
4	Przybiernów (P-38)	3 km SE of Przybiernów; 0.8 km W of Sosnowice	53°44'N 14°47'E	Ba 4510	Równina Goleniowska Plain	R	P-38a, P-38b, P-38c
5	Zielonczyn (Z)	2.5 km NE of Zielonczyn	53°42'N 14°42' E	Ba 5401	Równina Goleniowska Plain	T	Z1, Z6, Z12, Z20
6	Żurawina (Żur)	7 km NE of Stepnica	53°42'N 14°42'E	Ba 5401	Równina Goleniowska Plain	R	Żur1, Żur2, Żur3, Żur4, Żur5
7	Niewiadowo (Nw)	0.5 km W of Niewiadowo	53°39'N 14°53' E	Ba 5511	Równina Goleniowska Plain	R	Nw1, Nw2, Nw3, Nw4, Nw5, Nw6, Nw7, Nw8
8	Żółwia Błoć* (ŻBł)	1.2 km NW of Żółwia Błoć	53°38'N 14°52'E	Ba 5511	Równina Goleniowska Plain	R	ŻBł3, ŻBł4, ŻBł5, ŻBł6, ŻBł14, ŻBł17
9	Wrzosiec* (Wrz)	2.5 km N of Krzywice	53°36'N 14°57'E	Ba 6600	Równina Nowogardzka Plain	R	Wrz1, Wrz2

Table 1 cont.

10	Mszar koło Starej Dobrzycy* (SD)	1.5 km S of Stara Dobrzyca	53°48'N 15°32'E	Bb 4000	Równina Gryficka Plain	R	SD1, SD2, SD3, SD4, SD5, SD6, SD7, SD8, SD9, SD10, SD11, SD12, SD13, SD14, SD15, SD16
11	Reptowo (Rep)	N of Reptowo	53°22'N 14°50'E	Ba 8510	Równina Goleniowska Plain	R	Rep1
12	Kołowo (K)	0.5 km NW of Kołowo	53°19'N 14°40'E	Ba 9401	Wzgórza Bukowe Hills	T	K12, K13, K18
13	Ścienne (Głowacz reserve) (Śc)	2 km N of Ścienne	53°28'N 15°29'E	Ba 8901	Pojezierze Ińskie Lakeland	T	Śc1a, Śc2, Śc3, Śc4, Śc19
14	Czertyń (Cz)	1.8 km SW of Czertyń	53°21'N 15°34'E	Bb 9000	Pojezierze Ińskie Lakeland	T	Cz13
15	Bonin (B)	1.5 km SW of Bonin	53°11'N 15°21'E	Ca 1801	Pojezierze Choszczeńskie Lakeland	T	B1, B2a, B7, B8, B10, B16
16	Ziemomyśl I (Z-I)	0.5 km N of Ziemomyśl B	53°11'N 15°16'E	Ca 1800	Pojezierze Choszczeńskie Lakeland	R	Z-Ia, Z-Ic
17	Niesporowice (N)	0.6 km SE of Niesporowice	52°58'N 15°21'E	Ca 3811	Równina Gorzowska Plain	R	N9
18	Danków (D)	2 km SW of Danków	52°55'N 15°20'E	Ca 4800	Równina Gorzowska Plain	R	D6
19	Rosiczki Mirosławskie* (RM)	3,5 km NE of Mirosławiec; 1 km SW of Nieradź	53°21'N 16°09'E	Bb 9410	Pojezierze Wałeckie Lakeland	R	RM1, RM2, RM3
20	Torfowisko Toporzyk* (TT)	1.5 km N of Toporzyk	53°43'N 16°03'E	Bb 5311	Pojezierze Drawskie Lakeland	R	TT1, TT12, TT13
21	Zielone Bagna* (ZB)	2 km N of Nowe Worowo; 9 km S of Połczyn Zdrój	53°40'N 16°05'E	Bb 5311	Pojezierze Drawskie Lakeland	R	ZB1, ZB2, ZB2a, ZB3, ZB4, ZB5, ZB6, ZB7, ZB8, ZB9, ZB10, ZB11, ZB12, ZB13, ZB14, ZB15
22	Kolonia Kazimierz (Ka)	N of Kolonia Kazimierz; 10 km SW of Biały Bór	53°51'N 16°46'E	Bb 4800	Dolina Gwdy Valley	T	Ka1, Ka2, Ka3, Ka3a, Ka5, Ka5a, Ka6, Ka8, Ka9, Ka11, Ka15
23	Jezioro Cęgi Małe* (JCM)	2.5 km S of Trzyniec	53°56'N 17°08'E	Bc3001	Równina Charzykowska Plain	R	JCM1, JCM2, JCM3, JCM4, JCM5
Peatbogs investigated with the route method							
24	Jatki	2 km W of Jatki	53°57'N 14°52'E	Ba 2600	Wybrzeże Trzebiatowskie Coast	R	-
25	Stuchowo-Ciesław	2 km S of Stuchowo; 1.5 km N of Ciesław	53°56'N 15°01'E	Ba 2611	Równina Gryficka Plain	T	-
26	Wrzosowisko Sowno*	1.5 km NE of Sowno; 2.5 km NW of Płoty	53°48'N 15°14'E	Ba 4800	Równina Gryficka Plain	R	-

27	Krężel	0.5 km SW of Krężel; 2.2 km NW of Płoty	53°49'N 15°14'E	Ba 4800	Równina Gryficka Plain	T	-
28	Golczewskie Uroczysko*	3 km NW of Golczewo	53°48'N 15°01'E	Ba 3611	Równina Goleniowska Plain	R	-
29	Jezioro Czarne Lake near Niewiadowo	1.5 km W of Niewiadowo	53°39'N 14°52'E	Ba 5511	Równina Goleniowska Plain	T	-
30	Przybiernów (P-39)	3 km SE of Przybiernów; 0.5 km W of Sosnowice	53°44'N 14°47'E	Ba 4510	Równina Goleniowska Plain	R	-
31	Przybiernów (P-40)	3 km SE of Przybiernów; 0.2 km N of Sosnowice	53°44'N 14°48'E	Ba 4510	Równina Goleniowska Plain	R	-
32	Przybiernów (P-41)	3.3 km SE of Przybiernów; 0.6 km NE of Sosnowice	53°44'N 14°48'E	Ba 4510	Równina Goleniowska Plain	R	-
33	Trzęsacz	2.6 km N of Widzeńsko	53°41'N 14°44'E	Ba 5401	Równina Goleniowska Plain	R	-
34	Lewino	2.3 km NE of Widzeńsko	53°41'N 14°45'E	Ba 5500	Równina Goleniowska Plain	R	-
35	Kołowskie Trzęsawisko	1 km SE of Kołowo	53°18'N 14°43'E	Ba 9410	Wzgórza Bukowe Hills	T	-
36	Ziemomyśl II	1 km NE of Ziemomyśl B	53°11'N 15°17'E	Ca 1800	Pojezierze Choszczeńskie Lakeland	T	-
37	Stara Dobrzyca	1 km NE of Stara Dobrzyca	53°50'N 15°33'E	Bb 4000	Równina Gryficka Plain	T	-
38	Mszar nad Jeziorem Piaski*	2.5 km W of Karnice	53°42'N 15°27'E	Ba 5911	Równina Gryficka Plain	T	-
39	Bagno Zatomskie	2.5 km NE of Ińsko	53°27'N 15°34'E	Bb 8000	Pojezierze Ińskie Lakeland	T	-
40	Ziemsko	1.5 km SW of Ziemsko	53°27'N 15°42'E	Bb 8001	Pojezierze Ińskie Lakeland	T	-
41	Bórbagno Miałka*	0.8 km W of Miałka	53°25'N 15°28'E	Ba 8901	Pojezierze Ińskie Lakeland	R	-
42	Bagno Kielno	2.5 km E of Biała Ińska	53°24'N 15°27'E	Ba 8911	Pojezierze Ińskie Lakeland	T	-
43	Kinice	1 km N of Kinice	52°57'N 15°05'E	Ca 3611	Pojezierze Myśliborskie Lakeland	T	-
44	Rokitno	1 km NW of Rokitno	52°57'N 15°02'E	Ca 3610	Pojezierze Myśliborskie Lakeland	T	-
45	Lipiany	7 km NW of Lipiany, by the Pyrzyce-Myślibórz railway tracks	53°02'N 14°55'E	Ca 2511	Pojezierze Myśliborskie Lakeland	T	-
46	Bagno Chłopiny*	S of Chłopiny	52°50'N 15°02'E	Ca 4610	Równina Gorzowska Plain	T	-

47	Markowe Błota*	2 km SW of Moczydło	52°54’N 15°15’E	Ca 4701	Równina Gorzowska Plain	T	-
48	Jeziorka Głodne*	5 km W of Tuczno	53°11’N 16°04’E	Cb 1300	Równina Drawska Plain	R	-
49	Sicienko*	5 km SW of Krępa Krajeńska; S of Jezioro Sitno Lake	53°11’N 16°01’E	Cb 1300	Równina Drawska Plain	R	-
50	Golcowe Bagno*	2 km E of Golce	53°23’N 16°27’E	Bb 9600	Równina Wałecka Plain	T	-
51	Torfowisko Kaczory*	2.5 km E of Śmiłowo	53°07’N 16°57’E	Cb 2900	Pojezierze Krajeńskie Lakeland	R	-
52	Jezioro Czarne Lake (Messy)	5 km SW of Sępólno Krajeńskie	53°25’N 17°31’E	Bc 9300	Pojezierze Krajeńskie Lakeland	R	-
53	Czarci Staw*	4 km NE of Złotów	53°23’N 17°04’E	Bc 9000	Pojezierze Krajeńskie Lakeland	T	-
54	Żabiroślowe oczka	0.7 km NE of Łośnica	53°50’N 16°06’E	Bb 3410	Pojezierze Drawskie Lakeland	R	-
55	Jezioro Zimne Lake	7 km NE of Połczyn Zdrój; 0.8 E of Zaborze	53°48’N 16°10’E	Bb 4410	Pojezierze Drawskie Lakeland	R	-
56	Wrzoścowy mszar	1.7 km NW of Połczyn Zdrój	53°47’N 16°04’E	Bb 4311	Pojezierze Drawskie Lakeland	R	-
57	Borówka Bagienna	4 km NW of Toporzyk; 1km SE of Bronowo	53°42’N 16°00’E	Bb 5310	Pojezierze Drawskie Lakeland	R	-
58	Torfowisko nad Jeziorem Morzysław Mały*	1.5 km SW of Cieszyno	53°35’N 16°02’E	Bb 7300	Pojezierze Drawskie Lakeland	T	-
59	Jezioro Czarnówek Lake*	4 km N of Złocieniec	53°34’N 16°01’E	Bb 7300	Pojezierze Drawskie Lakeland	T	-
60	Zarańsko	0.2 km S of Zarańsko	53°33’N 15°50’E	Bb 7200	Pojezierze Drawskie Lakeland	T	-
61	Bagno Kusowo*	E of Kusowo	53°48’N 16°35’E	Bb 4710	Pojezierze Drawskie Lakeland	R	-
62	Wierzchomińskie Bagno*	1.5 km SW of Wierzchomino	54°09’N 15°57’E	Bb 0310	Równina Białogardzka Plain	R	-
63	Warnie Bagno*	2 km N and NE of Warnino	54°09’N 15°57’E	Bb 0211	Równina Białogardzka Plain	R	-
64	Brzezina Bagienna	2.5 km NE of Warnino	54°08’N 15°58’E	Bb 0310	Równina Białogardzka Plain	R	-

65	Smolno	1.2 km S of Smolno	54°09'N 15°54'E	Bb 0211	Równina Białogardzka Plain	R	-
66	Strachomino I	1.2 km S of Strachomino	54°09'N 15°51'E	Bb 0210	Równina Białogardzka Plain	R	-
67	Strachomino II	2.4 km SE of Strachomino	54°09'N 15°53'E	Bb 0211	Równina Białogardzka Plain	R	-
68	Bobolice – Głodowa	4 km NW of Bobolice; 0.5 km SE of Głodowa	53°58'N 16°34'E	Bb 2611	Pojezierze Drawskie Lake-land	T	-
69	Miłocice	0.2 km W of Miłocice	53°57'N 16°56'E	Bb 3900	Dolina Gwdy Valley	T	-
70	Jezioro Iłowatka Lake*	NW of Cybulin	53°59'N 16°47'E	Bb 2810	Dolina Gwdy Valley	R	-
71	Biały Dwór I	0.5 km NE of Biały Dwór	53°55'N 16°47'E	Bb 3800	Dolina Gwdy Valley	T	-
72	Biały Dwór II	0.5 km NW of Biały Dwór	53°55'N 16°47'E	Bb 3800	Dolina Gwdy Valley	T	-
73	Torfowiska Cybulińskie	1 km SW of Cybulin	53°58'N 16°46'E	Bb 2810	Dolina Gwdy Valley	T	-
74	Jezioro Oblica Lake	N of the Jezio-ro Oblica Lake	53°58'N 16°48'E	Bb 2811	Dolina Gwdy Valley	T	-
75	Kaliska	2 km NE of Kaliska	53°56'N 16°52'E	Bb 3801	Dolina Gwdy Valley	T	-
76	Biskupice	W of Biskupice	53°52'N 16°47'E	Bb 4811	Dolina Gwdy Valley	T	-
77	Jezioro Czarne Lake near Stępień	2 km SW of Stępień	53°49'N 16°44'E	Bb 4800	Dolina Gwdy Valley	T	-
78	Bocheńskie Błoto*	2.5 km NE of Sporysz	53°49'N 17°03'E	Bc 4010	Równina Charzy-kowska Plain	T	-
79	Bagnisko Niedźwiady*	3 km N of Nowa Brda	53°54'N 17°12'E	Bc 3110	Równina Charzy-kowska Plain	R	-
80	Jezioro Węgorzówko Lake	1.5 km SE of Stara Brda	53°56'N 17°15'E	Bc 3101	Równina Charzy-kowska Plain	T	-
81	Bagno Stawek*	2 km W of Asmus	53°53'N 17°33'E	Bc 3311	Równina Charzy-kowska Plain	T	-
82	Piecki*	2.5 km SE of Laska	53°55'N 17°34'E	Bc 3311	Równina Charzy-kowska Plain	R	-
83	Jezioro Małe Łowne Lake*	4 km SW of Konarzynki	53°48'N 17°28'E	Bc 4211	Równina Charzy-kowska Plain	R	-
84	Jezioro Sporackie Lake*	1.5 km S of Babilon	53°47'N 17°26'E	Bc 5201	Równina Charzy-kowska Plain	T	-
85	Nawionek*	2 km S of Laska	53°55'N 17°32'E	Bc 3310	Równina Charzy-kowska Plain	T	-
86	Moczadło*	2 km SW of Męcikał	53°49'N 17°38'E	Bc 4410	Bory Tucholskie Forest	T	-
87	Jezioro Bardze Małe Lake*	E of Stara Rogoźnica	53°46'N 17°26'E	Bc 5201	Równina Charzy-kowska Plain	T	-

88	Mętne*	3 km N of Rytel	53°47'N 17°47'E	Bc 4411	Bory Tucholskie Forest	R	-
89	Jezioro Zdręczno Lake*	2.5 km SE of Zapędowo	53°42'N 17°54'E	Bc 6501	Bory Tucholskie Forest	T	-
90	Jeziorka Kozie Lake*	2.5 km SE of Zapędowo	53°41'N 17°53'E	Bc 6501	Bory Tucholskie Forest	R	
91	Jezioro Mały Suszek Lake	0.5 km S of Suszek	53°43'N 17°46'E	Bc 5411	Bory Tucholskie Forest	T	-
92	Bagno Grzybna*	3 km W of Okoniny Polskie	53°41'N 18°02'E	Bc 6601	Bory Tucholskie Forest	T	-
93	Bagno Okoniny	0.5 km NW of Okoniny Polskie	53°41'N 18°03'E	Bc 6601	Bory Tucholskie Forest	T	-
94	Martwe*	1.5 km N of Pruskie	53°37'N 18°12'E	Bc 6711	Bory Tucholskie Forest	T	-
95	Dury*	4 km N of Osie	53°38'N 18°21'E	Bc 6811	Bory Tucholskie Forest	R	-
96	Osiny*	1 km S of Osiny	53°38'N 18°36'E	Bd 6010	Bory Tucholskie Forest	R	-
97	Jezioro Błotko Lake	N of the Jezioro Błotko Lake	53°50'N 17°33'E	Bc 4300	Równina Charzykowska Plain	T	-
98	Jeleń I	0.3 km NW of the Jezioro Jeleń Lake (forest section 39f)	53°50'N 17°35'E	Bc 4301	Równina Charzykowska Plain	T	-
99	Jeleń II	0.2 km NW of the Jezioro Jeleń Lake (forest section 52b)	53°50'N 17°34'E	Bc 4311	Równina Charzykowska Plain	T	-
100	Jezioro Głuche Lake	Around the Jezioro Głuche Lake	53°49'N 17°33'E	Bc 4310	Równina Charzykowska Plain	T	-
101	Jezioro Kacze Oko Lake	SW of the Jezioro Płęsno Lake	53°49'N 17°32'E	Bc 4310	Równina Charzykowska Plain	R	-
102	Jezioro Rybie Oko Lake	SW of the Jezioro Płęsno Lake	53°49'N 17°32'E	Bc 4310	Równina Charzykowska Plain	R	-
103	Jezioro Nierybno Lake	N of the Jezioro Nierybno Lake	53°50'N 17°34'E	Bc 4311	Równina Charzykowska Plain	R	-
104	Pętla Lipnickiego	NE of the Płęsno Lake (disused peat excavation pit)	53°49'N 17°34'E	Bc 4311	Równina Charzykowska Plain	T	-
105	Jezioro Główka Lake	W of the Jezioro Główka Lake	53°48'N 17°34'E	Bc 4311	Równina Charzykowska Plain	T	-
106	Jezioro Kocioł Lake	Around the Jezioro Kocioł Lake	53°49'N 17°35'E	Bc 4311	Równina Charzykowska Plain	T	-

107	Jezioro Kociołek Lake	Around the Jezioro Kociołek Lake	53°49'N 17°36'E	Bc 4311	Równina Charzykowska Plain	T	-
108	Jezioro Wielkie Gacno Lake	N and E bank of the Jezioro Wielkie Gacno Lake	53°48'N 17°34'E	Bc 4311	Równina Charzykowska Plain	R	-
109	Peatbog near Jezioro Wielkie Gacno Lake	S of the Jezioro Wielkie Gacno Lake	53°47'N 17°34'E	Bc 4311	Równina Charzykowska Plain	R	-
110	Glabus	W of the Jezioro Ostrowite Lake	53°48'N 17°35'E	Bc 4311	Równina Charzykowska Plain	R	-
111	Wiele – Lubnia	3.5 km NW of Wiele; 3.5 km NE of Lubnia	53°56'N 17°49'E	Bc 3500	Bory Tucholskie Forest	T	-
112	Jezioro Głuchówko Lake	NE of Wdzydze Tucholskie	53°58'N 17°56'E	Bc 2610	Bory Tucholskie Forest	T	-
113	Kruszyńskie Błota – Głuche	E of Kruszynia; 2.7 km SW of Olpuch	53°60'N 17°59'E	Bc 2610	Bory Tucholskie Forest	R	-
114	Torfowisko Strupino	1 km S of Juszki	54°02'N 17°58'E	Bc 2600	Bory Tucholskie Forest	T	-
115	Bruskowskie Bagno	E of Bruskowo Wielkie	54°29'N 16°56'E	Ab 6911	Równina Słupska Plain	R	-
116	Słowińskie Błota*	1.5 km NW of Słowino	54°21'N 16°29'E	Ab 8601 Ab 8611	Równina Słupska Plain	R	-
117	Jezioro Ściegnickie Lake	2 km SE of Ściegnica	54°20'N 16°49'E	Ab 8811	Równina Słupska Plain	T	-
118	Janiewickie Bagno*	2 km SW of Janiewice	54°16'N 16°44'E	Bb 9810	Równina Słupska Plain	R	-
119	Kruszyna-Płaszewo	0.5 km SE of Kruszyna	54°20'N 17°00'E	Ac 8010	Równina Słupska Plain	T	-
120	Torfowisko Zieliń Miastecki*	N of Zieliń	54°15'N 17°06'E	Ac 9011	Wysoczyzna Polanowska Plateau	R	-
121	Białogóra*	NE of Białogóra	54°49'N 17°58'E	Ac 3600	Wybrzeże Słowińskie Coast	T	-
122	Kluki*	0.5 km W of Kluki	54°41'N 17°19'E	Ac 4210	Wybrzeże Słowińskie Coast	R	-
123	Czarne Bagno – Karolinki*	SE of Kokoszki	54°34'N 17°34'E	Ac 6301	Pradolina Redy-Łeby Proto-Valley	R	-
124	Bagna Izbickie*	2 km S of Izbica	54°39'N 17°25'E	Ac 5201	Wybrzeże Słowińskie Coast	R	-
125	Torfowisko Pobłockie*	SW of Pobłocie	54°37'N 17°29'E	Ac 5310	Wysoczyzna Damnicka Plateau	R	-
126	Las Górkowski*	2 km NW of Cecenowo	54°40'N 17°34'E	Ac 5301	Pradolina Redy-Łeby Proto-Valley	R	-
127	Żurawie Chrusty*	NW of Mojuszowska Huta	54°20'N 17°57'E	Ac 8610	Pojezierze Kaszubskie Lakeland	T	-
128	Kurze Grzędy*	1 km NW of Bącz	54°23'N 17°58'E	Ac 8600	Pojezierze Kaszubskie Lakeland	R	-

129	Żurawie Błota*	1.5 km W of Nowa Huta	54°25'N 18°00'E	Ac 7611 Ac 8601	Pojezierze Kaszubskie Lakeland	R	-
130	Leśne Oczko*	2.5 km E of Miechucino	54°22'N 18°03'E	Ac 8611	Pojezierze Kaszubskie Lakeland	R	-
131	Staniszewskie Błoto*	2 km N of Miechucino	54°22'N 18°02'E	Ac 8601	Pojezierze Kaszubskie Lakeland	R	-
132	Żuromino I	1 km N of Żuromino	54°15'N 17°58'E	Ac 9610	Pojezierze Kaszubskie Lakeland	R	-
133	Żuromino II	N of Żuromino	54°14'N 17°57' E	Bc 0600	Pojezierze Kaszubskie Lakeland	R	-
134	Jezioro Ciche Lake*	1.5 km SE of Wierzchy	53°35'N 18°16'E	Bc 7800	Wysoczyzna Świecka Plateau	R	-

Selection of sites, plant communities and permanent research plots. A well-preserved vegetation cover was the main criterion for site selection. Sites with well-developed, floristically homogenous patches of peatland communities were pre-selected for analysis. Both published (Jasnowski 1962a, 1990; Jasnowski *et al.* 1968; Herbichowa 1979, 1998a; Jasnowska & Jasnowski 1981, 1983e; Brzeg *et al.* 1995, 1996; Ilnicki 2002; Herbichowa *et al.* 2007) and unpublished data, e.g., records concerning protected areas or information obtained from botanists and foresters, were used to locate and choose the sites.

Communities floristically and phytosociologically well-recognized, recorded frequently in raised and transitional bogs of Pomerania, were selected for mycological investigations of peatland communities in the region (Jasnowski 1962a; Jasnowski *et al.* 1968; Herbichowa 1979, 1998a; 2004a, b; Jasnowska & Jasnowski 1981, 1983a, b, c, d; Gos & Herbichowa 1991; Brzeg *et al.* 1995, 1996; Herbichowa & Potocka 2004; Banaś-Stankiewicz 2007a, b, c).

Habitat conditions of a peatland community and the homogeneity of its patches were decisive in determining the size, shape and number of permanent research plots (cf. Bujakiewicz 1981). The community type in which investigations were conducted was also used to establish the plot size (cf. Wojewoda 1975). The standard plot size of 400 m^2 (with the exception of one 300 m^2 plot), commonly used in Poland and regarded as the optimum (cf. Lisiewska 1965, 1978; Friedrich 1994, 2008), was applied in forest peatland communities but it ranged between 40 and 400 m^2 in non-forest peatland communities. This variation in non-forest phytocoenoses was caused by the frequent mosaic occurrence of plant communities in raised and transitional bogs (Pawłowski & Zarzycki 1977; Piotrowska 1997; Jasnowska *et al.* 1999) and the resulting difficulty in finding appropriately large, homogenous vegetation patches to set up uniformly-sized plots. Therefore some permanent research plots in non-forest peatland communities consisted of several sections and one phytosociological relevé was performed comprising a number of partial areas (cf. Dzwonko 2007; Friedrich 2008).

Permanent research plots (108 in total) were established in eight non-forest peatland communities: *Caricetum limosae* (13 plots), *Rhynchosporetum albae* (13), *Eriophoro angustifolii-Sphagnetum recurvi* (13), *Caricetum lasiocarpae* (11), *Caricetum rostratae* (8), *Erico-Sphagnetum medii* (9), *Sphagnetum magellanici* (10), and the community *Eriophorum vaginatum-Sphagnum fallax* (10), and in patches of two forest peatland communities: *Vaccinio uliginosi-Pinetum* (10) and *Vaccinio uliginosi-Betuletum pubescentis* (10).

Substrate analysis. Collective peat samples (from 3 to 5 spots at each plot depending on its size, at a depth of 5-20 cm) were collected for chemical substrate analyses to determine habitat parameters at each of 108 permanent research plots. The substrate was sampled in September or early October.

The following parameters were determined in substrate samples: the content of ammonia nitrogen and nitrate nitrogen (the distillation method), the content of nitrite nitrogen (colorimetrically with the Griess method), the content of phosphorus (colorimetrically with the phosphomolybdate blue method), pH reaction (potentiometrically), humidity (by weight in a moisture balance). Analyses were performed in the Department of Environment Protection and Development, West Pomeranian University of Technology, Szczecin. Analysis results are presented in a Table 2.

Table 2
Selected physico-chemical properties of the substrate

Community	Plot number	Humidity (%)	pH	P	N		
				$P\text{-}PO_4$	$N\text{-}NH_4$	$N\text{-}NO_3$	$N\text{-}NO_2$
				mg/100g of moist peat			
Caricetum limosae	B2a	91.4	4.53	0.07	0.89	0.28	0.004
	Ch1	95.3	4.65	0.06	1.54	0.28	0.003
	Ch2	91.3	4.45	0.06	1.20	0.22	0.003
	SD3	94.7	4.85	0.16	0.21	0.01	0.001
	SD4	94.5	4.65	0.12	0.21	0.01	0.001
	Ka1	91.1	4.35	0.07	0.12	0.09	0.003
	Śc1a	93.8	4.34	0.03	0.59	0.14	0.002
	Ka9	95.1	4.35	0.12	0.12	0.11	0.004
	Ka5	94.5	4.25	0.02	0.12	0.11	0.003
	B7	90.2	4.72	0.07	0.35	0.21	0.003
	B8	92.2	4.55	0.06	0.33	0.21	0.003
	Śc4	93.8	4.53	0.07	0.78	0.23	0.004
	Z6	95.2	4.54	0.03	1.12	0.14	0.050
Rhynchosporetum albae	ZB7	93.9	4.20	0.08	0.35	0.21	0.004
	ZB8	93.8	4.23	0.08	0.40	0.22	0.004
	SD12	94.6	4.42	0.14	0.21	0.05	0.001
	RM1	93.7	4.04	0.12	0.01	0.14	0.001
	RM2	93.6	4.17	0.07	0.01	0.05	0.001
	RM3	93.5	4.07	0.08	0.01	0.05	0.001
	JCM2	97.1	4.93	0.03	0.11	0.08	0.002
	JCM3	94.7	4.31	0.05	0.03	0.14	0.002
	Ka11	93.3	4.35	0.05	0.05	0.14	0.001
	Cz13	93.1	4.22	0.21	0.98	0.28	0.002
	ŻBł14	93.3	3.88	0.05	0.05	0.14	0.001
	Z12	95.2	4.55	0.02	0.25	0.14	0.003
	B10	92.2	4.54	0.07	0.11	0.08	0.001

Table 2 cont.

Caricetum lasiocarpae	Ka3a	89.1	4.64	0.05	0.05	0.14	0.001
	TT12	94.1	4.85	0.03	0.11	0.08	0.001
	TT13	94.7	4.43	0.03	0.13	0.07	0.002
	ZB1	92.5	4.60	0.08	0.28	0.14	0.001
	ZB2	94.5	4.30	0.04	0.09	0.03	0.001
	ZB2a	93.2	4.50	0.07	0.14	0.07	0.001
	SD1	95.6	4.33	0.07	0.03	0.12	0.002
	SD2	85.3	3.91	0.19	0.34	0.32	0.004
	Z1	89.6	4.75	0.05	0.11	0.10	0.001
	Ka2	90.6	4.65	0.05	0.11	0.11	0.001
	Ka3	88.3	4.20	0.14	0.17	0.16	0.002
Eriophoro angustifolii-Sphagnetum recurvi	Ka8	94.4	4.13	0.01	0.08	0.09	0.002
	ZB9	96.5	4.14	0.03	0.09	0.09	0.002
	ZB10	95.5	4.24	0.04	0.08	0.08	0.002
	SD13	95.6	4.40	0.07	0.04	0.12	0.003
	Nw1	94.3	4.01	0.09	0.09	0.11	0.008
	Nw2	93.6	4.30	0.06	0.04	0.07	0.003
	Żur4	94.6	4.46	0.04	0.28	0.14	0.004
	Żur5	95.2	4.07	0.06	0.28	0.14	0.004
	Ka15	94.1	4.33	0.03	0.08	0.09	0.001
	B16	94.5	4.03	0.07	0.16	0.09	0.004
	ŻBł17	95.6	4.59	0.37	0.04	0.12	0.003
	K18	91.2	4.32	0.04	1.40	0.14	0.015
	Śc19	89.5	4.53	0.07	0.98	0.28	0.004
Caricetum rostratae	Ka5a	96.3	4.11	0.09	0.07	0.09	0.002
	Ka6	94.4	4.13	0.06	0.08	0.09	0.002
	ZB3	96.5	4.20	0.08	0.28	0.14	0.001
	ZB4	94.5	4.20	0.04	0.07	0.02	0.001
	SD5	91.5	4.05	0.19	0.28	0.05	0.001
	SD6	92.9	4.59	0.15	0.28	0.05	0.001
	Śc2	92.5	4.15	0.16	0.21	0.05	0.001
	Śc3	90.5	4.08	0.14	0.56	0.28	0.007
Erico-Sphagnetum medii	ŻBł6	90.3	3.78	0.03	0.17	0.13	0.008
	ŻBł5	91.8	3.81	0.12	0.32	0.28	0.004
	Wrz1	93.5	3.96	0.12	0.09	0.11	0.004
	Wrz2	94.3	3.80	0.03	0.22	0.29	0.003
	Rob3	92.2	4.15	0.01	0.06	0.12	0.003
	Rob4	83.9	3.64	0.01	0.28	0.25	0.009
	Str1	93.6	3.90	0.01	0.12	0.11	0.004
	Str1A	88.2	3.85	0.01	0.31	0.13	0.009
	TT1	94.5	3.89	0.06	0.26	0.14	0.002
Sphagnetum magellanici	ZB5	91.8	4.02	0.08	0.09	0.11	0.007
	ZB6	92.4	4.16	0.08	0.09	0.11	0.008
	P-38c	94.1	4.15	0.03	0.07	0.08	0.007
	Żur1	91.2	4.45	0.04	0.07	0.08	0.008
	SD9	94.2	4.05	0.07	0.40	0.30	0.002
	SD10	91.4	4.35	0.10	0.10	0.09	0.004
	SD11	91.8	4.38	0.10	0.20	0.09	0.005
	Żur2	92.2	4.50	0.04	0.08	0.06	0.007
	Żur3	93.3	4.35	0.05	0.09	0.06	0.007
	JCM1	91.6	4.08	0.5	0.07	0.06	0.003

Table 2 cont.

Community *Eriophorum vaginatum-Sphagnum fallax*	Rep1	89.2	4.40	0.03	0.80	0.07	0.002
	K12	91.4	4.60	0.40	0.15	0.05	0.003
	K13	93.2	4.30	0.40	0.16	0.06	0.003
	D6	85.6	4.10	0.06	1.54	0.14	0.004
	N9	90.6	4.32	0.03	1.12	0.14	0.003
	Z-Ia	90.2	4.10	0.40	0.07	0.06	0.002
	SD7	89.9	4.16	0.06	0.45	0.15	0.002
	SD8	88.7	3.90	0.01	0.12	0.11	0.004
	P-38a	93.2	4.54	0.006	0.05	0.11	0.002
	P-38b	92.1	4.45	0.006	0.06	0.12	0.003
	B1	89.7	4.53	0.07	0.98	0.28	0.004
Vaccinio uliginosi-Pinetum	ZB14	90.1	4.14	0.15	0.55	0.34	0.003
	ZB15	86.4	3.76	0.17	0.38	0.24	0.015
	Nw6	89.7	3.82	0.18	0.65	0.18	0.005
	Nw7	91.1	4.11	0.17	0.66	0.17	0.004
	Nw8	91.4	3.99	0.04	0.35	0.20	0.003
	SD16	90.2	3.94	0.03	0.31	0.20	0.003
	ŻBł3	88.8	3.82	0.17	0.21	0.14	0.003
	ŻBł4	91.7	3.95	0.16	0.22	0.14	0.004
	JCM4	92.2	3.85	0.11	1.30	0.56	0.003
	JCM5	92.6	3.86	0.13	0.35	0.20	0.004
Vaccinio uliginosi-Betuletum pubescentis	ZB12	90.9	4.17	0.10	0.19	0.16	0.003
	ZB11	93.3	4.06	0.07	0.45	0.15	0.003
	ZB13	84.2	3.80	0.24	0.38	0.26	0.009
	Nw3	90.4	3.99	0.31	0.33	0.32	0.016
	Nw4	77.0	3.64	0.16	0.15	0.37	0.003
	Nw5	82.8	3.75	0.09	1.13	1.20	0.007
	SD14	94.0	4.71	0.09	0.28	0.26	0.002
	SD15	85.2	4.51	0.27	0.28	0.25	0.011
	Z20	83.7	4.55	0.08	0.84	0.77	0.003
	Z-Ic	88.9	4.15	0.37	1.12	0.28	0.006

Vegetation analysis. Phytosociological relevés were performed with the classical Braun-Blanquet method to identify plant communities at 108 permanent research plots selected for systematic mycological observations. They are presented separately in tables for each plant community (Appendix 1: Tabs A.1.1-A.1.10). Published phytosociological relevés were also included in the tables (Stasińska & Sotek 2003, 2004a). The systematics and the nomenclature were accepted after Matuszkiewicz W. (2001), Jasnowski *et al.* (1968), and Dierssen (1982). The nomenclature of vascular plants follows Mirek *et al.* (2002) and the nomenclature of mosses is according to Ochyra *et al.* (2003).

Mycological investigations. The richness and diversity of macromycetes occurring in raised and transitional bogs in Pomerania were investigated with the permanent research plot method and the route method. Systematic mycological observations at 108 permanent plots were conducted once a month on average between April and November over three to four vegetative seasons. Between 10 and 26 observations were conducted at each plot. A total 2 388 mycological observations were carried out.

All species of fungi were either collected or noted at individual plots each time and the substrate on which they grew was identified. The occurrence abundance of species producing ephemeral fruit bodies was estimated using the three-point scale by Jahn *et al.* (1967): **r** (*rarus*) – a species occurring singly or in few specimens in one place at a plot, **n** (*numerus*) – a species not occurring numerously, scattered at a plot, **a** (*abundans*) – a species with a high number of specimens, in many places at a plot.

In this study fungi are divided into three bioecological groups: mycorrhizal, saprotrophic and parasitic fungi. They were categorized in bioecological groups based on the substrate colonized and the live form of individual species after, for instance, Knudsen & Vesterholt (2008) and Rinaldi *et al.* (2008). Saprotrophic fungi were further divided into fungi growing on peat, litter, wood, animal dung, other fungi, and among mosses.

The results of mycological observations conducted at research plots are given in comprehensive tables presenting the contribution of macroscopic fungi in individual peatland communities (Appendix 1: Tabs A.2.1-A.2.10). Published mycosociological relevés were also included in the tables (Stasińska & Sotek 2003, 2004a). Mycological relevés in the tables are arranged by mycological probability, i.e. by the contribution of the species in common (Friedrich 1994). Species of fungi in bioecological groups were organised by the frequency of their occurrence and its abundance. The number of records and the occurrence abundance (upper index) according to the scale by Jahn *et al.* (1967) are given for species producing ephemeral fruit bodies. Fungal species with permanent, annual or perennial fruit bodies are marked with an "x". The number of vegetative seasons in which their living fruit bodies were observed is given for these species. Constancy degrees were calculated with the Braun-Blanquet method used in phytosociology. If the number of mycosociological relevés was fewer than ten, the number of plots at which a species was recorded (frequency) is given.

The route method was used to investigate 134 peatlands in addition to systematic investigations at permanent research plots. Entire sites were thoroughly searched and species of fungi occurring in peatland communities selected for mycological analyses were either collected or recorded as part of the route method. The syntaxonomic position of the patches was determined during the investigations but the occurrence abundance of fungi was not calculated. Investigations at individual sites with the route method were usually performed two to three times per year over a period of one to three years.

Relationships between macroscopic fungi and peatland communities were investigated and described using the synthetic-comparative method (Bujakiewicz 1981, 2008). Fidelity and constancy of the occurrence and the abundance of fruit body production of fungal species recorded at permanent research plots in peatland communities were used to assess these relationships. The results are presented in collective tables (Appendix 1: Tabs A.2.1-A.2.10).

A synthetic table was developed to render the occurrence of all species of macroscopic fungi within the bioecological groups against peatland communities (Appendix 1: Tab. A.2.11). The species of fungi are arranged in the table by their contribution to individual communities and the degrees of constancy and the number of plots at which a species was recorded.

The nomenclature of Ascomycota is given after Chmiel (2006), Hansen & Knudsen (2000) and Mułenko *et al.* 2008, Basidiomycota after Knudsen & Vesterholt (2008) and Legon *et al.* (2009) except fungi of the order *Ustilaginales* s.l., whose nomenclature follows Majewski *et al.* (2008). The systematic classification of fungi is accepted after Kirk *et al.* (2008). Threatened species of fungi are given after Wojewoda & Ławrynowicz (2006).

A list of macroscopic fungi and information regarding the habitat, occurrence site and collection date are given in Appendix 2.

The herbarium documentation is deposited in the Herbarium of the Department of Botany and Nature Conservation, Szczecin University (SZUB).

Selection criteria and the list of peatland fungi. Cartogram preparation methods. The substrate type on which a species grows and the habitat in which it occurs were the main criteria to distinguish a group of peatland fungi among macroscopic fungi recorded in the study area. The list of species of peatland fungi is based on: (1) data collected in this study during field investigations (permanent research plots and peatland penetration with the route method); (2) available literature data regarding Pomerania and other regions of Poland (Wojewoda 2003; Chmiel 2006; and the literature cited in both); (3) a variety of mycological studies, and especially peatland-related studies (Thormann & Rice 2007; and the literature cited therein), and (4) numerous monographs such as the most recent study on agaricoid, boletoid and cyphelloid fungi by Knudsen & Vesterholt (2008). The list also includes bryophilous fungi, mostly associated with sphagna, and mycorrhizal fungi growing mainly in peatlands, e.g., *Suillus flavidus*. Species parasitizing peatland plants, e.g., *Monilinia oxycocci*, are included. Fungal species with a broad ecological scale also occurring in other plant communities were omitted. The final total number of 21 species of fungi are listed. Ecological-geographic characteristics are briefly described for each and the distribution in Pomerania is mapped (Appendix 3).

Geographic elements were not distinguished due to the lack of comprehensive data. Information on the occurrence of the fungi is given only when fungal species are characterized. The exception is made for species such as *Bovista paludosa* that are already classified in a specific geographic element.

Cartogram maps were based on my investigations and all available published data (Magnus 1893, after Dominik 1936; Dominik & Pachlewski 1955; Bujakiewicz & Fiklewicz 1963; Skirgiełło 1972, 1984/1986; Bujakiewicz & Lisiewska 1983; Friedrich 1984, 1985/1986, 1994, 1997, 2002, 2006; Bujakiewicz 1986; Jasnowska *et al.* 1993; Domański 1997, after Wojewoda 2003; Ławrynowicz 1998; Komorowska 2000; Ławrynowicz & Szkodzik 2002; Ławrynowicz *et al.* 2002; Sotek *et al.* 2004; Stasińska & Sotek 2003, 2004a, b; Stasińska 2004, 2008; Stasińska *et al.* 2004; Wilga 2004; Kujawa & Gierczyk 2007) and unpublished information reported from Pomerania since the late 19^{th} century. They were developed using the ATPOL grid square system (Zając 1978) with mycological modifications (Wojewoda 2000). A 5 km × 5 km square was the basic cartogram unit. A specific peatland was used as a locality.

The mycology of peatlands in Pomerania is poorly recognized (scarce literature and herbarium data) and the maps (Appendix 3) give introductory information on the distribution of the species of peatland fungi in the region.

Statistical methods

Similarity coefficient. To measure mycological similarity between plant communities, the similarity coefficient (P) was calculated using Jaccard and Steinhaus's formula (Nespiak 1959; Krebs 2001):

$$P = \frac{2c}{a+b} \times 100\%$$

where: a – the number of fungal species in the first community, b – the number of fungal species in the second community, c – the number of fungal species that occur in both communities.

Analysis results of the species composition of fungi in the communities based on this coefficient are presented as a similarity diagram (Nespiak 1959).

Numerical analyses. *General remarks*. Data on the occurrence of species of fungi and plants in vegetation patches based on phytosociological (Appendix 1: Tabs A.1.1-A.1.10) and mycosociological relevés (Appendix 1: Tabs A.2.1-A.2.10) and environmental variables obtained in soil measurements (Tab. 2) were used in numerical analyses (cf. Dzwonko 2007). Data on the number of fungal species belonging to individual trophic groups collected in mycological relevés were also treated as environmental variables. Correlations between the occurrence of fungi/plants and environmental factors were examined and identified with the detrended correspondence analysis (DCA) arranging species and relevés and the partial canonical correspondence analysis (CCA) (ter Braak & Šmilauer 2002).

Data on the occurrence of species at the plots were recorded as binary values (the presence or absence of a species) on a dichotomous scale. Habitat data and other quantitative measures describing the plot size and the number of fungi and plants at the plots were recorded on an interval scale.

Statistical significance of environmental factors. The statistical significance of environmental factors to elucidate the mycological variability of vegetation patches was judged by the Monte Carlo permutation test (Manly 1991) and stepwise forward selection using CANOCO for Windows (ter Braak & Šmilauer 2002). The factor that best explains the variability of the entire set of variables is first selected and the sequence (ranking) of other factors is determined based on their decreasing significance for the total variability of the set in connection with the variables previously selected. The measure of fit is the sum of all eigenvalues of the CCA with each variable as the only additional variable. The program reports "extra fit" (Lambda-A), which is the change in the sum of all CCA eigenvalues (additional variance) when the successive variable is added. It significantly influences the model when its error value p equals or is lower than 0.05.

The plot size and the total number of species of plants (for the set of fungi) and the total number of species of fungi (for the data set of plants) were not the prime research question and therefore should not enter the synthetic gradients. This can be achieved by their status defined as covariables to partial out their influence. This is a partial CCA that amounts to a normal CCA but with the extra requirements that each synthetic gradient must be uncorrelated with the covariables (ter Braak & Verdonschot 1995). A total of 449 random permutations were used to test the significance of factors with the Monte Carlo method.

DCA. Mycological data (fungi) were arranged using the detrended correspondence analysis (ter Braak & Šmilauer 2002; Dzwonko 2007). The syntaxonomic classification according to Matuszkiewicz W. (2001) was superimposed on the ordination of mycological relevés and fungal species. Five mycosociologico-ecological groups of fungal species were identified (Tab. 3). The name of each group is based on the Latin name of the highest-constancy species or the species recorded most numerously and frequently in the pytocoenoses.

CCA and *GLM.* The partial canonical correspondence analysis (ter Braak 1986, 1988) performed with CANOCO for Windows (ter Braak & Šmilauer 2002) was used to identify correlations between the occurrence of fungal species and habitat conditions of their occurrence. Two data matrices were constructed: one on the occurrence of species at 108 research plots and one with a description of their habitat parameters. Each research plot was classified in one of the plant communities: *Caricetum lasiocarpae* (Cala), *Caricetum limosae* (Cali), *Caricetum rostratae* (Caro), *Eriophoro angustifolii-Sphagnetum recurvi* (EaSp), *Erico-Sphagnetum medii* (ErSp), *Rhynchosporetum albae* (Rhal), *Sphagnetum* *magellanici* (Spma), *Vaccinio uliginosi-Pinetum* (VuPn), *Vaccinio uliginosi-Betuletum pubescentis* (VuBe), the community *Eriophorum vaginatum-Sphagnum fallax* (zbEv). Each fungal species was classified in one of four bioecological groups: M (mycorrhizal fungi), Sl (litter-inhabiting fungi), Sp (saprotrophic fungi growing on peat), Sm (saprotrophic fungi growing among mosses). Parasitic fungi and lignicolous fungi, coprophilous fungi or fungi growing on other fungi were excluded because their occurrence depends on the presence of the host or suitable substrate. Species of fungi recorded only at one to three research plots were also omitted as their occurrence can be accidental and may not reflect actual conditions. The matrix describing species diversity consists of 108 research plots (rows) and binary information on the occurrence of 68 fungal species (columns). The matrix representing habitat variability at individual plots had 13 variables, i.e. columns describing: Hum (humidity [%]), pH (soil reaction), the content of phosphates P-PO_4 [mg/100g], ammonium salts N-NH_4 [mg/100g]), nitrates N-NO_3 [mg/100g], and nitrites N-NO_2 [mg/100g] as well as A (plot size), NN (the total number of plant species), NF (the total number of fungal species), NFM (the number of species of mycorrhizal fungi), NFSp (the number of species of saprotrophic fungi growing on peat), NFSm (the number of species of fungi growing among mosses), and NFSl (the number of species of litter-inhabiting fungi).

A (plot size) was treated as a covariable to partial out the influence of the plot size on the analysis results.

The statistical significance of the influence exerted by habitat variables on the occurrence of species was assessed with the permutation Monte Carlo method. Permutations (n = 499) were computed using a reduced model and the variables were ordered by forward selection.

The results were represented graphically using CANODRAW (ter Braak & Šmilauer 2002). The biplot method was used to visualize relationships between environmental variables and species. A generalized linear model was employed to determine pH and Hum variability gradients at the plots (McCullagh & Nelder 1983) with the normal (Gaussian) distribution and the quadratic gradation implemented in CANODRAW. This method is used as a substitute for the linear least-squares regression approach as binary variables are examined in the analysis. Logistic regression is obtained. It is used to calculate the probability of the occurrence of an event by fitting data to the logistic curve. Its shape is defined in this study as a power function formed as a concave or convex parabola.

4. RESULTS. MACROSCOPIC FUNGI IN PEATLAND COMMUNITIES OF POMERANIA

4.1. Macromycetes in non-forest peatland communities

Caricetum limosae

Habitat and floristic features. Mycological investigations were conducted in patches of *Caricetum limosae* at 13 permanent plots located in 6 peatlands: Bonin, Chomino, Kolonia Kazimierz, Mszar koło Starej Dobrzycy, Ścienne (Głowacz reserve) and Zielonczyn (Fig. 1). *Caricetum limosae* patches develop in very moist sites in these peatlands. They are part of quagmires in overgrowing dystrophic lakes (Kolonia Kazimierz, Mszar koło Starej

Dobrzycy) or occupy permanently flooded local terrain depressions (Bonin, Chomino, Ścienne).

The species composition of *Caricetum limosae* patches is poor. 7 to 10 species of vascular plants and 3 to 5 moss species, mostly sphagna, were recorded. Species characteristic of the community, *Carex limosa* and *Scheuchzeria palustris*, occur together in the majority of the study phytocoenoses although one evidently dominates then. A constant and sometimes high contribution of *Sphagnum fallax* and *Oxycoccus palustris* is noted in the structure of the phytocoenoses. Dwarf pines and birches grow in some of them at Bonin, Chomino and Zielonczyn peatlands (Appendix 1: Tab. A.1.1). A total of 24 species, including 16 species of vascular plants and 8 species of mosses, occur in *Caricetum limosae* phytocoenoses.

Mycological features. Altogether 25 species of fungi, including 8 mycorrhizal, 13 saprotrophic and 4 parasitic fungi, were recorded in *Caricetum limosae* at 13 permanent plots with a total area of 1 130 m^2. Between 6 and 18 species were noted at individual plots (Appendix 1: Tab. A.2.1). Saprotrophic fungi, and among them bryophilous fungi, associated with sphagna, e.g., *Galerina paludosa, G. sphagnorum* and *Arrhenia gerardiana*, dominated in *Caricetum limosae* both quantitatively and qualitatively. Other bryophilous species such as *Hypholoma elongatum* and *H. udum* also occurred numerously. Species growing on plant remains were noted considerably less frequently, with *Gymnopus androsaceus* and *Mycena galopus* occurring more often. One species, *Clavaria fragilis*, was recorded on peat. Several mycorrhizal fungi were recorded. They included *Laccaria proxima, Cortinarius huronensis, Lactarius helvus,* and *Russula emetica*, and they occurred exclusively at plots with *Pinus sylvestris*. *Lyophyllum palustre* was the most numerously and most frequently recorded species of parasitic fungi. *Monilinia oxycocci*, a species rare in Poland, occurred at one plot on fruits of *Oxycoccus palustris* depositing from the previous year.

Rhynchosporetum albae

Habitat and floristic features. Mycological observations were conducted in patches of *Rhynchosporetum albae* at 13 permanent plots established in 9 peatlands: Bonin, Czertyń, Kolonia Kazimierz, Jezioro Cęgi Małe, Mszar koło Starej Dobrzycy, Rosiczki Mirosławskie, Zielonczyn, Zielone Bagna, and Żółwia Błoć (Fig. 1). *Rhynchosporetum albae* phytocoenoses occur in strongly hydrated, periodically flooded sites in these peatlands. They develop on the banks of overgrowing dystrophic lakes (Czertyń, Jezioro Cęgi Małe) and in flat, moist depressions in peat-moss communities (Bonin, Mszar koło Starej Dobrzycy, Rosiczki Mirosławskie), as well as in old peat excavation pits (Jezioro Cęgi Małe, Kolonia Kazimierz, Zielone Bagna).

The species composition in *Rhynchosporetum albae* patches varies. Five to 11 species of vascular plants and 3 to 7 species of mosses were recorded. The phytocoenoses have a characteristic physiognomy created by abundant aggregations of *Rhynchospora alba*. *Drosera rotundifolia* and *Eriophorum angustifolium* are also permanent components of these phytocoenoses. Seedlings of *Pinus sylvestris* and *Betula pubescens* occur in some patches. The moss layer is mostly composed by sphagna, chiefly *Sphagnum fallax,* and *S. cuspidatum* in some phytocoenoses (Appendix 1: Tab. A.1.2). A total of 31 species, including 18 species of vascular plants and 13 moss species, were recorded in *Rhynchosporetum albae* phytocoenoses.

Mycological features. *Rhynchosporetum albae* is one of the poorest communities in fungi in the study area. Altogether only 12 macromycete species, including 3 mycorrhizal, 8 saprotrophic and one parasitic species, were recorded at 13 permanent plots with a total area of 1 110 m^2. Between 5 and 10 species were recorded at individual plots (Appendix 1: Tab. A.2.2). The patches are strongly hydrated and mostly species attached to sphagna: *Arrhenia gerardiana*, *Galerina paludosa, G. tibiicystis* and *G. sphagnorum*, bryophilous species: *Hypholoma elongatum* and *H. udum*, and *Lyophyllum palustre*, which parasitizes sphagna, grow in the phytocoenoses. These fungi were recorded many times at all of the plots with the exception of *Arrhenia gerardiana*, which was not recorded at one plot. Mycorrhizal fungi, including *Cortinarius huronensis* and *Lactarius helvus*, and litter-inhabiting fungi, *Mycena galopus* and *Gymnopus androsaceus*, occurred sporadically.

Eriophoro angustifolii-Sphagnetum recurvi

Habitat and floristic features. Thirteen permanent plots were established in phytocoenoses of *Eriophoro angustifolii-Sphagnetum recurvi* in 9 peatlands: Bonin, Kolonia Kazimierz, Kołowo, Mszar koło Starej Dobrzycy, Niewiadowo, Ścienne (Głowacz reserve), Zielone Bagna, Żółwia Błoć and Żurawina (Fig. 1). Plots for mycological investigations were set up in patches in strongly hydrated sites, in peatland depressions (Bonin, Kołowo, Mszar koło Starej Dobrzycy, Ścienne) or in old, overgrowing peat excavation pits (Kolonia Kazimierz, Zielone Bagna).

The species composition of *Eriophoro angustifolii-Sphagnetum recurvi* patches varies greatly. Altogether 6 to 16 species of vascular plants and 1 to 9 moss species were recorded. It is mostly a flat, carpet peat moss community, formed mainly by *Eriophorum angustifolium* and *Sphagnum fallax*. *Oxycoccus palustris* is also a permanent component of the phytocoenoses. Admixtures of other species, mostly *Carex rostrata* and *Drosera rotundifolia*, occur in some patches; *Pinus sylvestris* and *Betula pubescens* are also recorded. Sphagna dominate in the moss layer. As well as *Sphagnum fallax*, *S. cuspidatum* and *S. palustre* also play an important role in some phytocoenoses (Appendix 1: Tab. A.1.3). A total of 48 species, including 34 species of vascular plants and 14 moss species, occur in the *Eriophoro-Sphagnetum* phytocoenoses.

Mycological features. Altogether 29 species of fungi, including 8 mycorrhizal, 19 saprotrophic and 2 parasitic species, were recorded in *Eriophoro angustifolii-Sphagnetum recurvi* at 13 permanent plots with a total area of 3 370 m^2 (Appendix 1: Tab. A.2.3). The contribution of fungi in the study phytocoenoses is uneven, both quantitatively and qualitatively. The greatest number of species was recorded in the patch in Kolonia Kazimierz (22) and the smallest number was noted at the plot in Żółwia Błoć (6).

The greatest contribution of saprotrophic fungi was observed for species growing among sphagna and other moss species, e.g., *Galerina paludosa, G. sphagnorum, G. tibiicystis, Hypoloma elongatum, H. udum*, and *Arrhenia gerardiana,* and on plant remains, e.g., *Gymnopus androsaceus, Mycena galopus* and *M. sanguinolenta*. *Ascocoryne turficola*, *Hygrocybe coccineocrenata* and *Mycena adonis* var. *adonis*, rarely noted in Poland, also occurred here. Mycorrhizal fungi are the least numerous group. Species recorded more frequently and noted at four to six plots include *Thelephora terrestris, Laccaria proxima* and *Lactarius helvus*. The group of parasitic fungi was species-poor and only *Lyophyllum palustre* occurred abundantly and was recorded at all of the plots.

Caricetum lasiocarpae

Habitat and floristic features. Mycological investigations in *Caricetum lasiocarpae* were conducted at 11 permanent plots established in 5 peatlands: Kolonia Kazimierz, Mszar koło Starej Dobrzycy, Torfowisko Toporzyk, Zielonczyn and Zielone Bagna (Fig. 1). Phytocoenoses of *Caricetum lasiocarpae* in the Mszar koło Starej Dobrzycy, Kolonia Kazimierz and Zielonczyn peatlands develop as a characteristic, narrow belt adjacent to an overgrowing lake. The community also occurs on secondary habitats in Kolonia Kazimierz, Torfowisko Toporzyk and Zielone Bagna, occupying considerable areas of overgrowing peat pits.

A total of 43 species, including 29 species of vascular plants and 14 moss species, occur in *Caricetum lasiocarpae* while 8 to 14 species of vascular plants and 3 to 8 moss species were recorded in individual phytocoenoses. They are formed mainly by *Carex lasiocarpa*, with *Comarum palustre* as another permanent component of the community. *Eriophorum angustifolium*, *Carex rostrata* and *Menyanthes trifoliata* grow in the majority of phytocoenoses. The moss layer consists mainly of sphagna. *Sphagnum fallax* and *S. cuspidatum* occur at nearly all the patches. Juvenile birch and pine individuals grow in some phytocoenoses of *Caricetum lasiocarpae*. They form the shrub layer in some patches in the Kolonia Kazimierz peatland (Appendix 1: Tab. A.1.4).

Mycological features. The species composition of fungi in *Caricetum lasiocarpae* phytocoenoses is very poor (Appendix 1: Tab. A.2.4). Only patches situated on a secondary habitat in the Kolonia Kazimierz peatland (plots Ka3a and Ka3) are an exception. Between 5 and 20 species of fungi were recorded at individual plots. Altogether, 23 species of fungi, including 9 mycorrhizal, 12 saprotrophic and 2 parasitic species, were recorded at 11 permanent plots with a total area of 1 020 m^2. Bryophilous species dominated quantitatively; fungi attached to sphagna, e.g., *Galerina paludosa, G. sphagnorum* and *G. tibiicystis*, prevailed in the group. *Hypholoma elongatum* and *H. udum* were also some of the fungi occurring quite numerously and frequently. Mycorrhizal fungi, e.g., *Laccaria proxima, Lactarius helvus, L. tabidus* and *Cortinarius huronensis*, occurred more frequently only at plots Ka3a and Ka3 (Kolonia Kazimierz), often when the phytocoenoses were periodically strongly dried out. They are absent in other patches or occur sporadically. This is caused by factors such as the absence of trees and shrubs and strong patch flooding, especially after intensive rainfall. Fungi growing on plant remains occurred infrequently. *Mycena galopus* and *Gymnopus androsaceus* were recorded at the majority of the plots. Sphagna-infecting *Lyophyllum palustre* was the most frequently recorded parasitic species.

Caricetum rostratae

Habitat and floristic features. Mycological observations in *Caricetum rostratae* were conducted at 8 permanent plots established in 4 peatlands: Kolonia Kazimierz, Mszar koło Starej Dobrzycy, Ścienne (Głowacz reserve) and Zielone Bagna (Fig. 1). Phytocoenoses with permanent plots are in old, vast peat excavation pits (Kolonia Kazimierz, Zielone Bagna) or in flat, strongly hydrated peatland depressions (Ścienne, Mszar koło Starej Dobrzycy).

The species composition of *Caricetum rostratae* patches varies. 7 to 12 species of vascular plants and 2 to 9 moss species were recorded. The moss layer is dense and strongly saturated with water. It is built up of sphagna, mainly *Sphagnum fallax*, and less frequently

S. cuspidatum, S. palustre, and *S. squarrosum*. *Carex rostrata* is an evident dominant in the herb layer; *Eriophorum angustifolium* and *Comarum palustre* are also permanent components. Raised-bog species: *Alaucomnium palustre*, *Drosera rotundifolia*, *Oxycoccus palustris*, and *Sphagnum magellanicum*, also occur in some patches (Appendix 1: Tab. A.1.5). A total of 29 species, including 18 species of vascular plants and 11 moss species, occur in *Caricetum rostratae* phytocoenoses.

Mycological features. The species composition of macromycetes in *Caricetum rostratae* phytocoenoses is very poor. The number of taxa recorded in individual patches ranges from 6 to 12 (Appendix 1: Tab. A.2.5). Altogether only 15 species of fungi, including 4 mycorrhizal, 10 saprotrophic and 1 parasitic species, were recorded at 8 permanent plots with a total area of 1 600 m^2. *Lyophyllum palustre* parasitizing sphagna is the most numerously and frequently occurring species. *Galerina paludosa*, *G. tibiicystis, Hypholoma elongatum* and *H. udum* growing among sphagnum hummocks were also frequently recorded at all of the permanent plots. *Ascocoryne turficola* grew among *Carex rostrata* shoots and sphagna. *Mycena galopus* was a more frequently noted fungus growing on dead plant remains. Mycorrhizal fungi, e.g., *Lactarius tabidus, L. helvus*, and *Laccaria proxima*, occurred sporadically and only in some phytocoenoses.

Erico-Sphagnetum medii

Habitat and floristic features. Mycological observations in *Erico-Sphagnetum medii* were conducted at 9 permanent plots established in 5 peatlands: Roby, Stramniczka, Torfowisko Toporzyk, Wrzosiec and Żółwia Błoć (Fig. 1). *Erico-Sphagnetum medii* phytocoenoses develop mostly in places used industrially in the past, elevated, with a variable hydration level, sometimes periodically dried out or flooded (Wrzosiec) in the majority of the peatlands. They develop in old, long overgrown peat pits (Roby, Stramniczka) or less frequently on dykes separating them (Torfowisko Toporzyk).

Phytocoenoses of the community have a heathland-like, characteristic physiognomy in the field, created by abundant aggregations of *Erica tetralix* in places. As well as *Erica tetralix*, *Oxycoccus palustris*, *Andromeda polifolia* and *Drosera rotundifolia* are permanent components of the herb layer. *Calluna vulgaris*, *Eriophorum vaginatum, E. angustifolium* and *Molinia caerulea* also grow in the majority of the patches. The moss layer is mostly formed by *Sphagnum magellanicum* and *S. fallax*, and less extensively by *Aulacomnium palustre, Sphagnum capillifolium, S. papillosum* and other *Sphagnum* spp. Birches and dwarf pines are recorded in some phytocoenoses. The latter occur more numerously only in Wrzosiec bog (Appendix 1: Tab. A.1.6). Dead stumps, logs and branches were found only at some plots.

A total of 33 species, including 20 species of vascular plants and 13 moss species, occur in *Erico-Sphagnetum medii* phytocoenoses. 7 to 16 species of vascular plants and 3 to 5 moss species were noted in individual plots.

Mycological features. Altogether 54 species of fungi, including 22 mycorrhizal, 30 saprotrophic and 2 parasitic species, were recorded in *Erico-Sphagnetum medii* at 9 permanent plots with a total area of 1 800 m^2. The plot in Wrzosiec peatland was the richest site in fungal species (30 species), while the plot in Stramniczka was the poorest (20 species) (Appendix 1: Tab. A.2.6). Mycorrhizal fungi which constitute *ca* 40% of the total number of species are a rich and diversified group in *Erico-Sphagnetum medii* phytocoenoses.

Lactarius helvus and *Cortinarius huronensis* occurred at all of the permanent plots while species such as *C. semisanguineus*, *Lactarius tabidus, Paxillus involutus, Leccinum niveum, Laccaria proxima* and *Russula emetica* grew in the majority of the patches. Several mycorrhizal fungi rare in Poland, e.g., *Cortinarius fulvescens* and *Suillus flavidus*, were also recorded.

Saprotrophic fungi were a dominant group of the taxa recorded in this community. Bryophilous fungi (11 species) and litter-inhabiting fungi (9 species) can be distinguished in this group. *Hypholoma udum*, *H. elongatum* and *Galerina tibiicystis* among sphagna and *Mycena galopus* on plant remains grew at all of the research plots. *Mycena megaspora*, a species rare in Poland, occurred among mosses at four permanent plots. 4 species of fungi were recorded on peat. Of them, only *Entoloma sericatum* was recorded 8 times at one of the two plots at which it grew. Wood-inhabiting fungi comprise only 4 species. *Psilocybe coprophila* and *Panaeolus papilionaceus* var. *papilionaceus*, rare species of fungi, occurred on faeces of forest animals, probably wild boar dung. *Lyophyllum palustre* was the most frequently noted parasitic species although it was not recorded at all of the permanent plots.

Sphagnetum magellanici

Habitat and floristic features. Mycological investigations in *Sphagnetum magellanici* were conducted in 2 sub-communities: *S. m. typicum* (5 plots) and *S. m. pinetosum* (5 plots) in five peatlands: Jezioro Cęgi Małe, Mszar koło Starej Dobrzycy, Zielone Bagna, Przybiernów, and Żurawina (Fig. 1).

Sphagnetum magellanici typicum has a characteristic hummock structure. Hummocks are formed mostly by sphagna, mainly *Sphagnum magellanicum* (with an admixture of *S. capillifolium* or *S. rubellum* in places), accompanied by *Alaucomnium palustre* and *Polytrichum strictum*. *Oxycoccus palustris* is the most numerous species in the herb layer. *Drosera rotundifolia*, *Andromeda polifolia* and *Eriophorum angustifolium* are also constant components of phytocoenoses (Appendix 1: Tab. A.1.7, relevés 1-5). Strong periodical patch flooding (especially in spring) or drying (especially in summer) were observed in some years.

Pinus sylvestris f. *turfosa*, which occurs in *Sphagnetum magellanici pinetosum* phytocoenoses, gives it a characteristic physiognomy. Its cover is quite loose in the patches. It grows up to ca 5-7 m and reaches the age of 20 years after which it dies. *Betula pubescens* occurs sporadically. Phytocoenoses retain the hummock structure although the tree cover is low. Hummocks are built up of sphagna, mainly *Sphagnum magellanicum*. *Polytrichum strictum* also forms hummocks in some patches. *Oxycoccus palustris* is the most numerous species in the herb layer; *Drosera rotundifolia* and *Eriophorum angustifolium* are also permanent components. *Andromeda polifolia* and *Eriophorum vaginatum* play an important role in some phytocoenoses (Appendix 1: Tab. A.1.7, relevés from 6 to 10). Strong periodical flooding of the phytocoenoses contributes to the dieback and mortality of trees, especially pine. Single dead pine trunks and logs were found at the plots.

A total of 28 species, including 17 species of vascular plants and 11 moss species, occur in both sub-communities of *Sphagnetum magellanici* while 9 to 17 species of vascular plants and 2 to 8 moss species were recorded in individual phytocoenoses. Patches of *Sphagnetum magellanici typicum*, in which 26 species occurred in total (15 species of vascular plants and 11 moss species), are floristically richer than those of *Sphagnetum magellanici pinetosum*, in which 19 species (13 species of vascular plants and 6 moss species) were recorded.

Mycological features. Altogether 48 species of fungi, including 19 mycorrhizal, 27 saprotrophic and 2 parasitic species, were recorded in *Sphagnetum magellanici* at 10 permanent plots with a total area of 4 000 m^2. Between 16 and 25 species of fungi were noted at individual plots in *Sphagnetum magellanici typicum* and between 27 and 37 species were recorded in *Sphagnetum magellanici pinetosum* (Appendix 1: Tab. A.2.7). The contribution of fungi in individual phytocoenoses is not uniform. Plots established in *Sphagnetum magellanici pinetosum* were richer in fungi (48 species in total) than those in *Sphagnetum magellanici typicum* (31 species in total). This is mostly caused by the largely treeless structure of the typical sub-community. Fungi growing on wood were not recorded at plots in *Sphagnetum magellanici typicum* and mycorrhizal species occurred considerably less frequently and in a smaller number than at plots with pine and birch. Mycorrhizal *Laccaria proxima* and *Lactarius helvus* occurred in all the phytocoenoses. Species of mycorrhizal fungi in *Sphagnetum magellanici pinetosum* recorded more frequently were *Laccaria proxima, Lactarius helvus, Amanita fulva, Russula emetica, Cortinarius huronensis, Lactarius rufus*, and *Paxillus involutus*. Species such as *Inocybe napipes*, *Cortinarius flexipes* var. *flexipes*, *Russula claroflava, R. betularum, R. decolorans* and *R. paludosa*, fungi forming mycorrhizae with pine or birch, occurred only at the plots established in this sub-community. *Suillus flavidus*, a rare peatland fungus protected in Poland, was also recorded here (Appendix 1: Tab. A.2.7). The occurrence of fungi growing among mosses and on litter is the most similar between the two sub-communities both qualitatively and qualitatively (Appendix 1: Tab. A.2.7). Bryophilous fungi, e.g., *Galerina paludosa, G. tibiicystis, Hypholoma elongatum* and *H. udum*, and litter-inhabiting fungi, *Gymnopus androsaceus, Mycena galopus, M. epipterygia* var. *epipterygia* and *M. sanguinolenta*, occur in all of the phytocoenoses. *Arrhenia gerardiana* grew among sphagnum hummocks in small numbers but at nearly all of the plots. *Galerina sphagnorum, Lichenomphalia umbellifera* and *Mycena megaspora* also occurred in patches of both syntaxa. *Lyophyllum palustre* and *Rickenella fibula*, fungi parasitizing various moss species, also occurred in both sub-communities.

Community ***Eriophorum vaginatum-Sphagnum fallax***

Habitat and floristic features. Mycological investigations in the community *Eriophorum vaginatum-Sphagnum fallax* were conducted at 11 permanent plots established in 8 peatlands: Bonin, Danków, Kołowo, Mszar koło Starej Dobrzycy, Niesporowice, Przybiernów, Reptowo, and Ziemomyśl I (Fig. 1). Phytocoenoses of the community occur in sites with a variable hydration level in the majority of these areas. They are sometimes temporarily flooded or dried out over short periods which leads to the drying of *Sphagnum* moss carpets, especially in summer.

The community *Eriophorum vaginatum-Sphagnum fallax* has a characteristic physiognomy created by dark-green hummocks of *Eriophorum vaginatum*. As well as *E. vaginatum*, *Sphagnum fallax* and *Oxycoccus palustris* also grow abundantly in some phytocoenoses. *Carex canescens, Drosera rotundifolia*, *Eriophorum angustifolium* and *Aulacomnium palustre* occur in the majority of them. *Betula pendula*, *B. pubescens* and *Pinus sylvestris*, species forming mainly the shrub layer, are also recorded (Appendix 1: Tab. A.1.8). There are no dead stumps and logs at the plots, and only single branches were found at some. A total of 27 species, including 21 species of vascular plants and 6 moss species, were recorded in the community while 3 to 11 species of vascular plants and 2 to 5 moss species were noted in individual phytocoenoses.

Mycological features. Altogether 37 macromycete species, including 15 mycorrhizal, 20 saprotrophic and 2 parasitic species, were noted in the community *Eriophorum vaginatum-Sphagnum fallax* at 11 permanent plots with a total area of 4 070 m^2. From 12 to 30 species of fungi were recorded at individual plots (Appendix 1: Tab. A.2.8).

The contribution of mycorrhizal fungi in individual phytocoenoses is not uniform. This is to a large extent caused by the presence (or the lack) of birch or pine in the patches. For instance, mycorrhizal fungi occurred numerously at plots in Kołowo, Niesporowice and Mszar koło Starej Dobrzycy, while they were recorded sporadically in Przybiernów. The most numerously and frequently recorded mycorrhizal fungi include *Laccaria proxima, Lactarius helvus, Cortinarius huronensis, Paxillus involutus, Leccinum niveum*, and *Lactarius tabidus*.

Dominant saprotrophic fungi comprise bryophilous species, e.g., *Galerina paludosa*, *G. tibiicystis, Hypholoma elongatum* and *H. udum*, and species growing on plant remains (mainly *Eriophorum* and *Betula*), e.g., *Gymnopus androsaceus*, *Mycena glopus* and *Mycena epipterygia* var. *epipterygia*. *Ascocoryne turficola*, *Mycena adonis* var. *adonis* and *M. megaspora*, species rare in Poland, were recorded among sphagna. Fungi growing on peat, *Clavaria fragilis*, and on wood, e.g., *Mycena galericulata*, occurred infrequently. Only 2 parasitic fungi were recorded. One, *Lyophyllum palustre*, occurred at all of the plots.

4.2. Macromycetes in forest peatland communities

Vaccinio uliginosi-Pinetum

Habitat and floristic features. Mycological investigations in *Vaccinio uliginosi-Pinetum* were conducted at 10 permanent plots established in 5 peatlands: Jezioro Cęgi Małe, Mszar koło Starej Dobrzycy, Niewiadowo, Zielone Bagna and Żółwia Błoć (Fig. 1). *Vaccinio uliginosi-Pinetum* phytocoenoses cover variously-sized areas. They develop on peat soils formed from raised peats, of various hydration, however, often excessively dried out (Brzeg *et al.* 1996; Sotek *et al.* 2006; Banaś-Stankiewicz 2007c).

Pinus sylvestris, which grows only up to 10 m in height, predominates in the low tree stand with loose density. *Betula pubescens* is an admixture in some phytocoenoses. The undergrowth is weakly developed. It is built up mainly by *P. sylvestris*, with *B. pubescens* in some sites. The contribution of *Ledum palustre* and *Vaccinium uliginosum*, sometimes in mass, in the ground cover is characteristic. Raised-bog species, *Eriophorum vaginatum* and *Oxycoccus palustris*, are also constant components of the herb layer. Other species typical of raised bogs such as *Andromeda polifolia, Drosera rotundifolia, Sphagnum magellanicum* and *Polytrichum strictum*, are also frequent elements of *Vaccinio uliginosi-Pinetum* phytocoenoses. *Vaccinium myrtillus*, *V. vitis-idea* and *Calluna vulgaris* grow in the phytocoenoses due to substrate drying. The moss layer is formed by the above species and species such as *Sphagnum fallax, S. fimbriatum*, *S. palustre, Pleurozium schreberi* and *Polytrichum commune* (Appendix 1: Tab. A.1.9). Single dead trunks, overturned logs and stumps of pines or birches at different stages of decomposition as well as small amounts of fallen branches and twigs occur at the plots.

A total of 30 species, including 20 species of vascular plants and 10 moss species, occur in *Vaccinio uliginosi-Pinetum* while 10 to 17 species of vascular plants and 3 to 7 moss species were recorded in individual phytocoenoses.

Mycological features. *Vaccinio uliginosi-Pinetum* is rich in fungi. Altogether 102 species, including 38 mycorrhizal, 58 saprotrophic and 6 parasitic species, were recorded at 10 plots with a total area of 4 000 m^2. The contribution of fungi varies across the phytocoenoses. Plots in *Vaccinio uliginosi-Pinetum* in Niewiadowo were the richest sites in fungi with the number of taxa ranging from 56 to 65 while the poorest plots were in Jezioro Cęgi Małe, where the number of species is between 32 and 36 (Appendix 1: Tab. A.2.9).

The contribution of individual bioecological groups also varies. Mycorrhizal fungi are a fairly numerous group (37.2% of the total number of taxa). Companions of *Pinus sylvestris* dominate among mycorrhizal species. *Lactarius helvus, Russula emetica* and *Paxillus involutus* occurred at all of the plots while species such as *Cortinarius semisanguineus, Lactarius rufus, Thelephora terrestris, Suillus bovinus* and *S. variegatus* grew in the majority of the phytocoenoses. The presence of *Betula pubescens* trees in the tree stand encourages a numerous occurrence of birch-associated fungi in *Vaccinio uliginosi-Pinetum* phytocoenoses. Species growing here included *Lactarius tabidus*, *Russula claroflava, R. betularum* and *Leccinum niveum. Cortinarius rubellus, C. fulvescens* and *Suillus flavidus*, species of fungi rarely recorded in Poland, occurred sporadically at 1 or 2 plots.

Saprotrophic fungi constitute 56.9% of the total number of taxa. Only 9 fungal species occurred on peat. *Entoloma cetratum* was recorded in all of the phytocoenoses. 17 litter-inhabiting species were recorded. *Mycena galopus, M. sanguinolenta* and *Gymnopus androsaceus* occurred at all of the permanent plots. *Clitocybe vibecina, Mycena epipterygia* var. *epipterygia*, *M. cinerella* and *M. zephirus* grew in the majority of the patches. Fungi growing among mosses (12 species), and especially among sphagna, were a numerous group. *Hypholoma udum, H. elongatum, Galerina paludosa, G. hypnorum* and *Lichenomphalia umbellifera* occurred at the majority of the plots. *Galerina tibiicystis, Mycena adonis* var. *adonis, M. megaspora, Arrhenia gerardiana* and *Galerina jaapii*, species rare in Poland, were also noted here. Lignicolous fungi (20 species) do not occur in *Vaccinio uliginosi-Pinetum* frequently. Nearly 50% of them are fungi with annual or perennial fruit bodies growing on birch wood, e.g., *Fomes fomentarius, Piptoporus betulinus* and *Diatrypella favacea*, and on pine wood, e.g., *Stereum sanguinolentum* and *Trichaptum fuscoviolaceum*. The majority of lignicolous fungi occur only at 1 or 2 (3) plots.

Parasitic fungi in *Vaccinio uliginosi-Pinetum* are 5.9% of the total number of taxa. *Lyophyllum palustre* is a more frequently occurring species. *Sparassis crispa*, which is protected in Poland, grew at the base of a trunk of *Pinus sylvestris* at one of the plots.

Vaccinio uliginosi-Betuletum pubescentis

Habitat and floristic features. Mycological investigations in *Vaccinio uliginosi-Betuletum pubescentis* were conducted at 10 permanent plots established in 5 peatlands: Mszar koło Starej Dobrzycy, Niewiadowo, Zielone Bagna, Ziemomyśl I, and Zielonczyn (Fig. 1). Phytocoenoses of *Vaccinio uliginosi-Betuletum* develop on the peripheries of these sites or in their central parts, in post-lake basins. Some of the sites are strongly hydrated in early spring and after intensive rainfall.

Vaccinio uliginosi-Betuletum phytocoenoses are formed by aged tree stands with a fairly loose structure, mainly built up of *Betula pubescens* trees with an admixture of *Pinus sylvestris* and *Sorbus aucuparia*. Tree saplings grow in the shrub layer, mostly those of *Betula pubescens*. *Frangula alnus* occurs in some phytocoesnoses. The herb layer is usually well developed with *Lycopodium annotinum* and *Vaccinium myrtillus* occurring in mass in places.

Ledum palustre, Vaccinium uliginosum, V. vitis-idea and *Oxycoccus palustris* also grow in most patches. The moss layer is formed by, e.g., *Dicranum polysetum*, *D. scoparium*, *Polytrichastrum formosum, Sphagnum fallax, S. fimbriatum* and *S. palustre* (Appendix 1: Tab. A.1.10). Numerous dead trunks, overturned logs, stumps and fallen branches of mainly birch and pine are found at the plots.

A total of 39 species, including 27 species of vascular plants and 12 moss species, occur in *Vaccinio uliginosi-Betuletum pubescentis*, while 9 to 15 species of vascular plants and 3 to 7 moss species were recorded in its individual phytocoenoses.

Mycological features. *Vaccinio uliginosi-Betuletum pubescentis* is one of the richest plant communities in fungi in the study area. Altogether 121 species of fungi, including 38 mycorrhizal, 77 saprotrophic and 6 parasitic species, were noted at 10 permanent plots with a total area of 3 900 m^2 (Appendix 1: Tab. A.2.10).

The contribution of fungi in the phytocoenoses of *Vaccinio uliginosi-Betuletum pubescentis* varies. Differences are observed both for qualitative and quantitative relationships. Plots established in Zielone Bagna and Niewiadowo are the richest sites in fungi with the number of species ranging from 51 to 74. The poorest plots were in Mszar koło Starej Dobrzycy where the number of taxa is between 33 and 39.

Mycorrhizal fungi are 31.4% of all the taxa. Species forming mycorrhizae with birch dominate in their group. *Laccaria proxima, Lactarius tabidus*, *Amanita fulva*, *Leccinum niveum* and *Russula betularum* occurred at all of the plots. Companions of pine, which is an admixture in the tree stand, also occur in the majority of the patches, e.g., *Lactarius helvus, L. rufus, Paxillus involutus, Russula emetica, Thelephora terrestris*, and *Scleroderma citrinum*.

Saprotrophic fungi constitute 63.6% of the taxa recorded in *Vaccinio uliginosi-Betuletum pubescentis* phytocoenoses. Lignicolous fungi dominate in their group (39 species). The majority of lignicolous fungi grew on logs, stumps and branches of birch trees, less often pine trees, at different stages of decomposition. Seventeen of them are fungi with persistent annual or perennial fruit bodies, e.g., *Daedaleopsis confragosa, Diatrype stigma, Diatrypella favacea, Fomes fomentarius, Piptoporus betulinus*, and *Trichaptum fuscoviolaceum. Mycena galericulata, Daedaleopsis confragosa* and *Piptoporus betulinus* occurred at all of the permanent plots. Species such as *Diatrypella favacea, Exidia plana, Dacryomyces stillatus, Fomes fomentarius, Crepidotus variabilis* and *Calocera cornea* also grew in the majority of the sites. However, 19 species, that is nearly 50% of the taxa, occurred only at 1 or 2 (3) permanent plots.

Fungi growing among mosses are a small group (13 species). *Galerina paludosa, G. tibiicystis*, *Hypholoma udum* and *H. elongatum* occurred at the majority of the plots. *Galerina jaapii*, *Mycena adonis* var. *adonis* and *M. megaspora*, rarely recorded in Poland, also grew in some phytocoenoses. The contribution of litter-inhabiting fungi and fungi growing on peat is small (11 and 12 species, respectively). Species with a broad scale of occurrence prevail among them, e.g., *Mycena galopus, M. epipterygia* var. *epipterygia*, *M. sanguinolenta, M. zephirus*, *Gymnopus androsaceus* and *G. dryophilus*. Only *Mycena galopus, M. epipterygia* var. *epipterygia* and *Gymnopus androsaceus* were recorded at all of the research plots. *Nectria episphaeria* grew on old fruit bodies of *Diatrype stigma* and was recorded at five plots. *Stropharia semiglobata*, noted at only one plot, occurred on faeces of forest animals. Parasitic fungi are 5% of the taxa. *Rickenella fibula, Lyophyllum palustre* and *Nectria cinnabarina* occurred at the majority of the plots. *Xerocomus parasiticus*, protected in Poland, grew on fruit bodies of *Scleroderma citrinum* at one of the plots.

4.3. Bioecological groups of fungi and peatland communities

A total of 167 species of macroscopic fungi, including 101 saprotrophic (60.5%), 54 mycorrhizal (32.3%) and 12 parasitic (7.2%) fungi, were recorded at 108 permanent research plots in peatland phytocoenoses in Pomerania. Saprotrophic fungi were divided into saprotrophs growing on peat (14 species; 8.4%), among mosses (15 species; 9%), on litter (20 species; 12%), wood (48 species; 28.7%), animal dung (3 species; 1.8%) and other species of fungi (1 species; 0.6%) (Fig. 2).

The bioecological contribution of fungal groups in individual peatland communities varies (Fig. 3A, B). A dominant group in all types of communities are saprotrophic fungi which range from 52% (13 species) in *Caricetum limosae* to 66.7% in *Rhynchosporetum albae* (8 species) and *Caricetum rostratae* (10 species) of the total number of fungi collected in phytocoenoses of these communities. The contribution of mycorrhizal fungi is also considerable: from 25% (3 species) in *Rhynchosporetum albae* to 40.5% (15 species) in the *Eriophorum vaginatum-Sphagnum fallax* community and 40.7% (22 species) in *Erico-Sphagnetum medii*. The presence of parasitic fungi ranges from 3.7% (2 species) in *Erico-Sphagnetum medii* to 16% (4 species) in *Caricetum limosae*.

The contribution of saprotrophic fungi, especially bryophilous and lignicolous fungi, varies across individual communities (Fig. 3A, B). Bryophilous fungi predominate percentage-wise in *Rhynchosporetum albae* (50%) and *Caricetum rostratae* (46.6%) while they are a small group in *Vaccinio uliginosi-Pinetum* (11.7%) and *Vaccinio uliginosi-Betuletum pubescentis* phytocoenoses (10.7%). Lignicolous fungi were observed only in 5 of the 10 study communities. The bioecological contribution of lignicolous fungi is considerable only in *Vaccinio uliginosi-Betuletum pubescentis* (39 species; 32.2%) and *Vaccinio uliginosi-Pinetum* (20 species; 19.6%), due to the forest type of these phytocoenoses.

Litter-inhabiting fungi are a small group (Fig. 3A, B). Its percentage in individual communities ranges from 9.1% in *Vaccinio uliginosi-Betuletum pubescentis* to 20.7% in *Eriophoro angustifolii-Sphagnetum recurvi*, although the smallest number of species (2) was recorded in *Rhynchosporetum albae* and the greatest (17 species) in *Vaccinio uliginosi-Pinetum*.

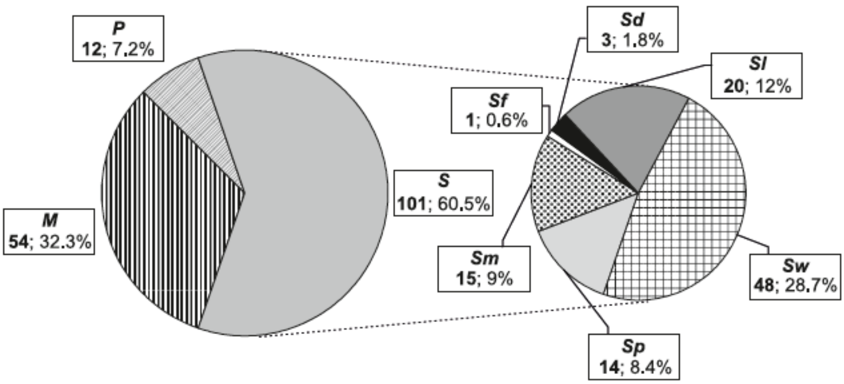


Fig. 2. The total number of species and the percentage contribution of bioecological groups of fungi in peatland communities: M – mycorrhizal fungi; S – saprotrophic fungi; Sp – saprotrophic fungi growing on peat; Sm – saprotrophic fungi growing among mosses; Sl – litter-inhabiting saprotrophic fungi; Sw – saprotrophic fungi growing on wood; Sf – saprotrophic fungi growing on other fungi; Sd – saprotrophic fungi growing on animal dung; P – parasitic fungi.

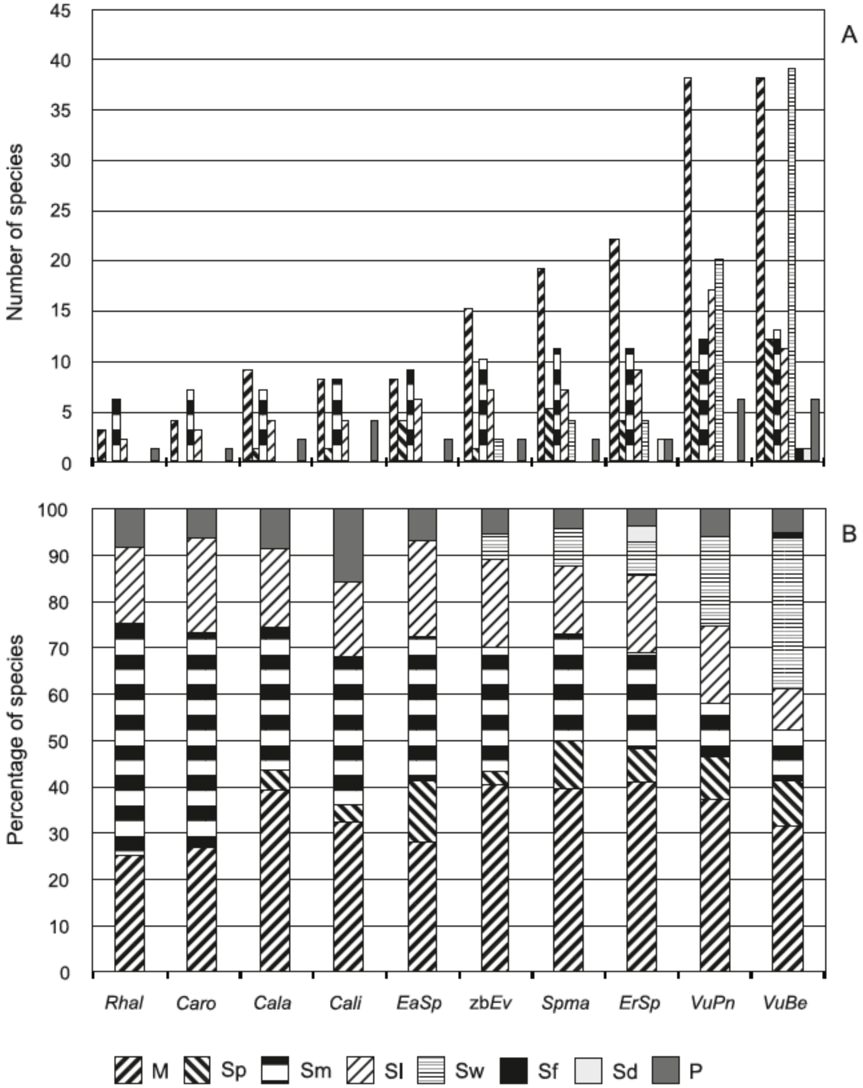


Fig. 3. The number of species (A) and the percentage contribution of bioecological groups of fungi (B) in individual peatland communities: *Cala – Caricetum lasiocarpae*; *Cali – Caricetum limosae*; *Caro – Caricetum rostratae*; *EaSp – Eriophoro angustifolii-Sphagnetum recurvi*; *ErSp – Erico-Sphagnetum medii*; *Rhal – Rhynchosporetum albae*; *Spma – Sphagnetum magellanici*; zb*Ev* – community *Eriophorum vaginatum-Sphagnum fallax*; *VuBe – Vaccinio uliginosi-Betuletum pubescentis*; *VuPn – Vaccinio uliginosi-Pinetum*.
For other abbreviations see Figure 2.

Saprotrophic fungi growing on peat are not numerous or they do not occur (in *Rhynchosporetum albae* and *Caricetum rostratae*) (Fig. 3A, B) as sphagna usually occupy almost entire areas of the patches. The greatest number of species of this group were recorded in *Vaccinio uliginosi-Betuletum pubescentis* (12 species; 9.9%) and *Vaccinio uliginosi-Pinetum* (9 species; 8.8%). They mostly occur in places that are not moist, are slightly elevated or in rain-free periods when the upper peat layer is dried out.

The contribution of saprotrophic fungi occurring on substrates of fungal and animal origin is small (Fig. 3A, B). Species of fungi growing on faeces of forest animals were recorded only in *Erico-Sphagnetum medii* (2 species; 3.7%) and *Vaccinio uliginosi-Betuletum pubescentis* phytocoenoses (1 species; 0.8%), and fungi growing on other fungal species were noted only in *Vaccinio uliginosi-Betuletum pubescentis*.

The percentage contribution and the number of mycorrhizal fungi in individual types of peatland communities vary (Fig. 3A, B). The greatest number of mycorrhizal species was recorded in *Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis* (38 species in each; 37.2% and 31.4%, respectively), while 19 species were recorded in *Sphagnetum magellanici* (39.6%) and *Erico-Sphagnetum medii* (22 species; 40.7%). Their number in other communities ranges from 3 species (25%) in *Rhynchosporetum albae* to 15 species (40.5%) in the phytocoenoses of *Eriophorum vaginatum-Sphagnum fallax* community.

4.4. Macromycetes of peatland communities: a comparative analysis

The number of species of fungi recorded in individual peatland communities ranges from 12 in *Rhynchosporetum albae* to 121 in *Vaccinio uliginosi-Betuletum pubescentis* (Appendix 1: Tab. A.2.11) while the number of plant species forming these communities is between 24 in *Caricetum limosae* and 48 in *Eriophoro angustifolii-Sphagnetum recurvi*. The number of plant species exceeds the number of fungal species in *Caricetum lasiocarpae, Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae* and *Caricetum rostratae* whereas the number of fungi is greater than that of plant species in other communities (Fig. 4).

Eighty three taxa (49.7%) occurred in only one of the communities, and they were recorded in 4 of the 10 phytocoenoses in total. 2 and 6 species were noted in *Caricetum limosae* and *Erico-Sphagnetum medii*, respectively, and 27 and 48 species in *Vaccinio uliginosi-Pinetum* and *Vaccinio*

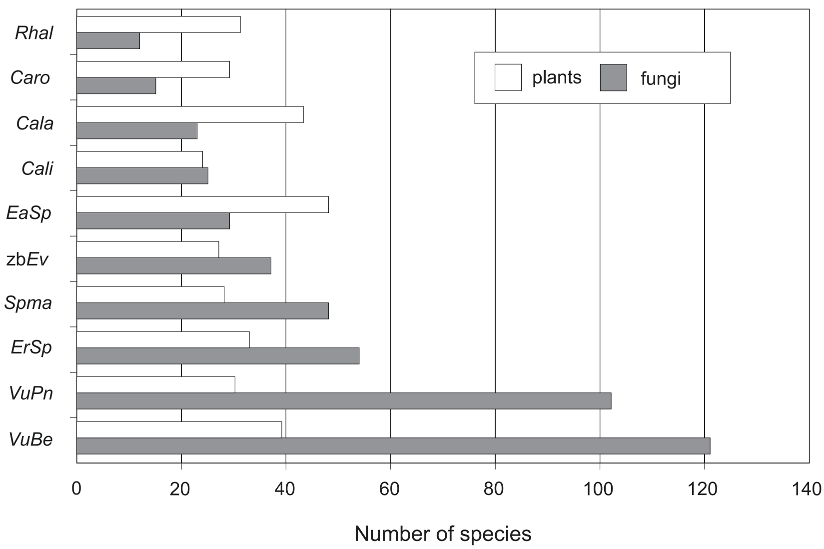


Fig. 4. The number of species of plants and fungi in peatland communities.
For abbreviations see Figure 3.

uliginosi-Betuletum pubescentis, respectively. *Anthracoidea limosa* and *Monilinia oxycocci* occurred in *Caricetum limosae* patches, while *Cortinarius acutus*, *C. obtusus, Hebeloma crustuliniforme, Mycena vitilis*, *Panaeolus papilionaceus* var. *papilionaceus* and *Psilocybe coprophila* were observed in *Erico-Sphagnetum medii* phytocoenoses. Fungal species recorded in *Vaccinio uliginosi-Pinetum* patches include *Amanita porphyria*, *Baeospora myosura*, *Calocera viscosa*, *Cortinarius brunneus, C. delibutus, C. rubellus* and *Mycena cinerella*, and those noted only in *Vaccinio uliginosi-Betuletum pubescentis* patches include *Ascocoryne sarcoides*, *Crepidotus variabilis*, *Daedaleopsis confragosa*, *Inonotus obliquus*, *Lactarius pubescens*, *Leccinum variicolor*, and *Russula aeruginea*.

Nine species were recorded in all the community types (5.4% of the total number of taxa). These are mostly saprotrophic fungi, with bryophilous species being the majority: *Galerina paludosa, G. tibiicystis, Hypholoma elongatum* and *H. udum*. Other fungi are litter-inhabiting species: *Gymnopus androsaceus* and *Mycena galopus*, mycorrhizal species: *Cortinarius huronensis* and *Lactarius helvus*, and *Lyophyllum palustre*, which parasitizes sphagna.

The greatest number of taxa in common were recorded for *Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis* (67). Fungal species that occur exclusively in both communities include *Auriscalpium vulgare*, *Calocera cornea*, *Diatrypella favacea, Fomes fomentarius, Lactarius necator*, *Leccinum scabrum*, *Mycena zephirus*, and *Scleroderma citrinum*.

4.5. Mycological similarity of the phytocoenoses

A comparison of similarity coefficients shows that the greatest mycological similarity is detected between non-forest peatland communities (Fig. 5). The highest similarity coefficients were obtained for *Rhynchosporetum albae* and *Caricetum rostratae* (89%) as well as *Caricetum limosae* and *Caricetum lasiocarpae* (83%). High similarity coefficients were also recorded for the community *Eriophorum vaginatum-Sphagnum fallax* and *Eriophoro angustifolii-Sphagnetum recurvi* (79%) as well as *Eriophoro angustifolii-Sphagnetum recurvi* and *Caricetum limosae* (78%). *Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis* are also mycologically similar with the similarity coefficient being 60%.

The smallest mycological similarity was detected between forest and non-forest peatland communities (Fig. 5). The lowest similarity coefficient was obtained between *Vaccinio*

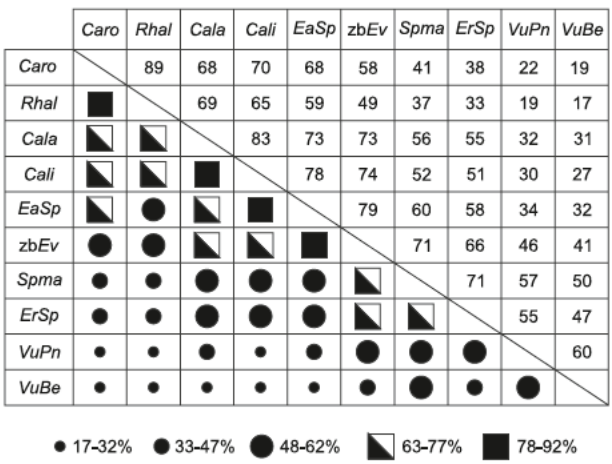


Fig. 5. A diagram of similarity coefficients in peatland communities.
For abbreviations see Figure 3.

uliginosi-Betuletum pubescentis and *Rhynchosporetum albae* / *Caricetum rostratae* – 17% and 19%, respectively, and between *Vaccinio uliginosi-Pinetum* and *Rhynchosporetum albae* / *Caricetum rostratae* – 19% and 22%, respectively. *Erico-Sphagnetum medii* and *Rhynchosporetum albae* (33%) as well as *Sphagnetum magellanici* and *Rhynchosporetum albae* (37%) are the least mycologically similar non-forest peatland communities.

4.6. Mycological differentiation of the phytocoenoses

The detrended correspondence analysis (DCA) gives the ordination of mycosociological relevés of peatland communities performed at individual research plots (Fig. 6). The horizontal axis (DCA I) gives the basic mycological differentiation of peatland communities starting from non-forest peatland communities: *Eriophoro angustifolii-Sphagnetum recurvi*, *Caricetum rostratae, Caricetum limosae, Rhynchosporetum albae*, *Caricetum lasiocarpae* (the left-hand side of the diagram), the community *Eriophorum vaginatum-Sphagnum fallax, Sphagnetum magellanici*, *Erico-Sphagnetum medii* (the central part of the diagram), to forest peatland communities: *Vaccinio uliginosi-Pinetum, Vaccinio uliginosi-Betuletum pubescentis* (the right-hand side of the diagram). The greatest mycological differentiation is displayed for forest peatland communities whereas it is weak in the case of non-forest peatland communities (DCA axis II).

Five mycosociologico-ecological groups of species of fungi can be distinguished based on the ordination of species by the DCA (Fig. 7A, B & Tab. 3):

I. *Galerina sphagnorum* group (the left-hand side of the diagram) consists of taxa preferring strongly hydrated habitats, periodically flooded, associated mostly with non-forest peatland communities: *Caricetum limosae, Rhynchosporetum albae*, *Eriophoro angustifolii-Sphagnetum recurvi*, *Caricetum lasiocarpae, Caricetum rostratae*.

II. *Hypholoma elongatum* group (the central part of the diagram) comprises fungal species occurring on strongly hydrated habitats, associated mostly with non-forest peatland communities: *Caricetum limosae, Rhynchosporetum albae*, *Eriophoro angustifolii-Sphagnetum recurvi*, *Caricetum lasiocarpae, Caricetum rostratae,* the community *Eriophorum vaginatum-Sphagnum fallax, Sphagnetum magellanici*, *Erico-Sphagnetum medii*.

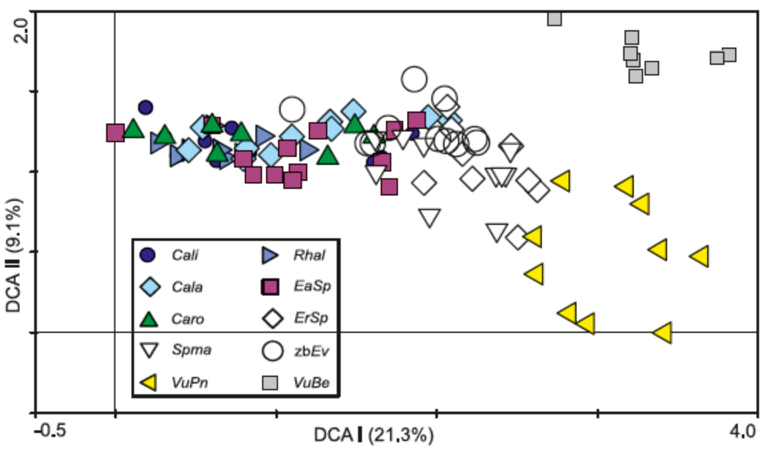
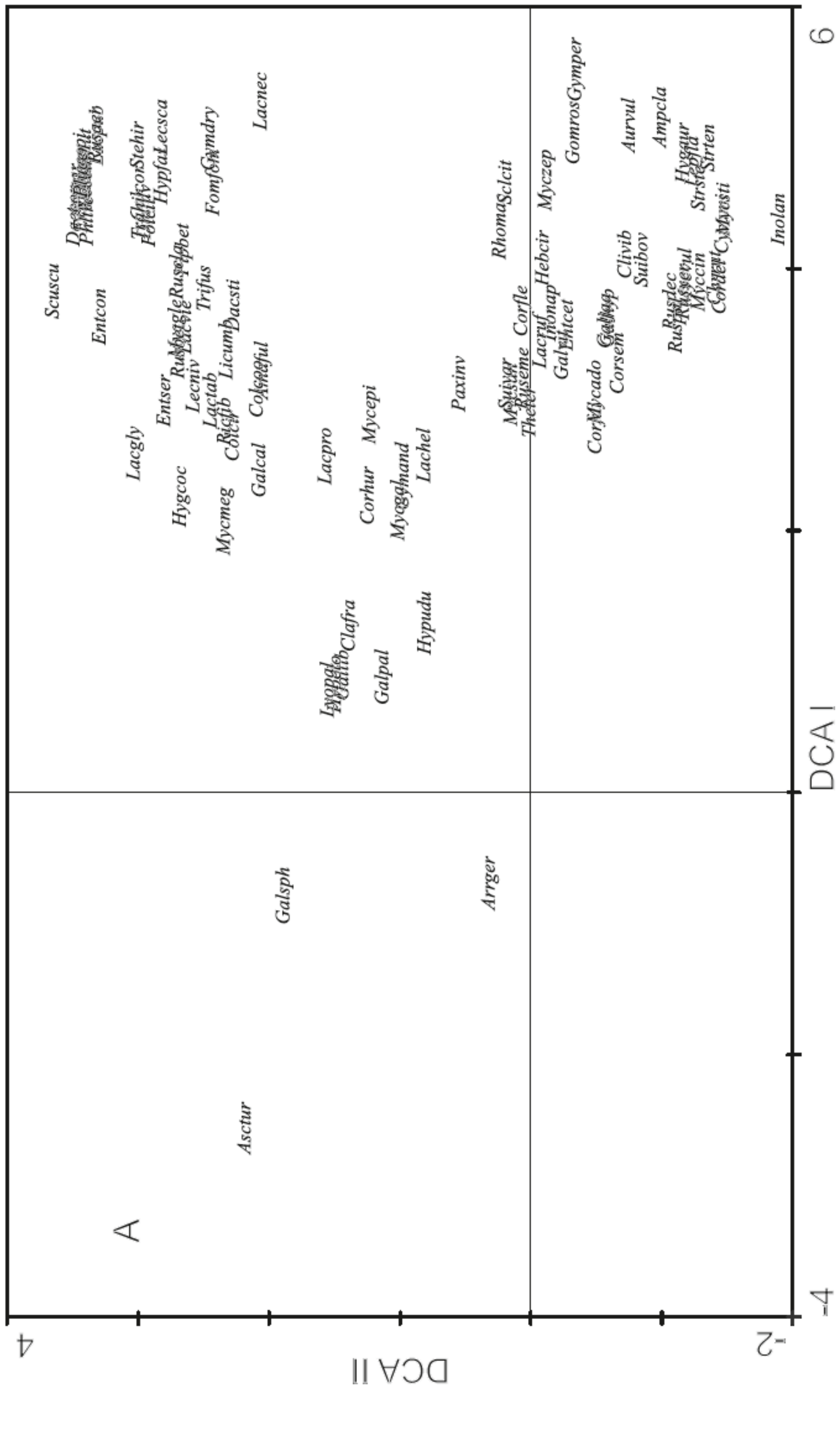


Fig. 6. Mycosociological relevés of peatland communities arranged along the first and second axes of the detrended correspondence analysis (DCA) based on mycological data.
For abbreviations see Figure 3.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DCA I
DCA II
-4
6
-2
4
Asctur
Galsph
Arrger
Galpal
Hypudu
Clafra
Lacpro
Mycepi
Corhur
Lachel
Paxinv
Mycmeg
Hygcoc
Lacgly
Galcal
Entser
Entcon
Scuscu
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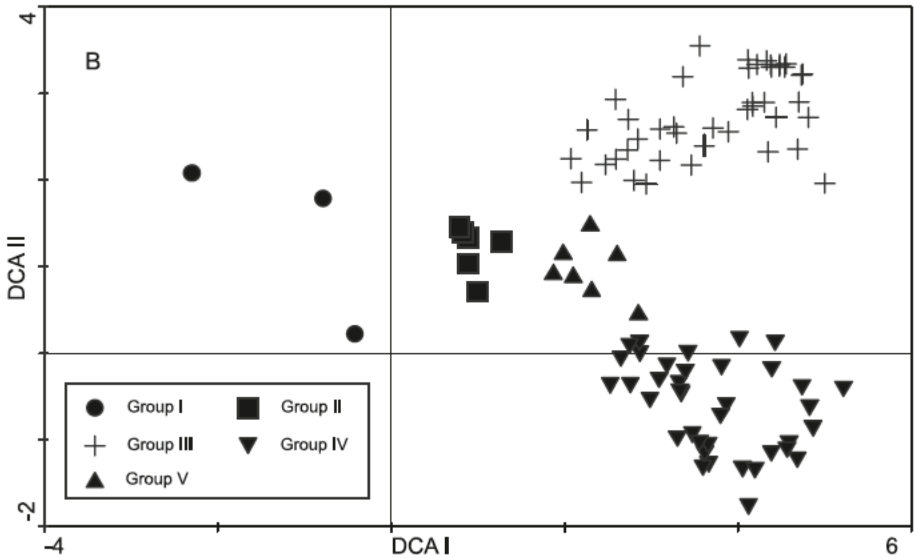

Fig. 7. Fungal species (A) and mycosociologico-ecological groups (B) arranged along the first and second axes of the detrended correspondence analysis (DCA).
For abbreviations see Table 3.

III. *Lactarius tabidus* group (the upper right-hand side of the diagram) covers species preferring weakly hydrated habitats, occurring primarily in the phytocoenoses of *Vaccinio uliginosi-Betuletum pubescentis*.
IV. *Russula emetica* group (the lower right-hand side of the diagram) consists of fungal species occupying weakly hydrated habitats mainly in the phytocoenoses of *Vaccinio uliginosi-Pinetum*.
V. *Lactarius helvus* group (the central part of the diagram) comprises fungal species with a broad ecological scale occurring in both non-forest and forest peatland communities.

Table 3

Groups of fungal species based on the DCA results

Mycosociolo-gico-ecological group	Taxon	Abbreviation	Trophic group	Community
I. *Galerina sphagnorum* group	*Arrhenia gerardiana* *Ascocoryne turficola* *Galerina sphagnorum*	*Arrger* *Asctur* *Galsph*	Sm Sm Sm	*Caricetum lasiocarpae, Caricetum limosae, Caricetum rostratae, Eriophoro angustifolii-Sphagnetum recurvi, Rhynchosporetum albae*
II. *Hypholoma elongatum* group	*Clavaria fragilis* *Galerina paludosa* *Galerina tibiicystis* *Hypholoma elongatum* *Hypholoma udum* *Lyophyllum palustre*	*Clafra* *Galpal* *Galtib* *Hypelo* *Hypudu* *Lyopal*	Sp Sm Sm Sm Sm P	*Caricetum lasiocarpae, Caricetum limosae, Caricetum rostratae, Eriophoro angustifolii- Sphagnetum recurvi, Rhynchosporetum albae, Erico-Sphagnetum medii, Sphagnetum magellanici*, community *Eriophorum vaginatum-Sphagnum fallax*

Table 3 cont.

III. *Lactarius tabidus* group	*Amanita fulva*	*Amaful*	M	*Vaccinio uliginosi- Betuletum pubescentis*
	Ascocoryne sarcoides	*Ascsar*	Sw	
	Calocera cornea	*Calcor*	Sw	
	Collybia cirrhata	*Colcir*	Sl	
	Collybia cookei	*Colcoo*	Sl	
	Crepidotus variabilis	*Crevar*	Sw	
	Dacryomyces stillatus	*Dacsti*	Sw	
	Daedaleopsis confragosa	*Daecon*	Sw	
	Diatrype stigma	*Diasti*	Sw	
	Diatrypella favacea	*Diafav*	Sw	
	Entoloma conferendum var. *conferendum*	*Entcon*	Sp	
	Entoloma sericatum	*Entser*	Sp	
	Exidia plana	*Exipla*	Sw	
	Fomes fomentarius	*Fomfom*	Sw	
	Galerina calyptrata	*Galcal*	Sm	
	Gymnopus dryophilus	*Gymdry*	Sp	
	Hygrocybe coccineocrenata	*Hygcoc*	Sp	
	Hypholoma fasciculare var. *fasciculare*	*Hypfas*	Sw	
	Kuehneromyces mutabilis	*Kuemut*	Sw	
	Lactarius glyciosmus	*Lacgly*	M	
	Lactarius necator	*Lacnec*	M	
	Lactarius pubescens	*Lacpub*	M	
	Lactarius tabidus	*Lactab*	M	
	Lactarius vietus	*Lacvie*	M	
	Leccinum niveum	*Lecniv*	M	
	Leccinum scabrum	*Lecsca*	M	
	Lichenomphalia umbellifera	*Licumb*	Sm	
	Mycena galericulata	*Mycgle*	Sw	
	Mycena megaspora	*Mycmeg*	Sm	
	Nectria cinnabarina	*Neccin*	P	
	Nectria episphaeria	*Necepi*	Sf	
	Phlebia tremellosa	*Phltre*	Sw	
	Piptoporus betulinus	*Pipbet*	Sw	
	Pluteus cervinus	*Plucer*	Sw	
	Polyporus ciliatus	*Polcil*	Sw	
	Rickenella fibula	*Ricfib*	P	
	Russula aeruginea	*Rusaer*	M	
	Russula betularum	*Rusbet*	M	
	Russula claroflava	*Ruscla*	M	
	Scutellinia scutellata	*Scuscu*	Sw	
	Stereum hirsutum	*Stehir*	Sw	
	Trametes hirsuta	*Trahir*	Sw	
	Trichaptum fuscoviolaceum	*Trifus*	Sw	

IV. *Russula emetica* group	*Ampulloclitocybe clavipes*	*Ampcla*	Sp	*Vaccinio uliginosi-Pinetum*
	Auriscalpium vulgare	*Aurvul*	Sl	
	Chroogomphus rutilus var. *rutilus*	*Chrrut*	M	
	Clitocybe vibecina	*Clivib*	Sl	
	Cortinarius delibutus	*Cordel*	M	
	Cortinarius flexipes var. *flexipes*	*Corflex*	M	
	Cortinarius fulvescens	*Corful*	M	
	Cortinarius semisanguineus	*Corsem*	M	
	Cystoderma amianthinum	*Cysami*	Sp	
	Entoloma cetratum	*Entcet*	Sp	
	Galerina hypnorum	*Galhyp*	Sm	
	Galerina jaapii	*Galjap*	Sm	
	Galerina vittiformis var. *vittiformis*	*Galvit*	Sm	
	Gomphidius roseus	*Gomros*	M	
	Gymnopus peronatus	*Gymper*	Sp	
	Hebeloma circinans	*Hebcir*	M	
	Hygrophoropsis aurantiaca	*Hygaur*	Sp	
	Inocybe lanuginosa	*Inolan*	M	
	Inocybe napipes	*Inonap*	M	
	Lactarius rufus	*Lacruf*	M	
	Lepista flaccida	*Lepfla*	Sp	
	Mycena adonis var. *adonis*	*Mycado*	Sm	
	Mycena cinerella	*Myccin*	Sl	
	Mycena sanguinolenta	*Mycsan*	Sl	
	Mycena stipata	*Mycsti*	Sw	
	Mycena vulgaris	*Mycvul*	Sl	
	Mycena zephirus	*Myczep*	Sl	
	Rhodocollybia maculata var. *maculata*	*Rhomac*	Sp	
	Russula decolorans	*Rusdec*	M	
	Russula emetica	*Ruseme*	M	
	Russula paludosa	*Ruspal*	M	
	Russula xerampelina	*Rusxer*	M	
	Scleroderma citrinum	*Sclcit*	M	
	Strobilurus stephanocystis	*Strste*	Sl	
	Strobilurus tenacellus	*Strten*	Sl	
	Suillus bovinus	*Suibov*	M	
	Suillus variegatus	*Suivar*	M	
	Thelephora terrestris	*Theter*	M	
V. *Lactarius helvus* group	*Cortinarius huronensis*	*Corhur*	M	*Caricetum lasiocarpae, Caricetum limosae, Caricetum rostratae, Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae*, *Erico-Sphagnetum medii*, *Sphagnetum magellanici*, community *Eriophorum vaginatum-Sphagnum fallax, Vaccinio uliginosi-Betuletum pubescentis, Vaccinio uliginosi-Pinetum*
	Gymnopus androsaceus	*Gymand*	Sl	
	Laccaria proxima	*Lacpro*	M	
	Lactarius helvus	*Lachel*	M	
	Mycena epipterygia var. *epipterygia*	*Mycepi*	Sl	
	Mycena galopus	*Mycgal*	Sl	
	Paxillus involutus	*Paxinv*	M	

Trophic group: M – mycorrhizal fungi, Sl – litter-inhabiting fungi, Sp – saprotrophic fungi growing on peat, Sm – saprotrophic fungi growing among mosses; Sw – saprotrophic fungi growing on wood, Sf – saprotrophic fungi growing on other fungi, P – parasitic fungi.

4.7. The influence of selected environmental factors on the occurrence of fungi

The canonical correspondence analysis (CCA) of descriptive and habitat variables and the occurrence of fungal species (Fig. 8A, B & Tab. 4) indicates mutual correlations between them. The variability gradient associated with the first CCA axis is described by the relationship between the total number of fungal species (NF), including the number of mycorrhizal fungi (NFM), the number of species of saprotrophic fungi growing on peat (NFSp) and the number of litter-inhabiting species of fungi (NFSl), whose values reach the optimum in the right-hand side of the diagram. This is opposed by the substrate pH gradient which reaches its maximum in the left-hand side of the CCA diagram along the first axis. Fungal species preferring moderately acid substrates, e.g, *Ascocoryne turficola, Galerina sphagnorum, G. paludosa, G. tibiicystis, Hypholoma udum* and *H. elongatum*, are on the left-hand side of the diagram along axis I, and species preferring acid substrates, e.g. *Ampuloclitocybe clavipes, Lepista flaccida, Gymnopus peronatus, Gomphidius roseus, Inocybe lanuginosa, Russula xerampelina, Cystoderma amianthinum* and *Cortinarius delibutus*, are on the right-hand side. The total number of fungal species (NF) and the number of species of mycorrhizal fungi (NFM), litter-inhabiting fungi (NFSl) and fungi growing on peat (NFSp) increases as pH decreases.

The second CCA axis is associated with substrate humidity (Hum) and species of saprotrophic fungi growing among mosses (NFSm) (Fig. 8A, B). Lower and central parts of the diagram are occupied by species preferring greater substrate hydration, belonging mostly to saprotrophic fungi growing among mosses (NFSm), e.g., *Arrhenia gerardiana, Hypholoma elongatum, Mycena adonis* var. *adonis*, mycorrhizal fungi (NFM), e.g., *Inocybe lanuginosa, Russula paludosa, R. xerampelina, Cortinarius delibutus, C. fulvescens, C. huronensis*, and litter-inhabiting saprotrophic fungi (NFSl), e.g., *Mycena vulgaris* and *M. cinerella*. The upper part of the diagram is occupied by species

Table 4
Correlations between environmental variables with axes I-IV of the canonical correspondence analysis (CCA)

Axis	CCA I	CCA II	CCA III	CCA IV
NN	0.6154	0.2282	0.0110	0.0869
NF	0.9337	0.1535	0.0649	–0.0381
NFM	0.8367	0.4165	–0.1628	–0.1211
NFSp	0.7375	0.2252	0.4582	–0.2187
NFSm	–0.5276	0.1450	–0.3085	–0.0142
NFSl	0.6027	0.6469	0.2180	0.2262
Hum	–0.4195	0.1631	0.1909	0.0582
pH	–0.3000	–0.3306	0.0755	0.2406
$P\text{-}PO_4$	0.1128	–0.1196	–0.0286	0.0618
$N\text{-}NH_4$	0.2618	0.0219	0.0010	0.2125
$N\text{-}NO_3$	0.4157	–0.1516	–0.1195	0.0320
$N\text{-}NO_2$	0.1546	–0.0765	–0.0047	–0.2499
Eigenvalues	0.2790	0.215	0.091	0.056

Abbreviations: see text above the table.

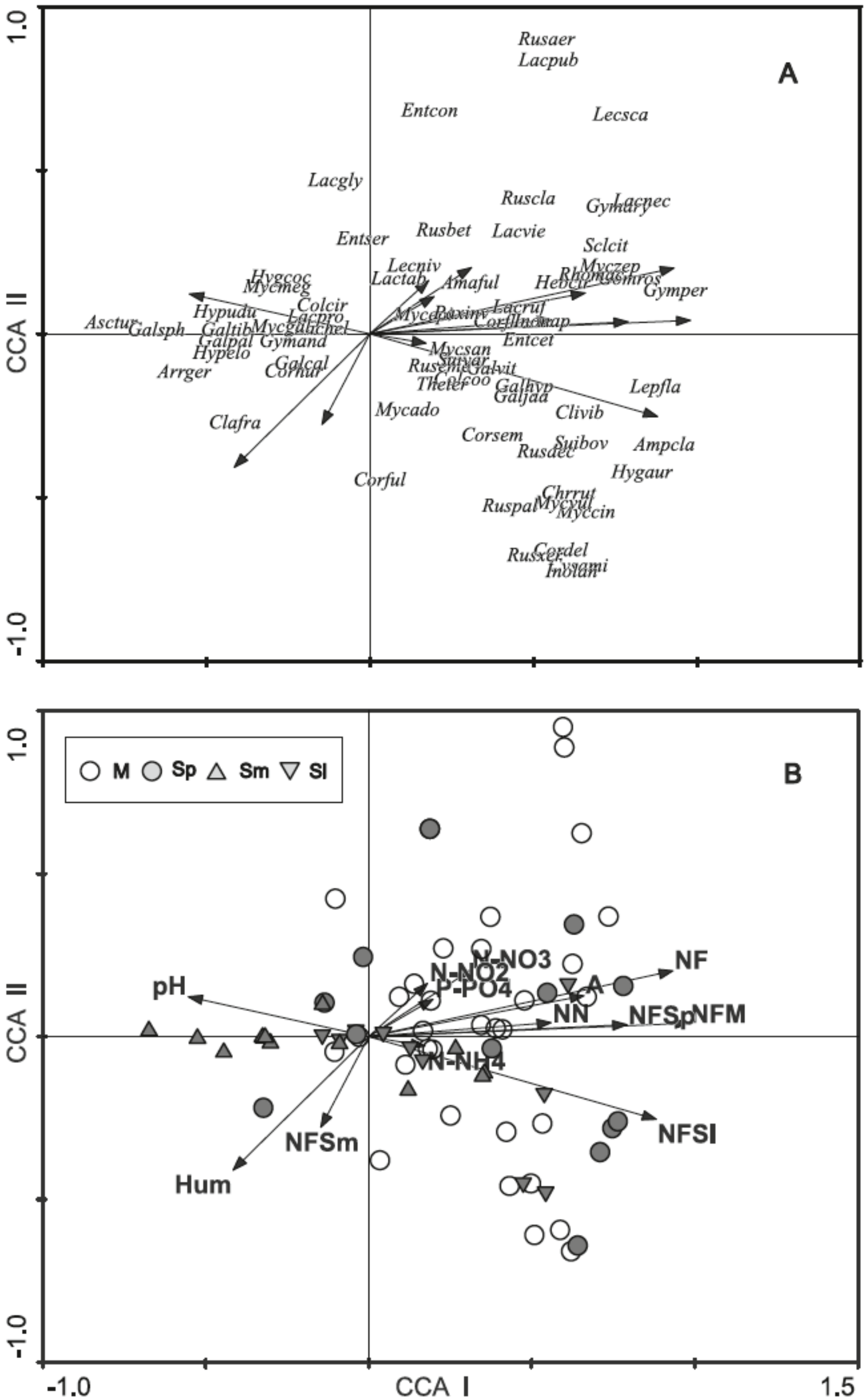

Fig. 8. Fungal species (A) and bioecological groups (B) arranged along the first and second axes of the canonical correspondence analysis (CCA) and their correlation with environmental variables (vectors).
For abbreviations see Table 3.

Table 5

CCA: Results of a stepwise analysis of the significance of environmental variables explaining variation of the data set of fungal species based on a permutation test with the Monte Carlo method (n=499). Lambda-A – additional variance explained by the variant added to the model, *p* – statistical significance, F – test function value

Variable	Lambda-A	*p*	F
NFM	0.42	0.002	26.88
NFSp	0.10	0.002	6.68
NF	0.07	0.002	5.47
NFSl	0.07	0.002	4.84
NFSm	0.06	0.002	4.72
A	0.04	0.002	2.94
pH	0.03	0.006	2.19
P-PO_4	0.03	0.010	2.00
N-NO_3	0.02	0.016	2.12
Hum	0.02	0.040	1.60
NN	0.02	0.056	1.59
N-NH_4	0.01	0.492	0.96
N-NO_2	0.01	0.592	0.87

Abbreviations: see text above the Table 4.

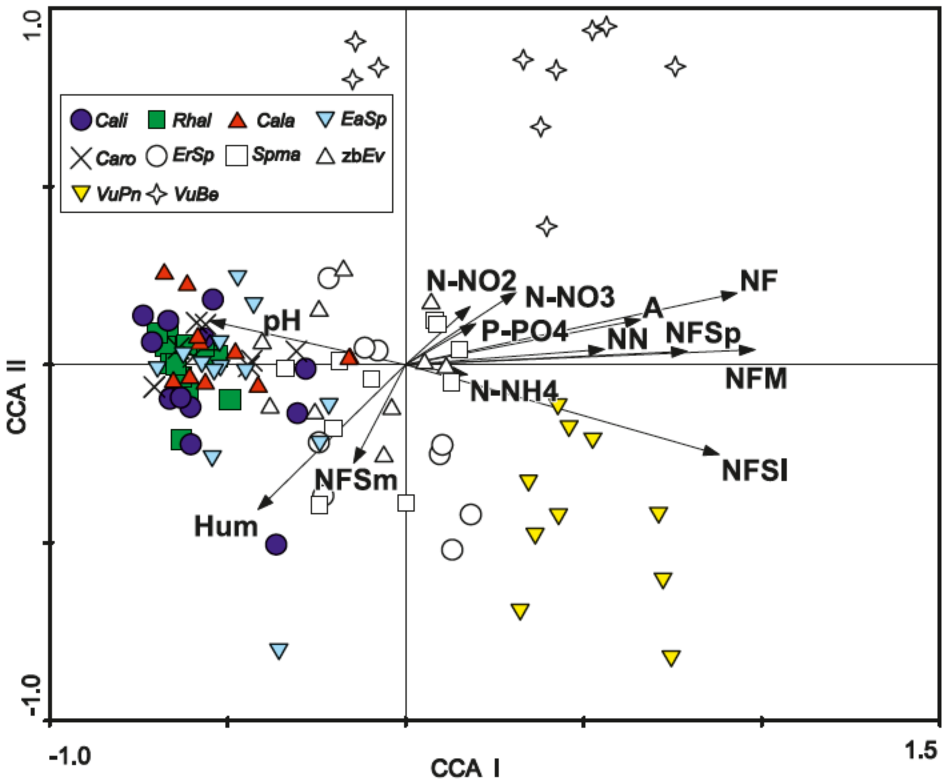

Fig. 9. Mycosociological relevés representing peatland communities arranged along the first and second axes of the canonical correspondence analysis (CCA) and their correlation with environmental variables (vectors) For abbreviations see text and Figure 3.

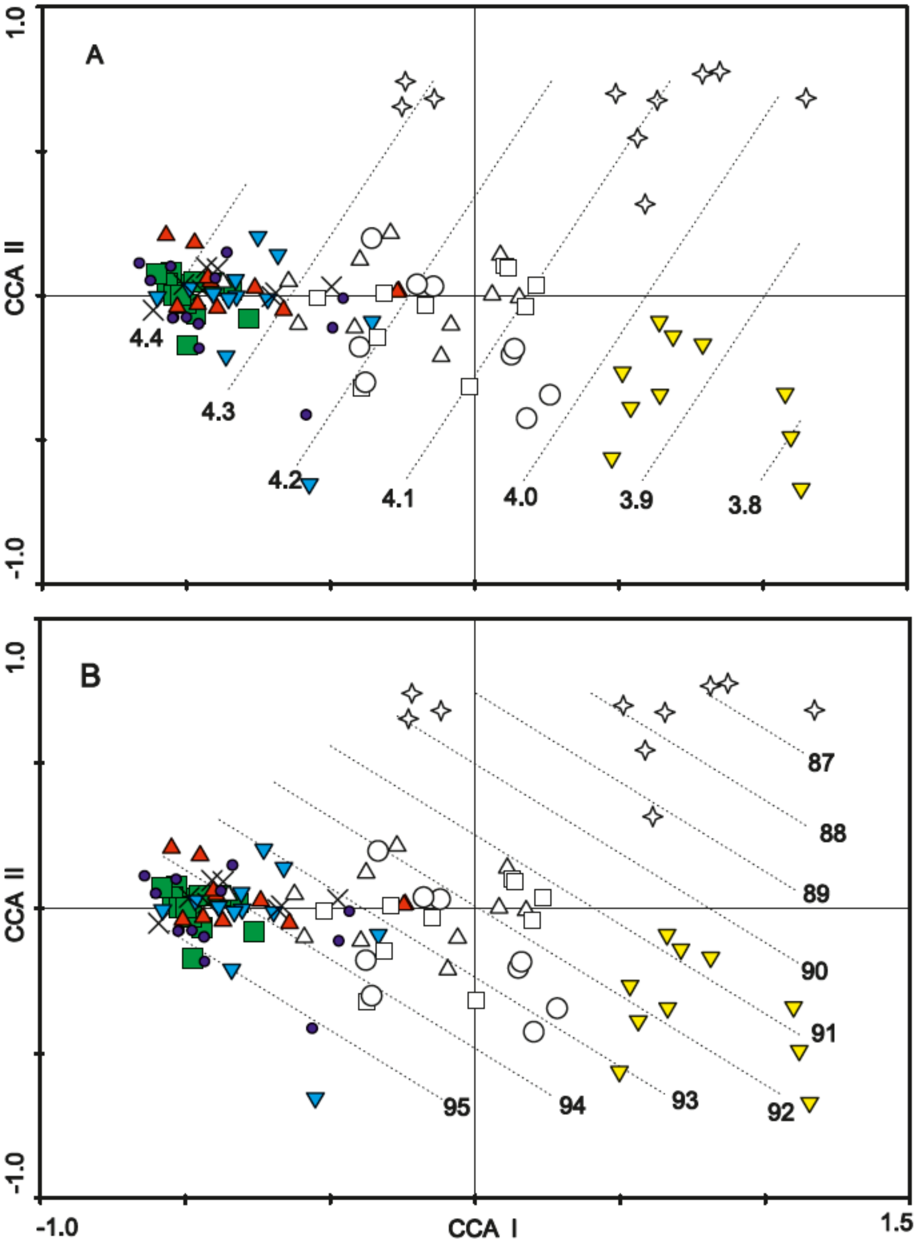

Fig. 10. A generalized linear model (GLM) of the substrate pH gradient (A) and substrate humidity (B) in the patches represented by mycosociological relevés arranged by the canonical correspondence analysis (CCA). For graphic signs used see Figure 9.

preferring weakly hydrated substrates, also belonging to mycorrhizal fungi (NFM), e.g., *Russula aeruginea, Lactarius pubescens* and *Leccinum scabrum*, and saprotrophic fungi growing on peat (NFSp), e.g., *Entoloma conferundum* var. *conferundum* and *Gymnopus dryophilus*. The Monte Carlo analysis shows that the total number of species of plants (NN) and the content of N-NH_4 and N-NO_2 in the substrate are not statistically significantly ($p>0.05$) correlated with the occurrence of fungi (Tab. 5) while other variables elucidate the distribution of fungal species on the plots defined by the first two CCA axes in a statistically significant way ($p<0.05$).

The ordination of research plots along axes I and II indicates similarity between habitat conditions that are observed in the majority of non-forest peatland communities (e.g., *Caricetum limosae, Caricetum lasiocarpae, Rhynchosporetum albae* and *Caricetum rostratae*), assembled on the left-hand side of the diagram (Fig. 9). The number of fungal species recorded in them is small and their substrate pH is relatively high (Fig. 10A). The number of species associated with low substrate pH is the highest in forest peatland communities (*Vaccinio uliginosi-Betuletum pubescentis* and *Vaccinio uliginosi-Pinetum*). Additionally, the high loading of CCA axis II by *Vaccinio uliginosi-Betuletum pubescentis* is related to the lowest substrate humidity (Hum) of the parameters recorded in the study (Fig. 10B).

4.8. Geographic and ecological analysis of selected species of peatland fungi in Pomerania

Twenty one species of peatland fungi occurring in Pomerania are characterized below.

Armillaria ectypa is a saprotroph that occurs on living raised bogs, Aapa mires, transitional bogs and fens, among *Sphagnum* species and herbaceous plants. It is probably a boreal-montane species, possibly a continental species (Ohenoja 2006), and is known from 12 European countries, e.g., Austria, the Czech Republic, Denmark, Finland, France, Germany, Great Britain, the Netherlands, Sweden and Switzerland as well as China, Japan and Turkey. It is a very rare and rare species worldwide, and has not been recorded in many countries for a number of years (Krieglsteiner 1991a; Kreisel 1992; Termorshuizen 1995; Żółciak *et al.* 1997; Zhang 1996, after Qin *et al.* 2007; Kudo & Nagasawa 2003; Ainsworth 2003, 2004; Dahlberg & Croneborg 2003, 2006; Ohenoja 2006; Wright 2007; Vesterholt 2008; Legon *et al.* 2009; Sesli & Denchev 2010). In Poland it was previously reported from one locality near Kalisz in *Leucobryo-Pinetum* (Kowalski 1974). The second site was discovered in 2007 in the Pojezierze Kaszubskie Lakeland near Żuromino (Appendix 3: 1). *Armillaria ectypa* grew in a transitional bog among *Sphagnum* spp. and vascular plants, e.g., *Carex rostrata*, *Comarum palustre, Drosera rotundifolia, Eriophorum angustifolium*, *Menyanthes trifoliata*, and *Oxycoccus palustris*.

Arrhenia gerardiana grows on living and dying sphagna, in peatlands and in moist coniferous forests. It is a widespread species in North America and Europe (Kuyper 1995); however, it is rare worldwide. It occurs in North America in Canada and the USA (Bigelow 1985; Roberts *et al.* 2004; Lamoureux 2008), and in Europe, e.g. in Austria, the Czech Republic, Denmark, Finland, France, Germany, Great Britain, Lithuania, the Netherlands, Norway, Russia, Slovakia, Spain, Sweden and Switzerland (Pilát 1969; Breitenbach & Kränzlin 1991; Krieglsteiner 1991a; Kuyper 1995; Dāniele [Avota] & Krastiņa 2002; Elborne 2008; Legon *et al.* 2009). In Poland it has been recorded at scattered localities, e.g., in the Białowieża National Park (Nespiak 1959), Wielkopolska (Bujakiewicz & Fiklewicz 1963; Fiklewicz-Sobstyl 1965), the Tatra Mts (Rudnicka-Jezierska 1965), the Góry Świętokrzyskie Mts (Łuszczyński 2002, 2007), on Babia Góra Mt (Bujakiewicz 1981), in the Masurian Lakeland (Olesiński & Wojewoda 1985/1987) and the Lublin Region (Flisińska 2004). In Pomerania it has been recorded for instance in the vicinity of Łeba (Dominik & Pachlewski 1955), the Puszcza Goleniowska Forest and Pojezierze Choszczeńskie Lakeland (Friedrich 1984, 1985/1986, 1997; Stasińska & Sotek 2003), the Cedynia Landscape Park (Friedrich 1994, 2002), and the Ińsko Landscape Park (Stasińska & Sotek 2004a; Stasińska *et al.* 2004). It has now been recorded at 43 new localities (Appendix 3: 2). In Pomerania *Arrhenia gerardiana* grows in raised and transitional bogs. Its occurrence optimum is recorded in the phytocoenoses of *Caricetum limosae, Rhynchosporetum albae*, and *Sphagnetum magellanici*. It has also been noted in *Caricetum lasiocarpae, Caricetum rostratae, Eriophoro angustifolii-Sphagnetum recurvi*, the community *Eriophorum vaginatum-Sphagnum fallax*, and *Vaccinio uliginosi-Pinetum*.

Ascocoryne turficola grows in peatlands, among *Sphagnum* spp. and on stems of a variety of *Carex* spp. It is known from many countries in Europe, e.g., the Czech Republic, Denmark, Finland, France, Germany, Great Britain, Norway, Sweden, and Switzerland (Dennis 1978; Cannon *et al.* 1985; Krieglsteiner 1993; Hansen & Knudsen 2000; Watling *et al.* 2001; Eriksson 2006). It is, however, a rare species worldwide. It has also been recorded at several sites in North America (Bunyard *et al.* 2008). In Poland it was first recorded in 1999 in Central Pomerania (Stasińska & Sotek 2004b). It has now been noted at ten new localities, all of them in Pomerania (Appendix 3: 3). *Ascocoryne turficola* grows here in transitional bogs, in strongly hydrated sites, among different *Sphagnum* spp. and on stems of *Carex rostrata* and *C. limosa*. It was first recorded on stems of *Eriophorum angustifolium*. *Ascocoryne turficola* has to date been noted in phytocoenoses of *Caricetum limosae, Caricetum rostratae, Eriophoro angustifolii-Sphagnetum recurvi*, and in the community *Eriophorum vaginatum-Sphagnum fallax*.

Bovista paludosa grows on humid and wet-fen meadows, in calcium-rich transitional bogs and fens, among mosses. It occurs in lowlands and in the mountains (up to 2 250 m a.s.l. in the Alps and up to 3 650 m a.s.l. in the Western Himalayas). It is a boreal species known from the temperate zone in the northern hemisphere: from North America (Canada), Asia (India) and 17 European countries, e.g., Austria, the Czech Republic, Estonia, France, Finland, Germany, Great Britain, Norway, Slovakia, Sweden, Switzerland and Ukraine (Krieglsteiner 1991b; Ulvinen 1997; Lizoň & Bacigálowa 1998; Järva 1999; Kreisel 2001; Adamčík & Ripkowá 2006; Dahlberg & Croneborg 2003, 2006; Legon *et al.* 2009). In Poland it is a rare species, recorded to date at nine localities, mostly in south Poland, e.g., in the Gorce Mts and the Pieniny Mts, in phytocoenoses of *Valeriano-Caricetum flavae* (Wojewoda 1966, 2002; Rudnicka-Jezierska 1991). A full list of localities and a distribution map are given by Wojewoda (2002). In Pomerania *Bovista paludosa* was first recorded in 2006 in the Bagno Stawek reserve in the Bory Tucholskie forest (Appendix 3: 4), where it grew among mosses, e.g., *Aulaucomium palustre*, *Calliergonella cuspidata*, and *Sphagnum* sp.

Cortinarius huronensis is a mycorrhizal species, usually growing among sphagna, but also among other mosses; mainly under pines, less frequently under birches and spruces, in peatlands, in humid coniferous and deciduous forests. It is a widespread species, known from North America and Europe, e.g., from Austria, Finland, France, Germany, Great Britain, Lithuania, Norway, Sweden, and Switzerland (Ammirati & Smith 1972; Krieglsteiner

1991b; Breitenbach & Kränzlin 2000; Dāniele [Avota] & Krastiņa 2002; Høiland 2008; Legon *et al.* 2009). The fungus is rare in Poland (Nespiak 1975; Wojewoda 2003), known from few localities, e.g., from the Białowieża National Park (Skirgiełło *et al.* 1992) and the Lublin region (Flisińska 2004). In Pomerania it has been recorded only at several sites, e.g., the Puszcza Goleniowska Forest (Stasińska & Sotek 2003 [as *Cortinarius sphagnogenus* (Mos.) Nes.]; Stasińska 2008). It has recently been recorded at 71 new localities (Appendix 3: 5). In Pomerania it has been recorded both in raised and transitional bogs. At its Pomeranian localities *Cortinarius huronensis* reaches the occurrence optimum in *Erico-Sphagnetum medii, Sphagnetum magellanici* and the community *Eriophorum vaginatum-Sphagnum fallax*. It has also been recorded in *Caricetum lasiocarpae, Caricetum limosae, Caricetum rostratae, Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae*, *Vaccinio uliginosi-Betuletum pubescentis*, and *Vaccinio uliginosi-Pinetum* phytocoenoses.

Cortinarius uliginosus f. ***uliginosus*** usually grows among *Sphagnum* spp. and other mosses, mostly under *Salix* sp., less frequently under *Alnus glutinosa*, in peatlands and humid mixed forests. It is a widespread species, known from North America (Greenland) and Europe, e.g., from Austria, Denmark, Finland, Germany, Great Britain, Lithuania, Norway, Spain, Sweden, and Switzerland (Krieglsteiner 1991b; Breitenbach & Kränzlin 2000; Soliño *et al.* 2000; Dāniele [Avota] & Krastiņa 2002; Borgen & Høiland 2008; Høiland 2008; Legon *et al.* 2009). It is rare in Poland (Nespiak 1975; Wojewoda 2003), known from few localities, e.g., Babia Góra Mt (Bujakiewicz 1979, 1981), where it occurred in patches of *Bazzanio-Piceetum* and *Sphagnetum magellanici*, the Pojezierze Łęczyńsko-Włodawskie Lakeland (Flisińska 1987 (1988), 1995), where it was recorded in *Sphagnetum magellanici* and *Vaccinio uliginosi-Pinetum*, and in Pomerania from the Słowiński National Park (Bujakiewicz & Lisiewska 1983). It has now been recorded at three new localities in Pomerania: Bobolice-Głodowa, Danków and Wrzosowisko Sowno nature reserve (Appendix 3: 6), where it grew on peat or among sphagna, under *Salix* sp., on the margins of raised and transitional bogs.

Galerina paludosa is a saprotroph growing among *Sphagnum* spp., mainly in peatlands, but also in bog woodland and humid meadows. It is a widespread species, known from North America, Asia and Europe, frequent in some regions (Thormann & Rice 2007; Gulden 2008; Legon *et al.* 2009). It occurs in North America in Canada and the USA (Smith & Singer 1964; Redhead 1989; Roberts *et al.* 2004; Lamoureux 2008), in Asia in Turkey (Sesli & Denchev 2010), in Europe, e.g., in Austria, Bulgaria, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Italy, Lithuania, Norway, Sweden, and Switzerland (Krieglsteiner 1991b; Breitenbach & Kränzlin 2000; Dāniele [Avota] & Krastiņa 2002; Perini *et al.* 2002; Gyosheva & Ganeva 2004; Kalamees & Saar 2006; Gulden 2008; Legon *et al.* 2009). It has been recorded at scattered localities in Poland (Skirgiełło 1984/1986; Wojewoda 2003), e.g., in the Białowieża National Park (Nespiak 1959; Skirgiełło *et al.* 1992), the Góry Świętokrzyskie Mts (Lisiewska 1979; Łuszczyński 2002, 2007), the Wielkopolska region (Fiklewicz-Sobstyl 1965; Ślusarczyk 2004, 2007; Lisiewska 2006), on Babia Góra Mt (Bujakiewicz 1979, 1981) and in the Lublin region (Flisińska 2004). In Pomerania it has been reported from, e.g., the Słowiński National Park (Bujakiewicz & Lisiewska 1983), Puszcza Goleniowska Forest (Friedrich 1984, 1985/1986, 1997; Stasińska & Sotek 2003; Stasińska 2008), Puszcza Wkrzańska Forest (Friedrich 2006), Pojezierze Myśliborskie Lakeland (Stasińska 2004), Cedynia Landscape Park (Friedrich 1994, 2002), and Ińsko Landscape Park (Stasińska & Sotek 2004a; Stasińska *et al.* 2004). It has now been recorded at 120 new sites in entire Pomerania

(Appendix 3: 7) both in raised and transitional bogs. At its Pomeranian localities *Galerina paludosa* reaches the occurrence optimum in *Caricetum limosae, Caricetum rostratae*, *Caricetum lasiocarpae, Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae*, *Sphagnetum magellanici,* and the community *Eriophorum vaginatum-Sphagnum fallax*. It has also been recorded in *Erico-Sphagnetum medii, Vaccinio uliginosi-Pinetum*, and *Vaccinio uliginosi-Betuletum pubescentis* phytocoenoses.

Galerina sphagnorum grows among *Sphagnum* spp., in peatlands, humid meadows and acid bog woodland. It is a widespread fungus, known from North America (Canada, USA), Asia (Turkey), and Europe (Thormann & Rice 2007; Gulden 2008; Sesli & Denchev 2010). In Europe it occurs in, e.g., Austria, Bulgaria, the Czech Republic, Denmark, Finland, Germany, Great Britain, Iceland, Lithuania, Norway, Sweden and Switzerland (Krieglsteiner 1991b; Breitenbach & Kränzlin 2000; Dāniele [Avota] & Krastiņa 2002; Gyosheva & Ganeva 2004; Gulden 2008; Legon *et al.* 2009). In Poland it is recorded at scattered localities (Wojewoda 2003), e.g., in the Białowieża National Park (Nespiak 1959; Skirgiełło *et al.* 1992), the Góry Świętokrzyskie Mts (Łuszczyński 2002, 2007), the Wielkopolska region (Bujakiewicz & Fiklewicz 1963; Fiklewicz-Sobstyl 1965; Lisiewska 2006; Ślusarczyk 2007), on Babia Góra Mt (Bujakiewicz 1979), and in the Lublin region (Flisińska 2004). In Pomerania it has been reported from the Słowiński National Park (Bujakiewicz & Lisiewska 1983), Puszcza Goleniowska Forest (Friedrich 1984, 1985/1986, 1997; Stasińska & Sotek 2003; Stasińska 2008), Puszcza Wkrzańska Forest (Friedrich 2006), Cedynia Landscape Park (Friedrich 1994, 2002), and Ińsko Landscape Park (Stasińska & Sotek 2004a; Stasińska *et al.* 2004). It has now been recorded at 40 new localities (Appendix 3: 8) in raised and transitional bogs. In Pomerania *Galerina sphagnorum* reaches its occurrence optimum in *Caricetum limosae, Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae*, and *Caricetum lasiocarpae* phytocoenoses. It has also been noted in *Sphagnetum magellanici, Caricetum rostratae*, the community *Eriophorum vaginatum-Sphagnum fallax*, *Erico-Sphagnetum medii*, and *Vaccinio uliginosi-Betuletum pubescentis.*

Galerina tibiicystis grows among *Sphagnum* spp., in peatlands and in humid coniferous forests. It is a widespread species occurring in North America (Canada, USA), Asia (Japan) and Europe (Thormann & Rice 2007; Gulden 2008; Lamoureux 2008). In Europe it has been noted, e.g., in Austria, the Czech Republic, Denmark, Finland, Germany, Great Britain, Lithuania, Norway, Sweden, and Switzerland (Krieglsteiner 1991b; Breitenbach & Kränzlin 2000; Dāniele [Avota] & Krastiņa 2002; Gulden 2008; Legon *et al.* 2009). It is a rare species in Poland, known from few localities (Wojewoda 2003), e.g., from Babia Góra Mt (Bujakiewicz 1979, 1981), the Wielkopolska region (Ślusarczyk 2004, 2007), and the Lublin region (Flisińska 2004). In Pomerania it has been recorded only at several sites in the Puszcza Goleniowska Forest and the Pojezierze Choszczeńskie Lakeland (Stasińska & Sotek 2003, 2004a). It has now been recorded at 59 new localities across Pomerania (Appendix 3: 9), where it occurs in raised and transitional bogs. At its Pomeranian localities, *Galerina tibiicystis* reaches its occurrence optimum in non-forest peatland communities: *Caricetum lasiocarpae, Sphagnetum magellanici,* the community *Eriophorum vaginatum-Sphagnum fallax*, *Erico-Sphagnetum medii, Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae*, *Caricetum limosae*, and *Caricetum rostratae*. It has also been noted in phytocoenoses of forest peatland communities: *Vaccinio uliginosi-Betuletum pubescentis*, and *Vaccinio uliginosi-Pinetum*.

Hygrocybe coccineocrenata is a saprotroph growing on humid soil, among mosses, often among *Sphagnum* spp., in peatlands, on banks of oligotrophic water bodies and in humid meadows. It is widespread in North America (Alaska, California, Canada) and Europe, especially in the boreal zone and in mountainous areas; it is recorded less frequently in the temperate zone (Arnolds 1990; Gumińska 1997; Boertmann 2008). In Europe the species occurs in, e.g., Austria, Denmark, Finland, France, Germany, Great Britain, Iceland, Italy, the Netherlands, Norway, Sweden, and Switzerland (Arnolds 1990; Krieglsteiner 1991b; Perini *et al.* 2002; Boertmann 2008; Legon *et al.* 2009). In Poland it was previously known from a few localities (Gumińska 1997; Wojewoda 2003), and has been also recently reported from the Lublin region (Flisińska 2004) and Wielkopolska region (Ślusarczyk 2007). In Pomerania it has been recorded in the Puszcza Goleniowska Forest (Friedrich 1984, 1985/1986; Stasińska & Sotek 2003; Stasińska 2008), Trójmiasto Landscape Park (Wilga 2004) and central Pomerania (Sotek *et al.* 2004; Stasińska & Sotek 2004a). It has now been recorded at 10 new localities (Appendix 3: 10). In Pomerania *Hygrocybe coccineocrenata* was recorded in raised and transitional bogs, in phytocoenoses of *Caricetum lasiocarpae*, *Eriophoro angustifolii-Sphagnetum recurvi*, *Erico-Sphagnetum medii, Sphagnetum magellanici*, and *Vaccinio uliginosi-Betuletum pubescentis.*

Hypholoma elongatum is a saprotroph growing mainly among *Sphagnum* spp., less frequently among other mosses, e.g., *Straminergon stramineum*, *Drepanocladus* spp. and *Polytrichum* spp., and on exposed soils. It mostly occurs in peatlands and in humid coniferous and mixed forests, sporadically in humid meadows. It is a widespread fungus in North America and Europe (Smith & Hesler 1968; Watling & Gregory 1987; Noordeloos 1999; Lamoureux 2008), also reported from Asia (Turkey) (Sesli & Denchev 2010). In Europe it occurs in, e.g., Austria, the Czech Republic, Estonia, France, Germany, Great Britain, Greece, Italy, the Netherlands, Switzerland, and Scandinavian countries (Krieglsteiner 1991a; Breitenbach & Kränzlin 1995; Noordeloos 1999; Diamandis & Perlerou 2001; Jankovský *et al.* 2002; Kalamees & Saar 2006; Perini *et al.* 2002; Vesterholt & Rald 2008; Legon *et al.* 2009). In Poland it has been recorded at single localities across the country (Wojewoda 2003), e.g., in the Białowieża National Park (Skirgiełło *et al.* 1992), Wielkopolska region (Bujakiewicz & Fiklewicz 1963; Fiklewicz-Sobstyl 1965; Lisiewska 2006), the Tatra Mts (Frejlak 1973), the Góry Świętokrzyskie Mts (Lisiewska 1979; Łuszczyński 2002, 2007), on Babia Góra Mt (Bujakiewicz 1979, 1981), in the Pojezierze Mazurskie Lakeland (Olesiński & Wojewoda 1985/1987), and the Lublin region (Flisińska 2004). In Pomerania it has to date been reported from scattered sites, e.g., from the Słowiński National Park (Bujakiewicz & Lisiewska 1983), Puszcza Goleniowska Forest (Friedrich 1984, 1985/1986, 1997; Stasińska & Sotek 2003; Stasińska 2008), Puszcza Wkrzańska Forest (Friedrich 2006), Pojezierze Myśliborskie Lakeland (Stasińska 2004), Cedynia Landscape Park (Friedrich 1994, 2002), and Ińsko Landscape Park (Stasińska & Sotek 2004a; Stasińska *et al.* 2004). *Hypholoma elongatum* has now been recorded at 118 new localities (Appendix 3: 11). In Pomerania it occurs in raised and transitional bogs. The occurrence optimum is recorded in non-forest peatland communities: *Caricetum lasiocarpae, Caricetum limosae, Caricetum rostratae*, *Erico-Sphagnetum medii, Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae*, *Sphagnetum magellanici,* and the community *Eriophorum vaginatum-Sphagnum fallax*. It has also been noted in phytocoenoses of forest peatland communities: *Vaccinio uliginosi-Betuletum pubescentis* and *Vaccinio uliginosi-Pinetum*.

Hypholoma myosotis grows on soil, among mosses, e.g., *Sphagnum* spp. and *Polytrichum* spp., in peatlands and humid forests with birch, willow and alder. It is widespread in North America and Europe (Smith & Hesler 1968; Noordeloos 1999). It occurs in, e.g., Austria, Bulgaria, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Ireland, Iceland, Italy, the Netherlands, Norway, Russia, Slovakia, Spain, Sweden, Switzerland, and Turkey (Krieglsteiner 1991a; Breitenbach & Kränzlin 1995; Noordeloos 1999; Perini *et al.* 2002; Gyosheva & Ganeva 2004; Kalamees & Saar 2006; Vesterholt & Rald 2008; Legon *et al.* 2009; Sesli & Denchev 2010). In Poland it is a rare species known from few localities, e.g., from the Wielkopolska region (Bujakiewicz & Fiklewicz 1963; Ślusarczyk 2004, 2007), the Białowieża National Park (Skirgiełło *et al.* 1992), and the Lublin region (Flisińska 2004). In Pomerania it has been recorded in *Vaccinio uliginosi-Betuletum pubescentis* in the Słowiński National Park (Bujakiewicz & Lisiewska 1983), in *Ribeso nigri-Alnetum* in the Cedynia Landscape Park (Friedrich 1994, 2002), and in the Bory Tucholskie Forest (Komorowska 2000). It has now been recorded at three new localities (Appendix 3: 12). It grew on peat or among sphagna in phytocoenoses of *Vaccinio uliginosi-Betuletum pubescentis* in the Roby and Stramniczka nature reserves. The third locality is in the Bory Tucholskie National Park, where *Hypholoma myosotis* grew among mosses, on the bank of lake Wielkie Gacno.

Hypholoma udum is a saprotroph growing on wet soil, among grasses (*Molinia caerulea*) and mosses (*Polytrichum* spp., *Sphagnum* spp.), mostly in peatlands and in humid forests and scrub. It is widespread in North America and Europe (Noordeloos 1999; Thormann & Rice 2007; Lamoureux 2008). In Europe it occurs in, e.g. Austria, the Czech Republic, Denmark, Finland, France, Germany, Great Britain, Iceland, the Netherlands, Norway, Sweden, and Switzerland (Krieglsteiner 1991a; Breitenbach & Kränzlin 1995; Noordeloos 1999; Vesterholt & Rald 2008; Legon *et al.* 2009). In Poland it is known from many scattered localities (Wojewoda 2003), e.g., from the Białowieża National Park (Nespiak 1959; Skirgiełło *et al.* 1992), the Pojezierze Mazurskie Lakeland (Olesiński & Wojewoda 1985/1987), the Góry Świętokrzyskie Mts (Lisiewska 1979; Łuszczyński 2002, 2007), Babia Góra Mt (Bujakiewicz 1979, 1981), Wielkopolska region (Bujakiewicz & Fiklewicz 1963; Lisiewska 2006), and the Lublin region (Flisińska 2004). In Pomerania it has been reported from, e.g., the Słowiński National Park (Bujakiewicz & Lisiewska 1983), Puszcza Goleniowska Forest (Friedrich 1984, 1985/1986, 1997; Stasińska 2008), Cedynia Landscape Park (Friedrich 1994, 2002), Bory Tucholskie Forests (Komorowska 2000), Ińsko Landscape Park (Stasińska & Sotek 2004a; Stasińska *et al.* 2004), and Puszcza Wkrzańska Forest (Friedrich 2006). It has now been recorded in Pomerania at 105 new localities (Appendix 3: 13). In Pomerania *Hypholoma udum* grows in raised and transitional bogs. It reaches the occurrence optimum in phytocoenoses of non-forest peatland communities, primarily in *Eriophoro angustifolii-Sphagnetum recurvi*, *Sphagnetum magellanici*, and *Erico-Sphagnetum medii*. It occurred in *Caricetum lasiocarpae, Caricetum limosae, Caricetum rostratae*, *Rhynchosporetum albae*, and the community *Eriophorum vaginatum-Sphagnum fallax*, and was also often recorded in forest peatland communities, *Vaccinio uliginosi-Betuletum pubescentis* and *Vaccinio uliginosi-Pinetum*.

Leccinum niveum forms mycorrhizae with various birch species, e.g., *Betula pubescens* and *B. pendula*. It grows among *Sphagnum* spp., primarily in raised and transitional bogs but also on the margins of humid pine forest. It is rare but widespread occurring in the temperate, boreal, subalpine and arctic zones. The species is known from North America (Canada, USA), Asia (China) and Europe, e.g., from Denmark, Estonia, Finland, France, Germany, Great Britain, the Netherlands, Norway, Sweden, and Switzerland (Kreisel 1987; Breitenbach & Kränzlin 1991; Lannoy & Estades 1995; Den Bakker & Noordeloos 2005; Fu *et al.* 2006; Kalamees & Saar 2006; Den Bakker *et al.* 2007; Knudsen & Taylor 2008a;

Legon *et al.* 2009). In Poland it was known from few sites, e.g., the Pojezierze Mazurskie Lakeland (Olesiński & Wojewoda 1985/1987, Góry Świętokrzyskie Mts (Łuszczyński 2000), and Lublin region (Flisińska 2004). In Pomerania it has been recorded in the Bory Tucholskie National Park (Ławrynowicz 1998), Trójmiasto Landscape Park (Wilga 2002, 2004), Ińsko Landscape Park (Stasińska *et al.* 2004), Pojezierze Myśliborskie Lakeland (Stasińska 2004), and Puszcza Goleniowska Forest (Stasińska 2008). It has now been recorded in Pomerania at 66 new localities (Appendix 3: 14). *Leccinum niveum* reaches its occurrence optimum in *Vaccinio uliginosi-Betuletum pubescentis* but it also occurs in phytocoenoses of *Caricetum lasiocarpae, Erico-Sphagnetum medii, Sphagnetum magellanici,* the community *Eriophorum vaginatum-Sphagnum fallax*, and *Vaccinio uliginosi-Pinetum*. In Pomerania it mostly occurs in raised and transitional bogs.

Leccinum variicolor is a mycorrhizal species, closely associated with birch. It grows on soil or among *Sphagnum* spp., in humid deciduous forests or in open sites. The fungus is widespread and occurs in the northern hemisphere, in the temperate, boreal, subalpine and arctic zones. It is known from North America (Canada, USA), Asia (China, Japan) and Europe, e.g., from Austria, Estonia, France, Germany, Great Britain, Macedonia, the Netherlands, Switzerland, and Scandinavian countries (Krieglsteiner 1991b; Lannoy & Estades 1995; Den Bakker & Noordeloos 2005; Fu *et al.* 2006; Kalamees & Saar 2006; Den Bakker *et al.* 2007; Karadelev *et al.* 2007; Knudsen & Taylor 2008a; Legon *et al.* 2009). In Poland it is a very rare species, recorded at several localities: in the Lublin region (Flisińska 2004), Wielkopolska region (Ślusarczyk 2007) and the Góry Świętokrzyskie Mts (Łuszczyński 2007), where it occurred in the community *Abies alba-Sphagnum girgensohnii*. In Pomerania it was recorded at three localities (Appendix 3: 15), in the Mszar koło Starej Dobrzycy, Roby and Stramniczka nature reserves, where it grew on peat or among sphagna, in phytocoenoses of *Vaccinio uliginosi-Betuletum pubescentis*.

Lyophyllum palustre is a fungal parasite of *Sphagnum* spp., growing in peatlands and in humid coniferous and mixed forests. It is a widespread species, known from North America (Canada, USA), Asia (Japan, Russia, Turkey) and Europe, e.g., from the Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, the Netherlands, Norway, Sweden, and Switzerland (Untiedt & Müller 1984; Breitenbach & Kränzlin 1991; Krieglsteiner 1991a; Jankovský *et al*. 2002; Roberts *et al.* 2004; Davey & Currah 2006; Kalamees & Saar 2006; Thormann & Rice 2007; Lamoureux 2008; Vesterholt & Ludwig 2008; Legon *et al*. 2009; Sesli & Denchev 2010). It is common in Scandinavian countries, especially in the temperate and boreal zones (Vesterholt & Ludwig 2008). In Poland it is recorded in different regions of the country (Skirgiełło 1984/1986; Wojewoda 2003), e.g., in the Białowieża National Park (Nespiak 1959; Skirgiełło *et al*. 1992), the Góry Świętokrzyskie Mts (Lisiewska 1979; Łuszczyński 2000), the Wielkopolska region (Ślusarczyk 2004, 2007), on Babia Góra Mt (Bujakiewicz 1979, 1981), in the Pojezierze Mazurskie Lakeland (Olesiński & Wojewoda 1985/1987) and the Lublin region (Flisińska 2004). In Pomerania it was previously known from, e.g., the Słowiński National Park (Bujakiewicz & Lisiewska 1983), Puszcza Goleniowska Forest (Friedrich 1984, 1985/1986, 1997; Stasińska & Sotek 2003; Stasińska 2008), Puszcza Wkrzańska Forest (Friedrich 2006), Pojezierze Myśliborskie Lakeland (Stasińska 2004), Cedynia Landscape Park (Friedrich 1994, 2002), and Ińsko Landscape Park (Stasińska & Sotek 2004a; Stasińska *et al.* 2004). It has now been recorded at 124 new localities (Appendix 3: 16). In Pomerania *Lyophyllum palustre* occurs primarily in raised and transitional bogs. At its Pomeranian localities, *Lyophyllum palustre* reaches the occurrence optimum in non-forest peatland communities: *Caricetum lasiocarpae, Caricetum limosae, Caricetum rostratae, Eriophoro angustifolii-Sphagnetum recurvi, Rhynchosporetum albae, Sphagnetum magellanici,* and the community *Eriophorum vaginatum-Sphagnum fallax*, but it also occurs numerously in phytocoenoses of forest peatland communities: *Vaccinio uliginosi-Betuletum pubescentis* and *Vaccinio uliginosi-Pinetum*.

Monilinia oxycocci is a parasite that produces fruit bodies on rotten and mummified fruits of *Oxycoccus palustris* depositing from the previous year. It is a widespread species, known from North America, Asia and Europe, e.g., from the Czech Republic, Denmark, Finland, Germany, Great Britain, Norway, Russia, Sweden, Switzerland, and Ukraine (Dennis 1978; Cannon *et al.* 1985; Batra 1991; Krieglsteiner 1993; Redhead 1997; Hansen & Knudsen 2000; Minter *et al.* 2004). It is a rare species in Poland although it was recorded at scattered localities as early as the late 19th century (Hennings 1891; Ludwig 1892; Magnus 1896, after Palmer & Truszkowska 1969), e.g., in Mazowsze, Masuria and Podlasie (Palmer & Truszkowska 1969), the Lublin region (Sałata & Bednarczyk 1977), and on Babia Góra Mt (Bujakiewicz 1981), where it was recorded in *Sphagnetum magellanici*. In Pomerania it has been reported from the vicinity of Lębork (Magnus 1893, after Dominik 1936) and Bonin (Stasińska & Sotek 2004a), where it was noted in *Caricetum limosae* phytocoenoses. It has now been recorded at two new localities (Appendix 3: 17): in the Jezioro Cęgi Małe nature reserve and in the Ziemomyśl I bog.

Mycena adonis var. ***adonis*** is a saprotroph growing on soil, plant remains, among grasses and mosses, e.g., *Sphagnum* spp., in humid coniferous and mixed forests, in peatlands and sporadically in humid meadows. It is a widespread species, known from North America (Canada, USA), Asia (Turkey) and Europe, e.g., from Austria, Bulgaria, Denmark, Finland, Germany, Great Britain, Lithuania, Norway, Sweden, and Switzerland (Smith 1947; Breitenbach & Kränzlin 1991; Krieglsteiner 1991b; Maas Geesteranus 1992a, b; Dāniele [Avota] & Krastiņa 2002; Gyosheva & Ganeva 2004; Emmett *et al.* 2008; Lamoureux 2008; Legon *et al*. 2009; Sesli & Denchev 2010). It is a rare species in Poland although it is known from various regions in the country (Lisiewska 1987; Wojewoda 2003), e.g., from the Pieniny National Park (Gumińska 1981), the Białowieża National Park (Skirgiełło *et al.* 1992), the Góry Świętokrzyskie Mts (Łuszczyński 2007), the Wielkopolska region (Lisiewska 2006), and the Lublin region (Flisińska 2004). In Pomerania it is recorded sporadically, e.g., in the Cedynia Landscape Park and Puszcza Wkrzańska Forest (Friedrich 1994, 2002, 2006), Bory Tucholskie Forests (Ławrynowicz & Szkodzik 2002; Ławrynowicz *et al.* 2002), Puszcza Bukowa Forest near Szczecin (Stasińska, Sotek 2004a), vicinity of Słupsk (Domański 1997; after Wojewoda 2003). The species has now been noted at 16 new localities in different parts of Pomerania (Appendix 3: 18), where it occurred in raised and transitional bogs. At its Pomeranian localities, *Mycena adonis* var. *adonis* reaches its occurrence optimum in phytocoenoses of *Vaccinio uliginosi-Pinetum* but it has also been recorded in *Sphagnetum magellanici, Erico-Sphagnetum medii, Eriophoro angustifolii-Sphagnetum recurvi*, *Eriophorum vaginatum-Sphagnum fallax*, and *Vaccinio uliginosi-Betuletum pubescentis*.

Mycena megaspora grows on soil, among *Sphagnum* spp. or other mosses, usually among shoots of *Calluna vulgaris*, *Empetrum nigrum*, *Erica tetralix* and *Vaccinium* sp., in humid coniferous forests, in peatlands and heathland, sometimes at previously burnt sites. It is a widespread species, known from North America (Canada, USA), Asia (Turkey) and Europe, e.g., from Austria, Bulgaria, Denmark, Estonia, Finland, France, Germany, Great Britain, Lithuania, Norway, Sweden, and Switzerland (SMITH 1947; KRIEGLSTEINER 1991b; DĀNIELE [AVOTA] & KRASTIŅA 2002; MAAS GEESTERANUS 1992a, b; GYOSHEVA & GANEVA 2004; KALAMEES & SAAR 2006; EMMETT *et al.* 2008; LAMOUREUX 2008; LEGON *et al*. 2009; SESLI & DENCHEV 2010). In Poland it is a rare species which occurs at single localities in various regions of the country (LISIEWSKA 1987; WOJEWODA 2003), e.g., in the Puszcza Białowieska Forest and on Babia Góra Mt (BUJAKIEWICZ 2002), the Góry Świętokrzyskie Mts (LISIEWSKA 1978, 1979; ŁUSZCZYŃSKI 2002), the Wielkopolska region (LISIEWSKA 2006), and the Lublin region (FLISIŃSKA 2004). In Pomerania it was previously recorded only in the Cedynia Landscape Park in phytocoenoses of *Leucobryo-Pinetum* and *Sphagnetum magellanici* (FRIEDRICH 1994, 2002). *Mycena megaspora* has now been recorded at 7 new localities (Appendix 3: 19), where it grew in raised and transitional bogs, in phytocoenoses of *Erico-Sphagnetum medii, Sphagnetum magellanici, Eriophorum vaginatum-Sphagnum fallax, Vaccinio uliginosi-Pinetum*, and *Vaccinio uliginosi-Betuletum pubescentis*.

Psathyrella sphagnicola is a saprotroph growing among mosses, mainly *Sphagnum* spp., in peatlands, in wet sites, in coniferous forests or in forests with birch present in the tree stand. It is known from North America, Asia (Turkey) and Europe, e.g., from the Czech Republic, Denmark, Finland, France, Germany, Great Britain, Lithuania, Norway, Slovakia, Sweden, and Switzerland (SMITH 1972; KITS VAN WAVEREN 1985; KRIEGLSTEINER 1991a; BREITENBACH & KRÄNZLIN 1995; DĀNIELE [AVOTA] & KRASTIŅA 2002; VAŠUTOWÁ 2006; LAMOUREUX 2008; ÖRSTADIUS & KNUDSEN 2008; LEGON *et al.* 2009; SESLI & DENCHEV 2010). It is very rare or rare worldwide, red-listed in many countries (HOLEC & BERAN 2006; SENN-IRLET *et al.* 2007). In Poland the taxon was previously reported from a few scattered localities (WOJEWODA 2003), e.g., in the Białowieża National Park (NESPIAK 1959; SKIRGIEŁŁO *et al.* 1992) and in the Lublin region (FLISIŃSKA 2004), in phytocoenoses of *Sphagnetum magellanici*. In Pomerania *Psathyrella sphagnicola* has been recorded in the Bory Tucholskie National Park (Appendix 3: 20), where it grew in three small peatlands, among *Sphagnum* spp., *Oxycoccus palustris* and *Ledum palustre*, under *Betula pubescens* and *Pinus sylvestris,* in *Vaccinio uliginosi-Pinetum*.

Suillus flavidus is a mycorrhizal species associated with *Pinus sylvestris* and other two-needle pine species. It grows on soil and among mosses, e.g., *Sphagnum* spp. and *Polytrichum* spp., in peatlands and in humid pine forests. The fungus is widespread but it is a very rare species in many countries, and is protected or red-listed (HOLEC & BERAN 2006; SENN-IRLET *et al.* 2007). It occurs in North America, Asia and Europe, e.g., in Austria, Bulgaria, the Czech Republic, Denmark, Estonia, Finland, Germany, Great Britain, Iceland, Norway, Russia, Sweden, and Switzerland (BREITENBACH & KRÄNZLIN 1991; KRIEGLSTEINER 1991b; ASSYOV & DENCHEV 2004; KALAMEES & SAAR 2006; KNUDSEN & TAYLOR 2008b; LEGON *et al.* 2009). In Poland it has been recorded in peatlands in various regions of the country (SKIRGIEŁŁO 1972; WOJEWODA 2003), e.g., in the Góry Świętokrzyskie Mts (ŁUSZCZYŃSKI 2000, 2002), the Wielkopolska region (ŚLUSARCZYK 2004), and the Lublin region (FLISIŃSKA 2004). In Pomerania it was until recently known only from a few localities, e.g., from the Pojezierze Myśliborskie Lakeland (BUJAKIEWICZ & FIKLEWICZ 1963), Słowiński National Park (BUJAKIEWICZ & LISIEWSKA 1983; BUJAKIEWICZ 1986), and Bory Tucholskie Forests (KOMOROWSKA 2000). It has now been recorded in Pomerania at 15 new localities (Appendix 3: 21), where it grew mostly in raised bogs, less frequently in transitional bogs, in phytocoenoses of *Erico-Sphagnetum medii, Sphagnetum magellanici* and *Vaccinio uliginosi-Pinetum*.

5. RESULTS REVIEW AND DISCUSSION

5.1. Macromycetes of peatland communities: Pomerania and other regions in Poland

The results of research into macroscopic fungi in forest and non-forest peatland communities in Pomerania conducted over a period of several years fill a gap in the mycological recognition of peatland ecosystems in Poland. They also give an opportunity to assess the similarity or its lack between biotas of macroscopic fungi in the same communities across a variety of regions in Poland.

The macromycete biota in *Caricetum limosae* in Pomerania is considerably richer than that in the Pojezierze Łęczyńsko-Włodawskie Lakeland recorded by Flisińska (1987/1988). 25 species of fungi were recorded in the phytocoenoses in Pomerania (cf. Appendix 1: Tab. A.2.1) while 13 species were recorded in the Pojezierze Łęczyńsko-Włodawskie Lakeland. Only 7 species occurred in both regions. Bryophilous fungi, e.g., *Galerina paludosa, Hypholoma elongatum* and *H. udum*, dominated in *Caricetum limosae* patches in both. *Lyophyllum palustre*, which parasitizes sphagna, also occurred numerously. The contribution of mycorrhizal fungi is considerable in some patches of *Caricetum limosae* in Pomerania (cf. Appendix 1: Tab. A.2.1) due to the presence of pine and birch.

The occurrence of macroscopic fungi in *Rhynchosporetum albae* in Pomerania is similar to that observed in studies by Ślusarczyk (2004, 2007) in the Pojezierze Lubuskie Lakeland. The diversity of fungal species in the phytocoenoses of *Rhynchosporetum albae* in both regions is small. From 4 to 7 species were recorded in the patches in the Pojezierze Lubuskie Lakeland and from 5 to 10 in Pomerania. Bryophilous fungi were a dominant group, which can be attributed to strong hydration of the phytocoenoses studied. *Galerina paludosa*, *Hypholoma elongatum* and *Lyophyllum palustre* occurred in phytocoenoses in both regions.

In comparison with the Pojezierze Lubuskie Lakeland (Ślusarczyk 2004), the biota of macroscopic fungi in *Eriophoro angustifolii-Sphagnetum recurvii* in Pomerania is considerably richer. A total of 29 species of fungi were noted in Pomerania and 11 in the Pojezierze Lubuskie Lakeland, with only 7 taxa in common. Phytocoenoses of this community in both regions are mycologically similar by the presence of fungi associated with the moss layer, e.g., *Galerina paludosa, G. tibiicystis, Hypholoma elongatum, H. udum*, and *Lyophyllum palustre*. *Gymnopus androsaceus* and *Russula emetica*, fungi mostly associated with pine, also occur in both areas. Patches of *Eriophoro angustifolii-Sphagnetum recurvi* in Pomerania have a considerably higher contribution of mycorrhizal and litter-inhabiting saprotrophic fungi than in the Pojezierze Lubuskie Lakeland: 8 mycorrhizal species and 6 litter-inhabiting species were recorded in Pomerania, and 3 and 1 in the Pojezierze Lubuskie Lakeland, respectively. The differences in the fungas of this community in both regions are probably caused by different hydration levels and the presence of trees.

The results of studies conducted by Ślusarczyk (2004, 2007) in *Caricetum lasiocarpae* in the Pojezierze Lubuskie Lakeland differ from those presented in this study. The number of fungal species recorded by Ślusarczyk (2007) in individual phytocoenoses of the community ranges from 12 to 13 while between 5 and 20 species of fungi were recorded at the study sites (cf. Appendix 1: Tab. A.2.4). A greater occurrence of trees in some phytocoenoses in Pomerania in comparison with the Pojezierze Lubuskie Lakeland may be one of the underlying reasons and can lead to a more numerous occurrence of mycorrhizal fungi in these phytocoenoses. Bryophilous fungi such as *Galerina paludosa* and *Hypholoma elongatum* as well as *Lyophyllum palustre* are the primary taxa (5 in total) that occur in the patches both in Pomerania and the Pojezierze Lubuskie Lakeland (Ślusarczyk 2004, 2007).

The number of taxa and the species composition of the macromycete biota recorded in a variety of *Sphagnetum magellanici pinetosum* phytocoenoses in Pomerania do not differ considerably. Between 27 and 37 species of fungi were recorded in the study patches (cf. Appendix 1: Tab. A.2.7), 32 in a patch in the Puszcza Goleniowska Forest (Friedrich 1985/1986), and 29 in the Cedynia Landscape Park (Friedrich 1994). 24 species occur both in the study area and the Puszcza Goleniowska Forest, and 23 in the study area and the Cedynia Landscape Park. However, only 15 species of fungi occurred in all of the Pomeranian phytocoenoses. The majority of them were bryophilous fungi such as *Arrhenia gerardiana*, *Galerina paludosa*, *G. sphagnorum*, *Hypholoma elongatum*, and *H. udum*, and mycorrhizal fungi, e.g., *Laccaria proxima*, *Lactarius helvus, L. rufus, Russula emetica*, and *Suillus varigatus*.

Some mycological similarity is observed between phytocoenoses of *Sphagnetum magellanici pinetosum* in the study area and its patches in the Białowieża National Park (Nespiak 1959), where 24 to 28 species were recorded. Only 16 species occurred in both. A considerable contribution of *Picea excelsa* in the tree stand in *Sphagnetum magellanici pinetosum* in the Białowieża National Park (Nespiak 1959) and different climatic conditions may cause the dissimilarity of the fungal biotas of this sub-community in the two regions.

The biota of macroscopic fungi of *Sphagnetum magellanici* in the study area is poorer (48 species) than that in the Góry Świętokrzyskie Mts (59 species) (Łuszczyński 2001, 2007) and the Pojezierze Łęczyńsko-Włodawskie Lakeland (54 species) (Flisińska (1987/1988), but it is richer in species than that in the north Wielkopolska region (42 species) (Fiklewicz-Sobstyl 1965) and on Babia Góra Mt (29 species) (Bujakiewicz 1981). Its phytocoenoses in the study area and in other regions differ not only by the number of taxa but also by the species composition of fungi. The greatest number of the same taxa was recorded at the study sites and in the patches in the Pojezierze Łęczyńsko-Włodawskie Lakeland (22 species) as well as the Góry Świętokrzyskie Mts (21) while the smallest number on Babia Góra Mt (13). Species that occurred in phytocoenoses in all of these regions are *Arrhenia gerardiana, Galerina paludosa, Hypholoma elongatum, Lactarius rufus*, and *Russula emetica*.

The number of mycorrhizal fungi and fungi growing among mosses recorded in the study phytocoenoses of *Sphagnetum magellanici* and its patches in the above regions is similar. A small contribution of lignicolous fungi was recorded in the study patches (4 species) and the patches in the Wielkopolska region (3 species) and on Babia Góra Mt (1 species), while their number is considerable in the Góry Świętokrzyskie Mts (20 species) and in the Pojezierze Łęczyńsko-Włodawskie Lakeland (14 species). This is likely to be related mostly to the availability of suitable substrate on which wood-inhabiting fungi can develop.

The results of observations conducted in the *Eriophorum vaginatum-Sphagnum fallax* community in Pomerania differ considerably from those obtained in the Pojezierze Lubuskie Lakeland (Ślusarczyk 2004). Altogether 56 species of fungi were recorded in the community in the Pojezierze Lubuskie Lakeland while only 37 species were noted in Pomerania (cf. Appendix 1: Tab. A.2.8). Nineteen species are in common. The contribution of wood-inhabiting fungi in the phytocoenoses in Pomerania is small (2 species) while they are a dominant group in the Pojezierze Lubuskie Lakeland (22 species). This is influenced by the presence of large amounts of available dead wood which provides the substrate (Ślusarczyk 2004). The contribution of fungi belonging to other bioecological groups in the phytocoenoses of *Eriophorum vaginatum-Sphagnum fallax* is similar in both regions.

The richness of the biota of macroscopic fungi in the study patches of *Vaccinio uliginosi-Pinetum* and that in its patches in other regions of Poland (Nespiak 1959; Fiklewicz-Sobstyl 1965; Lisiewska 1978, 1979; Łuszczyński 2007) differ. The number of fungal species recorded in the study patches ranges between 32 and 65 (cf. Appendix 1: Tab. A.2.9.) while from 26 to 32 species were recorded in the Góry Świętokrzyskie Mts (Lisiewska 1978; Łuszczyński 2007), between 25 and 27 in the Białowieża National Park (Nespiak 1959), and 20 and 34 in north Wielkopolska (Fiklewicz-Sobstyl 1965).

The biota of macroscopic fungi in *Vaccinio uliginosi-Pinetum* in Pomerania also differs although a full comparative analysis is prevented by divergent formats of results presentation (Friedrich 1984, 1997; Bujakiewicz 1986) or methods used. A total number of 102 species were recorded in my investigations, 59 in the proposed Wilcze Uroczysko Olszanka reserve (Friedrich 1997), 48 in the Słowiński National Park (Bujakiewicz 1986), and 33 in the Puszcza Goleniowska Forest (Friedrich 1984).

The greatest mycological similarity is observed for phytocoenoses of *Vaccinio uliginosi-Pinetum* in Pomerania. The funga of the study patches of *Vaccinio uliginosi-Pinetum* is considerably similar to that of its patches in the proposed Wilcze Uroczysko Olszanka reserve (Friedrich 1997) and the Słowiński National Park (Bujakiewicz 1986) (44 and 36 species in common, respectively). Phytocoenoses in other regions in Poland (Nespiak 1959; Fiklewicz-Sobstyl 1965; Bujakiewicz 1975; Lisiewska 1978; Kałucka 1995) are mycologically considerably less similar to the study patches. The only exception is the Pojezierze Łęczyńsko-Włodawskie Lakeland (Flisińska 1987/1988), where 37 of the species occurring in the study patches were recorded. This was probably influenced by similar habitat conditions and a similar floristic composition of the phytocoenoses. The smallest number of the same species (11) was recorded in the study patches of *Vaccinio uliginosi-Pinetum* and its patches in the Lasy Pszczyńskie Forest (Bujakiewicz 1975) as well as the Jodły Łaskie reserve (Kałucka 1995). This can be explained not only by divergent climatic conditions but also by differences in the composition of plant species, mostly trees, forming these phytocoenoses.

The greatest species richness is observed for mycorrhizal fungi in the study patches of *Vaccinio uliginosi-Pinetum* (cf. Appendix 1: Tab. A.2.9), its patches in the Słowiński National Park (Bujakiewicz 1986), and other regions in Poland (Nespiak 1959; Fiklewicz-Sobstyl 1965; Bujakiewicz 1975; Lisiewska 1978; Flisińska 1987/1988; Kałucka 1995; Łuszczyński 2007). Species such as *Russula emetica, Lactarius rufus, Paxillus involutus, Amanita fulva*, and *Lactarius helvus*, fungi forming mycorrhizae with pine, occurred in the majority of these phytocoenoses. Lignicolous fungi predominate only in the phytocoenoses of this community in the proposed Wilcze Uroczysko Olszanka nature reserve (Friedrich 1997) and in the Puszcza Goleniowska Forest (Friedrich 1984), which is probably related to a high amount and the diversity of the substrate.

Many species of macroscopic fungi occurring in the study patches of *Vaccinio uliginosi-Pinetum* were also recorded in its phytocoenoses in other regions in Poland such as the vicinity of Głowno town (Rudnicka-Jezierska 1963), the Ziemia Chrzanowska region and Jaworzno town (Wojewoda 1973, 1979, 1981), and the Lasy Janowskie Landscape Park

(Flisińska 1997). These studies usually provide only lists of fungal species and a comparative analysis would not be viable.

The results of my investigations conducted in *Vaccinio uliginosi-Betuletum pubescentis* phytocoenoses in the study area mostly diverge from those obtained by Friedrich (1985/1986, 1997) in the Puszcza Goleniowska Forest and the proposed Wilcze Uroczysko Olszanka nature reserve and by Bujakiewicz (1986) in the Słowiński National Park. The number of species in the study patches ranges between 33 and 74 (cf. Appendix 1: Tab. A.2.10) while 78 species were noted in a single patch in the Słowiński National Park and 85 species in the Puszcza Goleniowska Forest. On the other hand, altogether 43 species of fungi were recorded in patches of *Vaccinio uliginosi-Betuletum pubescentis* in the proposed Wilcze Uroczysko Olszanka reserve (Friedrich 1997). The greatest number of species in common was recorded in its patches in the study area and the Puszcza Goleniowska Forest (46) and the Słowiński National Park (45).

Mostly mycorrhizal fungi (e.g., *Amanita fulva*, *Paxillus involutus*) and wood-inhabiting fungi (e.g., *Mycena galericulata*, *Piptoporus betulinus*) are the same fungal components in the above patches of *Vaccinio uliginosi-Betuletum pubescentis*. These groups of fungi are also the richest in species. This is related to the occurrence of the same tree species, mainly birch and pine, in the tree stands and the diversity and the availability of suitable substrate on which lignicolous fungi can develop. The study phytocoenoses of *Vaccinio uliginosi-Betuletum pubescentis* are distinguished by the occurrence of bryophilous fungi such as *Galerina tibiicystis* and *G. sphagnorum*, which form a fairly numerous group (13 species). This is influenced by a well-developed moss layer and a considerable contribution of sphagna in it.

The above comparative analysis of the effectes of this study and the results of previous mycosociological observations carried out in peatland communities in a variety of regions in Poland (Nespiak 1959; Fiklewicz-Sobstyl 1965; Lisiewska 1978, 1979; Bujakiewicz 1975, 1979, 1981, 1982; Friedrich 1985/1986, 1994, 1997; Flisińska 1987/1988; Kałucka 1995; Ślusarczyk 2004, 2007; Łuszczyński 2007) shows a considerable richness of the biota of macroscopic fungi in the majority of peatland communities in Pomerania.

5.2. Indicator value of macroscopic fungi in peatland communities

Peatland communities examined in this study differ by the composition of fungal species. Species of fungi that were recorded in only one of the communities constitute 49.7% (83 species) of all the taxa recorded. However, based on the observations conducted so far it is difficult to indicate species that could be treated as phytosociologically characteristic or differential of a community as the majority of fungi recorded in only one of the study communities have a low constancy or frequency, usually occurred in it sporadically and were not abundant (cf. Appendix 1: Tab. A.2.11). These species are also noted in non-peatland plant communities where they often grow more abundantly and reach a higher constancy. Therefore they do not have indicator value for the study communities because they do not meet one of the crucial criteria of characteristic species, that is fidelity (Wojewoda 1975; Adamczyk 1996).

It is often difficult to establish the attachment degree of individual species of fungi to a specific plant community as the mutual relationship that fungi and plant communities enter is versatile and largely depends on the entirety of ecological conditions that a plant community provides for fungi (Kornaś 1957; Nespiak 1959; Bujakiewicz 1982; Friedrich 1994). Many fungal species depend directly on a specific vascular plant species, for instance ectomycorrhizal fungi on a tree species, while only indirectly on the community in which they occur (Wojewoda 1975). Based on statistical analyses, five mycosociologico-ecological groups of fungal species were distinguished: four groups were identified depending on a specific phytocoenosis or a group of phytocoenoses with which they were associated and one group of fungal species with a broader ecological scale, recorded in all of the peatland communities examined here, was detected (cf. Fig. 7A, B & Tab. 3).

Galerina sphagnorum group (I), comprises *Galerina sphagnorum*, *Arrhenia gerardiana*, and *Ascocoryne turficola*. A considerable contribution of these fungal species was recorded in at least one of the non-forest peatland community: *Caricetum lasiocarpae, Caricetum rostratae, Caricetum limosae, Eriophoro angustifolii-Sphagnetum recurvi*, and *Rhynchosporetum albae*. Species of fungi that occur numerously and grow frequently in phytocoenoses of all of the study non-forest peatland communities, *Hypholoma elongatum, H. udum*, *Galerina paludosa, G. tibiicystis* and *Lyophyllum palustre*, and *Clavaria fragilis* (which was noted more often in the patches of *Sphagnetum magellanici* and the community *Eriophorum vaginatum-Sphagnum fallax*) belong to the *Hypholoma elongatum* group (II). Species of fungi that prefer strongly hydrated habitats, associated with mosses, especially with sphagna, forming fungal synusiae characteristic of peat-moss communities (Nespiak 1959; Stasińska & Sotek 2004a), were mostly classed in these two groups. Some fungal species, e.g., *Arrhenia gerardiana, Galerina paludosa, G. sphagnorum*, *Hypholoma elongatum*, *Lyophyllum palustre*, included in the two groups, were noted in patches of the same non-forest peatland communities in, for instance, the Puszcza Goleniowska Forest (Friedrich 1985/1986), the Cedynia Landscape Park (Friedrich 1994), on Babia Góra Mt (Bujakiewicz 1981), in the Pojezierze Łęczyńsko-Włodawskie Lakeland (Flisińska (1987/1988), and the Pojezierze Lubuskie Lakeland (Ślusarczyk 2004, 2007), and raised and transitional bogs in Denmark (Lange 1948), the Czech Republic (Kotlaba 1953), and Italy (Perini *et al.* 2002).

Two further groups (III. *Lactarius tabidus* and IV. *Russula emetica*) comprise species of fungi preferring weakly hydrated habitats that occur in forest peatland communities: *Vaccinio uliginosi-Betuletum pubescentis*, and *Vaccinio uliginosi-Pinetum* (cf. Fig. 7A, B & Tab. 3). The *Lactarius tabidus* group (III), consists of 43 species of fungi that grow primarily in phytocoenoses of *Vaccinio uliginosi-Betuletum pubescentis*. Birch-associated fungi, e.g. *Lactarius necator, L. tabidus*, *Piptoporus betulinus* and *Russula aeruginea*, and species with a broader ecological scale, e.g., *Gymnopus dryophilus, Pluteus cervinus*, and *Stereum hirsutum*, also recorded in a variety of deciduous forests such as oak-hornbeam forests or beech forests (Ławrynowicz 1973; Lisiewska 1965, 1974, 1978; Wojewoda 1975; Friedrich 1985/1986, 1994; Stasińska 1999; Łuszczyński 2007), belong to this group. The presence of macromycetes of meso- and eutrophic deciduous forests in the fungal biota of *Vaccinio uliginosi-Betuletum pubescentis* may be one of the factors indicative of a more mesotrophic nature of this community in comparison with *Vaccinio uliginosi-Pinetum*, as suggested by Matuszkiewicz W. (2001).

The *Russula emetica* group (IV), consists of 38 species of fungi recorded mostly in *Vaccinio uliginosi-Pinetum* phytocoenoses (cf. Fig. 7A, B & Tab. 3). However, the species cannot be regarded as closely associated with this community. The majority of them are also noted, sometimes commonly, in *Leucobryo-Pinetum* and mixed coniferous forests (*Querco roboris-Pinetum, Serratulo-Pinetum*), e.g., *Hygrophoropsis aurantiaca, Lactarius rufus, Russula emetica*, and *Strobilurus tenacellus* (Nespiak 1959; Bujakiewicz 1981; Friedrich 1994). The mycological dissimilarity of *Vaccinio uliginosi-Pinetum* is rather a result of habitat conditions in which its patches develop, which allows fungi preferring more oligotrophic and moist habitats, e.g. fungi attached to sphagna, to develop (Favre 1948; Lange 1948; Nespiak 1959; Lisiewska 1978; Bujakiewicz 1981; Flisińska 1987/1988; Salo 1993; Friedrich 1994, 1997).

5.3. The role of fungi in peatland communities

Fungi are an important component of each phytocoenosis. They closely depend on it and, at the same time, influence it by performing a range of functions in it (Kornaś 1957; Arnolds 1992). Saprotrophic fungi that take part in the decomposition of the organic matter, biotrophic fungi that form symbioses with plants, and necrotrophic fungi that parasitize living organisms, can be distinguished based on the functions related to their nutrition types (Arnolds 1992).

Of the bioecological groups of fungi identified in the peatland communities studied here, the closest relationship with forest phytocoenoses (*Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis*) is recorded for mycorrhizal fungi which, according to Lisiewska (1974), Bujakiewicz (1982), and Friedrich (1994), best characterize forest communities. Mycorrhizal fungi have a considerable contribution in both communities (37.2% in the coniferous forest and 31.4% in the birch forest). They are associated mostly with tree species dominant in each community: pine in *Vaccinio uliginosi-Pinetum* and birch in *Vaccinio uliginosi-Betuletum pubescentis*. The high contribution of mycorrhizal fungi in forest peatland communities is indicative of the good condition of the tree stands and normal biological relationships occurring in the phytocoenoses. According to Termorshuizen & Schaffers (1987), degeneration of populations of forest trees and fungi usually occurs simultaneously and is at the same time a symptom of a decrease in the number of fruit bodies and the disappearance of some mycorrhizal fungi, which may be an indication of a reduction in mycorrhizal abilities of the mycelium and also indirectly of a reduction in the biological condition of trees.

The contribution of mycorrhizal fungi in non-forest peatland communities depends on the presence of trees and shrubs in the phytocoenoses or close nearby. Mycorrhizal fungi occur in *Erico-Sphagnetum medii*, *Sphagnetum magellanici*, and the community *Eriophorum vaginatum-Sphagnum fallax* more frequently and numerously than in *Caricetum lasiocarpae, Caricetum limosae, Eriophoro angustifolii-Sphagnetum recurvi, Caricetum rostratae*, and *Rhynchosporetum albae*, which are largely treeless (Matuszkiewicz W. 2001). An increasing contribution of mycorrhizal fungi in non-forest peatland communities may be one of the first signs of adverse changes occurring in these phytocoenoses as the penetration of trees and their mycorrhizal partners into non-forested peat-moss communities affects habitat conditions (Jasnowski 1972; Jasnowska *et al.* 2000; Herbichowa *et al.* 2007).

Saprotrophic fungi that take part in the decomposition of the organic matter sometimes show a very high degree of nutritive preferences and specialization by developing on specific substrates, sometimes regardless of the plant community in which they develop (Lisiewska 1974; Friedrich 1994) such as saprotrophic fungi growing among mosses, and especially species associated with sphagna, e.g., *Galerina paludosa* and *G. tibiicystis*. They were recorded in all of the peatland communities. Fungi growing among mosses are a dominant group, both qualitatively and quantitatively, in *Rhynchosporetum albae* (50%)

and *Caricetum rostratae* (46.7%). Species belonging to this group also have a considerable contribution in *Caricetum limosae* (32%) and *Eriophoro angustifolii-Sphagnetum recurvi* (31%) (cf. Fig. 3B).

A close correlation with the substrate on which they grow is also recorded for wood-inhabiting saprotrophic fungi. The frequency and abundance of their occurrence depends on the substrate type and its decomposition degree (Kreisel 1961b; Lisiewska 1974; Wojewoda 1975). Over 75% of species of lignicolous fungi recorded in the communities occur on birch wood whose abundance encourages their occurrence. On the other hand, less than 25% of species of fungi colonize pine wood. Lignicolous fungi mainly occurred in forest peatland communities (in *Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis*), occurred sporadically in *Erico-Sphagnetum medii*, *Sphagnetum magellanici* and the community *Eriophorum vaginatum-Sphagnum fallax*, and did not occur in other non-forest peatland communities (cf. Fig. 3A, B).

Only *Lyophyllum palustre,* parasitizing sphagna, plays an important role in the peatland communities in the small group of parasitic fungi (7.2%) as it occurs frequently and in a high number, especially in non-forest peatland communities.

5.4. Environmental factors and macromycete diversity in peatland phytocoenoses

The occurrence of macromycetes is closely related to and affected by a variety of abiotic factors (e.g., climatic factors, soil properties) and biotic factors, e.g., the species composition of plant communities, relationships between fungi and specific plant species (Nespiak 1959; Gumińska 1962; Wojewoda 1975; Lisiewska 1978; Bujakiewicz 1981, 1982; Friedrich 1985/1987, 1994; Łuszczyński 2007). The results of this study also indicate important correlations between the occurrence of fungal species and selected factors of the environment such as the humidity and reaction (pH) of the substrate as well as its chemical properties (cf. chapter 4.7).

Like vascular plants, species that prefer specific pH values and react differently to its changes can be distinguished among fungi (Hung & Trappe 1983; Dennis 1985; Tyler 1989; Watling 1995; Ferris *et al.* 2000). A negative correlation between the total number of fungi (including the number of mycorrhizal fungi, saprotrophic fungi growing on peat and litter-inhabiting saprotrophic fungi) and substrate reaction (pH) was recorded in the study communities. Additionally, the occurrence of specific species of fungi is largely determined by their pH requirements (cf. chapter 4.7).

Substrate humidity is another factor that affects the diversity of fungi in individual vegetation patches (cf. chapter 4.7). Species preferring greater moisture content of the substrate include mostly bryophilous fungi, e.g., *Hypholoma elongatum*, occurring numerously primarily in non-forest peatland communities such as *Rhynchosporetum albae* and *Eriophoro angustifolii-Sphagnetum recurvi*, some mycorrhizal fungi, e.g. *Inocybe lanuginosa* and *Russula paludosa*, and litter-inhabiting saprotrophic fungi, e.g., *Mycena cinerella*, occurring more frequently in *Vaccinio uliginosi-Pinetum* or *Erico-Sphagnetum medii*. Weakly humid substrates are preferred by many mycorrhizal fungi, e.g., *Russula aeruginea* and *Lactarius pubescens*, growing primarily in *Vaccinio uliginosi-Betuletum pubescentis*.

Periodic drying of the phytocoenoses, mostly belonging to communities usually occupying more humid habitats, e.g., *Caricetum lasiocarpae* and *Sphagnetum magellanici*, has an important effect on the diversity of fungi in the peatland communities. The dried-out top layer of the substrate does not encourage the development of fungal species preferring humid substrates while mycorrhizal and litter-inhabiting fungi occur then more commonly. Periodic flooding of vegetation patches also plays a role. Stagnating water inhibits the development of fungi even of species preferring greater moisture content of the substrate. Similar observations were made by Nespiak (1959) in peatland communities in the Białowieża National Park, Bujakiewicz (1986) in the Słowiński National Park, and Ślusarczyk (2004, 2007) in a peatland of the Pojezierze Lubuskie Lakeland.

Raised and transitional bogs are ecosystems poor in nutrient compounds, especially in nitrogen and phosphorus. The diversity of fungi occurring in the peatland communities in the study area also depends on the substrate's chemical properties (cf. chapter 4.7.). Positive correlation coefficients were detected between the total number of species of fungi (including the number of mycorrhizal fungi, saprotrophic fungi growing on peat and litter-inhabiting saprotrophic fungi) and the content of phosphorus and different nitrogen forms in the substrate. On the other hand, the correlation between these factors (the content of phosphorus and different nitrogen forms in the substrate) and the number of species growing among mosses is weakly negative or is absent (cf. chapter 4.7.). However, it is difficult to explain unequivocally the influence of these factors on the occurrence of individual groups of fungi. This is caused by, for instance, the fact that individual species of ectomycorrhizal species of fungi can prefer different forms of nitrogen depending on the type of nitrogen metabolism while forming mycorrhizae (Rudawska 1998). A range of ectomycorrhizal species of fungi also have different tolerance to a high or low nitrogen content in the substrate (Kranabetter *et al.* 2008). The substrate's chemical properties, and especially the availability of different nitrogen forms, play an important role in the production of fruit bodies (Ferris *et al.* 2000). In experiments conducted in transitional bogs in Finland, Salo (1979) showed that an increase in the content of nitrogen and phosphorus in the substrate (caused by fertilization) influenced an increase in fruit-body production by mycorrhizal and saprotrophic fungi. At the same time, many researchers have noticed a reduction in the number of species and fruit bodies of ectomycorrhizal fungi in coniferous forests caused by a high nitrogen content in the substrate (Ohenoja 1988; Termorshuizen 1993; Baar 1996).

The canonical correspondence analysis showed that the majority of the non-forest peatland communities were characterized by similar habitat conditions (cf. Fig. 9 & 10A, B). This is reflected by the small number of recorded taxa and a similar species composition of fungi (cf. chapter 4.1). Divergent habitat conditions are observed in forest peatland communities, *Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis*. The lowest pH and substrate moisture content values were recorded in the patches of these communities (cf. Fig. 9 & 10A, B), which encourages the development of fungi and is confirmed by the high number of recorded taxa (cf. chapter 4.2), sometimes several times higher than that recorded in the non-forest peatland communities.

Tree penetration, mostly by *Pinus sylvestris*, *Betula pubescens* and *B. pendula*, into treeless (open) peat-moss communities has a considerable influence on the species composition of fungi in peatland phytocoenoses, especially non-forest ones. This contributes to a considerable increase in the diversity of the species composition of fungi because mycorrhizal partners, e.g., *Laccaria proxima*, *Lactarius helvus* and *Russula emetica*, begin to occur in the phytocoenoses of peatland communities together with trees. This is consistent with observations conducted in raised and transitional bogs near Królewiec and Poznań by Neuhoff (1922, 1928), in the Białowieża National Park by Nespiak (1959), Switzerland by Favre (1948), Denmark by Lange (1948), the Czech Republic by Kotlaba (1953), north Germany by Kreisel (1954, 1961a), Finland by Salo (1993), and Italy by Perini *et al.* (2002). Peatland overgrowing by trees and forest development, together with the lowering of the water level, leads to changes in habitat conditions (Jasnowski 1972; Herbichowa & Jąkalska 1985; Jasnowska *et al.* 2000; Stasińska *et al.* 2004; Herbichowa *et al.* 2007; Budyś 2008). Consequently, this may contribute to the recession of species of fungi associated with mosses, and especially with sphagna, e.g., *Galerina paludosa* and *Lyophyllum palustre*, and a more numerous and frequent occurrence of species with a broader ecological scale (Ślusarczyk 2007).

6. SUMMARY OF RESULTS AND CONCLUSIONS

- Investigations into macroscopic fungi of raised and transitional bogs in Pomerania spanned a period of 10 years and were carried out at 134 sites (71 raised bogs and 63 transitional bogs) in 9 non-forest peatland communities: *Caricetum lasiocarpae, Caricetum limosae*, *Caricetum rostratae*, *Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae*, *Erico-Sphagnetum medii*, *Sphagnetum magellanici*, and the community *Eriophorum vaginatum-Sphagnum fallax*, and 2 forest communities: *Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis*. Mycological observations in *Caricetum rostratae* and *Erico-Sphagnetum medii* were conducted in Poland for the first time.
- A total of 191 species of macroscopic fungi were recorded in raised and transitional bogs in the study area, including 167 taxa noted at 108 permanent research plots. The occurrence of 5 protected species of fungi (e.g., *Bovista paludosa, Suillus flavidus*), 31 taxa of red-listed macromycetes (e.g. *Hygrocybe coccineocrenata* and *Lyophyllum palustre*), and a few species very rarely recorded in Poland (e.g., *Armillaria ectypa* and *Leccinum variicolor*) is of special value and makes this funga highly interesting. The analysis of the contribution of these species shows that raised and transitional bogs are crucial in preserving the resources of the macromycete biota.
- The distribution of 21 species of peatland fungi in Pomerania was mapped and is presented as cartograms. As the mycology of raised and transitional bogs is poorly recognized, the cartograms provide only introductory information on the distribution of peatland fungi in Pomerania and may be used as the basis of further and/or future studies.
- Peatland communities poor in fungi in the study area include *Rhynchosporetum albae* (12 species recorded at 13 plots) and *Caricetum rostratae* (15 species recorded at 8 plots). *Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis* were the richest communities in fungi (102 and 121 species at ten plots, respectively). The number of species of macroscopic fungi recorded in individual peatland communities varies. It depends on the community type and is not dependent on the number of observations and the number and the total area of research plots.
- Peatland communities in the study area differ by species composition of their funga. However, based on the observations conducted so far, it is difficult to indicate those species that can be treated as phytosociologically characteristic or differential of a community as they do not meet the basic criterion of fidelity of characteristic species.
- Of biological groups of fungi distinguished in peatland communities in the study area, the closest relationships with forest phytocoenoses are recorded for mycorrhizal fungi. A considerably lower relationship with specific plant communities was observed for

saprotrophic fungi that are attached to a specific substrate rather than to a community. This is especially evident for saprotrophic fungi growing among mosses, and in particular for fungi associated with *Sphagnum* mosses which occurred in all of the communities. Similar correlations were also observed for parasitic fungi that, such as *Lyophyllum palustre*, are associated with a specific host.

- Of non-forest peatland communities, the greatest mycological similarity is recorded between *Rhynchosporetum albae* and *Caricetum rostratae* (the similarity coefficient 89%) as well as *Caricetum limosae* and *Caricetum lasiocarpae* (83%). *Erico-Sphagnetum medii* and *Rhynchosporetum albae* were the least similar communities (33%). A considerable similarity of the biota of macroscopic fungi was observed for forest peatland communities, *Vaccinio uliginosi-Pinetum* and *Vaccinio uliginosi-Betuletum pubescentis* (60%).
- Five mycosociologico-ecological groups of macroscopic fungi species were distinguished. Four of these groups comprise species of fungi that are attached to a specific phytocoenosis or a group of phytocoenoses. The fifth group consists of species having a broader ecological scale, recorded in the majority of the communities.
- An analysis of the influence of environmental conditions on the occurrence of macroscopic fungi in the peatland communities shows that:
  - the majority of environmental variables describing chemical properties, humidity and pH of the substrate have a statistically significant ($p < 0.05$) influence on the diversity of macromycete species in peatland communities in the study area;
  - periodic phytocoenosis drying has a high impact on fungal diversity. This is observed primarily in the communities that occupy usually more humid habitats (e.g., *Caricetum lasiocarpae* and *Sphagnetum magellanicum*) as the dried-out upper surface does not encourage the development of fungi that prefer a greater moisture content of the substrate;
  - periodic flooding of vegetation patches affects the diversity of fungi as stagnating water inhibits the development of fungi, even of species that prefer substrates having a greater moisture content.

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8. GRZYBY MAKROSKOPOWE TORFOWISK WYSOKICH I PRZEJŚCIOWYCH POMORZA (streszczenie)

Cel badań. Celem głównym pracy jest poznanie bogactwa i różnorodności gatunkowej grzybów makroskopowych torfowisk wysokich i przejściowych Pomorza oraz określenie zależności między grzybami makroskopowymi a występujacymi tu zbiorowiskami torfowiskowymi na tle warunków środowiskowych. Realizacji celu głównego były podporządkowane

następujace zadania szczegółowe: (1) poznanie bioty grzybów makroskopowych (macromycetes) torfowisk wysokich i przejściowych na podstawie składu gatunkowego grzybów wielkoowocnikowych zbiorowisk torfowiskowych nieleśnych i leśnych; (2) poznanie stosunków mikocenologicznych w wybranych zbiorowiskach torfowiskowych nieleśnych i leśnych; (3) próba określenia wartości wskaźnikowej grzybów oraz wyróżnienia grup gatunków diagnostycznych dla poszczególnych fitocenoz lub grup fitocenoz; (4) określenie udziału i roli grup bioekologicznych grzybów w badanych zbiorowiskach torfowiskowych nieleśnych i leśnych; (5) określenie wpływu wybranych czynników środowiska na występowanie grzybów torfowiskowych i ich różnorodność gatunkową; (6) poznanie rozmieszczenia wybranych gatunków grzybów torfowiskowych na Pomorzu.

Teren badań. Badaniami objęto obszar Pomorza o powierzchni 52 tys. km kw. położony w północno-zachodniej części Polski. Jego granicę północną wyznacza brzeg Morza Bałtyckiego, południową – rzeki Warta i Noteć wraz z Kanałem Noteckim, zachodnią – granica państwa z Niemcami, a wschodnią – rzeka Wisła (Fig. 1).

Współczesna rzeźba terenu badań jest efektem bezpośredniej i pośredniej działalności lądolodu skandynawskiego podczas ostatniego zlodowacenia bałtyckiego. Charakterystycznym elementem krajobrazu są wzgórza w kształcie wałów i kopulaste pagóry moreny czołowej osiągające wysokość 167 m n.p.m w okolicach Cedyni i 329 m n.p.m – w okolicach Kartuz (Wieżyca). Przez środkową część regionu, wzdłuż wału moreny czołowej, przebiega dział wodny rozdzielający rzeki należące do dorzeczy Odry i Wisły od rzek uchodzących wprost do Morza Bałtyckiego. Obszar Pomorza podlega wpływom klimatu oceanicznego i charakteryzuje się dużą różnorodnością warunków klimatycznych. W części zachodniej i południowej średnia roczna suma opadów wynosi 550-600 mm, a w części północno-wschodniej – 650-700 mm. Średnia roczna temperatura powietrza wynosi 8,5°C w części zachodniej i 7,5°C – w części wschodniej regionu.

Torfowiska wysokie, jeden z typów torfowsk objętych badaniami, występują najczęściej na obszarach wododziałowych; największe z nich, tzw. torfowiska kopułowe typu bałtyckiego rozwijają się przeważnie w strefie przymorskiej Pomorza. Torfowiska przejściowe, drugi z typów torfowisk uwzględniony w badaniach, znajdują się na obszarach młodoglacjalnych i rzadko zajmują większe powierzchnie. Na Pomorzu najliczniej występują w Borach Tucholskich, na Równinie Charzykowskiej oraz na Pojezierzach Bytowskim i Drawskim.

Na torfowiskach przejściowych, spośród zbiorowisk torfowiskowych nieleśnych badano *Caricetum lasiocarpae, C. limosae*, *C. rostratae, Eriophoro angustifolii-Sphagnetum recurvi* i *Rhynchosporetum albae*. *Caricetum lasiocarpae* wykształca się w wilgotnych obniżeniach torfowisk, często tworzy darnie lub kożuchy pływające na powierzchni zarastających jezior. *Caricetum limosae* rozwija się na siedliskach wilgotnych, na zarastających dystroficznych i oligotroficznych jeziorach, jest składnikiem pływającego pła; występuje także w podtopionych dolinkach na torfowiskach wysokich. *Caricetum rostratae* rośnie w miejscach z wysokim poziomem wody, najczęściej nad brzegami zarastających jezior, na obrzeżach torfowisk oraz w zarastających rowach i dołach poeksploatacyjnych. *Eriophoro angustifolii-Sphagnetum recurvi* rozwija się w miejscach zawsze silnie uwodnionych; występuje w obniżeniach na torfowiskach, nad brzegami dystroficznych jezior oraz w zarastających dołach potorfowych. *Rhynchosporetum albae* wykształca się na odsłoniętym torfie w wilgotnych zagłębieniach torfowisk, nad brzegami dystroficznych jezior oraz w wyrobiskach poekploatacyjnych. Spośród zbiorowisk wysokotorfowiskowych nieleśnych badano *Erico-Sphagnetum medii*, *S. magellanici* i zbiorowisko *Eriophorum vaginatum-Sphagnum fallax*. *Erico-Sphagnetum medii* rozwija się przede wszystkim na torfowiskach wysokich położonych w strefie przymorskiej regionu, głównie w miejscach dawniej eksploatowanych, wyniesionych, ze zmiennym poziomem uwodnienia. *Sphagnetum magellanici*, w zależności od warunków siedliskowych, wykształca się w podzespołach: typowym lub z udziałem karłowatej sosny. Zbiorowisko *Eriophorum vaginatum-Sphagnum fallax* na większości zbadanych obiektów rośnie w miejscach o zmiennym poziomie uwodnienia, niekiedy podlega okresowemu krótkotrwałemu podsuszeniu.

Na badanych torfowiskach obecne są także leśne zbiorowiska torfowiskowe – *Vaccinio uliginosi-Pinetum* i *Vaccinio uliginosi-Betuletum pubescentis*. Fitocenozy sosnowego boru bagiennego rozwijają się najczęściej w lokalnych bezodpływowych zagłębieniach lub wchodzą w skład rozległych kompleksów torfowiskowych, płaty brzeziny bagiennej zaś wykształcają się na peryferiach badanych obiektów bądź w centralnych ich częściach, w basenach pojeziornych.

Materiał i metody. Obiektem badań były grzyby makroskopowe z gromady workowców – Ascomycota i rzędów Helotiales, Leotiales, Pezizales, Hypocreales, Xylariales oraz podstawczaków – Basidiomycota i rzędów Ustilaginales, Dacrymycetales, Tremellales, Agaricales, Boletales, Cantharellales, Geastrales, Gomphales, Hymenochaetales, Polyporales, Russulales i Thelephorales, rosnące na torfowiskach wysokich i przejściowych Pomorza. Podstawą opracowania były badania terenowe prowadzone w latach 1999-2009 na obszarze 134 torfowisk – na 71 torfowiskach wysokich i 63 torfowiskach przejściowych (Tab. 1; Fig. 1).

Metoda stałych powierzchni. Badania mikosocjologiczne prowadzono na 108 stałych powierzchniach obserwacyjnych, na których wykonano zdjęcia fitosocjologiczne roślinności klasyczną metodą Braun-Blanqueta i zestawiono w tabelach, oddzielnie dla każdego z badanych zbiorowisk torfowiskowych (Appendix 1: Tabele A.1.1-A.1.10). W ośmiu zbiorowiskach torfowiskowych nieleśnych (*Caricetum lasiocarpae*, *C. limosae*, *C. rostratae*, *Erico-Sphagnetum medii*, *Eriophoro angustifolii-Sphagnetum recurvi*, *Rhynchosporetum albae*, *Sphagnetum magellanici* i zbiorowisku *Eriophorum vaginatum-Sphagnum fallax*) wyznaczono łącznie 88 powierzchni obserwacyjnych o wielkości od 40 do 400 m kw., natomiast w dwóch zbiorowiskach torfowiskowych leśnych (*Vaccinio uliginosi-Pinetum* i *Vaccinio uliginosi-Betuletum*) wyznaczono łącznie 20 powierzchni o wielkości 400 m kw. (z wyjątkiem jednej powierzchni o wielkości 300 m kw.).

Obserwacje mikosocjologiczne wykonywano średnio raz w miesiącu, od kwietnia do listopada, w ciągu 3-4 sezonów wegetacyjnych. Na każdej powierzchni przeprowadzono od 10 do 26 obserwacji. Uzyskane wyniki ujęto w tabele (Appendix 1: Tabele A.2.1-A.2.10) przedstawiające udział grzybów makroskopowych w poszczególnych zbiorowiskach torfowiskowych. W pracy przyjęto podział grzybów na trzy grupy bioekologiczne: grzyby mikoryzowe, saprotroficzne i pasożytnicze. Dla gatunków o krótkotrwałych owocnikach podano liczbę notowań oraz obfitość występowania (w indeksie górnym) według skali Jahna *et al.* (1967), natomiast dla gatunków o trwałych owocnikach podano liczbę sezonów wegetacyjnych, w których obserwowano ich żywe owocniki.

Metoda marszrutowa. Materiał zbierany był również przy użyciu metody marszrutowej w tych samych zbiorowiskach torfowiskowych, w których wyznaczono stałe powierzchnie do badań mikosocjologicznych. Obserwacje metodą marszrutową prowadzono na 134 torfowiskach, przeważnie 2-3 razy w ciągu roku przez okres 1-3 lat.

Analiza chemiczna. Parametry siedliska określano na podstawie analiz chemicznych prób podłoża pobranych ze 108 stałych powierzchni obserwacyjnych. W próbach podłoża oznaczono: zawartość fosforu, azotu amonowego, azotanowego i azotynowego oraz odczyn i wilgotność (por. Tab. 2).

Metoda porównawcza. W celu określenia zależności między grzybami makroskopowymi a badanymi zbiorowiskami torfowiskowymi posłużono się metodą syntetyczno-porównawczą (Bujakiewicz 1981, 2008).

Metody numeryczne. Dane mikologiczne (grzyby) poddano uporządkowaniu metodą nietendencyjnej analizy zgodności DCA (ter Braak & Šmilauer 2002; Dzwonko 2007). Na uzyskane uporządkowanie zdjęć mikosocjologicznych i gatunków grzybów narzucono ich klasyfikację syntaksonomiczną według W. Matuszkiewicza (2001) oraz wyodrębniono pięć grup mikosocjologiczno-ekologicznych gatunków grzybów. Dla określenia związków pomiędzy występowaniem gatunków grzybów a warunkami siedliskowymi ich bytowania zastosowano metodę kanonicznej analizy zgodności CCA (ter Braak 1986), z wykorzystaniem programu CANOCO. Uzyskane wyniki obliczeń przedstawiono graficznie przy użyciu programu CANODRAW (ter Braak & Šmilauer 2002). Dodatkowo, dla określenia gradientów zmienności pH i Hum (wilgotność podłoża) na płaszczyźnie powierzchni zastosowano uogólniony model liniowy GLM (Mc Cullagh & Nelder 1983) z wykorzystaniem rozkładu Gaussa i opcji stopniowania potęgowego, implementowany w programie CANODRAW. W celu określenia stopnia podobieństwa mikologicznego badanych zbiorowisk roślinnych zastosowano współczynnik podobieństwa (P) według wzoru Jaccarda i Steinhausa (Nespiak 1959; Krebs 2001).

Metoda kartograficzna. Kartogramowe mapy rozmieszczenia 21 gatunków grzybów torfowiskowych (Appendix 3) wykonano w systemie siatki kwadratów ATPOL (Zając 1978), w modyfikacji mikologicznej (Wojewoda 2000). Za podstawową jednostkę kartogramu przyjęto kwadrat 5 × 5 km.

Wyniki i wnioski

- Biota grzybów makroskopowych badanych torfowisk wysokich i przejściowych liczy łącznie 191 gatunków (por. Appendix 2), przy czym na 108 stałych powierzchniach obserwacyjnych odnotowano 167 taksonów. Jej walory podnosi obecność pięciu gatunków grzybów prawnie chronionych (np. *Bovista paludosa*, *Suillus flavidus*) i 31 taksonów zagrożonych ujętych w czerwonej liście grzybów wielkoowocnikowych (np. *Hygrocybe coccineocrenata* i *Lyophyllum palustre*) oraz kilku gatunków (m.in. *Armillaria ectypa* i *Leccinum variicolor*) bardzo rzadko notowanych w Polsce. Analiza ich udziału w zbiorowiskach torfowiskowych wykazała duże znaczenie torfowisk wysokich i przejściowych w zachowaniu zasobów cennej bioty macromycetes.
- W płatach *Caricetum rostratae* i *Erico-Sphagnetum medii* obserwacje mikosocjologiczne prowadzono po raz pierwszy w Polsce.
- Do najuboższych w grzyby fitocenoz torfowiskowych należą *Rhynchosporetum albae* (12 gatunków) i *Caricetum rostratae* (15), a do najbogatszymi w grzyby – *Vaccinio uliginosi-Pinetum* i *Vaccinio uliginosi-Betuletum* (odpowiednio 102 i 121) (Appendix 1: Tab. A2.11). Stwierdzono, że liczba gatunków grzybów makroskopowych odnotowanych w poszczególnych zbiorowiskach torfowiskowych jest różna i nie zależy od liczby obserwacji oraz od liczby i łącznego areału stałych powierzchni, lecz od typu zbiorowiska.
- Zbadane zbiorowiska torfowiskowe różnią się między sobą składem gatunkowym grzybów. Wśród odnotowanych taksonów, 49,7% (83 gatunki) stanowią grzyby, które występowały tylko w jednym z badanych zbiorowisk, przy czym stwierdzone zostały jedynie

w czterech z dziesięciu fitocenoz. W *Caricetum limosae* i *Erico-Sphagnetum medii* odnotowano odpowiednio 2 i 6 gatunków, natomiast w *Vaccinio uliginosi-Pinetum* i *Vaccinio uliginosi-Betuletum* – odpowiednio 27 i 48. Na podstawie dotychczasowych obseracji trudno jest jednak wskazać gatunki, które można by uznać za charakterystyczne lub wyróżniające dany zespół w znaczeniu fitosocjologicznym, ponieważ nie spełniają one jednego z podstawowych warunków, jakim dla gatunków charakterystycznych jest wierność.

- Udział bioekologicznych grup grzybów w zbiorowiskach torfowiskowych jest zróżnicowany (Fig. 3A, B). We wszystkich zbiorowiskach dominują grzyby saprotroficzne, które stanowią od 52% (13 gatunków) w *Caricetum limosae* do 66,7% w *Rhynchosporetum albae* (8) i *Caricetum rostratae* (10) łącznej liczby gatunków grzybów odnotowanych w tych fitocenozach. Znaczny też jest udział grzybów mikoryzowych – od 25% (3 gatunki) w *Rhynchosporetum albae* do 40,5% (15) w zbiorowisku *Eriophorum vaginatum-Sphagnum fallax* i 40,7% (22) w *Erico-Sphagnetum medii*, natomiast udział gatunków pasożytniczych waha się od 3,7% (2 gatunki) w *Erico-Sphagnetum medii* do 16% (4) w *Caricetum limosae*. W wyróżnionych grupach bioekologicznych najbardziej zróżnicowany jest udział grzybów saprotroficznych (Fig. 3A, B). Grzyby briofilne procentowo dominują w *Rhynchosporetum albae* (50%) i *Caricetum rostratae* (46,6%) nad grzybami rosnącymi na mchach w *Vaccinio uliginosi-Pinetum* (11,7%) i *Vaccinio uliginosi-Betuletum* (10,7%). Grzyby nadrzewne obserwowano tylko w pięciu z dziesięciu badanych zbiorowisk, przy czym udział liczbowy i procentowy tej grupy grzybów jest znaczący tylko w fitocenozach leśnych – *Vaccinio uliginosi-Betuletum* (39 gatunków, 32,2%) i *Vaccinio uliginosi-Pinetum* (20, 19,6%). Grzyby saprotroficzne rosnące na torfie stanowią niezbyt liczną grupę lub jest ich brak (w *Rhynchosporetum albae* i *Caricetum rostratae*), gdyż z reguły prawie całe powierzchnie płatów zajmują torfowce.
- Spośród wyróżnionych bioekologicznych grup grzybów, w odniesieniu do badanych zbiorowisk torfowiskowych silne powiązania z fitocenozami leśnymi wykazują grzyby mikoryzowe. Znacznie słabsze powiązania z określonym zbiorowiskiem roślinnym wykazują grzyby saprotroficzne, które przywiązane są bardziej do określonego podłoża niż do zbiorowiska. Najwyraźniej zaznacza się to w przypadku grzybów saprotroficznych rosnących wśród mchów, a zwłaszcza dotyczy to grzybów związanych z torfowcami, które występowały we wszystkich badanych zbiorowiskach. Podobne powiązania, jak w przypadku grzybów saprotroficzncyh obserwowano także wśród grzybów pasożytniczych, które (jak np. *Lyophyllum palustre*) związane są z określonym żywicielem.
- Spośród badanych fitocenoz torfowiskowych nieleśnych najbardziej zbliżone do siebie pod względem mikologicznym są *Rhynchosporetum albae* i *Caricetum rostratae* (współczynnik podobieństwa wynosi 89%) oraz *Caricetum limosae* i *Caricetum lasiocarpae* (83%), najmniej zaś – *Erico-Sphagnetum medii* i *Rhynchosporetum albae* (33%). Znaczne podobieństwo bioty grzybów makroskopowych wykazują zbiorowiska torfowiskowe leśne – *Vaccinio uliginosi-Pinetum* i *Vaccinio uliginosi-Betuletum* (60%).
- Wyróżniono pięć grup mikosocjologiczno-ekologicznych gatunków grzybów makroskopowych (Fig. 7A, B; Tab. 3): **grupa I *Galerina sphagnorum*** – obejmuje taksony preferujące siedliska silnie uwodnione, okresowo podtapiane, związane głównie ze zbiorowiskami torfowiskowymi nieleśnymi, m.in. *Caricetum limosae, C. rostratae, Eriophoro angustifolii-Sphagnetum recurvi, Rhynchosporetum albae*; **grupa II *Hypholoma elongatum*** – skupia gatunki grzybów występujące na siedliskach silnie uwodnionych, związane głównie ze zbiorowiskami torfowiskowymi nieleśnymi, m.in. *Caricetum limosae, C. rostratae,*

Eriophoro angustifolii-Sphagnetum recurvi, *Erico-Sphagnetum medii, Sphagnetum magellanici*, zbiorowisko *Eriophorum vaginatum-Sphagnum fallax*,; **grupa III *Lactarius tabidus*** – obejmuje gatunki preferujące siedliska słabo uwodnione, występujące przede wszystkim w płatach *Vaccinio uliginosi-Betuletum*; **grupa IV *Russula emetica*** **–** skupia gatunki grzybów występujące na siedliskach słabo uwodnionych, głównie w płatach *Vaccinio uliginosi-Pinetum*; **grupa V *Lactarius helvus*** **–** obejmuje gatunki grzybów o szerokiej skali ekologicznej, występujące w zbiorowiskach torfowiskowych nieleśnych i leśnych.

- Analizując wpływ czynników środowiska na występowanie grzybów makroskopowych w badanych zbiorowiskach torfowiskowych stwierdzono, że:
  - większość rozpatrywanych zmiennych środowiskowych dotyczących właściwości chemicznych, wilgotności i wartości odczynu podłoża wykazuje statystycznie istotny ($p < 0.05$) wpływ na różnorodność gatunkową grzybów makroskopowych w badanych zbiorowiskach torfowiskowych;
  - duży wpływ na różnorodność grzybów ma okresowe podsuszenie płatów zbiorowisk, np. *Caricetum lasiocarpae* i *Sphagnetum magellanicum,* zajmujących z reguły wilgotniejsze siedliska, ponieważ przesuszona górna warstwa podłoża nie sprzyja rozwojowi grzybów preferujących większe uwilgotnienie podłoża;
  - na różnorodność grzybów wpływa okresowe podtopienie płatów roślinności, ponieważ stagnująca woda hamuje rozwój grzybów, nawet gatunków preferujących większe uwilgotnienie podłoża.
- W pracy przedstawiono charakterystykę ekologiczno-geograficzną 21 gatunków grzybów torfowiskowych, dla których sporządzono mapy kartogramowe ich rozmieszczenia na Pomorzu (Appendix 3). Ze względu na rozpoznanie mikologiczne dotyczące części torfowisk wysokich i przejściowych tego regionu dają one wstępną orientację o rozmieszczeniu grzybów torfowiskowych na Pomorzu i mogą stanowić punkt wyjścia do dalszych badań.

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Appendix 1

Vegetation and macroscopic fungi at the research plots

Table A.1.1
Caricetum limosae

Successive number	1	2	3	4	5	6	7	8	9	10	11	12	13	Constancy
Plot number	B2a	B7	Ch1	Ka1	Śc1a	Ch2	SD3	Ka9	B8	Z6	Ka5	SD4	Śc4	
Localities	B	B	Ch	Ka	Śc	Ch	SD	Ka	B	Z	Ka	SD	Śc	
Day	27	20	31	20	22	31	15	28	20	01	28	15	19	
Month	05	06	07	07	06	07	06	07	06	07	07	06	06	
Year	2003	2000	2001	2003	2002	2001	2004	2001	2000	1999	2001	2004	2001	
Density of shrub layer b (%)	5	5	5	-	-	-	-	-	5	5	-	-	-	
Cover of herb layer c (%)	60	70	85	70	50	60	50	80	80	85	80	50	80	
Cover of moss layer d (%)	70	70	60	60	60	60	90	90	80	80	80	70	60	
Plot area (m^2)	100	70	100	100	100	80	60	50	60	100	60	70	180	
Total number of species in a relevé	13	14	11	12	11	11	13	12	13	13	10	12	14	
including: vascular plants	8	9	8	7	7	8	10	7	8	8	7	8	10	
cryptogamic plants	5	5	3	5	4	3	3	5	5	5	3	4	4	
Ch. *Caricetum limosae*														
Scheuchzeria palustris	4.4	3.3	3.3	4.4	3.3	3.3	1.1	1.2	1.1	3.3	4.4	1.1	4.4	V
Carex limosa	1.1	1.1	.	+	1.1	1.1	3.3	4.4	4.4	.	1.1	3.3	2.2	V
Ch. *Rhynchosporion albae, Scheuchzerietalia palustris*														
Sphagnum cuspidatum d	1.1	3.3	+	1.1	1.1	+	+	2.2	1.1	+	.	1.1	2.2	V
Rhynchospora alba	.	.	+	.	.	+	+	+	+	.	.	.	.	II
Ch. *Scheuchzerio-Caricetea nigrae*														
Eriophorum angustifolium	1.1	+	2.2	1.1	1.1	2.2	+	.	1.1	2.2	1.1	1.1	+	V
Straminergon stramineum d	+	1.1	+	.	+	+	1.1	.	1.1	1.1	.	1.1	.	IV
Warnstorfia fluitans d	.	+	.	.	.	.	.	.	1.1	+	.	.	1.1	II
Menyanthes trifoliata	.	1.1	.	.	.	.	.	+	.	.	.	.	.	I
Comarum palustre	.	+	.	.	.	.	.	.	.	.	.	+	.	I
Ch. *Oxycocco-Sphagnetea*														
Oxycoccus palustris	2.2	2.2	4.4	2.2	2.2	3.3	1.1	3.3	1.1	4.4	3.3	2.2	2.2	V
Drosera rotundifolia	1.1	+	+	+	+	1.1	1.1	+	+	2.2	+	1.1	1.1	V
Sphagnum magellanicum d	1.1	1.2	.	.	1.1	.	.	.	1.2	1.1	.	.	2.2	III
Aulacomnium palustre d	+	.	.	1.1	.	.	.	1.1	.	.	+	+	.	II
Andromeda polifolia	+	.	2.2	.	.	1.1	.	.	.	.	.	.	.	II
Sphagnum papillosum d	.	.	.	+	.	.	.	1.1	.	.	.	.	.	I
Eriophorum vaginatum	.	.	.	.	.	.	.	.	.	+	.	.	+	I
Accompanying species														

Sphagnum fallax	d	4.4	3.3	4.4	3.3	4.4	4.4	5.5	4.4	4.4	4.4	4.4	4.4	3.3	V
Pinus sylvestris	b	1.1	1.1	1.1	.	.	.	+	.	+	1.1	.	+	.	III
Carex rostrata		.	.	.	.	1.1	.	1.1	.	.	1.1	1.1	1.1	1.2	III
Betula pubescens	b	+	+	+	.	.	.	.	.	1.1	+	.	.	.	II
	c	.	.	+	.	.	+	+	.	+	.	.	.	+	II
Phragmites australis		.	.	.	+	+	.	+	.	.	.	.	.	+	II
Sphagnum denticulatum	d	.	.	.	1.2	.	.	.	2.2	.	.	1.1	.	.	II
Lysimachia thyrsiflora		.	.	.	+	.	.	.	+	.	.	+	.	.	II
Ledum palustre		.	.	.	.	.		.	.	.	.	.	.	+	I

Abbreviations: see Table 1 in text

Table A.2.1
Fungi in *Caricetum limosae*

Successive number	1	2	3	4	5	6	7	8	9	10	11	12	13	Constancy
Plot number	B2a	B7	Ch1	Ka1	Śc1a	Ch2	SD3	Ka9	B8	Z6	Ka5	SD4	Śc4	
Localities	B	B	Ch	Ka	Śc	Ch	SD	Ka	B	Z	Ka	SD	Śc	
Plot area (m^2)	100	70	100	100	100	80	60	50	60	100	60	70	180	
Number of observations	23	14	21	24	21	21	25	10	14	14	10	25	15	
Total number of species	18	18	15	11	9	9	8	8	8	7	7	7	6	
Mycorrhizal fungi														
Laccaria proxima	7^{r-n}	3^{r-n}	3^{r-n}	.	.	.	.	1^{r}	.	.	.	.	.	II
Cortinarius huronensis	6^{r-n}	2^{r}	3^{r-n}	.	.	.	.	.	.	.	.	.	.	II
Lactarius helvus	6^{r-n}	2^{r}	3^{r}	.	.	.	.	.	.	.	.	.	.	II
Russula emetica	2^{r}	2^{r}	1^{r}	.	.	.	.	.	.	.	.	.	.	II
Paxillus involutus	5^{r}	1^{r}	.	.	.	.	.	.	.	.	.	.	.	I
Suillus variegatus	3^{r}	1^{r}	.	.	.	.	.	.	.	.	.	.	.	I
Lactarius tabidus	3^{r}	.	.	.	.	.	.	.	.	.	.	.	.	I
Lactarius glyciosmus	.	1^{r}	.	.	.	.	.	.	.	.	.	.	.	I
Saprotrophic fungi														
a) on peat														
Clavaria fragilis	.	.	.	3^{n-a}	.	.	.	.	.	.	.	.	.	I
b) among mosses														
Galerina paludosa	9^{r-n}	7^{r-n}	9^{r-n}	7^{r}	8^{r}	10^{r-n}	6^{r-n}	7^{r-n}	10^{r-a}	11^{r-a}	8^{r-n}	7^{r-n}	9^{r-n}	V

Table A.2.1 cont.

	1	2	3	4	5	6	7	8	9	10	11	12	13	
Hypholoma elongatum	6^{r-n}	5^{r-n}	7^{r-a}	5^{r-n}	5^{r-n}	3^{r-a}	5^{r}	4^{r-n}	6^{r-n}	6^{r-n}	7^{r-n}	4^{r}	5^{r-n}	V
Hypholoma udum	5^{r}	3^{r}	5^{r}	7^{r-n}	7^{r-n}	5^{r}	4^{r}	3^{r}	3^{r}	3^{r}	4^{r}	3^{r}	3^{r-n}	V
Galerina sphagnorum	2^{r}	2^{r}	.	2^{r}	3^{r}	1^{r}	4^{r-n}	3^{r-n}	6^{a}	7^{n-a}	4^{r-n}	5^{r-n}	5^{r-n}	V
Arrhenia gerardiana	2^{r}	4^{r}	.	5^{r}	4^{r}	3^{r}	4^{r}	3^{r}	4^{r-n}	2^{r}	6^{r-n}	.	5^{n}	V
Galerina tibiicystis	8^{r-n}	.	3^{r}	9^{r-n}	9^{r-n}	8^{r-n}	6^{r-n}	.	4^{n}	4^{r-n}	.	7^{r-n}	.	IV
Ascocoryne turficola	.	.	.	3^{n}	3^{r}	.	.	.	.	.	.	2^{n}	.	II
Galerina calyptrata	3^{r}	.	2^{r}	.	.	.	.	.	.	.	.	.	.	I
c) on litter														
Gymnopus androsaceus	7^{r-n}	4^{r}	3^{r}	5^{r}	.	1^{r}	.	1^{r}	.	.	1^{r}	.	.	III
Mycena galopus	8^{r-n}	1^{r}	5^{r-n}	6^{r}	5^{r}	4^{r}	.	.	.	.	.	.	.	III
Collybia cirrata	.	2^{r}	1^{r}	.	.	.	.	.	.	.	.	.	.	I
Mycena epipterygia var. *epipterygia*	.	.	1^{r}	.	.	.	.	.	.	.	.	.	.	I
Parasitic fungi														
Lyophyllum palustre	8^{r-n}	5^{r-n}	8^{r-n}	12^{r-n}	13^{r-a}	11^{n-a}	11^{n-a}	7^{n-a}	12^{n-a}	10^{r-a}	8^{r-n}	12^{n-a}	10^{n-a}	V
Anthracoidea limosa	7^{r}	4^{r-n}	.	.	.	.	.	.	5^{a}	.	.	.	.	II
Rickenella fibula	.	.	1^{r}	.	.	.	1^{r}	.	.	.	.	.	.	I
Monilinia oxycocci	.	2^{r-n}	.	.	.	.	.	.	.	.	.		.	I

Degree of abundance (Jahn *et al.* 1967): a - abundant, n - numerous, r – rare; x – perennial fruitbodies; other abbreviations see Table 1

Table A.1.2

Rhynchosporetum albae

Successive number	1	2	3	4	5	6	7	8	9	10	11	12	13	Constancy
Plot number	RM1	JCM3	ZB7	ZB8	SD12	JCM2	RM2	B10	RM3	Z12	ŻBł14	Cz13	Ka11	
Localities	RM	JCM	ZB	ZB	SD	JCM	RM	B	RM	Z	ŻBł	Cz	Ka	
Day	27	23	09	09	15	23	27	20	27	28	30	19	28	
Month	05	07	07	07	06	07	05	06	05	07	05	06	07	
Year	2003	2001	2004	2004	2004	2001	2003	2000	2003	2001	2001	2001	2001	
Cover of herb layer c (%)	60	60	50	50	70	55	55	60	55	60	60	60	60	
Cover of moss layer d (%)	80	80	40	60	80	80	65	40	60	60	80	40	60	
Plot area (m²)	150	100	100	100	100	100	120	50	100	40	60	40	50	
Total number of species in a relevé	14	10	16	18	13	8	11	11	10	13	10	12	13	
including: vascular plants	8	7	11	11	8	5	5	7	5	9	6	8	8	
cryptogamic plants	6	3	5	7	5	3	6	4	5	4	4	4	5	
Ch. *Rhynchosporetum albae*														

Rhynchospora alba		4.4	4.4	3.3	3.3	4.4	4.4	4.4	4.4	4.4	4.4	3.3	3.3	4.4	V
Ch. *Rhynchosporion albae, Scheuchzerietalia palustris*															
Sphagnum cuspidatum	d	1.1	4.4	2.2	3.3	2.2	4.4	2.2	2.2	3.3	.	.	1.1	+	V
Carex limosa		.	1.1	.	.	.	.	.	+	.	+	.	1.2	+	II
Drosera intermedia		.	.	+	+	.	.	.	.	+	.	.	.	.	II
Scheuchzeria palustris		.	.	.	.	.	.	+	.	.	.	.	.	.	I
Ch. *Scheuchzerio-Caricetea nigrae*															
Eriophorum angustifolium		1.1	1.2	2.2	1.1	1.1	+	+	1.1	+	+	1.1	1.1	1.1	V
Menyanthes trifoliata		.	.	+	.	.	1.1	.	+	.	+	.	+	+	III
Straminergon stramineum	d	.	.	.	.		.	.	+	.	+	+	.	+	II
Warnstorfia fluitans	d	+	.	+	+	+	.	.	.	.	.	.	.	.	II
Comarum palustre		1.1	.	1.1	2.2	.	.	.	.	.	.	.	.	.	II
Warnstorfia exannulata	d	.	.	1.1	+	.	.	.	.	.	.	.	.	.	I
Agrostis canina		.	.	.	.	.	.	.	.	.	+	.	.	+	I
Carex canescens		.	.	.	.	.	.	.	.	.	+	+	.	.	I
Carex lasiocarpa		.	.	.	.	.	.	.	.	.	.	.	+	.	I
Sphagnum teres	d	.	.	.	.	.	.	.	.	+	.	.	.	.	I
Ch. *Oxycocco-Sphagnetea*															
Drosera rotundifolia		1.1	+	1.1	1.1	2.2	1.1	1.1	+	1.1	1.1	3.3	3.3	1.1	V
Oxycoccus palustris		+	+	1.1	2.2	1.1	+	.	+	.	2.2	2.2	2.2	1.1	V
Sphagnum magellanicum	d	.	1.2	.	1.1	+	1.2	.	.	.	2.2	1.2	2.2	2.2	IV
Aulacomnium palustre	d	.	.	.	.	+	.	+	1.1	.	+	1.2	+	+	III
Sphagnum fuscum	d	+	.	.	.	.	.	1.1	.	1.1	.	.	.	.	II
Andromeda polifolia		.	1.1	.	.	.	.	.	.	.	.	.	+	.	I
Accompanying species															
Sphagnum fallax	d	4.4	1.1	2.2	3.3	4.4	1.1	3.3	2.2	2.2	3.3	4.4	2.2	3.3	V
Pinus sylvestris	c	1.1	+	+	+	+	.	+	.	+	.	.	.	.	III
Carex rostrata		.	.	.	+	1.1	.	.	1.1	.	+	+	.	1.1	III
Betula pubescens	c	+	.	+	1.1	+	.	.	.	.	.	.	.	.	II
Sphagnum palustre	d	1.1	.	1.1	+	.	.	.	.	.	.	.	.	.	II
Molinia caerulea		.	.	+	1.1	+	.	.	.	.	.	.	.	.	II
Sphagnum fimbriatum	d	+	.	.	.	.	.	1.1	.	+	.	.	.	.	II
Polytrichum commune	d	1.1	.	.	.	.	.	+	.	.	.	.	.	.	I
Calluna vulgaris		.	.	+	+	.	.	.	.	.	.	.	.	.	I
Sphagnum squarrosum	d	.	.	.	+	.	.	.	.	.	.	.	.	.	I

Abbreviations: see Table 1 in text

Table A.2.2
Fungi in *Rhynchosporetum albae*

Successive number	1	2	3	4	5	6	7	8	9	10	11	12	13	Constancy
Plot number	RM1	JCM3	ZB7	ZB8	SD12	JCM2	RM2	B10	RM3	Z12	ŻBł 14	Cz13	Ka11	
Localities	RM	JCM	ZB	ZB	SD	JCM	RM	B	RM	Z	ŻBł	Cz	Ka	
Plot area (m^2)	150	100	100	100	100	100	120	50	100	40	60	40	50	
Number of observations	26	23	24	24	25	23	26	14	26	14	14	15	10	
Total number of species	10	9	9	8	8	7	7	7	7	6	6	6	5	
Mycorrhizal fungi														
Cortinarius huronensis	4^{r}	4^{r}	.	2^{r}	.	2^{r}	.	.	.	.	.	.	.	II
Lactarius helvus	4^{r}	.	1^{r}	.	3^{r}	.	.	.	.	.	.	.	.	II
Lactarius tabidus	.	.	2^{r}	.	.	.	.	.	.	.	.	.	.	I
Saprotrophic fungi														
a) among mosses														
Galerina paludosa	10^{r-n}	10^{r-n}	11^{r-n}	9^{r-n}	7^{r}	9^{r-n}	9^{r}	9^{n-a}	7^{r}	10^{n}	9^{n-a}	7^{n}	6^{r-n}	V
Galerina sphagnorum	2^{r}	3^{r}	5^{r-n}	7^{r-n}	3^{r}	4^{r}	4^{r}	7^{n-a}	3^{r}	7^{n}	5^{n}	3^{r}	2^{r}	V
Hypholoma elongatum	5^{r-n}	6^{r-n}	5^{r-n}	5^{r-a}	5^{r-n}	5^{r-n}	6^{r-n}	6^{n}	6^{r-n}	5^{n}	6^{r-n}	4^{n-a}	3^{r-n}	V
Hypholoma udum	6^{r-n}	6^{r-n}	7^{r}	6^{r}	6^{r-n}	7^{r-n}	7^{r-n}	2^{r}	6^{-n}	1^{r}	5^{r}	4^{r-n}	.	V
Arrhenia gerardiana	.	9^{r-n}	7^{r-n}	6^{r}	5^{r}	8^{r}	6^{r}	5^{r-n}	5^{r}	.	4^{r}	6^{n}	1^{r}	V
Galerina tibiicystis	13^{r-a}	12^{r-a}	13^{r-a}	15^{r-a}	9^{r-a}	13^{r-a}	12^{r-n}	5^{n}	10^{r-n}	2^{n}	.	.	.	IV
b) on litter														
Mycena galopus	5^{r}	2^{r}	.	.	.	.	.	.	.	.	.	.		I
Gymnopus androsaceus	2^{r}	.	.	.	.	.	.	.	.	.	.	.		I
Parasitic fungi														
Lyophyllum palustre	11^{r-n}	15^{r-a}	13^{r-n}	15^{r-n}	12^{r-n}	14^{r-n}	15^{r-a}	12^{r-n}	14^{r-n}	12^{n-a}	10^{n-a}	7^{r-n}	5^{n}	V

Abbreviations see Table 1 and Table A.2.1

Table A.1.3

Eriophoro angustifolii-Sphagnetum recurvi

Successive number		1	2	3	4	5	6	7	8	9	10	11	12	13	Constancy
Plot number		Ka8	K18	SD13	ZB10	Nw2	Żur5	Nw1	ZB9	Żur4	B16	Ka15	Śc19	ŻBł17	
Localities		Ka	K	SD	ZB	Nw	Żur	Nw	ZB	Żur	B	Ka	Śc	ŻBł	
Day		05	24	15	09	26	20	26	09	20	20	24	14	30	
Month		07	07	06	07	06	06	06	07	06	06	07	09	05	
Year		2001	2001	2004	2004	2004	2004	2004	2004	2004	2000	2002	2002	2001	
Density of shrub layer	b (%)	5	15	5	-	-	-	-	-	-	5	-	5	5	
Cover of herb layer	c (%)	85	70	60	60	50	60	40	60	40	80	85	70	85	
Cover of moss layer	d (%)	70	40	70	70	70	90	90	100	90	70	100	70	70	
Plot area (m^2)		400	70	400	400	400	300	400	400	300	70	100	50	80	
Total number of species in a relevé		18	10	15	15	8	7	7	17	8	12	12	14	17	
including: vascular plants		16	8	12	6	6	6	5	8	7	8	7	11	14	
cryptogamic plants		2	2	3	9	2	1	2	9	1	4	5	3	3	
D. *Eriophoro angustifolii-Sphagnetum recurvi*															
Eriophorum angustifolium		4.4	4.4	4.4	4.4	3.3	3.3	3.3	4.4	3.3	4.4	4.4	3.3	4.4	V
Sphagnum fallax	d	.	3.3	4.4	3.3	4.4	5.5	5.5	4.4	5.5	3.3	5.5	4.4	3.3	V
Ch. *Rhynchosporion albae, Scheuchzerietalia palustris*															
Rhynchospora alba		.	.	.	+	.	.	.	+	.	.	.	1.1	.	II
Carex limosa		.	.	+	.	.	.	.	.	.	+	.	1.1	.	II
Ch. *Scheuchzerio-Caricetea nigrae*															
Sphagnum cuspidatum	d	.	.	1.1	+	1.1	.	+	3.3	.	.	.	.	.	II
Comarum palustre		2.2	.	+	2.2	.	.	.	1.1	.	.	.	.	.	II
Carex canescens		.	.	1.1	.	.	.	.	.	+	.	.	+	+	II
Straminergon stramineum	d	.	.	+	+	.	.	.	+	.	.	.	.	.	II
Menyanthes trifoliata		+	.	+	.	.	.	.	.	.	.	+	.	.	II
Agrostis canina		2.2	.	.	.	.	.	.	.	.	.	+	.	.	I
Sphagnum teres	d	.	.	.	+	.	.	.	1.1	.	.	.	.	.	I
Warnstorfia exannulata	d	.	.	.	+	.	.	.	1.1	.	.	.	.	.	I
Carex lasiocarpa		+	.	.	.	.	.	.	.	.	.	.	.	.	I
Carex nigra		.	.	.	.	.	.	.	.	.	.	.	.	+	I
Hydrocotyle vulgaris		+	.	.	.	.	.	.	.	.	.	.	.	.	I
Ch. *Oxycocco-Sphagnetea*															
Oxycoccus palustris		+	2.2	2.2	1.2	2.2	2.2	2.2	1.1	2.2	2.2	2.2	3.3	3.2	V
Drosera rotundifolia		.	.	1.1	.	+	2.2	+	+	+	+	1.1	2.2	.	IV

Eriophorum vaginatum		.	1.2	+	.	1.2	1.2	.	.	+	+	.	+	+	IV
Andromeda polifolia		.	+	.	.	1.2	.	1.1	.	.	+	.	.	2.2	II
Polytrichum strictum	d	.	.	.	.	.	.	.	.	.	1.1	+	1.1	1.2	II
Aulacomnium palustre	d	.	.	.	.	.	.	.	.	.	1.1	2.3	.	1.2	II
Erica tetralix		.	.	.	.	.	.	.	.	.	.	.	.	1.2	I
Sphagnum papillosum	d	.	.	.	.	.	.	.	.	.	.	+	.	.	I
Ch. *Vaccinio-Piceetea*															
Pinus sylvestris	b	+	.	1.1	.	.	.	.	.	.	1.2	.	.	1.2	II
	c	.	.	+	+	+	+	+	+	+	.	.	.	.	III
Betula pubescens	b	.	2.1	.	.	.	.	.	.	.	.	.	1.1	+	II
	c	.	+	.	+	.	.	.	+	.	.	.	.	.	II
Ledum palustre		.	1.2	.	.	.	.	.	.	.	.	.	+	.	I
Vaccinium myrtillus		.	.	.	.	.	.	.	.	.	.	.	.	1.2	I
Vaccinium uliginosum		.	.	.	.	.	.	.	.	.	.	.	.	1.2	I
Accompanying species															
Carex rostrata		1.1	1.1	1.1	.	.	1.1	.	1.1	1.1	2.2	1.2	2.2	.	IV
Sphagnum palustre	d	.	2.2	.	1.1	.	.	.	1.2	.	2.2	.	1.2	3.3	III
Sphagnum flexuosum	d	.	.	.	1.1	.	.	.	2.2	.	.	.	.	.	I
Sphagnum squarrosum	d	.	.	.	2.2	.	.	.	1.1	.	.	.	.	.	I
Polytrichum commune	d	1.2	.	.	.	.	.	.	.	.	.	+	.	.	I
Lysimachia thyrsiflora		1.1	.	.	.	.	.	.	.	.	.	+	.	.	I
Sphagnum subnitens	d	.	.	.	1.1	.	.	.	+	.	.	.	.	.	I
Phragmites australis		.	.	+	.	.	.	.	.	.	.	.	+	.	I
Sphagnum denticulatum	d	4.4	.	.	.	.	.	.	.	.	.	.	.	.	I
Betula pendula	b	1.1	.	.	.	.	.	.	.	.	.	.	.	.	I
Molinia caerulea		1.1	.	.	.	.	.	.	.	.	.	.	.	.	I
Alnus glutinosa	c	.	+	.	.	.	.	.	.	.	.	.	.	.	I
Calluna vulgaris		.	.	.	.	.	.	.	.	.	.	.	.	+	I
Juncus effusus		+	.	.	.	.	.	.	.	.	.	.	.	.	I
Peucedanum palustre		+	.	.	.	.	.	.	.	.	.	.	.	.	I
Salix cinerea	b	+	.	.	.	.	.	.	.	.	.	.	.	.	I
Salix sp.	b	+	.	.	.	.	.	.	.	.	.	.	.	.	I
Thelypteris palustris		.	.	.	.	.	.	.	.	.	.	.	.	+	I

Abbreviations: see Table 1

Table A.2.3

Fungi in *Eriophoro angustifolii-Sphagnetum recurvi*

Successive number	1	2	3	4	5	6	7	8	9	10	11	12	13	Constancy
Plot number	Ka8	K18	SD13	ZB10	Nw2	Żur5	Nw1	ZB9	Żur4	B16	Ka15	Śc19	ŻBł17	
Localities	Ka	K	SD	ZB	Nw	Żur	Nw	ZB	Żur	B	Ka	Śc	ŻBł	
Plot area (m^2)	400	70	400	400	400	300	400	400	300	70	100	50	80	
Number of observations	24	16	25	24	26	24	26	24	24	14	10	16	14	
Total number of species	22	21	18	11	11	11	10	9	9	8	7	7	6	
Mycorrhizal fungi														
Thelephora terrestris	6^{r}	.	5^{r}	6^{r}	.	.	.	3^{r}	.	1^{r}	3^{n}	.	.	III
Laccaria proxima	7^{r-n}	4^{r-n}	5^{r}	.	.	.	.	.	.	1^{r}	.	.	.	II
Lactarius helvus	3^{r}	.	4^{r-n}	4^{r}	1^{r}	.	.	.	.	.	.	.	.	II
Cortinarius huronensis	4^{r}	2^{r}	3^{r}	.	.	.	.	.	.	.	.	.	.	II
Lactarius tabidus	6^{r}	.	4^{r}	.		.	.	.	.	.	.	.	.	I
Lactarius glyciosmus	.	2^{r}	.	.	.	.	.	.	.	.	.	.	.	I
Russula emetica	.	.	2^{r}	.	.	.	.	.	.	.	.	.	.	I
Cortinarius fulvescens	.	1^{n}	.	.	.	.	.	.	.	.	.	.	.	I
Saprotrophic fungi														
a) on peat														
Clavaria fragilis	2^{n}	5^{n-a}	.	.	.	.	.	.	.	.	.	.	.	I
Entoloma sericatum	1^{r}	3^{r}	.	.	.	.	.	.	.	.	.	.	.	I
Hygrocybe coccineocrenata	1^{r}	2^{r-n}	.	.	.	.	.	.	.	.	.	.	.	I
Entoloma cetratum	.		2^{r}	.	.	.	.	.	.					I
b) among mosses														
Galerina paludosa	8^{r-n}	10^{r-n}	13^{r-n}	12^{r-n}	9^{r-n}	13^{r-a}	15^{r-n}	12^{r-n}	12^{r-a}	8^{r-n}	5^{r-n}	6^{r-n}	9^{r}	V
Hypholoma elongatum	6^{n}	9^{n-a}	5^{r-n}	6^{n-a}	3^{r-n}	5^{r-a}	3^{r-n}	6^{r-a}	5^{r-a}	3^{r-n}	4^{n}	6^{r-n}	5^{n}	V
Hypholoma udum	7^{r-n}	4^{r}	4^{r-n}	8^{r-a}	7^{r-n}	8^{r-a}	6^{r}	9^{r-a}	7^{r-a}	3^{r-n}	.	2^{r}	4^{r-n}	V
Galerina sphagnorum	2^{r}	4^{r}	1^{r}	4^{r-n}	.	4^{r}	2^{r}	5^{r-a}	5^{r-n}	5^{n}	3^{r-n}	4^{n}	6^{n}	V
Galerina tibiicystis	8^{r-n}	.	11^{r-n}	13^{r-a}	8^{r-n}	13^{r-a}	11^{r}	14^{r-n}	12^{r-a}	4^{r-n}	.	.	3^{r}	IV
Arrhenia gerardiana	.	7^{r-n}	3^{r}	7^{r-n}	.	1^{r}	5^{r}	8^{r-n}	2^{r}	.	.	3^{r-n}	.	IV
Galerina calyptrata	2^{r}	1^{r}	.	.	1^{r}	.	.	.	.	.	.	.	.	II
Mycena adonis var. *adonis*	1^{r}	2^{n}	.	.	.	.	.	.	.	.	.	.	.	I
Ascocoryne turficola	.	.	.	.	.	.	.	.	.	.	.	3^{n-a}	.	I

Table A.2.3 cont.

c) on litter														
Mycena galopus	7^{r}	4^{r-n}	2^{r}	4^{r}	5^{r-n}	7^{r}	4^{r}	3^{r}	5^{r}	.	1^{r}	.	.	IV
Gymnopus androsaceus	4^{r}	5^{r-n}	2^{r}	2^{r}	3^{r}	4^{r}	4^{r}	.	2^{r}	.	.	.	.	IV
Mycena sanguinolenta	2^{r}	1^{r}	3^{r}	.	4^{r-n}	2^{r}	2^{r}	.	.	.	.	.	.	III
Mycena epipterygia var. *epipterygia*	1^{r}	3^{n-a}	2^{r}	.	3^{r-n}	2^{r}	.	.	.	.	.	.	.	II
Collybia cirrata	1^{r}	1^{r}	.	.	.	.	.	.	.	.	.	.	.	I
Marasmius epiphyllus	.	1^{r}	.	.	.	.	.	.	.	.	.	.	.	I
Parasitic fungi														
Lyophyllum palustre	11^{r-n}	11^{r-a}	13^{r-n}	16^{r-a}	13^{r-n}	14^{r-a}	16^{r-a}	13^{r-n}	14^{r-a}	10^{n-a}	8^{r-n}	12^{n-a}	9^{n-a}	V
Rickenella fibula	3^{r}	.	.	.	.	.	.	.	.	.	1^{r}	.	.	I

Abbreviations see Table 1 and Table A.2.1

Table A.1.4
Caricetum lasiocarpae

Successive number		1	2	3	4	5	6	7	8	9	10	11	Constancy
Plot number		Ka3a	Ka3	TT13	SD2	ZB1	TT12	ZB2	SD1	ZB2a	Z1	Ka2	
Localities		Ka	Ka	TT	SD	ZB	TT	ZB	SD	ZB	Z	Ka	
Day		28	05	09	15	09	09	09	15	09	01	24	
Month		07	07	07	06	07	07	07	06	07	07	07	
Year		2001	2001	2004	2004	2004	2004	2004	2004	2004	1999	2002	
Density of shrub layer	b (%)	5	20	-	-	-	-	-	-	-	-	-	
Cover of herb layer	c (%)	70	90	70	70	60	60	60	80	70	90	90	
Cover of moss layer	d (%)	70	100	90	70	50	90	70	60	80	70	100	
Plot area (m^2)		150	100	100	50	100	90	100	60	100	70	50	
Total number of species in a relevé		18	17	16	17	17	14	15	18	13	14	16	
including: vascular plants		12	11	11	13	9	8	9	14	10	11	13	
cryptogamic plants		6	6	5	4	8	6	6	4	3	3	3	
Ch. *Caricetum lasiocarpae*													
Carex lasiocarpa		4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	5.5	4.4	V
Sphagnum obtusum	d	2.2	3.3	.	.	.	.	.	.	.	.	.	I
Ch. *Caricion lasiocarpae*													
Comarum palustre		2.2	2.2	1.1	2.2	1.1	1.1	2.2	2.2	1.1	1.1	1.2	V
Menyanthes trifoliata		+	2.2	1.1	1.1	.	.	.	2.2	1.1	+	2.2	IV
Sphagnum teres	d	.	.	.	.	1.1	2.2	2.2	.	.	.	.	II
Carex diandra		.	.	.	.	.	.	.	.	.	+	.	I
Ch. *Scheuchzerio-Caricetea nigrae*													
Sphagnum cuspidatum	d	3.3	3.3	1.1	3.3	+	.	.	3.3	1.1	+	3.3	V
Eriophorum angustifolium		.	.	1.1	1.1	1.1	1.1	1.1	1.1	1.1	+	1.1	V
Straminergon stramineum	d	.	.	+	+	+	+	+	.	+	+	.	IV
Agrostis canina		2.2	3.3	.	1.1	1.1	.	.	+	.	.	+	III
Warnstorfia fluitans	d	.	.	+	+	+	1.1	+	+	.	.	.	III
Carex canescens		.	.	.	+	+	.	.	1.1	.	.	.	II
Carex limosa		.	.	.	.	.	.	.	+	.	.	1.1	I
Hydrocotyle vulgaris		.	.	.	.	.	.	.	.	1.1	+	.	I
Triglochin palustre		.	.	+	.	.	1.1	.	.	.	.	.	I
Ch. *Oxycocco-Sphagnetea*													
Oxycoccus palustris		1.1	+	2.2	.	.	.	.	.	2.2	1.1	1.1	III
Aulacomnium palustre	d	1.1	2.2	.	.	1.1	.	.	+	.	.	+	III
Drosera rotundifolia		.	.	.	.	+	.	+	.	.	+	+	II
Sphagnum magellanicum	d	.	.	.	.	1.1	.	+	.	.	.	.	I
Sphagnum papillosum	d	1.1	+	.	.	.	.	.	.	.	.	.	I
Polytrichum strictum	d	+	+	.	.	.	.	.	.	.	.	.	I
Accompanying species													
Sphagnum fallax	d	1.1	.	4.4	3.3	3.3	4.4	3.3	2.2	4.4	4.4	3.3	V
Carex rostrata		1.1	.	1.2	1.1	.	1.1	.	1.1	+	1.1	2.2	IV
Betula pubescens	b	1.1	+	.	.	.	.	.	.	.	.	.	I
	c	+	.	+	+	+	+	+	+	.	.	.	IV
Lysimachia thyrsiflora		.	1.1	.	+	.	.	.	+	+	+	+	III
Peucedanum palustre		.	.	.	.	+	+	+	.	+	+	1.1	III
Lysimachia vulgaris		.	.	+	+	1.1	.	+	.	+	.	.	III
Salix sp.	c	.	.	+	+	+	.	.	+	.	.	.	II
Molinia caerulea		+	+	.	.	.	.	1.1	.	.	.	.	II
Galium palustre		+	.	+	.	.	.	.	.	.	.	+	II
Pinus sylvestris	b	+	1.1	.	.	.	.	.	.	.	.	.	I
	c	+	.	.	.	+	.	+	.	.	.	.	II
Calla palustris		.	.	.	1.1	.	.	.	1.2	.	.	.	I

Table A.1.4 cont.

Sphagnum fimbriatum	d	.	.	.	.	1.1	.	2.2	.	.	.	.	I
Sphagnum subnitens	d	.	.	2.2	.	.	1.1	.	.	.	.	.	I
Carex paniculata		.	.	.	+	.	.	.	+	.	.	.	I
Phragmites australis		.	.	.	.	.	+	.	+	.	.	.	I
Betula pendula	b	.	2.2	.	.	.	.	.	.	.	.	.	I
Sphagnum denticulatum	d	.	1.1	.	.	.	.	.	.	.	.	.	I
Sphagnum flexuosum	d	.	.	.	.	.	1.1	.	.	.	.	.	I
Calamagrostis canescens		.	+	.	.	.	.	.	.	.	.	.	I
Thelypteris palustris		.	.	.	.	.	.	.	.	.	.	+	I

Abbreviations: see Table 1

Table A.2.4

Fungi in *Caricetum lasiocarpae*

Successive number	1	2	3	4	5	6	7	8	9	10	11	Constancy
Plot number	Ka3a	Ka3	TT13	SD2	ZB1	TT12	ZB2	SD1	ZB2a	Z1	Ka2	
Localities	Ka	Ka	TT	SD	ZB	TT	ZB	SD	ZB	Z	Ka	
Plot area (m^2)	200	100	100	50	100	90	100	60	100	70	50	
Number of observations	24	10	26	25	24	26	24	25	24	14	10	
Total number of species	20	19	12	11	11	10	9	9	9	7	5	
Mycorrhizal fungi												
Laccaria proxima	7^{r-a}	5^{r-a}	4^{r-n}	2^{r}	.	2^{r}	3^{r}	2^{r}	.	.	.	IV
Lactarius helvus	6^{r-n}	3^{r}	2^{r}	1^{r}	2^{r}	5^{r}	.	.	.	.	.	III
Leccinum niveum	4^{r}	1^{r}	1^{r}	.	.	.	.	.	.	.	.	II
Cortinarius huronensis	6^{r}	3^{r-n}	.	.	.	.	.	.	.	.	.	I
Lactarius tabidus	6^{r-n}	.	1^{r}	.	.	.	.	.	.	.	.	I
Paxillus involutus	4^{r}	2^{r-n}	.	.	.	.	.	.	.	.	.	I
Russula emetica	3^{r}	1^{r}	.	.	.	.	.	.	.	.	.	I
Suillus variegatus	3^{r}	1^{r}	.	.	.	.	.	.	.	.	.	I
Lactarius glyciosmus	.	2^{r-n}	.	.	.	.	.	.	.	.	.	I
Saprotrophic fungi												
a) on peat												
Hygrocybe coccineocrenata	1^{r}	1^{r}	.	.	.	.	.	.	.	.	.	I
b) among mosses												
Galerina paludosa	5^{r}	6^{r-n}	9^{r-n}	8^{r-n}	11^{r-n}	6^{r}	10^{r-n}	7^{r}	8^{r-n}	9^{n}	8^{r-n}	V
Hypholoma udum	5^{r-n}	2^{r-n}	6^{r-n}	4^{r-n}	5^{r-n}	4^{r}	3^{r-n}	3^{r}	3^{r}	4^{r-n}	3^{r-n}	V
Hypholoma elongatum	4^{n}	4^{r-n}	5^{r-n}	5^{r-n}	4^{r}	4^{n}	5^{r-n}	4^{n}	4^{r-a}	5^{r-n}	4^{r-n}	V
Galerina sphagnorum	.	1^{r}	3^{r-n}	3^{r-n}	4^{r-n}	1^{r}	3^{n}	4^{r-n}	5^{r-n}	6^{n}	3^{r-n}	V
Galerina tibiicystis	8^{r-n}	.	11^{r-a}	8^{r-n}	7^{r-n}	9^{r-n}	6^{r-n}	7^{r-n}	8^{r-a}	3^{n}	.	V
Arrhenia gerardiana	.	.	.	.	.	1^{r}	.	3^{r}	4^{r-n}	2^{r}	.	II
Galerina calyptrata	1^{r}	1^{r}	.	.	1^{r}	.	.	.	.	.	.	II
c) on litter												
Mycena galopus	8^{r-n}	3^{r-n}	5^{r}	3^{r-n}	3^{r}	3^{r}	2^{r}	2^{r}	3^{r}	.	.	V
Gymnopus androsaceus	6^{r}	3^{n}	2^{r}	1^{r}	2^{r}	.	1^{r}	.	1^{r}	.	.	IV
Mycena epipterygia var. *epipterygia*	3^{r}	2^{n}	.	.	.	.	.	.	.	.	.	I
Collybia cookei	1^{r}	.	.	.	.	.	.	.	.	.	.	I
Parasitic fungi												
Lyophyllum palustre	8^{r-n}	7^{r-a}	13^{n-a}	13^{r-a}	15^{n-a}	15^{n-a}	14^{n-a}	12^{r-n}	9^{n-a}	10^{a}	10^{r-a}	V
Rickenella fibula	4^{r}	2^{r}	.	1^{r}	3^{r}	.	.	.	.	.	.	II

Abbreviations see Table 1 and Table A.2.1

Tabela A.1.5

Caricetum rostratae

Successive number		1	2	3	4	5	6	7	8	Total number of plots at which the species occurred
Plot number		Ka5a	Ka6	Śc3	ZB3	Śc2	SD6	SD5	ZB4	
Localities		Ka	Ka	Śc	ZB	Śc	SD	SD	ZB	
Day		20	05	19	09	19	15	15	09	
Month		07	07	06	07	06	06	06	07	
Year		2003	2001	2001	2004	2001	2004	2004	2004	
Density of shrub layer	b (%)	10	5	-	-	-	-	-	-	
Cover of herb layer	c (%)	70	80	70	70	60	80	60	70	
Cover of moss layer	d (%)	70	80	80	90	70	70	70	90	
Plot area (m²)		300	200	300	200	200	100	200	100	
Total number of species in a relevé		17	16	12	17	10	12	15	19	
including: vascular plants		11	12	7	11	8	9	11	10	
cryptogamic plants		6	4	5	6	2	3	4	9	
Ch. *Sphagno-Caricetum rostratae*										
Carex rostrata		4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	8
Ch. *Scheuchzerio-Caricetea nigrae*										
Eriophorum angustifolium		2.2	2.2	2.2	2.2	1.1	2.2	1.1	2.1	8
Comarum palustre		1.1	1.1	+	1.1	+	1.1	+	2.1	8
Menyanthes trifoliata		+	1.2	.	1.1	+	1.1	+	.	6
Sphagnum cuspidatum	d	.	.	.	1.1	.	1.1	+	2.2	4
Carex lasiocarpa		+	+	.	.	.	1.1	1.1	.	4
Agrostis canina		1.1	2.2	.	+	.	.	.	.	3
Carex limosa		.	.	+	+	.	+	.	.	3
Warnstorfia fluitans	d	.	.	.	+	.	.	.	+	2
Drepanocladus aduncus	d	.	.	.	.	.	.	.	1.2	1
Straminergon stramineum	d	.	.	.	.	.	.	.	+	1
Ch. *Oxycocco-Sphagnetea*										
Aulacomnium palustre	d	2.2	2.2	2.2	.	1.1	+	1.1	1.1	7
Drosera rotundifolia		.	+	1.1	+	+	.	+	1.1	6
Oxycoccus palustris		.	.	2.2	1.1	1.1	.	+	1.2	5
Sphagnum magellanicum	d	.	.	+	2.2	.	.	.	.	2
Accompanying species										
Sphagnum fallax	d	1.1	3.3	4.4	4.4	4.4	4.4	4.4	4.4	8
Betula pubescens	b	1.1	1.1	.	.	.	.	.	.	2
	c	+	+	.	+	+	+	+	+	7
Sphagnum palustre	d	1.1	1.1	1.1	2.2	.	.	+	1.1	6
Molinia caerulea		1.1	1.1	.	1.2	.	1.1	+	+	6
Pinus sylvestris	b	1.1	.	.	.	.	.	.	.	1
	c	.	+	.	+	.	+	+	+	5
Sphagnum squarrosum	d	3.3	3.3	.	1.1	.	.	.	+	4
Phragmites australis		+	.	+	.	+	.	+	.	4
Sphagnum fimbriatum	d	+	.	+	.	.	.	.	1.1	2
Lysimachia vulgaris		.	1.1	.	.	.	.	.	.	1
Polytrichum commune	d	1.1	.	.	.	.	.	.	.	1
Calamagrostis canescens		+	.	.	.	.	.	.	.	1
Galium palustre		.	+	.	.	.	.	.	.	1
Lysimachia thyrsiflora		.	.	.	.	.	.	.	+	1
Salix sp.	c	.	.	.	.	.	.	.	+	1

Abbreviations: see Table 1

Table A.2.5

Fungi in *Caricetum rostratae*

Successive number	1	2	3	4	5	6	7	8	Frequency
Plot number	Ka5a	Ka6	Śc3	ZB3	Śc2	SD6	SD5	ZB4	
Localities	Ka	Ka	Śc	ZB	Śc	SD	SD	ZB	
Plot area (m²)	300	200	300	200	200	100	200	100	
Number of observations	23	24	25	24	25	25	25	24	
Total number of species	12	9	9	8	8	8	7	6	
Mycorrhizal fungi									
Lactarius tabidus	5^{r}	4^{r}	.	.	.	.	.	.	2
Lactarius helvus	5^{r-n}	.	.	2^{r}	.	.	.	.	2
Cortinarius huronensis	4^{r}	.	.	1^{r}	.	.	.	.	2
Laccaria proxima	3^{r}	3^{r}	.	.	.	.	.	.	2
Saprotrophic fungi			.		.				
a) among mosses									
Galerina tibiicystis	8^{r-n}	6^{r-n}	10^{r-n}	8^{r-n}	8^{r-n}	7^{r-n}	8^{r-n}	6^{r-n}	8
Galerina paludosa	7^{r}	4^{r}	9^{r-n}	6^{r}	8^{r}	8^{r-n}	6^{r-n}	7^{r}	8
Hypholoma udum	6^{r-n}	3^{r}	5^{r-n}	4^{r}	6^{r-n}	5^{r}	6^{r-n}	4^{r-n}	8
Hypholoma elongatum	5^{r-n}	5^{n-a}	5^{n-a}	6^{r-n}	5^{n-a}	5^{r-n}	5^{r-n}	5^{r-n}	8
Galerina sphagnorum	.	.	2^{r}	.	3^{r}	4^{r-n}	4^{r}	2^{r}	5
Arrhenia gerardiana	.	.	4^{r-n}	.	2^{r}	3^{r}	.	.	3
Ascocoryne turficola	.	.	2^{n}	.	.	1^{r}	.	.	2
b) on litter									
Mycena galopus	6^{r-n}	5^{r}	3^{r}	3^{r}	4^{r}	.	3^{r}	.	6
Gymnopus androsaceus	5^{r}	2^{r}	.	.	.	.	.	.	2
Mycena sanguinolenta	2^{r}	.	.	.	.	.	.	.	1
Parasitic fungi									
Lyophyllum palustre	9^{r-n}	8^{r}	15^{r-a}	11^{r-n}	14^{r-a}	12^{r-n}	9^{r}	11^{r}	8

Abbreviations see Table 1 and Table A.2.1

Table A.1.6

Erico-Sphagnetum medii

Successive number		1	2	3	4	5	6	7	8	9	Total number of plots at which the species occurred
Plot number		Wrz2	TT1	ŻBł5	Wrz1	Rob4	Str1	Rob3	ŻBł6	Str1A	
Localities		Wrz	TT	ŻBł	Wrz	Rob	Str	Rob	ŻBł	Str	
Day		27	23	03	27	07	17	07	03	17	
Month		06	08	07	06	09	09	09	07	09	
Year		2004	2007	1999	2004	2007	2007	2007	1999	2007	
Density of tree layer	a (%)	-	5	-	-	+	-	-	-	+	
Density of shrub layer	b (%)	25	10	5	25	5	10	5	-	5	
Cover of herb layer	c (%)	75	80	50	70	90	100	60	60	90	
Cover of moss layer	d (%)	70	70	30	50	35	80	30	75	60	
Plot area (m²)		300	100	150	200	200	300	200	100	250	
Total number of species in a relevé		17	19	19	19	16	16	15	11	15	
including: vascular plants		12	14	14	16	12	12	11	7	11	
cryptogamic plants		5	5	5	3	4	4	4	4	4	

D. *Erico-Sphagnetum medii*											
Erica tetralix		3.4	3.3	3.3	3.3	3.3	3.3	2.2	4.3	3.3	9
Sphagnum papillosum	d	+	.	.	1.2	.	2.2	.	.	1.1	4
Sphagnum compactum	d	.	.	2.2	.	.	.	.	.	.	1
Ch. *Oxycocco-Sphagnetea*											
Oxycoccus palustris		3.3	3.3	+	2.2	1.1	4.4	1.1	+	3.3	9
Andromeda polifolia		2.2	1.1	2.2	1.1	1.1	+	+	+	1.1	9
Drosera rotundifolia		+	1.1	2.2	+	1.1	+	1.1	+	+	9
Eriophorum vaginatum		.	1.1	+	2.2	3.3	1.1	1.2	+	2.2	8
Sphagnum magellanicum	d	3.3	3.3	.	3.4	.	1.1	.	3.3	1.1	6
Aulacomnium palustre	d	1.2	.	+	+	1.1	.	.	2.2	.	5
Polytrichum strictum	d	+	.	+	.	.	1.1	.	+	1.1	5
Sphagnum capillifolium	d	.	2.2	1.1	.	1.1	.	+	.	.	4
Sphagnum rubellum	d	.	1.1	.	.	.	.	2.2	.	.	2
Ch. *Scheuchzerio-Caricetea nigrae*											
Eriophorum angustifolium		2.1	2.2	+	1.1	.	3.3	+	+	.	7
Rhynchospora alba		.	+	.	.	2.2	.	.	.	.	2
Carex lasiocarpa		1.1	.	.	1.1	.	.	.	.	.	2
Ch. *Vaccinio-Piceetea*											
Betula pubescens	a	.	.	.	.	+	.	.	.	+	2
	b	1.1	1.1	+	1.1	1.1	1.1	1.1	.	1.1	8
Pinus sylvestris	a	.	1.1	.	.	.	.	.	.	+	2
	b	2.1	1.1	1.1	2.1	.	1.1	.	.	+	6
Ledum palustre		.	1.1	1.1	+	2.2	.	1.1	.	.	5
Vaccinum myrtillus		.	1.1	+	+	.	+	.	2.2	.	5
Vaccinum uliginosum		.	.	.	.	+	+	+	.	1.1	4
Pleurozium schreberi	d	.	1.1	.	.	.	.	1.1	.	.	2
Vaccinum vitis-idea		.	.	1.2	.	.	.	.	.	.	1
Accompanying species											
Calluna vulgaris		1.1	2.2	1.1	2.2	3.3	+	2.2	.	2.2	8
Molinia caerulea		1.1	1.1	1.2	+	+	+	+	.	.	7
Sphagnum fallax	d	3.3	.	.	.	.	4.4	.	2.2	3.3	4
Dicranum bonjeanii	d	.	.	.	.	1.2	.	1.1	.	.	2
Frangula alnus	b	+	.	.	+	.	.	.	.	.	2
Phragmites australis		+	.	.	+	.	.	.	.	.	2
Sphagnum palustre	d	.	.	.	.	2.2	.	.	.	.	1
Sphagnum subnitens	d	.	.	1.2	.	.	.	.	.	.	1
Hypnum jutlandicum	d	.	1.1	.	.	.	.	.	.	.	1
Quercus robur	c	.	.	.	+	.	.	.	.	.	1
Sorbus aucuparia	b	.	.	+	.	.	.	.	.	.	1

Abbreviations: see Table 1

Table A.2.6

Fungi in *Erico-Sphagnetum medii*

Successive number	1	2	3	4	5	6	7	8	9	Frequency
Plot number	Wrz2	TT1	ŻBł5	Wrz1	Rob4	Str1	Rob3	ŻBł6	Str1A	
Localities	Wrz	TT	ŻBł	Wrz	Rob	Str	Rob	ŻBł	Str	
Plot area (m^2)	300	100	150	200	200	300	200	100	250	
Number of observations	25	22	26	25	22	22	22	26	22	
Total number of species	30	29	27	27	23	22	22	21	20	
Mycorrhizal fungi										
Lactarius helvus	4^{r-n}	9^{r-a}	9^{r}	4^{r}	8^{r-n}	9^{r-a}	4^{r-n}	4^{r}	11^{r-a}	9
Cortinarius huronensis	4^{r}	8^{r-n}	9^{r-n}	3^{r}	2^{r}	6^{r}	3^{r}	5^{n}	4^{r}	9
Cortinarius semisanguineus	5^{r}	.	7^{r}	4^{r}	7^{r-a}	9^{r-n}	7^{r-a}	5^{r}	9^{r-n}	8
Lactarius tabidus	4^{r-n}	3^{r}	7^{r}	5^{r-n}	7^{r-n}	4^{r-n}	9^{r-n}	.	7^{r-n}	8
Paxillus involutus	2^{r}	5^{r}	5^{r}	3^{r}	.	4^{r}	.	1^{r}	6^{r-n}	7
Leccinum niveum	2^{r}	4^{r}	6^{r}	4^{r}	1^{r}	4^{r}	.	.	5^{r}	7
Laccaria proxima	3^{r}	.	8^{r-n}	2^{r}	2^{r}	.	2^{r-a}	6^{r-n}	.	6
Russula emetica	4^{r}	4^{r}	6^{r}	3^{r}	.	6^{r-n}	.	.	8^{r-n}	6
Suillus variegatus	3^{r}	.	7^{r}	4^{r}	.	3^{r}	.	2^{r}	2^{r}	6
Amanita fulva	2^{r}	.	4^{r}	3^{r}	2^{r}	2^{r}	.	.	2^{r}	6
Thelephora terrestris	7^{r}	22^{r}	4^{r}	9^{r}	.	.	.	7^{r}	.	5
Cortinarius flexipes var. *flexipes*	6^{r-n}	9^{r-a}	4^{r}	7^{r-n}	.	.	5^{r-n}	.	.	5
Russula betularum	1^{r}	.	.	2^{r}	3^{r}	.	.	.	.	3
Suillus bovinus	.	3^{r}	5^{r-n}	.	.	.	.	.	.	2
Russula xerampelina	.	1^{r}	2^{r}	.	.	.	.	.	.	2
Cortinarius fulvescens	.	8^{r-n}	.	.	.	.	.	.	.	1
Chroogomphus rutilus var. *rutilus*	.	.	.	.	.	3^{r}	.	.	.	1
Russula paludosa	.	.	3^{r}	.	.	.	.	.	.	1
Hebeloma crustuliniforme	.	.	.	.	.	.	2^{r}	.	.	1
Suillus flavidus	.	2^{r}	.	.	.	.	.	.	.	1
Cortinarius acutus	.	1^{r}	.	.				.		1
Cortinarius obtusus	.	1^{r}	.	.	.	.	.	.	.	1
Saprotrophic fungi										
a) on peat										
Entoloma sericatum	.	.	.	.	2^{r}	.	8^{r}	.	.	2
Clavaria fragilis	.	.	.	.	.	.	4^{r-n}	2^{r}	.	2
Hygrocybe coccineocrenata	1^{r}	.	.	.	.	.	1^{r}	.	.	2
Rhodocollybia maculata var. *maculata*	.	.	1^{r}	.	.	.	.	.	.	1
b) among mosses										
Hypholoma udum	3^{r}	6^{r-n}	5^{r-n}	4^{r}	12^{r-a}	13^{r-a}	10^{r-a}	8^{r-n}	9^{r-a}	9
Galerina tibiicystis	2^{r}	4^{r}	9^{r-n}	1^{r}	7^{r-n}	4^{r}	4^{r-n}	12^{r-a}	3^{r}	9
Hypholoma elongatum	3^{r}	1^{r}	3^{r-n}	1^{r}	6^{r-a}	6^{r-a}	5^{n-a}	5^{r-n}	3^{r-n}	9
Galerina paludosa	.	1^{r}	6^{r}	.	5^{r-n}	4^{r}	8^{r-n}	9^{r-n}	5^{r}	7
Galerina calyptrata	1^{r}	1^{r}	.	.	3^{n}	3^{r}	5^{r-n}	.	2^{r}	6
Galerina hypnorum	3^{r}	.	4^{r}	4^{r}	.	1^{r}	.	.	3^{r}	5
Mycena megaspora	.	.	.	.	7^{r-a}	4^{r-n}	2^{r}	.	3^{r}	4
Galerina vittiformis var. *vittiformis*	2^{r}	.	3^{r}	.	5^{r-a}	.	.	3^{r}	.	4
Mycena adonis var. *adonis*	.	.	.	2^{r}	3^{r}	.	2^{r}	.	.	3
Galerina sphagnorum	.	.	.	.	2^{r}	.	.	1^{r}	.	2
Lichenomphalia umbellifera	2^{r}		.	.				.		1

c) on litter										
Mycena galopus	7^{r-n}	12^{r-a}	8^{r}	8^{r-n}	3^{r-n}	14^{r-a}	7^{r-a}	9^{r-n}	12^{r-n}	9
Gymnopus androsaceus	6^{r-n}	11^{r-a}	10^{r-n}	5^{r-n}	.	8^{n-a}	7^{r-n}	8^{r}	10^{r-a}	8
Mycena epipterygia var. *epipterygia*	3^{r-n}	4^{r-n}	3^{r}	3^{r-n}	5^{r-n}	2^{r-n}	4^{r-n}	4^{r}	.	8
Mycena sanguinolenta	6^{r-n}	3^{r-n}	5^{r-n}	5^{r-n}	.	.	.	6^{r}	.	5
Collybia cookei	2^{r}	2^{r-n}	.	.	.	.	.	.	1^{n}	3
Clitocybe vibecina	.	3^{r-n}	.	2^{r-n}	.	.	.	.	.	2
Mycena vitilis	.	3^{r}	.	.	.	.	.	.	.	1
Mycena vulgaris	.	.	.	2^{r}	.	.	.	.	.	1
Collybia cirrata	.	.	.	.	.	.	.	2^{r}	.	1
d) on wood										
Mycena galericulata	3^{r}	1^{r}	.	2^{r}	1^{r}	.	.	.	.	4
Dacryomyces stillatus	.	2^{r}	.	3^{r}	.	.	.	.	.	2
Trichaptum abietinum	3X	.	.	.	.	.	.	.	.	1
Trametes hirsuta	.	1X	.	.	.	.	.	.	.	1
e) on animal dung										
Psilocybe coprophila	.	.	.	.	2^{n-a}	.	1^{r}	.	.	2
Panaeolus papilionaceus var. *papilionaceus*	.	.	.	.	.	1^{r}	.	.	.	1
Parasitic fungi										
Lyophyllum palustre	2^{r}	.	9^{r}	.	4^{r-n}	7^{r-n}	.	14^{r-a}	4^{r}	6
Rickenella fibula	2^{r}	.	.	3^{r}	.	.	4^{r-n}	3^{r}	.	4

Abbreviations see Table 1 and Table A.2.1

Table A.1.7

Sphagnetum magellanici

Successive number	1	2	3	4	5	6	7	9	9	10	Constancy
Plot number	ZB5	ZB6	SD9	Żur1	P-38c	SD10	JCM1	SD11	Żur3	Żur2	
Localities	ZB	ZB	SD	Żur	P-38	SD	JCM	SD	Żur	Żur	
Day	09	09	15	20	29	15	23	15	20	20	
Month	07	07	06	06	06	06	07	06	06	06	
Year	2004	2004	2004	2004	2004	2004	2001	2004	2004	2004	
Density of shrub layer b (%)	-	-	-	-	-	40	5	40	70	50	
Cover of herb layer c (%)	40	20	20	35	40	35	40	40	30	40	
Cover of moss layer d (%)	100	100	90	75	90	90	60	80	70	70	
Plot area (m^2)	400	400	400	400	400	400	400	400	400	400	
Total number of species in a relevé	17	15	15	9	11	14	11	15	11	12	
including: vascular plants	11	8	9	6	6	9	9	10	8	11	
cryptogamic plants	8	7	6	3	5	5	2	5	3	3	
	S.m. typicum					*S.m. pinetosum*					
Ch. *Sphagnetum magellanici*, *Sphagnetalia magellanici*											
Sphagnum magellanicum d	5.5	4.4	4.4	4.4	3.4	4.4	3.3	4.4	3.3	3.3	V
Oxycoccus palustris	3.3	2.2	2.3	3.3	3.3	3.3	2.2	3.3	2.3	3.3	V
Andromeda polifolia	2.2	1.1	+	+	2.2	2.2	3.3	2.3	.	.	IV
Polytrichum strictum d	1.2	1.2	1.1	.	1.1	3.3	.	2.3	.	.	III
Eriophorum vaginatum	+	.	.	+	1.2	.	1.1	.	2.2	2.3	III
Sphagnum rubellum d	.	.	2.2	.	.	+	2.2	1.1	.	.	II
Sphagnum capillifolium d	1.2	2.2	.	.	.	.	.	.	.	.	I
Sphagnum fuscum d	.	.	+	.	.	.	.	.	.	.	I

Ch. *Oxycocco-Sphagnetea*												
Drosera rotundifolia		2.2	1.1	1.1	1.1	2.2	1.1	1.1	2.2	2.2	2.2	V
Aulacomnium palustre	d	1.1	2.2	+	+	3.3	+	.	+	.	+	IV
Ch. *Scheuchzerio-Caricetea nigrae*												
Eriophorum angustifolium		1.1	1.1	1.1	2.2	1.1	+	+	+	1.1	1.1	V
Scheuchzeria palustris		.	.	1.1	+	.	.	.	.	.	+	II
Comarum palustre		+	+	.	.	.	.	.	.	.	.	I
Rhynchospora alba		.	.	+	.	.	.	.	.	.	+	I
Carex limosa		.	.	1.1	.	.	.	.	.	.	.	I
Straminergon stramineum	d	.	.	.	.	+	.	.	.	.	.	I
Warnstorfia fluitans	d	+	.	.	.	.	.	.	.	.	.	I
Accompanying species								.				
Sphagnum fallax	d	+	1.1	2.2	1.1	3.3	2.2	.	1.1	3.4	3.3	V
Pinus sylvestris f. *turfosa*	b	.	.	.	.	.	3.3	1.1	3.4	4.4	3.4	III
Betula pubescens	b	.	.	.	.	.	1.1	.	+	+	1.1	II
	c	+	.	+	.	.	+	.	+	.	.	II
Calluna vulgaris		+	.	.	.	.	+	1.1	+	.	.	II
Molinia caerulea		.	+	.	.	.	.	.	+	+	1.1	II
Sphagnum palustre	d	+	1.1	.	.	.	.	.	.	1.2	.	II
Ledum palustre		.	.	.	.	.	+	1.1	1.1	.	.	II
Pinus sylvestris	c	+	+	.	.	.	.	.	.	+	.	II
Sphagnum fimbriatum	d	1.1	1.1	.	.	.	.	.	.	.	.	I
Carex rostrata		.	.	+	.	1.1	.	.	.	.	.	I
Salix sp.	c	.	+	.	.	.	.	.	.	.	.	I
Vaccinium uliginosum		.	.	.	.	.	.	+	.	.	.	I

Abbreviations: see Table 1

Table A.2.7

Fungi in *Sphagnetum magellanici*

Successive number	1	2	3	4	5	6	7	8	9	10	Constancy
Plot number	ZB5	ZB6	SD9	Żur1	P-38c	SD10	JCM1	SD11	Żur3	Żur2	
Localities	ZB	ZB	SD	Żur	P-38	SD	JCM	SD	Żur	Żur	
Plot area (m^2)	400	400	400	400	400	400	400	400	400	400	
Number of observations	24	24	25	24	24	25	23	25	24	24	
Total number of species	25	21	18	17	16	37	34	33	28	27	
	S. m. typicum					*S. m. pinetosum*					
Mycorrhizal fungi											
Laccaria proxima	6^{r-n}	5^{r-n}	5^{r}	6^{r-n}	5^{r-n}	11^{r-n}	7^{r-n}	13^{r-a}	8^{r-n}	11^{r-a}	V
Lactarius helvus	4^{r-n}	5^{r-n}	5^{r-n}	4^{r-n}	4^{r-n}	8^{r-a}	6^{r-n}	7^{r-n}	6^{r-n}	5^{r-n}	V
Amanita fulva	2^{r}	3^{r}	.	1^{r}	.	4^{r}	7^{r}	6^{r}	9^{r}	7^{r}	IV
Russula emetica	2^{r}	3^{r}	.	2^{r}	.	5^{r-n}	5^{r}	6^{r-n}	5^{r-n}	4^{r}	IV
Cortinarius huronensis	2^{r}	3^{r}	.	.	.	6^{r-n}	6^{r-n}	8^{r-a}	4^{r-n}	3^{r}	IV
Lactarius rufus	2^{r}	.	.	3^{r}	.	5^{r-n}	8^{r-n}	7^{r-n}	7^{r-n}	6^{r-n}	IV
Paxillus involutus	2^{r}	.	.	.	2^{r}	5^{r}	6^{r}	7^{r-n}	4^{r-n}	5^{r}	IV
Leccinum niveum	1^{r}	.	1^{r}	.	.	5^{r-n}	.	1^{r}	1^{r}	6^{r-n}	III
Suillus variegatus	.	.	.	.	1^{r}	4^{r}	5^{r}	5^{r-n}	4^{r}	3^{r}	III
Thelephora terrestris	4^{r}	2^{r}	4^{r}	.	.	6^{r}	8^{r}	7^{r}	.	.	III
Inocybe napipes	.	.	.	.	.	3^{r}	5^{r}	4^{r}	2^{r}	1^{r}	III
Cortinarius semisanguineus		.	.	1^{r}	.	3^{r}	5^{r}	4^{r}	.	.	II

Russula claroflava	.	.	.	.	.	4^{r}	.	2^{r}	1^{r}	3^{r}	II
Cortinarius flexipes var. *flexipes*		.	.	.	.	3^{r}	.	5^{n-a}	.	5^{n-a}	II
Russula betularum	.	.	.	.	.	2^{r}	.	.	1^{r}	3^{r}	II
Russula paludosa	.	.	.	.	.	.	4^{r}	.	1^{r}	.	I
Lactarius vietus	.	.	.	.	.	1^{r}	.	.	.	3^{r}	I
Russula decolorans	.	.	.	.	.	.	6^{r}	.	.	.	I
Suillus flavidus	.	.	.	.	.	.	3^{r}	.	.	.	I
Saprotrophic fungi											
a) on peat											
Entoloma cetratum	.	.	.	1^{r}	.	3^{r}	6^{r-n}	5^{r-n}	5^{r}	3^{r}	III
Clavaria fragilis	3^{r-n}	2^{r-n}	3^{r-n}	.	.	.	.	.	.	.	II
Entoloma sericatum	.	.	1^{r}	.	.	.	3^{r}	.	.	.	I
Hygrocybe coccineocrenata	.	2^{r-n}	.	.	.	.	.	1^{r}	.	.	I
Entoloma conferendum var. *conferendum*	.	2^{r}	.		.	1^{r}	.	.	.	.	I
b) among mosses											
Galerina paludosa	7^{r-n}	8^{r-n}	7^{r}	7^{r-n}	9^{r-n}	9^{r-n}	7^{r-n}	7^{r-n}	6^{r-n}	6^{r-n}	V
Hypholoma elongatum	5^{r-n}	4^{r-n}	5^{n-a}	3^{r-n}	4^{r-n}	4^{r-n}	4^{r-n}	4^{r-n}	4^{r-n}	3^{r-n}	V
Hypholoma udum	6^{r-n}	5^{r-a}	7^{r-a}	3^{r-n}	6^{r-n}	4^{r-n}	5^{r}	5^{r-n}	5^{r-n}	6^{r-n}	V
Galerina tibiicystis	9^{r-n}	8^{r-n}	10^{r-a}	9^{r-n}	11^{r-a}	9^{r-n}	7^{r-n}	7^{r}	8^{r-n}	8^{r}	V
Arrhenia gerardiana	3^{r-n}	5^{r-n}	5^{r-n}	2^{r}	3^{r}	3^{r}	3^{r}	.	2^{r}	1^{r}	V
Galerina sphagnorum	2^{r-n}	3^{r-n}	4^{r-n}	.	2^{r-n}	4^{r-n}	1^{r}	2^{r-n}	.	.	IV
Lichenomphalia umbellifera	5^{r}	6^{r-n}	.	.	2^{r}	4^{r-n}	.	2^{r}	.	.	III
Mycena adonis var. *adonis*	.	.	.	.	.	2^{r}	5^{r-n}	4^{r}	.	2^{r}	II
Galerina jaapii	.	.	.	.	.	1^{r}	3^{r}	2^{r}	.	.	II
Galerina hypnorum	.	.	.	.		.	3^{r}	.	1^{r}	.	I
Mycena megaspora	2^{r}	.	.	.	.	1^{r}	.	.	.	.	I
c) on litter											
Gymnopus androsaceus	6^{r-n}	5^{r}	8^{r-n}	5^{r-n}	6^{r-a}	10^{r-n}	11^{r-n}	11^{r-a}	11^{r-n}	12^{r-n}	V
Mycena galopus	7^{r-a}	8^{r-a}	12^{r-a}	7^{r-n}	6^{r-a}	10^{r-a}	9^{r-a}	9^{r-n}	9^{r-a}	10^{r-n}	V
Mycena epipterygia var. *epipterygia*	4^{r-n}	3^{r}	3^{n}	2^{r}	3^{r-a}	4^{r-n}	4^{r-n}	4^{n}	4^{r-n}	3^{r-n}	V
Mycena sanguinolenta	6^{r-n}	5^{r-n}	7^{r-a}	2^{r}	3^{n}	6^{r}	8^{r-n}	5^{r-n}	6^{r-n}	7^{r-n}	V
Collybia cirrata	2^{r-n}	.	2^{r}	.	.	.	4^{r}	.	.	.	II
Mycena vulgaris	.	.	.	.	.	.	3^{r}	.	.	.	I
Collybia cookei	.	.	.	.	.	2^{r}	.	.	.	.	I
d) on wood											
Dacryomyces stillatus	.	.	.	.	.	2^{r}	2^{r}	3^{r}	1^{r}	2^{r}	III
Trichaptum fuscoviolaceum	.	.	.	.	.	3X	2X	2X	1X	.	II
Piptoporus betulinus	.	.	.	.	.	1X	.	.	.	.	I
Panellus mitis	.	.	.	.	.	.	.	2^{r}	.	.	I
Parasitic fungi											
Lyophyllum palustre	9^{r-a}	8^{r-a}	11^{r-a}	8^{r-n}	12^{r-a}	9^{r-a}	7^{r-n}	7^{r-n}	6^{r-n}	7^{r-n}	V
Rickenella fibula	2^{r}	.	.	.	.	.	.	2^{r}	1^{r}	.	II

Abbreviations see Table 1 and Table A.2.1

Table A.1.8

Community *Eriophorum vaginatum-Sphagnum fallax*

Successive number		1	2	3	4	5	6	7	8	9	10	11	Constancy
Plot number		K12	K13	SD8	N9	Z-Ia	D6	P-38a	SD7	Rep1	P-38b	B1	
Localities		K	K	SD	N	Z-I	D	P-38	SD	Rep	P-38	B	
Day		24	28	15	10	25	10	29	15	25	29	20	
Month		07	06	06	06	05	06	06	06	05	06	06	
Year		2001	2003	2004	2001	2001	2001	2004	2004	2006	2004	2000	
Density of shrub layer	b (%)	25	5	5	5	5	5	+	5	20	-	10	
Cover of herb layer	c (%)	50	70	65	90	90	70	85	60	60	70	70	
Cover of moss layer	d (%)	70	70	30	70	55	50	70	40	60	60	80	
Plot area (m^2)		400	400	400	400	400	400	400	400	400	400	70	
Total number of species in a relevé		10	12	7	13	12	13	8	6	9	10	16	
including: vascular plants		8	10	4	11	8	10	5	3	7	7	11	
cryptogamic plants		2	2	3	2	4	3	3	3	2	3	5	
D. *Eriophorum vaginatum-Sphagnum fallax*													
Eriophorum vaginatum		3.3	4.4	4.4	4.4	4.4	4.4	4.3	4.4	4.4	4.3	4.4	V
Sphagnum fallax	d	4.4	4.4	3.3	4.4	3.3	3.3	4.4	3.3	4.4	4.4	3.3	V
Ch. *Sphagnion magellanici, Sphagnetalia magellanici*													
Oxycoccus palustris		2.2	2.2	2.2	3.3	3.3	+	3.3	1.1	.	3.2	.	V
Sphagnum magellanicum	d	.	.	1.1	.	1.2	.	.	2.2	.	.	3.3	II
Polytrichum strictum	d	.	.	.	.	+	+	.	.	.	.	1.1	II
Andromeda polifolia		.	.	.	.	+	.	.	.	.	.	+	I
Ch. *Oxycocco-Sphagnetea*													
Drosera rotundifolia		.	+	.	2.2	1.1	+	2.2	.	.	2.2	+	IV
Aulacomnium palustre	d	.	.	+	.	.	.	1.2	+	1.1	1.1	1.1	III
Ch. *Scheuchzerio-Caricetea nigrae*													
Carex canescens		1.2	1.1	.	2.2	.	2.2	.	.	1.1	1.1	+	IV
Eriophorum angustifolium		+	+	.	.	+	+	.	.	.	1.1	1.1	III
Sphagnum cuspidatum	d	2.2	2.2	.	2.2	2.2	2.2	.	.	.	.	.	III
Straminergon stramineum	d	.	.	.	.	.	.	1.1	.	.	+	+	II
Carex limosa		.	.	.	.	2.2	.	.	.	.	.	1.1	I
Carex nigra		.	.	.	1.2	.	+	.	.	.	.	.	I
Menyanthes trifoliata		.	.	.	1.2	.	.	.	.	.	.	+	I
Carex lasiocarpa		.	.	.	+	.	.	.	.	.	.	.	
Accompanying species													
Betula pubescens	b	2.2	1.1	+	.	1.1	+	.	.	2.2	.	2.1	IV
	c	+	.	.	.	+	.	.	.	+	.	.	II
Pinus sylvestris	b	.	.	1.1	1.1	.	+	+	1.1	.	.	+	III
	c	.	+	1.1	.	.	+	+	.	.	.	.	II
Carex rostrata		.	.	.	1.2	2.2	.	+	.	.	+	2.2	III
Ledum palustre		1.1	1.1	.	.	.	.	.	.	+	.	.	II
Betula pendula	b	.	+	.	+	.	1.1	.	.	.	.	.	II
	c	.	.	.	1.1	.	+	.	.	.	.	.	I
Phragmites australis		+	+	.	.	.	.	.	.	+	.	.	II
Juncus effusus		+	.	.	.	.	.	.	.	.	+	.	I
Molinia caerulea		.	.	.	.	.	.	.	.	1.1	.	.	I
Picea excelsa	b	.	.	.	+	.	.	.	.	.	.		I
Quercus robur	c	.	.	.	.	.	.	.	.	.	.	+	I
Thelypteris palustris		.	.	.	.	.	+	.	.	.	.	.	I

Abbreviations: see Table 1

Table A.2.8
Fungi in community of *Eriophorum vaginatum-Sphagnum fallax*

Successive number	1	2	3	4	5	6	7	8	9	10	11	Constancy
Plot number	K12	K13	SD8	N9	Z-Ia	D6	P-38a	SD7	Rep1	P-38b	B1	
Localities	K	K	SD	N	Z-I	D	P-38	SD	Rep	P-38	B	
Plot area (m^2)	400	400	400	400	400	400	400	400	400	400	70	
Number of observations	23	23	25	24	23	22	24	25	26	24	14	
Total number of species	30	28	24	23	23	19	18	17	16	15	12	
Mycorrhizal fungi												
Laccaria proxima	11^{r-n}	7^{n-a}	11^{r-n}	9^{r-n}	8^{r-a}	8^{r-n}	5^{r}	7^{r-n}	8^{r-n}	7^{r}	3^{r-n}	V
Lactarius helvus	8^{r-n}	5^{r-n}	9^{r-a}	7^{r}	7^{r-n}	5^{r}	4^{r}	7^{r-n}	4^{n}	.	.	V
Cortinarius huronensis	9^{n-a}	4^{r}	8^{r-n}	8^{n-a}	7^{r-n}	8^{n-a}	2^{r}	2^{r}	.	.	3^{r}	V
Paxillus involutus	6^{r}	3^{r}	6^{r-n}	5^{r}	4^{r}	6^{r}	3^{r}	3^{r}	.	.	.	IV
Leccinum niveum	8^{r-n}	5^{r-n}	5^{r}	4^{r-n}	4^{r}	4^{r}	.	.	3^{r}	.	.	IV
Lactarius tabidus	6^{r-n}	7^{r-n}	5^{r-n}	2^{r}	3^{r}	3^{r}	.	.	8^{r-n}	.	.	IV
Amanita fulva	7^{r}	2^{r}	6^{r}	2^{r}	.	3^{r}	.	2^{r}	.	.	.	III
Russula betularum	5^{r}	6^{r}	4^{r}	2^{r}	4^{r}	.	.	.	2^{r}	.	.	III
Thelephora terrestris	.	2^{r}	6^{r}	.	.	6^{r}	.	.	8^{n}	.	2^{n}	III
Lactarius rufus	7^{r-n}	.	5^{r-n}	5^{r-a}	.	7^{r}	.	.	.	.	.	II
Suillus variegatus	8^{r-n}	2^{r}	4^{r}	6^{r-n}	.	.	.	.	.	.	.	II
Russula emetica	5^{r}	.	5^{r-n}	5^{r}	.	.	.	.	.	.	.	II
Cortinarius fulvescens	5^{r-a}	3^{n}	.	.	.	.	.	.	.	.	.	I
Lactarius glyciosmus	5^{r}	.	.	.	2^{r}	.	.	.	.	.	.	I
Lactarius vietus	.	3^{r-n}	.	.	.	.	.	.	.	.	.	I
Saprotrophic fungi												
a) on peat												
Clavaria fragilis	5^{r-n}	3^{n}	.	.	.	.	.	2^{r}	.	.	.	II
b) among mosses												
Galerina paludosa	10^{r-n}	5^{r-n}	5^{r}	10^{r}	10^{r}	9^{r}	7^{r-n}	6^{r}	7^{r-n}	7^{r-n}	8^{r-n}	V
Hypholoma elongatum	7^{n-a}	4^{r-n}	5^{r-n}	7^{n}	8^{r-n}	6^{n}	5^{r-n}	4^{r-n}	4^{r}	6^{r-a}	3^{r}	V
Hypholoma udum	4^{r}	4^{r-n}	4^{r}	4^{r}	4^{r}	4^{r}	6^{r-n}	6^{r-n}	4^{r}	4^{r-n}	1^{r}	V
Galerina tibiicystis	4^{r-n}	3^{r}	3^{r}	5^{r}	4^{r-n}	.	7^{r-n}	5^{r}	3^{r}	8^{r-a}	.	V
Galerina calyptrata	6^{r-n}	3^{r}	5^{r}	6^{n}	4^{r-n}	.	3^{r}	3^{r}	.	2^{r}	.	IV
Galerina sphagnorum	6^{r-n}	3^{r}	.	.	.	.	4^{r}	3^{r}	.	3^{r}	2^{r}	III
Arrhenia gerardiana	5^{r}	2^{r}	.	4^{r}	4^{r-n}	.	2^{r}	.	.	3^{r}	.	III
Mycena adonis var. *adonis*	4^{n}	3^{r}	.	.	.	.	.	.	.	.	.	I
Ascocoryne turficola	.	.	.	.	3^{r-n}	.	.	.	.	2^{r}	.	I
Mycena megaspora	.	.	.	.	.	.	1^{r}	.	.	2^{r}	.	I
c) on litter												
Gymnopus androsaceus	10^{r-n}	5^{r-n}	8^{-n}	9^{n}	9^{r-n}	13^{n-a}	7^{r-n}	6^{r-n}	5^{r-n}	6^{r-n}	4^{r-n}	V
Mycena galopus	9^{r-n}	4^{r-n}	8^{r-a}	7^{r}	8^{r}	8^{r-n}	6^{r-n}	7^{r-n}	6^{r-n}	7^{r-a}	3^{r}	V
Mycena epipterygia var. *epipterygia*	6^{n-a}	3^{n}	4^{r-a}	3^{r}	6^{r-n}	5^{r-a}	3^{r}	3^{r-n}	4^{r}	4^{r}	4^{r}	V
Mycena sanguinolenta	5^{n}	1^{r}	5^{r}	3^{r}	.	9^{r-n}	3^{r}	.	.	.	.	III
Collybia cirrata	.	2^{r}	.	.	.	.	.	.	.	3^{r}	.	I
Collybia cookei	.	.	3^{r}	.	.	.	.	2^{r}	.	.	.	I
Marasmius epiphyllus	3^{r}	.	.	.	1^{r}	.	.	.	.	.	.	I
d) on wood												
Mycena galericulata	6^{r-n}	.	.	2^{r}	4^{r}	1^{r}	.	.	3^{r}	.	.	III
Piptoporus betulinus	.	.	.	.	2X	.	.	.	.	.	.	I
Parasitic fungi												
Lyophyllum palustre	12^{n-a}	8^{r-n}	7^{r}	11^{r-n}	13^{n-a}	11^{r-n}	11^{r-a}	6^{r}	10^{r-n}	12^{n-a}	11^{r-n}	V
Rickenella fibula	4^{r}	2^{r}	1^{r}	.	4^{r}	4^{r}	1^{r}	.	2^{r}	.	1^{r}	IV

Abbreviations see Table 1 and Table A.2.1

Table A.1.9

Vaccinio uliginosi-Pinetum

Successive number		1	2	3	4	5	6	7	8	9	10	Constancy
Plot number		Nw8	Nw7	Nw6	ZB15	ZB14	SD16	ŹBł4	ŹBł3	JCM4	JCM5	
Localities		Nw	Nw	Nw	ZB	ZB	SD	ŻBł	ŻBł	JCM	JCM	
Day		26	26	26	09	09	15	30	30	24	24	
Month		06	06	06	07	07	06	05	05	07	07	
Year		2004	2004	2004	2004	2004	2004	2001	2001	2001	2001	
Density of tree layer	a (%)	60	40	45	40	60	40	40	60	60	60	
Density of shrub layer	b (%)	5	15	15	20	5	5	15	5	5	5	
Cover of herb layer	c (%)	40	25	35	60	75	40	30	35	55	60	
Cover of moss layer	d (%)	40	70	80	50	70	75	40	70	40	60	
Plot area (m^2)		400	400	400	400	400	400	400	400	400	400	
Total number of species in a relevé		16	19	19	20	23	18	15	19	16	17	
including: vascular plants		12	12	13	13	17	13	12	15	10	12	
cryptogamic plants		4	7	6	7	6	5	3	4	5	5	
Trees and shrubs:												
Pinus sylvestris	a	4.4	3.1	3.3	3.2	3.3	3.3	3.4	4.3	4.4	4.4	V
	b	+	2.1	1.1	2.2	1.1	1.1	2.2	1.1	1.1	1.2	V
	c	+	+	.	1.1	1.1	+	.	.	.	+	III
Betula pubescens	a	1.1	1.1	1.1	1.1	2.2	1.1	.	.	+	+	IV
	b	1.1	1.1	2.1	2.2	+	+	.	+	+	.	IV
	c	+	+	.	+	1.1	.	.	+	+	+	IV
Frangula alnus	b	.	.	+	+	+	.	.	+	.	.	II
	c	.	.	.	.	+	.	.	.	.	.	I
Juniperus communis	b	.	.	.	+	+	.	.	.	.	.	I
Ch., D.* *Vaccinio uliginosi-Pinetum*												
Ledum palustre		2.1	1.2	2.2	3.3	3.4	2.2	2.2	1.1	3.3	3.3	V
Vaccinium uliginosum		1.1	1.2	1.2	1.2	2.3	1.2	1.2	1.2	1.2	1.1	V
**Eriophorum vaginatum*		1.2	1.1	1.2	1.1	2.3	2.2	+	1.2	2.2	1.2	V
**Oxycoccus palustris*		1.1	+	1.1	1.1	2.1	1.2	1.1	2.2	1.1	2.2	V
**Aulacomnium palustre*	d	+	.	1.1	.	.	1.1	.	+	.	.	II
Ch. *Vaccinio-Piceetea*												
Vaccinium myrtillus		2.2	1.1	2.2	2.3	2.2	2.2	1.2	1.2	1.1	1.1	V
Vaccinium vitis-idea		+	1.1	+	1.1	1.1	+	+	+	1.1	1.1	V
Pleurozium schreberi	d	.	+	+	3.3	3.4	.	.	+	1.2	+	IV
Dicranum scoparium	d	.	+	.	+	.	.	.	.	1.2	+	II
Dicranum polysetum	d	.	.	.	1.2	2.2	.	.	.	.	.	I
Ch. *Oxycocco-Sphagnetea*												
Andromeda polifolia		1.1	+	+	.	+	1.1	+	1.1	1.2	1.1	V
Sphagnum magellanicum	d	.	+	.	1.1	2.2	.	+	.	2.2	2.2	III
Drosera rotundifolia		.	+	+	+	+	+	.	.	.	+	III
Polytrichum strictum	d	.	+	1.2	+	+	+	.	.	.	.	III
Erica tetralix		.	.	.	.	.	.	+	1.2	.	.	I
Ch. *Scheuchzerio-Caricetea nigrae*												
Eriophorum angustifolium		+	1.1	1.1	.	+	+	1.1	1.1	1.1	1.1	V
Carex lasiocarpa		.	.	.	.	+	.	.	.	.	.	I
Rhynchospora alba		.	.	.	.	+	.	.	.	.	.	I
Accompanying species												
Sphagnum fallax	d	3.3	4.4	4.4	1.2	2.2	4.4	3.3	4.4	1.1	3.3	V
Calluna vulgaris		1.1	1.1	+	1.2	1.2	1.2	.	+	1.1	2.2	V
Sphagnum fimbriatum	d	+	1.1	2.2	2.2	2.2	.	1.1	1.2	.	.	IV

Sphagnum palustre	d	1.1	1.1	1.2	.	.	1.1	.	.	.	.	II
Molinia caerulea		+	.	.	.	.	+	1.2	1.1	.	.	II
Polytrichum commune	d	.	.	.	.	.	1.2	.	.	2.2	2.3	II
Dryopteris carthusiana		.	.	.	.	.	.	+	+	.	.	I
Rubus sp.		.	.	.	+	+	.	.	.	.	.	I

Abbreviations: see Table 1

Table A.2.9
Fungi in *Vaccinio uliginosi-Pinetum*

Successive number	1	2	3	4	5	6	7	8	9	10	Constancy
Plot number	Nw8	Nw7	Nw6	ZB15	ZB14	SD16	ŻBł4	ŻBł3	JCM4	JCM5	
Localities	Nw	Nw	Nw	ZB	ZB	SD	ŻBł	ŻBł	JCM	JCM	
Plot area (m^2)	400	400	400	400	400	400	400	400	400	400	
Number of observations	26	26	26	24	24	25	26	26	23	23	
Total number of species	65	59	56	46	44	42	42	38	36	32	
Mycorrhizal fungi											
Lactarius helvus	7^{r-n}	4^{r-n}	5^{n}	5^{n}	7^{n-a}	4^{r-n}	4^{r-n}	7^{r}	5^{r-n}	7^{r-n}	V
Russula emetica	6^{r-n}	5^{r}	5^{r-n}	2^{r}	4^{r}	5^{r}	6^{r}	5^{r}	5^{r}	6^{r}	V
Paxillus involutus	7^{r-n}	4^{r}	5^{r}	4^{r-n}	5^{r-n}	3^{r}	5^{r}	5^{r}	3^{r}	2^{r}	V
Laccaria proxima	6^{r-n}	5^{r-n}	6^{r-n}	.	6^{r-a}	6^{r-n}	7^{r-a}	6^{r-n}	6^{n}	6^{n-a}	V
Lactarius rufus	7^{r-a}	6^{r}	5^{r}	5^{r-n}	.	3^{r}	4^{r-n}	5^{r-n}	4^{r-n}	6^{r-n}	V
Cortinarius semisanguineus	7^{r-n}	6^{r-n}	5^{r}	5^{r-n}	.	4^{r}	3^{r}	2^{r}	3^{r}	6^{r-n}	V
Cortinarius flexipes var. *flexipes*	.	6^{n-a}	5^{r-a}	3^{r}	4^{n}	5^{r-n}	3^{r}	3^{n}	4^{r-n}	5^{n}	V
Thelephora terrestris	11^{r}	6^{r}	7^{r}	5^{r}	.	.	7^{r}	8^{r}	8^{r}	8^{r}	IV
Suillus variegatus	5^{r-n}	4^{r-n}	3^{r-n}	3^{r}	5^{r}	2^{r}	.	3^{r}	.	3^{r}	IV
Suillus bovinus	6^{r-a}	5^{r-n}	5^{r-n}	4^{r-n}	.	4^{r-n}	2^{r}	.	3^{r-n}	2^{r}	IV
Amanita fulva	.	4^{r}	5^{r}	.	4^{r-n}	5^{r}	3^{r}	4^{r}	2^{r}	4^{r}	IV
Hebeloma circinans	.	4^{r}	3^{r}	.	2^{r}	1^{r}	1^{r}	2^{r}	.	2^{r}	IV
Inocybe napipes	4^{r}	2^{r}	.	.	3^{r}	4^{r}	2^{r}	3^{r}	.	5^{r}	IV
Russula paludosa	5^{r}	3^{r}	2^{r}	.	.	3^{r}	2^{r}	.	3^{r}	5^{r}	IV
Lactarius tabidus	5^{r}	7^{r-a}	7^{r-n}	.	6^{r-n}	6^{r-n}	.	4^{r-n}	.	.	III
Chroogomphus rutilus var. *rutilus*	2^{r}	1^{r}	4^{r}	.	2^{r}	.	2^{r}	.	1^{r}	.	III
Scleroderma citrinum	7^{r-n}	5^{r}	.	6^{r-n}	.	3^{r}	1^{r}	.	.	.	III
Russula claroflava	.	5^{r}	6^{r}	3^{r}	4^{r}	2^{r}	.	.	.	.	III
Leccinum niveum	.	2^{r}	2^{r}	.	4^{r}	2^{r}	.	2^{r}	.	.	III
Cortinarius delibutus	4^{r}	2^{r}	.	.	.	.	3^{r}	2^{r}	.	1^{r}	III
Russula betularum	.	1^{r}	2^{r}	.	2^{r}	4^{r}	.	3^{r}	.	.	III
Russula xerampelina	2^{r}	2^{r}	.	3^{r}	.	.	.	2^{r}	1^{r}	.	III
Russula decolorans	.	.	.	1^{r}	.	.	1^{r}	.	4^{r}	5^{r}	II
Cortinarius huronensis	.	.	.	.	2^{r}	1^{r}	3^{r}	2^{r}	.	.	II
Inocybe lanuginosa	2^{r}	.	.	3^{r-n}	.	.	2^{r}	.	1^{r}	.	II
Amanita porphyria	2^{r}	.	4^{r}	.	.	.	1^{r}	.	.	.	II
Lactarius vietus	.	.	2^{r}	.	.	2^{r}	.	2^{r}	.	.	II
Gomphidius roseus	2^{r}	.	.	1^{r}	1^{r}	.	.	.	.	.	II
Cortinarius cinnamomeoluteus	5^{r}	3^{r}	.	.	.	.	.	.	.	.	I
Cortinarius rubellus	2^{r}	.	.	3^{r}	.	.	.	.	.	.	I
Rhodocollybia butyracea f. *butyracea*	3^{r}	.	.	2^{r}	.	.	.	.	.	.	I

Table A.2.9 cont.

Lactarius necator	.	3^{r}	.	2^{r}	.	.	.	.	.	.	I
Cortinarius alboviolaceus	.	.	2^{n}	.	.	.	.	.	.	.	I
Suillus flavidus	.	.	.	.	2^{r}	.	.	.	.	.	I
Cortinarius brunneus	.	.	.	1^{r}	.	.	.	.	.	.	I
Cortinarius fulvescens	1^{r}	.	.	.	.	.	.	.	.	.	I
Lactarius deliciosus	.	.	.	.	1^{r}	.	.	.		.	I
Leccinum scabrum	.	.	.	1^{r}	.	.	.	.	.	.	I
Saprotrophic fungi											
a) on peat											
Entoloma cetratum	7^{r-n}	5^{r}	5^{r-n}	4^{r}	3^{r}	5^{r-n}	4^{r}	4^{r}	3^{r}	5^{r}	V
Rhodocollybia maculata var. *maculata*	5^{r}	3^{r}	.	.	.	1^{r}	.	.	2^{r}	2^{r}	III
Cystoderma amianthinum	3^{r}	2^{r}	.	4^{r}	.	.	.	1^{r}	2^{r}	.	III
Hygrophoropsis aurantiaca	4^{r}	3^{r}	2^{r}	3^{r-n}	.	.	.	.	2^{r}	.	III
Ampulloclitocybe clavipes	3^{r}	3^{r}	1^{r}	2^{r}	.	.	.	.	.	.	II
Lepista flaccida	4^{r}	3^{r}	.	.	.	.	1^{r}	.	.	.	II
Gymnopus dryophilus	.	1^{r}	2^{r}	1^{r}	.	.	.	.	.	.	II
Gymnopus peronatus	3^{r}	.	.	2^{r}	.	.	.	.	.	.	I
Stropharia aeruginosa	2^{r}	.	.	.	.	.	.	.	.	.	I
b) among mosses											
Hypholoma udum	4^{r-n}	4^{r-n}	5^{r-n}	.	5^{r-n}	5^{r-n}	3^{r}	6^{r-n}	5^{r-n}	5^{r-n}	V
Galerina paludosa	2^{r}	3^{r}	3^{r}	.	.	5^{r}	3^{r}	6^{r-n}	4^{r-n}	7^{r-n}	IV
Hypholoma elongatum	.	3^{n}	2^{n}	.	4^{r-n}	3^{r}	3^{r-n}	4^{n}	.	3^{r-n}	IV
Lichenomphalia umbellifera	.	5^{r}	3^{r}	2^{r}	3^{r}	5^{r}	.	2^{r}	·	·	III
Galerina hypnorum	4^{r-n}	2^{r}	3^{r-n}	2^{r}	.	.	3^{r}	.	3^{n}	.	III
Galerina tibiicystis	.	.	.	.	.	3^{r}	4^{r-n}	5^{r-n}	3^{r-n}	4^{r-n}	III
Mycena adonis var. *adonis*	3^{r-n}	.	.	.	3^{r-n}	.	3^{r}	2^{r}	2^{n}	.	III
Galerina jaapii	1^{r}	1^{r}	.	.	.	.	1^{r}	1^{r}	2^{n}	.	III
Arrhenia gerardiana	.	.	.	.	.	1^{r}	.	2^{r}	2^{r}	4^{r}	II
Galerina vittiformis var. *vittiformis*	.	.	3^{r}	.	1^{r}	.	2^{r}	3^{r}	.	.	II
Galerina calyptrata	.	.	2^{r}	.	2^{r}	1^{r}	.	2^{r}	.	.	II
Mycena megaspora	.	.	.	.	.	1^{r}	.	.	.	.	I
c) on litter											
Mycena galopus	9^{r-a}	9^{r-n}	8^{r-n}	7^{r-n}	9^{n-a}	7^{r}	7^{r-n}	8^{r-a}	6^{r-n}	9^{r-a}	V
Gymnopus androsaceus	9^{n-a}	7^{r-a}	6^{r-n}	5^{r}	8^{r-n}	4^{r}	5^{r}	3^{r}	4^{r}	5^{r-n}	V
Mycena sanguinolenta	9^{r-a}	7^{r-n}	9^{r-n}	4^{r}	7^{r}	5^{r}	5^{r}	3^{r}	6^{r-n}	5^{r-n}	V
Mycena epipterygia var. *epipterygia*	3^{r}	3^{r}	3^{r}	4^{r}	3^{r}	2^{r}	2^{r}	.	2^{r}	3^{r}	V
Clitocybe vibecina	4^{n-a}	4^{r-n}	4^{r-a}	3^{r-n}	.	3^{r}	2^{r}	2^{r}	2^{n}	1^{n}	V
Mycena cinerella	4^{n-a}	3^{r-n}	3^{n}	.	2^{a}	3^{r}	2^{r}	2^{r}	2^{n}	2^{n}	V
Mycena zephirus	4^{r-n}	3^{r-n}	2^{n}	3^{n-a}	2^{n}	2^{n}	1^{r}	.	.	.	IV
Auriscalpium vulgare	4^{r}	2^{r}	1^{r}	2^{r}	3^{r}	.	.	.	.	.	III
Mycena vulgaris	3^{r}	2^{r}	3^{r}	.	2^{n}	.	1^{r}	.			III
Strobilurus tenacellus	4^{r-n}	3^{r-n}	3^{r}	2^{r}	.	.	.	.	.	.	II
Strobilurus stephanocystis	2^{r}	3^{r}	2^{r}	.	1^{r}	.	.	.	.	.	II
Collybia cirrata	.	.	.	.	1^{r}	.	.	1^{r}	.	2^{r}	II
Clitocybe candicans var. *candicans*	2^{r}	.	.	1^{r}	.	.	.	.	.	.	I
Collybia cookei	2^{r}	.	.	.	.	.	.	.			I
Baeospora myosura	2^{r}	.	.	.	.	.	.	.			I
Roridomyces rorida	2^{r}	.	.	.	.	.	.	.	.	.	I
Mycena filopes	.	.	.	1^{r}	.	.	.	.	.	.	I
d) on wood											
Fomes fomentarius	4X	4X	4X	3X	3X	3X	.	.	.	.	III
Piptoporus betulinus	4X	4X	4X	3X	3X	3X	.	.	.	.	III
Dacryomyces stillatus	.	1^{r}	1^{r}	2^{r}	2^{r}	.	.	.	2^{r}	2^{r}	III

Mycena stipata	5^r	3^r	4^r	.	4^r	.	2^r	.	.	.	III
Mycena galericulata	.	3^r	2^r	1^r	3^r	.	.	.	.	.	II
Diatrypella favacea	.	3X	3X	.	3X	.	.	.	.	.	II
Stereum sanguinolentum	2X	.	1X	1X	.	.	.	.	.	.	II
Postia caesia	1X	.	.	.	.	.	1X	.	1X	.	II
Calocera viscosa	5^r	.	2^r	1^r	.	.	.	.	.	.	II
Polyporus ciliatus	.	.	1^r	.	1^r	1^r	.	.	.	.	II
Trichaptum fuscoviolaceum	4X	.	.	3X	.	.	.	.	.	.	I
Calocera cornea	.	3^r	2^r	.	.	.	.	.	.	.	I
Hypholoma fasciculare var. *fasciculare*	.	.	2^n	.	1^r	.	.	.	.	.	I
Fomitopsis pinicola	4X	.	.	.	.	.	.	.	.	.	I
Stereum hirsutum	.	1X	.	.	.	.	.	.	.	.	I
Trametes hirsuta	.	.	1X	.	.	.	.	.	.	.	I
Hypholoma capnoides	1^r	.	.	.	.	.	.	.	.	.	I
Panellus mitis	1^r	.	.	.	.	.	.	.	.	.	I
Sphaerobolus stellatus	.	.	.	.	1^r	.	.	.			I
Tricholomopsis rutilans		1^r	.	.	.	.	.	.	.	.	I
Parasitic fungi											
Lyophyllum palustre	.	5^r	3^r	.	.	6^r	7^r	8^r	5^r	8^{r-n}	IV
Rickenella fibula	4^r	.	.	4^r	.	1^r	3^r	.	3^r	.	III
Phaeolus schweinitzii	.	3X	.	.	.	.	.	.	.	.	I
Heterobasidion annosum	3X	.	.	.	.	.	.	.	.	.	I
Sparassis crispa	3^r	.	.	.	.	.	.	.	.	.	I
Tremella encephala	1^r	.	.	.	.	.	.	.	.	.	I

Abbreviations see Table 1 and Table A.2.1

Table A.1.10

Vaccinio uliginosi-Betuletum pubescentis

Successive number		1	2	3	4	5	6	7	8	9	10	Constancy
Plot number		ZB12	ZB11	Nw3	ZB13	Nw4	Nw5	Z-Ic	Z20	SD14	SD15	
Localities		ZB	ZB	Nw	ZB	Nw	Nw	Z-I	Z	SD	SD	
Day		09	09	26	09	26	26	15	28	15	15	
Month		07	07	06	07	06	06	09	07	06	06	
Year		2004	2004	2004	2004	2004	2004	2002	2001	2004	2004	
Density of tree layer	a (%)	60	70	50	60	50	40	70	60	50	40	
Density of shrub layer	b (%)	5	10	5	15	5	5	5	5	15	5	
Cover of herb layer	c (%)	70	70	50	70	40	60	40	60	50	20	
Cover of moss layer	d (%)	10	60	60	30	50	30	50	50	60	80	
Plot area (m^2)		400	400	400	400	400	400	400	300	400	400	
Total number of species in a relevé		21	19	18	18	15	17	16	11	17	14	
including: vascular plants		15	13	13	11	11	14	12	9	11	10	
cryptogamic plants		6	6	5	7	4	3	4	4	6	4	
Trees and shrubs:												
Ch. Ass. *Betula pubescens*	a	4.4	4.4	3.2	4.4	3.1	3.1	4.4	4.4	3.3	3.3	V
	b	1.1	1.2	1.1	2.1	1.1	1.1	.	+	2.2	1.1	V
	c	+	+	.	+	+	+	.	.	1.1	+	IV
Pinus sylvestris	a	+	1.1	1.1	1.1	2.1	1.2	.	.	2.1	1.1	IV
	b	.	.	.	.	.	.	.	1.1	.	.	I
	c	+	+	.	.	+	.	.	+	+	+	III
Frangula alnus	b	1.1	1.1	1.1	1.1	.	+	+	.	.	.	III
	c	+	1.1	+	+	.	+	+	.	.	.	III

Sorbus aucuparia	a	+	1.2	.	+	.	.	.	.	.	.	II
	b	+	1.1	+	+	+	1.1	.	.	.	.	III
Fagus sylvatica	b	+	1.2	.	.	.	.	.	.	.	.	I
Salix cinerea	b	.	.	.	.	.	.	1.1	+	.	.	I
Salix aurita	b	.	.	.	.	.	.	1.1	.	.	.	I
Ch. *Vaccinio uliginosi-Betuletum pubescentis*												
Lycopodium annotinum		4.4	3.4	.	4.4	+	3.3	.	.	.	.	III
Ch. *Vaccinio-Piceetea*												
Ledum palustre		+	1.1	1.2	1.1	1.1	+	.	.	1.2	1.1	IV
Vaccinium myrtillus		2.3	3.3	2.2	2.3	2.2	3.3	.	.	+	.	IV
Vaccinium uliginosum		+	1.2	1.2	.	+	1.2	.	.	1.2	1.1	IV
Pleurozium schreberi	d	1.1	3.3	2.2	1.1	3.3	3.3	.	.	.	.	III
Vaccinium vitis-idea		+	1.1	+	+	+	+	.	.	.	.	III
Dicranum polysetum	d	+	2.2	1.1	+	2.2	.	.	.	.	.	III
Dicranum scoparium	d	+	1.2	1.2	1.2	.	1.2	.	.	.	.	III
Trientalis europea		+	+	+	+	.	1.1	.	.	.	.	III
Ch. *Oxycocco-Sphagnetea*												
Oxycoccus palustris		+	.	.	+	.	+	.	2.2	1.1	2.2	III
Eriophorum vaginatum		.	.	.	.	.	.	2.2	3.3	2.2	1.2	II
Polytrichum strictum	d	.	.	.	.	.	.	1.1	1.1	1.1	+	II
Aulacomnium palustre	d	.	.	.	.	.	.	1.1	.	1.1	2.2	II
Andromeda polifolia		.	.	.	.	.	.	.	.	1.1	+	I
Sphagnum magellanicum	d	.	.	.	.	.	.	.	+	+	.	I
Ch. *Scheuchzerio-Caricetea nigrae*												
Comarum palustre		.	.	.	.	.	.	2.2	.	.	.	I
Carex lasiocarpa		.	.	.	.	.	.	+	.	.	.	I
Sphagnum cuspidatum	d	.	.	.	.	.	.	.	.	+	.	I
Accompanying species												
Sphagnum fallax	d	+	.	2.2	2.2	+	.	3.3	3.3	3.3	4.4	IV
Molinia caerulea		+	.	2.2	.	+	.	.	1.1	2.2	1.2	III
Sphagnum palustre	d	1.1	1.1	.	+	.	.	.	.	2.3	1.1	III
Sphagnum fimbriatum	d	.	+	2.2	1.1	1.2	1.1	.	.	.	.	III
Deschampsia flexuosa		+	+	1.1	.	2.2	1.2	.	.	.	.	III
Rubus sp.		+	1.2	+	1.1	.	.	.	.	.	.	II
Polytrichastrum formosum	d	2.2	1.2	.	1.1	.	.	.	.	.	.	II
Carex rostrata		.	.	.	.	.	.	1.1	.	1.1	+	II
Dryopteris carthusiana		.	.	1.1	.	+	.	+	.	.	.	II
Juncus effusus		.	.	.	.	.		+	.	+	+	II
Sphagnum squarrosum	d	.	.	.	.	.	.	1.1	1.1	.	.	I
Calla palustris		.	.	.	.	.	.	1.1	.	.	.	I
Equisetum fluviatile		.	.	.	.	.	.	+	.	.	.	I
Dryopteris filix-mas		.	.	.	.	.	.	.	+	.	.	I

Abbreviations: see Table 1

Table A.2.10
Fungi in *Vaccinio uliginosi-Betuletum pubescentis*

Successive number	1	2	3	4	5	6	7	8	9	10	Constancy
Plot number	ZB12	ZB11	Nw3	ZB13	Nw4	Nw5	Z-Ic	Z20	SD14	SD15	
Localities	ZB	ZB	Nw	ZB	Nw	Nw	Z-I	Z	SD	SD	
Plot area (m^2)	400	400	400	400	400	400	400	300	400	400	
Number of observations	24	24	26	24	26	26	23	14	25	25	
Total number of species	74	62	61	58	52	51	41	40	39	33	
Mycorrhizal fungi											
Laccaria proxima	7^{r-a}	8^{r-a}	7^{r}	3^{n}	6^{r}	8^{r-n}	12^{r-a}	9^{r-a}	15^{r-a}	14^{r-n}	V
Lactarius tabidus	11^{r-a}	5^{r-a}	6^{n-a}	6^{r-a}	10^{r-a}	9^{r-a}	9^{n-a}	5^{r-n}	10^{n-a}	10^{n-a}	V
Amanita fulva	7^{r-n}	4^{r-n}	5^{r}	5^{r}	4^{r}	5^{r}	3^{r}	5^{r-n}	5^{r}	6^{r}	V
Leccinum niveum	1^{r}	4^{r-n}	5^{r-n}	2^{r}	3^{r}	4^{r}	6^{r}	6^{r-n}	5^{r-n}	4^{r-n}	V
Russula betularum	5^{r}	2^{r}	3^{n}	1^{r}	3^{r}	4^{r}	5^{r}	3^{r}	6^{r-a}	3^{r-n}	V
Russula claroflava	9^{r-n}	6^{r}	6^{r}	5^{r-n}	5^{r}	7^{r}	5^{r}	.	5^{r-n}	4^{n-a}	V
Paxillus involutus	5^{r-a}	3^{n}	5^{r-n}	2^{r}	5^{r-n}	4^{r}	2^{r}	7^{r-n}	5^{r-n}	.	V
Lactarius helvus	.	3^{r}	5^{r}	4^{r}	3^{r}	2^{r}	6^{r}	6^{r-n}	6^{r-a}	5^{n-a}	V
Cortinarius flexipes var. *flexipes*	5^{n-a}	5^{n-a}	7^{n}	5^{n-a}	4^{n}	4^{r-a}	.	2^{n}	.	.	IV
Russula emetica	.	3^{r}	3^{r}	2^{n}	4^{r}	5^{r-n}	.	6^{r}	3^{r}	.	IV
Scleroderma citrinum	9^{r-n}	4^{r}	4^{r-n}	5^{r}	4^{r-n}	6^{r-n}	.	.	.	.	III
Thelephora terrestris	7^{r}	.	5^{r}	.	3^{n}	11^{r}	.	3^{n}	.	7^{r}	III
Lactarius rufus	5^{r-a}	4^{r-n}	3^{r-n}	3^{r}	7^{r-n}	.	.	6^{r-n}	.	.	III
Russula aeruginea	7^{r-n}	4^{r}	2^{r}	2^{r}	4^{r}	.	.	.	.	.	III
Lactarius pubescens	3^{r}	2^{n}	.	4^{r}	3^{r}	2^{r}	.	.	.	.	III
Suillus variegatus	.	1^{r}	1^{r}	3^{r}	.	2^{r}	.	5^{r}	.	.	III
Cortinarius huronensis	.	.	3^{r}	1^{r}	.	.	4^{r}	7^{n-a}	.	.	II
Lactarius vietus	2^{r}	.	2^{r}	4^{n}	.	.	.	.	.	5^{r}	II
Lactarius glyciosmus	.	.	.	.	2^{r}	.	2^{r}	4^{r-n}	3^{r-n}	.	II
Hebeloma circinans	.	2^{r}	2^{r}	2^{r}	.	.	3^{r-n}	.	.	.	II
Inocybe napipes	.	1^{r}	1^{r}	2^{r}	1^{r}	.	.	.	.	.	II
Russula fragilis	4^{r-n}	3^{r}	2^{r}	.	.	.	.	.	.	.	II
Lactarius necator	3^{n}	3^{r}	.	.	3^{r}	.	.	.	.	.	II
Leccinum scabrum	3^{r}	.	.	3^{r}	.	.	.	1^{r}	.	.	II
Cortinarius armillatus	.	.	3^{r}	.	1^{r}	1^{r}	.	.	.	.	II
Suillus bovinus	.	2^{r-n}	.	3^{n}	.	.	.	.	.	.	I
Gomphidius roseus	.	2^{r}	.	3^{r}	.	.	.	.	.	.	I
Laccaria laccata	3^{r-n}	.	.	.	.	.	.	.	.	.	I
Tricholoma fulvum	3^{n}	.	.	.	.	.	.	.	.	.	I
Laccaria amethystina	2^{r}	.	.	.	.	.	.	.	.	.	I
Leccinum variicolor	.	.	.	.	.	.	.	.	.	2^{r}	I
Amanita citrina f. *citrina*	1^{r}	.	.	.	.	.	.	.	.	.	I
Clavulina coralloides	1^{r}	.	.	.	.	.	.	.	.	.	I
Cortinarius semisanguineus	1^{r}	.	.	.	.	.	.	.	.	.	I
Leccinum versipelle	.	.	.	.	.	1^{r}	.	.	.	.	I
Rhodocollybia butyracea f. *butyracea*	1^{r}	.	.	.	.	.	.	.	.	.	I
Russula decolorans	.	.	.	.	1^{r}	.	.	.	.	.	I
Tylopilus felleus	1^{r}	.	.	.	.		.	.	.	.	I

Table A.2.10 cont.

Saprotrophic fungi											
a) on peat											
Rhodocollybia maculata var. *maculata*	5^{r}	3^{r-n}	3^{r}	4^{r}	4^{r}	1^{r}	.	.	.	.	III
Gymnopus dryophilus	7^{r}	5^{r-n}	2^{r}	.	4^{r-n}	2^{r}	.	.	.	.	III
Entoloma cetratum	.	2^{r}	4^{r}	5^{r}	3^{r}	4^{r}	.	.	.	.	III
Entoloma conferendum var. *conferendum*	.	1^{r}	3^{r}	1^{r}	.	.	1^{r}	.	2^{r}	.	III
Entoloma sericatum	.	2^{r}	.	3^{r}	.	4^{r}	2^{r}	.	.	.	II
Gymnopus peronatus	3^{r}	2^{r}	.	.	.	.	.	.	.	.	I
Hygrocybe coccineocrenata	.	.	2^{r}	.	.	.	.	.	.	1^{r}	I
Lycoperdon perlatum	3^{r}	.	.	.	.	.	.	.	.	.	I
Ampulloclitocybe clavipes	2^{r}	.	.	.	.	.	.	.	.	.	I
Hygrophoropsis aurantiaca	1^{r}	.	.	.	.	.	.	.	.	.	I
Lepista flaccida	1^{r}	.	.	.	.	.	.	.	.	.	I
Stropharia aeruginosa	1^{r}	.	.	.	.	.	.	.	.	.	I
b) among mosses											
Galerina paludosa	.	.	8^{r}	2^{r}	2^{r}	4^{r}	6^{r-n}	2^{n}	6^{r}	6^{r-n}	IV
Hypholoma udum	.	.	4^{r-n}	4^{r}	3^{n}	3^{r-n}	5^{n}	.	7^{r-n}	4^{r-n}	IV
Hypholoma elongatum	.	.	3^{n}	2^{n}	2^{n}	3^{n}	5^{n}	.	4^{r-n}	4^{n}	IV
Galerina tibiicystis	.	.	8^{r}	3^{r}	2^{r}	.	7^{r-n}	.	6^{r}	7^{r}	III
Lichenomphalia umbellifera	.	.	3^{r}	.	.	3^{r}	3^{r}	.	3^{r}	3^{r}	III
Galerina calyptrata	.	.	1^{r}	.	.	2^{r}	.	.	3^{r}	.	II
Galerina hypnorum	.	1^{r}	.	.	2^{r}	.	.	3^{r}	.	.	II
Galerina jaapii	.	.	1^{r}	.		1^{r}	.	.	.	3^{r}	II
Galerina sphagnorum	.	.	.	.	.	.	2^{r}	.	1^{r}	.	I
Galerina vittiformis var. *vittiformis*	.	.	1^{r}	.	2^{r}	.	.	.	.	.	I
Mycena adonis var. *adonis*	.	.	.	2^{r}	.	.	.	.	.	.	I
Mycena acicula	.	.	.	.	1^{r}	.	.	.	.	.	I
Mycena megaspora	.	.	.	.	.	.	.	.	.	1^{r}	I
c) on litter											
Mycena galopus	8^{r-n}	6^{r-n}	9^{r-a}	11^{r-n}	11^{r-n}	11^{r-a}	12^{r}	3^{n}	9^{r-n}	8^{r-n}	V
Gymnopus androsaceus	7^{r-n}	6^{r-n}	7^{n-a}	6^{r-n}	9^{r-a}	6^{r-a}	8^{r-n}	8^{n-a}	8^{r-n}	9^{r-a}	V
Mycena epipterygia var. *epipterygia*	4^{r}	4^{r}	3^{r}	2^{r}	3^{r}	3^{r}	3^{n}	4^{r-n}	2^{r}	3^{r-n}	V
Mycena sanguinolenta	7^{r-a}	5^{r-n}	6^{r-n}	5^{r-n}	6^{r-n}	8^{r-a}	.	1^{r}	1^{r}	.	IV
Mycena zephirus	3^{r-n}	4^{r-a}	2^{n}	1^{n}	2^{n}	3^{r-n}	.	.	.	.	III
Collybia cirrata	2^{n}	.	.	.	1^{r}	.	2^{n}	.	2^{r}	.	II
Clitocybe vibecina	1^{r}	3^{r-n}	.	1^{n}	.	.	.	.	.	.	II
Collybia cookei	.	.	2^{r}	.	.	1^{r}	.	.	.	.	I
Auriscalpium vulgare	1^{r}	2^{r}	.	.	.	.	.	.	.	.	I
Clitocybe candicans var. *candicans*	2^{r}	.	.	.	.	.	.	.	.	.	I
Mycena pura	1^{r}	.	.	.	.	.	.	.	.	.	I
d) on wood											
Piptoporus betulinus	3X	3X	4X	3X	4X	4X	3X	2X	3X	3X	V
Daedaleopsis confragosa	3X	3X	1X	3X	3X	4X	3X	1X	3X	3X	V
Mycena galericulata	6^{r}	4^{n}	5^{r}	3^{n}	4^{r}	5^{r}	4^{n}	5^{n-a}	3^{r}	2^{r}	V
Diatrypella favacea	1X	1X	1X	1X	1X	1X	2X	.	1X	3X	V
Exidia plana	4^{r-n}	2^{r}	4^{r}	3^{r}	3^{r}	4^{r}	.	3^{n}	3^{r}	5^{r}	V
Dacryomyces stillatus	2^{r}	2^{r}	3^{r}	1^{r}	.	2^{r}	3^{r}	.	5^{r}	3^{r}	IV
Fomes fomentarius	3X	3X	4X	3X	3X	4X	.	2X	3X	.	IV
Crepidotus variabilis	3^{r-n}	4^{n}	4^{r-n}	3^{r-n}	3^{r-n}	4^{r-n}	2^{n}	1^{n}	.	.	IV
Calocera cornea	2^{r}	4^{r}	3^{r}	.	3^{r}	.	2^{r}	1^{n}	3^{r}	.	IV
Polyporus ciliatus	3^{r}	2^{r}	1^{r}	.	.	1^{r}	2^{r}	2^{r}	1^{r}	.	IV

Ascocoryne sarcoides	3^{r}	2^{n}	.	1^{r}	.	2^{r}	2^{r}	.	2^{r}	.	III
Pluteus cervinus	3^{r}	2^{r}	.	1^{r}	1^{r}	.	.	1^{r}	1^{r}	.	III
Diatrype stigma	3X	3X	3X	3X	.	3X	2X	.	.	.	III
Trichaptum fuscoviolaceum	3X	1X	.	.	3X	.	.	.	2X	1X	III
Trametes hirsuta	3X	1X	.	.	1X	.	1X	1X	.	.	III
Stereum hirsutum	2X	1X	1X	1X	.	.	.	1X	.	.	III
Hypholoma fasciculare var. *fasciculare*	4^{n-a}	3^{n-a}	.	2^{n}	.	4^{n}	.	.	1^{n}	.	III
Phlebia tremellosa	.	3^{r}	3^{r}	.	.	2^{r}	.	.	.	3^{r}	II
Scutellinia scutellata	.	.	1^{r}	.	.	.	2^{r}	5^{r-n}	.	1^{r}	II
Kuehneromyces mutabilis	.	2^{r}	3^{r}	3^{r}	2^{r}	.	.	.	.	.	II
Megacollybia platyphylla	2^{r}	4^{r-n}	2^{r}	.	.	.	.	.	.	.	II
Bjerkandera adusta	.	1X	.	3X	.	2X	.	.	.	.	II
Xylaria hypoxylon	.	1X	.	.	.	.	1X	1X	.	.	II
Peniophora cinerea	.	1X	1X	.	.	.	.	.	.	.	I
Mycena haematopus	3^{r}	.	.	.	.	1^{r}	.	.	.	.	I
Phlebia radiata	2^{r}	.	.	.	.	.	1^{r}	.	.	.	I
Schizophyllum commune	.	.	.	.	.	.	1X	1X	.	.	I
Inonotus obliquus	.	.	4X	.	.	.	.	.	.	.	I
Trametes versicolor	.	.	.	.	.	3X	.	.	.	.	I
Stereum rugosum	.	.	.	.	2X	.	.	.	.	.	I
Stereum subtomentosum	.	.	.	1X	.	.	.	.	.	.	I
Lycoperdon pyriforme	6^{r}	.	.	.	.	.	.	.	.	.	I
Trichaptum abietinum	.	.	.	.	.	.	.	1X	.	.	I
Hypholoma lateritium	2^{n}	.	.	.	.	.	.	.	.	.	I
Macrotyphula fistulosa	2^{n}	.	.	.	.	.	.	.	.	.	I
Phaeomarasmius erinaceus	.	.	.	.	.	.	.	2^{r-n}	.	.	I
Hohenbuehelia atrocoerulea	2^{r}	.	.	.		.	.	.	.	.	I
Lentinellus cochleatus	1^{r}	.	.		.	.	.	.	.	.	I
Ramaria stricta	1^{r}	.	.	.	.	.	.	.	.	.	I
e) on animal dung											
Stropharia semiglobata	.	.	.	.	.	.	.	.	.	1^{r}	I
f) on fungi											
Nectria episphaeria	5^{r}	5^{r}	2^{r}	3^{r}	.	.	2^{r}	.	.	.	III
Parasitic fungi											
Rickenella fibula	4^{r}	2^{r}	.	4^{r}	5^{r-n}	4^{r-n}	2^{r}	4^{r-n}	4^{r}	3^{r}	V
Lyophyllum palustre	.	.	12^{r-n}	7^{r-n}	5^{r-n}	4^{r-n}	11^{r-n}	6^{r-n}	7^{r-n}	8^{r-n}	IV
Nectria cinnabarina	4^{r}	3^{r}	3^{r}	1^{r}	1^{r}	3^{r}	.	3^{n}	2^{r}	.	IV
Armillaria ostoyae	3^{r}	2^{r}	.	.	.	.	.	.	.	.	I
Chondrostereum purpureum	.	.	.	1X	.	.	.	.	.	.	I
Xerocomus parasiticus	2^{r}	.	.	.	.	.	.	.	.	.	I

Abbreviations see Table 1 and Table A.2.1

Table A.2.11
The diversity of macroscopic fungi in peatland communities of Pomerania

Successive number	1	2	3	4	5	6	7	8	9	10
Communities	*VuBe*	*VuPn*	*ErSp*	*Spma*	zb*Ev*	*EaSp*	*Cali*	*Cala*	*Caro*	*Rhal*
Total number of plots	10	10	9	10	11	13	13	11	8	13
Total plot area (m^2)	3900	4000	1800	4000	4070	3370	1130	1020	1600	1110
Total number of observations	237	249	212	242	253	267	237	232	195	264
Total number of species	121	102	54	48	37	29	25	23	15	12
Mycorrhizal fungi										
Lactarius helvus	V^{r-a}	V^{r-a}	9^{r-a}	V^{r-a}	V^{r-a}	II^{r-n}	II^{r-n}	III^{r-n}	2^{r-n}	II^{r}
Cortinarius huronensis	II^{r-a}	II^{r}	9^{r-n}	IV^{r-a}	V^{r-a}	II^{r}	II^{r-n}	I^{r-n}	2^{r}	II^{r}
Laccaria proxima	V^{r-a}	V^{r-a}	6^{r-a}	V^{r-a}	V^{r-a}	II^{r-n}	II^{r-n}	IV^{r-a}	2^{r}	.
Lactarius tabidus	V^{r-a}	III^{r-a}	8^{r-n}	.	IV^{r-n}	I^{r}	I^{r}	I^{r-n}	2^{r}	I^{r}
Russula emetica	IV^{r-n}	V^{r-n}	6^{r-n}	IV^{r-n}	II^{r-n}	I^{r}	II^{r}	I^{r}	.	.
Paxillus involutus	V^{r-a}	V^{r-n}	7^{r-n}	IV^{r-n}	IV^{r-n}	.	I^{r}	I^{r-n}	.	.
Suillus variegatus	III^{r}	IV^{r-n}	6^{r}	III^{r-n}	II^{r-n}	.	I^{r}	I^{r}	.	.
Leccinum niveum	V^{r-n}	III^{r}	7^{r}	III^{r-n}	IV^{r-n}	.	.	II^{r}	.	.
Thelephora terrestris	III^{r-n}	IV^{r}	5^{r}	III^{r}	III^{r-n}	III^{r-n}	.	.	.	.
Amanita fulva	V^{r-n}	IV^{r-n}	6^{r}	IV^{r}	III^{r}	.	.	.	.	.
Russula betularum	V^{r-a}	III^{r}	3^{r}	II^{r}	III^{r}	.	.	.	.	.
Lactarius glyciosmus	II^{r-n}	.	.	.	I^{r}	I^{r}	I^{r}	I^{r-n}	.	.
Lactarius rufus	III^{r-a}	V^{r-a}	.	IV^{r-n}	II^{r-a}	.	.	.	.	.
Cortinarius flexipes var. *flexipes*	IV^{r-a}	V^{r-a}	5^{r-a}	II^{r-a}	.	.	.	.	.	.
Cortinarius semisanguineus	I^{r}	V^{r-n}	8^{r-a}	II^{r}	.	.	.	.	.	.
Lactarius vietus	II^{r-n}	II^{r}	.	I^{r}	I^{r-n}	.	.	.	.	.
Cortinarius fulvescens	.	I^{r}	1^{r-n}	.	I^{r-a}	I^{n}	.	.	.	.
Russula claroflava	V^{r-a}	III^{r}	.	II^{r}	.	.	.	.	.	.
Inocybe napipes	II^{r}	IV^{r}	.	III^{r}	.	.	.	.	.	.
Suillus bovinus	I^{r-n}	IV^{r-a}	2^{r-n}	.	.	.	.	.	.	.
Russula paludosa	.	IV^{r}	1^{r}	I^{r}	.	.	.	.	.	.
Russula decolorans	I^{r}	II^{r}	.	I^{r}	.	.	.	.	.	.
Suillus flavidus	.	I^{r}	1^{r}	I^{r}	.	.	.	.	.	.
Hebeloma circinans	II^{r-n}	IV^{r}	.	.	.	.	.	.	.	.
Scleroderma citrinum	III^{r-n}	III^{r-n}	.	.	.	.	.	.	.	.
Russula xerampelina	.	III^{r}	2^{r}	.	.	.	.	.	.	.
Chroogomphus rutilus var. *rutilus*	.	III^{r}	1^{r}	.	.	.	.	.	.	.
Lactarius necator	II^{r-n}	I^{r}	.	.	.	.	.	.	.	.
Leccinum scabrum	II^{r}	I^{r}	.	.	.	.	.	.	.	.
Gomphidius roseus	I^{r}	II^{r}	.	.	.	.	.	.	.	.
Rhodocollybia butyracea f. *butyracea*	I^{r}	I^{r}	.	.	.	.	.	.	.	.
Cortinarius delibutus	.	III^{r}	.	.	.	.	.	.	.	.
Lactarius pubescens	III^{r-n}	.	.	.	.	.	.	.	.	.
Russula aeruginea	III^{r-n}	.	.	.	.	.	.	.	.	.
Amanita porphyria	.	II^{r}	.	.	.	.	.	.	.	.
Cortinarius armillatus	II^{r}	.	.	.	.	.	.	.	.	.
Inocybe lanuginosa	.	II^{r-n}	.	.	.	.	.	.	.	.
Russula fragilis	II^{r-n}	.	.	.	.	.	.	.	.	.
Amanita citrina f. *citrina*	I^{r}	.	.	.	.	.	.	.	.	.
Clavulina coralloides	I^{r}	.	.	.	.	.	.	.	.	.
Cortinarius alboviolaceus	.	I^{n}	.	.	.	.	.	.	.	.
Cortinarius brunneus	.	I^{r}	.	.	.	.	.	.	.	.
Cortinarius cinnamomeoluteus	.	I^{r}	.	.	.	.	.	.	.	.
Cortinarius rubellus	.	I^{r}	.	.	.	.	.	.	.	.
Laccaria amethystina	I^{r}	.	.	.	.	.	.	.	.	.

Laccaria laccata	I^{r-n}	.	.	.	.	.	.	.	.	.
Lactarius deliciosus	.	I^{r}	.	.	.	.	.	.	.	.
Leccinum variicolor	I^{r}	.	.	.	.	.	.	.	.	.
Leccinum versipelle	I^{r}	.	.	.	.	.	.	.	.	.
Tricholoma fulvum	I^{n}	.	.	.	.	.	.	.	.	.
Tylopilus felleus	I^{r}	.	.	.	.	.	.	.	.	.
Cortinarius acutus	.	.	1^{r}	.	.	.	.	.	.	.
Cortinarius obtusus	.	.	1^{r}	.	.	.	.	.	.	.
Hebeloma crustuliniforme	.	.	1^{r}	.	.	.	.	.	.	.
Saprotrophic fungi										
a) on peat										
Clavaria fragilis	.	.	2^{r-n}	II^{r-n}	II^{r-n}	I^{n-a}	I^{n-a}	.	.	.
Hygrocybe coccineocrenata	I^{r}	.	2^{r}	I^{r-n}	.	I^{r-n}	.	I^{r}	.	.
Entoloma cetratum	III^{r}	V^{r-n}	.	III^{r-n}	.	I^{r}	.	.	.	.
Entoloma sericatum	II^{r}	.	2^{r}	I^{r}	.	I^{r}	.	.	.	.
Rhodocollybia maculata var. *maculata*	III^{r-n}	III^{r}	1^{r}	.	.	.	.	.	.	.
Gymnopus dryophilus	III^{r-n}	II^{r}	.	.	.	.	.	.	.	.
Entoloma conferendum var. *conferendum*	III^{r}	.	.	I^{r}	.	.	.	.	.	.
Hygrophoropsis aurantiaca	I^{r}	III^{r}	.	.	.	.	.	.	.	.
Ampulloclitocybe clavipes	I^{r}	II^{r}	.	.	.	.	.	.	.	.
Lepista flaccida	I^{r}	II^{r}	.	.	.	.	.	.	.	.
Gymnopus peronatus	I^{r}	I^{r}	.	.	.	.	.	.	.	.
Stropharia aeruginosa	I^{r}	I^{r}	.	.	.	.	.	.	.	.
Cystoderma amianthinum	.	III^{r}	.	.	.	.	.	.	.	.
Lycoperdon perlatum	I^{r}	.	.	.	.	.	.	.	.	.
b) among mosses										
Hypholoma udum	IV^{r-n}	V^{r-n}	9^{r-a}	V^{r-a}	V^{r-n}	V^{r-a}	V^{r-n}	V^{r-n}	8^{r-n}	V^{r-n}
Hypholoma elongatum	IV^{r-n}	IV^{r-n}	9^{r-a}	V^{r-a}	V^{r-a}	V^{r-a}	V^{r-a}	V^{r-a}	8^{r-a}	V^{r-a}
Galerina paludosa	IV^{r-n}	IV^{r-n}	7^{r-n}	V^{r-n}	V^{r-n}	V^{r-a}	V^{r-a}	V^{r-n}	8^{r-n}	V^{r-a}
Galerina tibiicystis	III^{r-n}	III^{r-n}	9^{r-a}	V^{r-a}	V^{r-a}	IV^{r-a}	IV^{r-n}	V^{r-a}	8^{r-n}	IV^{r-a}
Galerina sphagnorum	I^{r}	.	2^{r}	IV^{r-n}	III^{r-n}	V^{r-a}	V^{r-a}	V^{r-n}	5^{r-n}	V^{r-a}
Arrhenia gerardiana	.	II^{r}	.	V^{r-n}	III^{r-n}	IV^{r-n}	V^{r-n}	II^{r-n}	3^{r-n}	V^{r-n}
Galerina calyptrata	II^{r}	II^{r}	6^{r-n}	.	IV^{r-n}	II^{r}	I^{r}	II^{r}	.	.
Mycena adonis var. *adonis*	I^{r}	III^{r-n}	3^{r}	II^{r-n}	I^{r-n}	I^{r-n}	.	.	.	.
Mycena megaspora	I^{r}	I^{r}	4^{r-a}	I^{r}	I^{r}	.	.	.	.	.
Lichenomphalia umbellifera	III^{r}	III^{r}	1^{r}	III^{r-n}	.	.	.	.	.	.
Galerina hypnorum	II^{r}	III^{r-n}	5^{r}	I^{r}	.	.	.	.	.	.
Ascocoryne turficola	.	.	.	.	I^{r-n}	I^{n-a}	II^{r-n}	.	2^{r-n}	.
Galerina jaapii	II^{r}	III^{r-n}	.	II^{r}	.	.	.	.	.	.
Galerina vittiformis var. *vittiformis*	I^{r}	II^{r}	4^{r-a}	.	.	.	.	.	.	.
Mycena acicula	I^{r}	.	.	.	.	.	.	.	.	.
c) on litter										
Mycena galopus	V^{r-a}	V^{r-a}	9^{r-a}	V^{r-a}	V^{r-a}	IV^{r-n}	III^{r-n}	V^{r-n}	6^{r-n}	I^{r}
Gymnopus androsaceus	V^{r-a}	V^{r-a}	8^{r-a}	V^{r-a}	V^{r-a}	IV^{r-n}	III^{r-n}	IV^{r-n}	2^{r}	I^{r}
Mycena epipterygia var. *epipterygia*	V^{r-n}	V^{r}	8^{r-n}	V^{r-a}	V^{r-a}	II^{r-a}	I^{r}	I^{r-n}	.	.
Mycena sanguinolenta	IV^{r-a}	V^{r-a}	5^{r-n}	V^{r-a}	III^{r-n}	III^{r-n}	.	.	1^{r}	.
Collybia cirrata	II^{r-n}	II^{r}	1^{r}	II^{r-n}	I^{r}	I^{r}	I^{r}	.	.	.
Collybia cookei	I^{r}	I^{r}	3^{r-n}	I^{r}	I^{r}	.	.	I^{r}	.	.
Clitocybe vibecina	II^{r-n}	V^{r-a}	2^{r-n}	.	.	.	.	.	.	.
Mycena vulgaris	.	III^{r-n}	1^{r}	I^{r}	.	.	.	.	.	.

Mycena zephirus	III^{r-a}	IV^{r-a}	.	.	.	.	.	.	.	.
Auriscalpium vulgare	I^{r}	III^{r}	.	.	.	.	.	.	.	.
Clitocybe candicans var. *candicans*	I^{r}	I^{r}	.	.	.	.	.	.	.	.
Marasmius epiphyllus	.	.	.	.	I^{r}	I^{r}	.	.	.	.
Mycena cinerella	.	V^{r-a}	.	.	.	.	.	.	.	.
Strobilurus tenacellus	.	II^{r-n}	.	.	.	.	.	.	.	.
Strobilurus stephanocystis	.	II^{r}	.	.	.	.	.	.	.	.
Baeospora myosura	.	I^{r}	.	.	.	.	.	.	.	.
Roridomyces rorida	.	I^{r}	.	.	.	.	.	.	.	.
Mycena filopes	.	I^{r}	.	.	.	.	.	.	.	.
Mycena pura	I^{r}	.	.	.	.	.	.	.	.	.
Mycena vitilis	.	.	1^{r}	.	.	.	.	.	.	.
d) on wood										
Mycena galericulata	V^{r-a}	II^{r}	4^{r}	.	III^{r-n}	.	.	.	.	.
Piptoporus betulinus	V^{r-n}	III^{r}	.	I^{r}	I^{r}	.	.	.	.	.
Dacryomyces stillatus	IV^{r}	III^{r}	2^{r}	III^{r}	.	.	.	.	.	.
Trichaptum fuscoviolaceum	III^{r}	I^{r}	.	II^{r}	.	.	.	.	.	.
Trametes hirsuta	III^{r-n}	I^{r}	1^{r}	.	.	.	.	.	.	.
Diatrypella favacea	V^{r-n}	II^{r}	.	.	.	.	.	.	.	.
Fomes fomentarius	IV^{r}	III^{r}	.	.	.	.	.	.	.	.
Polyporus ciliatus	IV^{r}	II^{r}	.	.	.	.	.	.	.	.
Calocera cornea	IV^{r-n}	I^{r}	.	.	.	.	.	.	.	.
Hypholoma fasciculare var. *fasciculare*	III^{n-a}	I^{r-n}	.	.	.	.	.	.	.	.
Stereum hirsutum	III^{r-n}	I^{r}	.	.	.	.	.	.	.	.
Panellus mitis	.	I^{r}	.	I^{r}	.	.	.	.	.	.
Trichaptum abietinum	I^{n}	.	1^{r}	.	.	.	.	.	.	.
Daedaleopsis confragosa	V^{r}	.	.	.	.	.	.	.	.	.
Exidia plana	V^{r-n}	.	.	.	.	.	.	.	.	.
Crepidotus variabilis	IV^{r-n}	.	.	.	.	.	.	.	.	.
Ascocoryne sarcoides	III^{r-n}	.	.	.	.	.	.	.	.	.
Diatrype stigma	III^{r}	.	.	.	.	.	.	.	.	.
Mycena stipata	.	III^{r}	.	.	.	.	.	.	.	.
Pluteus cervinus	III^{r}	.	.	.	.	.	.	.	.	.
Bjerkandera adusta	II^{r}	.	.	.	.	.	.	.	.	.
Calocera viscosa	.	II^{r}	.	.	.	.	.	.	.	.
Kuehneromyces mutabilis	II^{r}	.	.	.	.	.	.	.	.	.
Megacollybia platyphylla	II^{r-n}	.	.	.	.	.	.	.	.	.
Phlebia tremellosa	II^{r}	.	.	.	.	.	.	.	.	.
Postia caesia	.	II^{r}	.	.	.	.	.	.	.	.
Scutellinia scutellata	II^{r-n}	.	.	.	.	.	.	.	.	.
Stereum sanguinolentum	.	II^{r}	.	.	.	.	.	.	.	.
Xylaria hypoxylon	II^{r-n}	.	.	.	.	.	.	.	.	.
Fomitopsis pinicola	.	I^{r}	.	.	.	.	.	.	.	.
Hohenbuehelia atrocoerulea	I^{r}	.	.	.	.	.	.	.	.	.
Hypholoma capnoides	.	I^{r}	.	.	.	.	.	.	.	.
Hypholoma lateritium	I^{n}	.	.	.	.	.	.	.	.	.
Inonotus obliquus	I^{r}	.	.	.	.	.	.	.	.	.
Lentinellus cochleatus	I^{r}	.	.	.	.	.	.	.	.	.
Lycoperdon pyriforme	I^{r}	.	.	.	.	.	.	.	.	.
Macrotyphula fistulosa	I^{n}	.	.	.	.	.	.	.	.	.
Mycena haematopus	I^{r}	.	.	.	.	.	.	.	.	.
Peniophora cinerea	I^{r}	.	.	.	.	.	.	.	.	.

Phaeomarasmius erinaceus	I^{r-n}	.	.	.	.	.	.	.	.	.
Phlebia radiata	I^{r}	.	.	.	.	.	.	.	.	.
Ramaria stricta	I^{r}	.	.	.	.	.	.	.	.	.
Schizophyllum commune	I^{r-a}	.	.	.	.	.	.	.	.	.
Sphaerobolus stellatus	.	I^{r}	.	.	.	.	.	.	.	.
Stereum rugosum	I^{r}	.	.	.	.	.	.	.	.	.
Stereum subtomentosum	I^{r}	.	.	.	.	.	.	.	.	.
Trametes versicolor	I^{r}	.	.	.	.	.	.	.	.	.
Tricholomopsis rutilans	.	I^{r}	.	.	.	.	.	.	.	.
e) on animal dung										
Stropharia semiglobata	I^{r}	.	.	.	.	.	.	.	.	.
Psilocybe coprophila	.	.	2^{r-a}	.	.	.	.	.	.	.
Panaeolus papilionaceus var. *papilionaceus*	.	.	1^{r}	.	.	.	.	.	.	.
f) on fungi										
Nectria episphaeria	III^{r}	.	.	.	.	.	.	.	.	.
Parasitic fungi										
Lyophyllum palustre	IV^{r-n}	IV^{r-n}	6^{r-a}	V^{r-a}	V^{r-a}	V^{r-a}	V^{r-a}	V^{r-a}	8^{r-a}	V^{r-a}
Rickenella fibula	V^{r-n}	III^{r}	4^{r-n}	II^{r}	IV^{r}	I^{r}	I^{r}	II^{r}	.	.
Nectria cinnabarina	IV^{r-n}	.	.	.	.	.	.	.	.	.
Anthracoidea limosa	.	.	.	.	.	.	II^{r-a}	.	.	.
Armillaria ostoyae	I^{r}	.	.	.	.	.	.	.	.	.
Chondrostereum purpureum	I^{r}	.	.	.	.	.	.	.	.	.
Heterobasidion annosum	.	I^{r}	.	.	.	.	.	.	.	.
Monilinia oxycocci	.	.	.	.	.	.	I^{r-n}	.	.	.
Phaeolus schweinitzii	.	I^{r}	.	.	.	.	.	.	.	.
Sparassis crispa	.	I^{r}	.	.	.	.	.	.	.	.
Tremella encephala	.	I^{r}	.	.	.	.	.	.	.	.
Xerocomus parasiticus	I^{r}	.	.	.	.	.	.	.	.	.

Appendix 2

A list of macromycete species of raised and transitional bogs in Pomerania

Detailed data on the occurrence of macroscopic fungi species, including information on the substrate on which they grew, the habitat, the occurrence site and the observation date, are given on the list. Species of fungi recorded in the Reptowo peatland are not included as they are listed in a separate paper (Stasińska 2008) and only those species that were recorded at the permanent research plot in the peatland are given.

Plant community: *Cala – Caricetum lasiocarpae, Cali – Caricetum limosae, Caro – Caricetum rostratae, EaSp – Eriophoro angustifolii-Sphagnetum recurvi, ErSp – Erico-Sphagnetum medii, Rhal – Rhynchosporetum albae, Spma – Sphagnetum magellanici,* zb*Ev* – community *Eriophorum vaginatum-Sphagnum fallax, VuPn – Vaccinio uliginosi-Pinetum, VuBe – Vaccinio uliginosi-Betuletum pubescentis*; loc. – locality(-ies); 1, 2, 3, 4, ... – locality number (see Tab. 1); IV-IX 2001 – observation date; threat categories (according to Wojewoda & Ławrynowicz 2006): E – Endangered, V – Vulnerable, R – Rare; § – protected species (Regulation of the Minister of the Environment on species of wild growing fungi under protection 2004).

ASCOMYCOTA

Helotiales

Ascocoryne sarcoides (Jacq.) J. W. Groves & D. E. Wilson – on wood of deciduous trees; *VuPn, VuBe*; 11 loc.: 1, 3, 7, 10, 16, 20-21, 24, 26, 41, 61; X-XI 2002, 2004-2007.

Ascocoryne turficola (Boud.) Korf – among *Sphagnum* spp., on stems of *Carex rostrata* Stokes, *Carex limosa* L. and *Eriophorum angustifolium* Honck.; *Cali*, *EaSp*, *Caro*, zb*Ev*; 14 loc.: 4, 10, 13, 16-17, 22, 80-81, 88, 90, 92-93, 101, 119; IX-X 1999, 2002, 2003-2007; Stasińska & Sotek (2004a, b); Stasińska *et al.* (2004).

Monillinia oxycocci (Woronin) Honey – on fallen mummified fruits of *Oxycoccus palustris* Pers.; *Cali*; 3 loc.: 15-16, 23; V-VI 2001; Stasińska & Sotek (2004a).

Leotiales

Leotia lubrica (Scop.) Pers. – among *Sphagnum* spp., under birch and *Myrica gale* L.; 2 loc.: 1, 91; IX 2004, 2008.

Pezizales

Leucoscypha leucotricha (Alb. & Schwein.: Fr.) Boud. – among mosses; 1 loc.: 5; IX 2002; Stasińska & Sotek (2003).

Scutellinia scutellata (L.) Lambotte – on wood of deciduous trees; *VuBe*; 17 loc.: 1-2, 5, 7, 10, 12-16, 20, 25, 36, 45-46, 48, 134; VIII-X 2000-2002, 2004-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).

Hypocreales

Nectria cinnabarina (Tode) Fr. – on dead twigs and branches of birch; *VuBe*; 27 loc.: 1-3, 5, 7, 10, 13-15, 18, 20-21, 38, 45, 52, 61, 64, 78, 114-116, 118, 122, 126-129, 131; IX-XI 2000-2002, 2004-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).

Nectria episphaeria (Tode) Fr. – on *Diatrype stigma* (Hoffm.) Fr.; *VuBe*; 11 loc.: 1-2, 7, 16, 20-21, 45, 61, 79, 115, 131; IV-XI 2000, 2003-2009.

Xylariales

Diatrype stigma (Hoffm.) Fr. – on dead twigs and branches of *Betula pendula* Roth. and *B. pubescens* Ehrh.; *VuBe*; 17 loc.: 1-2, 5, 7, 10-11, 16, 20-21, 45, 61-62, 64, 78, 79, 115, 131; IV-XI 2000, 2003-2009.
Diatrypella favacea (Fr.) Ces. & De Not. [= *Diatrypella verrucaeformis* (Ehrh.) Nitschke] – on senescent twigs and branches of *Betula pendula* Roth. and *B. pubescens* Ehrh.; *VuPn*, *VuBe*; 22 loc.: 1-2, 5, 7, 10, 16, 20-21, 35, 38, 45, 50, 61-62, 64, 78-79, 115, 122, 126-127, 131; IV-XI 2000-2009.
Xylaria hypoxylon (L.) Grev. – on dead wood; *VuBe;* 21 loc.: 1-2, 3, 5, 13-14, 16, 18, 20-21, 24-26, 45, 61, 64, 78, 88, 115, 126, 129; VII-XI 2000-2004, 2007-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).

BASIDIOMYCOTA

Ustilaginales

Anthracoidea limosa (H. Syd.) Kukkonen – on *Carex limosa* L.; *Cali*; 2 loc.: 10, 15; VI-VIII 2000-2005; Stasińska & Sotek (2003, 2004a).

Dacrymycetales

Calocera cornea (Batsch) Fr. – on decayed and fallen trunks; *VuPn*, *VuBe*; 32 loc.: 1-2, 5, 7, 10, 12-14, 16, 20-21, 24, 26, 45, 57, 61, 81, 90, 95-96, 114-115, 118, 121-122, 124, 126-131; VII-IX 2000-2006; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Calocera viscosa (Pers.) Fr. – on dead wood of conifers, e.g., on stumps; *VuPn*; 18 loc.: 2, 7, 20-21, 50, 52, 79, 89-90, 95-96, 115-116, 118, 128-131; IX-X 2005-2009.
Dacryomyces stillatus Nees – on dead stumps, trunks and branches; *ErSp, Spma, VuPn, VuBe*; 31 loc.: 1-2, 6-7, 9-10, 12-13, 16, 20-21, 23, 57, 62, 64, 69, 79, 83, 90, 95-96, 103, 114-120, 128, 130; VII-X 2001-2002, 2004-2009; Stasińska *et al.* (2004).

Tremellales

Exidia plana Donk – on fallen twigs, branches and trunks of birch; *VuBe*; 19 loc.: 1-2, 5, 7, 10, 14-13, 18, 20-21, 26, 45-46, 52, 61, 64, 69, 96, 118; IV-V, IX-XI 2000-2002, 2004-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Tremella encephala Willd. – on basidiocarps of *Stereum sanguinolentum* (Alb. & Schwein.) Fr. − on coniferous wood; *VuPn*; 2 loc.: 2, 7; VII, IX-X 2005, 2008.

Agaricales

Amanita citrina (Schaeff.) Pers. f. ***citrina*** – on soil; *VuBe*; 3 loc.: 2, 20, 21, IX 2006-2009.
Amanita fulva (Schaeff.: Fr.) Fr. – on soil; *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 75 loc.: 1-2, 5-10, 12, 14-18, 21, 23-26, 28-30, 38, 40, 43, 46, 50-53, 56-59, 61-62, 64, 72-73, 75, 77-79, 82, 84, 87-91, 97, 100-106, 109-112, 114-118, 120, 122, 126-131; VIII-X 1999-2007; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Amanita porphyria Alb. & Schw.: Fr. – on soil; *VuPn*; 3 loc.: 7-8, 20; IX-X 2001, 2004-2005; 2008-2009.
Amanita virosa (Fr.) Bertill. – V; on soil, among *Molinia caerulea* (L.) Moench s. str., under birch; 1 loc.: 2; VIII 2008.
Ampulloclitocybe clavipes (Pers.: Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys [= *Clitocybe clavipes* (Pers.: Fr.) P. Kumm.] – on soil, among mosses; *VuPn*, *VuBe*; 16 loc.: 2, 7, 20-21, 50, 53, 79, 89-90, 94-96, 103, 114, 116, 118; IX-XI 2004-2009.
Armillaria ectypa (Fr.: Fr.) Herink – among *Sphagnum* spp.; 1 loc.: 133; IX 2007.
Armillaria ostoyae (Romagn.) Herink – on wood; *VuBe*; 10 loc.: 1-2, 20-21, 28, 46, 64, 88, 115, 126; X-XI 2004-2009.

Arrhenia gerardiana (Peck) Elborne [= *Omphalina sphagnicola* (Berk.) M.M. Moser s. auct.] – V; on *Sphagnum* spp.; *Cali, Rhal, EaSp*, *Cala, Caro, Spma,* zb*Ev, VuPn*; 50 loc.: 1-8, 10, 12-17, 19, 20-23, 25-26, 34, 36-37, 47, 60, 61, 63, 66, 68, 71, 79, 88-92, 94-95, 103, 107, 111-114, 120, 129, 133-134; VI-X 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004); Sotek *et al.* (2004).
Baeospora myosura (Fr.: Fr.) Singer – on fallen, buried cones of Scots pine; *VuPn*; 3 loc.: 2, 7, 20; IX-XI 2006, 2008.
Bovista paludosa Lév. – V, §; on soil, among mosses; 1 loc.: 81; IX 2006.
Chondrostereum purpureum (Pers.) Pouzar – on dead or dying trunks of birch; *VuBe*; 8 loc.: 1-2, 20-21, 41, 61, 64, 118; VI-XI 2005, 2008-2009.
Clavaria fragilis Holmsk. [= *Clavaria vermicularis* Fr.] – on peat and among mosses; *Cali*, *EaSp*, *ErSp*, *Spma*, zb*Ev*; 17 loc.: 1, 8, 10, 12, 14, 21-22, 28, 54, 58-59, 78, 80, 91, 96, 107, 111; IX-XI 1999, 2001-2009; Stasińska & Sotek (2004a).
Clitocybe candicans (Pers.: Fr.) P. Kumm. var. ***candicans*** – on soil; *VuPn*, *VuBe*; 3 loc.: 7, 21, 79; IX-X 2006.
Clitocybe vibecina (Fr.) Quél. [= *Clitocybe langei* Singer ex Hora] – on needle litter of Scots pine; *ErSp*, *VuPn*, *VuBe*; 25 loc.: 7, 8, 9, 10, 20-21, 23, 50, 52, 56-57, 78-79, 83-84, 87, 89-90, 94-96, 111, 116, 118, 129; X-XI 2001-2002, 2004-2008.
Collybia cirrata (Pers.) Quél. – on old, fallen basidiocarps of Agaricales or among mosses; *Cali, EaSp*, *ErSp, Spma,* zb*Ev, VuPn, VuBe*; 22 loc.: 3-4, 7-8, 10, 12, 15-16, 21-23, 45, 50, 60, 74, 98-99, 103-104, 106, 111, 129; VIII-X 1999, 2001-2007; Stasińska & Sotek (2004a).
Collybia cookei (Bres.) J.D. Arnold – on old, fallen basidiocarps of Agaricales or among mosses; *Cala, ErSp*, *Spma*, zb*Ev, VuPn, VuBe*; 11 loc.: 1-2, 7, 9-10, 13, 20, 22, 45, 105, 118; VIII-X 2001-2002; 2004-2009; Stasińska *et al.* (2004).
Coprinus heptemerus (M. Lange & A.H. Sm.) Vilgalys, Hopple & Jacq. Johnson – on dung lying on *Sphagnum* spp.; 1 loc.: 45; X 2002.
Coprinus stercorea (Fr.) Redhead, Vilgalys & Moncalvo [= *Coprinus stercoreus* (Scop.) Fr. sensu P.D. Ort. & Watl. (1979)] – on dung lying on *Sphagnum* spp.; 1 loc.: 5; VI 2000; Stasińska & Sotek (2003).
Cortinarius acutus (Pers.) Fr. – R; on needle litter and between mosses, under Scots pine; *ErSp, VuPn, VuBe*; 2 loc.: 2, 20; IX 2008.
Cortinarius alboviolaceus (Pers.: Fr.) Fr. – on peat and among mosses, under birch; *VuPn, VuBe*; 3 loc.: 1, 7, 61; IX-X 2005, 2007.
Cortinarius armillatus (Fr.: Fr.) Fr. – on peat, under birch; *VuBe*; 15 loc.: 1-2, 7, 38, 45, 52, 61, 64, 86, 96-97, 111, 115, 118, 124; VIII-IX 2001, 2004-2009.
Cortinarius brunneus (Pers.: Fr.) Fr. – on peat; *VuPn*, *VuBe*; 2 loc.: 2, 21; IX-X 2004, 2008.
Cortinarius cinnamomeoluteus P.D. Orton – on peat; *VuPn*; 6 loc.: 7, 20, 50, 52, 79, 118; IX 2004-2006, 2009.
Cortinarius delibutus Fr. – on peat, under birch; *VuPn*, *VuBe*; 5 loc.: 2, 7, 8, 23, 124; IX-X 2001-2002, 2004-2005, 2008.
Cortinarius flexipes (Pers.: Fr.) Fr. var. ***flexipes*** – on peat, under Scots pine and birch; *ErSp*, *Spma*, *VuPn*, *VuBe*; 40 loc.: 1-2, 5-10, 13, 20-21, 23, 26, 38, 45, 50, 52, 56-57, 60-62, 67, 77-79, 83, 89-91, 101, 103, 114, 116, 118, 127-131; IX-XI 1999-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Cortinarius fulvescens Fr. [= *Cortinarius fasciatus* (Scop.) Fr.] – E; on peat, among mosses, under Scots pine; *EaSp, ErSp,* zb*Ev, VuPn*; 6 loc.: 1-2, 7, 12-13, 20; IX-X 2001-2004, 2007-2009; Stasińska & Sotek (2004a); Stasińska *et al.* (2004).
Cortinarius huronensis Ammirati & A.H. Sm. – among *Sphagnum* spp., under Scots pine and birch; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*: *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 76 loc.: 1-10, 12-27, 36, 38, 43, 45, 48, 50-51, 53-54, 56-57, 60-61, 62, 63, 65-68, 71-78, 86, 90-91, 93-97, 100-103, 107, 109, 110-114, 119-120, 132-133; VII-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).
Cortinarius rubellus Cooke [= *Cortinarius speciosissimus* Kühner & Romagn.] – on peat and among mosses; *VuPn*; 4 loc.: 7, 20, 21, 129; IX-X 2005-2007.

Cortinarius obtusus (Fr.: Fr.) Fr. s.l. – on needle litter and between mosses, under Scots pine; *ErSp*; 1 loc.: 20; IX-X 2008-2009.
Cortinarius semisanguineus (Fr.: Fr.) Fr. – on peat, needle litter and among *Sphagnum* spp.; *EaSp, ErSp, Spma, VuPn, VuBe*; 33 loc.: 1-2, 6-10, 21, 23, 50, 52, 56-57, 61-62, 78, 82-84, 87-90, 94-96, 111, 114, 116, 120, 129-131; VIII-X 1999-2002, 2004-2009.
Cortinarius uliginosus Berk. f. ***uliginosus*** – on peat, under willow; 3 loc.: 18, 26, 68; X 2002.
Crepidotus variabilis (Pers.: Fr.) P. Kumm. – on twigs and litter; *VuBe*; 17 loc.: 3, 5, 7, 14, 16, 20-21, 26, 45-46, 53, 61, 64, 69, 79, 96, 111; VII-X 2000-2002, 2004-2006; Stasińska & Sotek (2003).
Cystoderma amianthinum (Scop.: Fr.) Fayod – on peat and among mosses and litter; *VuPn*; 12 loc.: 7, 8, 20-21, 23, 83, 95-96, 111, 118, 126, 131; IX-XI 2001, 2004-2009.
Entoloma cetratum (Fr.: Fr.) M.M. Moser – on peat and among mosses; *EaSp*, *Spma*, *VuPn*, *VuBe*; 34 loc.: 2, 3, 5-8, 10, 20-21, 23, 38, 45, 48, 50, 52, 56-57, 62-63, 78-79, 89-90, 103, 111, 116, 118, 120, 126-131; V-VII, IX-X 2001-2009.
Entoloma conferendum (Britzelm.) Noordel. var. ***conferendum*** – among *Sphagnum* spp.; *VuBe*, *Spma*; 6 loc.: 7, 10, 16, 20-21, 49; IX-X 2002, 2004-2005, 2008.
Entoloma chalybaeum (Fr.: Fr.) Noordel. var. ***chalybaeum*** – R; among *Sphagnum* spp.; 1 loc.: 1; IX 2008, 2009.
Entoloma sericatum (Britzelm.) Sacc. – on peat and among mosses, under birch; *EaSp, ErSp, Spma, VuBe*; 18 loc.: 1-2, 7, 10, 12, 16, 20-23, 49, 51, 66, 71, 73, 120, 129, 133; IX-X 2000-2009; Stasińska & Sotek (2004a).
Entoloma mougeotii (Fr.) Hesler var. ***mougeotii*** – V; on soil, among mosses, under willow and alder; 1 loc.: 26; VII 2001.
Galerina calyptrata P.D. Orton – on mosses; *Cali, EaSp, Cala, ErSp,* zb*Ev, VuPn, VuBe*; 27 loc.: 1-5, 7-10, 12-17, 20-22, 24, 26, 36, 45, 60, 77, 111, 113, 129; VIII-X 2000-2009; Stasińska & Sotek (2004a); Stasińska *et al.* (2004).
Galerina cinctula P.D. Orton – among *Sphagnum* spp. and *Erica tertalix* L.; *ErSp*; 1 loc.; 20; IX 2008.
Galerina hypnorum (Schrank: Fr.) Kühner s. Horak 2005 and de Haan & Walleyn 2006 – on peat and mosses; *ErSp*, *Spma*, *VuPn*, *VuBe*; 19 loc.: 2, 5-9, 20-21, 23, 52, 56, 63, 77, 79, 90, 103, 116, 118, 130; IX-XI 2000-2002, 2004-2009; Stasińska & Sotek (2003).
Galerina jaapii A.H. Sm. & Singer [= *Galerina mycenoides* (Fr.) Kühner] – E; on mosses; *Rhal, Spma*, *VuPn*, *VuBe*; 6 loc.: 2, 7, 8, 10, 20, 23; IX-X 2001-2005, 2008-2009.
Galerina paludosa (Fr.) Kühner – R; on *Sphagnum* spp.; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 129 loc.: 1-40, 42-82, 84-98, 101-121, 123-134; VI-X 1999-2009; Stasińska (2004); Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004); Sotek *et al.* (2004).
Galerina sphagnorum (Pers.: Fr.) Kühner – R; on *Sphagnum* spp.; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuBe*; 48 loc.: 1-8, 10, 12-16, 19-23, 26, 28, 36, 40, 58-59, 61, 63, 68, 73-74, 77, 88, 91, 97, 101-104, 106-108, 111, 113, 117, 120, 129; 132-133; VIII-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004); Sotek *et al.* (2004).
Galerina tibiicystis (G.F. Atk.) Kühner – among *Sphagnum* spp.; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 63 loc.: 1-13, 15-17, 19-23, 26-25, 36, 45, 47-49, 51, 54-57, 60, 65-68, 73, 77-78, 81-82, 85-92, 94-95, 111-113, 116, 119, 123, 127-128, 132, 134; VI-X 1999-2009; Stasińska & Sotek (2003, 2004a).
Galerina vittiformis (Fr.) Singer var. ***vittiformis*** – on mosses; *ErSp*, *VuPn*, *VuBe*; 13 loc.: 1-2, 7-9, 20-21, 48, 52, 73, 79, 96, 111; IX-X 1999-2002, 2004-2005, 2007-2009.
Gymnopus androsaceus (L.: Fr.) Antonín & Noordel. [= *Marasmius androsaceus* (L.: Fr.) Fr.] – on fallen needles and twigs of coniferous and deciduous trees and on *Carex* sp. and *Eriophorum* sp.; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 120 loc.: 1-46, 48-68, 70-79, 81-82, 84-85, 87-96, 98-107, 109-112, 114-120, 122-123, 126-131; VI-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).
Gymnopus dryophilus (Bull.: Fr.) Murrill – on litter; *VuPn*, *VuBe*; 8 loc.: 1-2, 7, 20-21, 45, 52, 69; V-X 1999-2001, 2004-2009.

Gymnopus peronatus (Bolton: Fr.) Antonín, Halling & Noordel. – on peat and litter of deciduous and coniferous trees; *VuPn*, *VuBe*; 10 loc.: 2, 7, 20-21, 50, 52, 57, 62-63, 111; IX-X 2004-2005, 2007-2009.
Hebeloma crustuliniforme (Bull.) Quél. s.l. – on peat; *ErSp*, *VuPn*, *VuBe*; 4 loc.: 1-2, 20, 73; VIII-IX 2007-2008.
Hebeloma circinans (Quél.) Sacc. [= *Hebeloma longicaudum* (Pers.: Fr.) P. Kumm. ss. J.E. Lange] – on peat and among *Sphagnum* spp.; *VuPn, VuBe*; 18 loc.: 7-8, 10, 16, 21, 23, 50, 56, 62-64, 77, 79, 91, 103, 110-111, 129; IX-X 2001-2002, 2004-2009.
Hebeloma sacchariolens Quél. – on peat; *ErSp*, *VuBe*; 2 loc.: 1, 20; IX-X 2008.
Hohenbuehelia atrocoerulea (Fr.: Fr.) Singer – on dead branches of birch, *VuBe*; 4 loc.: 20-21, 61, 63; VIII-IX 2006, 2009.
Hygrocybe cantharellus (Schwein.: Fr.) Murrill [= *Hygrocybe lepida* Arnolds] – V; on soil; 1 loc.: 2; X 2008.
Hygrocybe coccineocrenata (P.D. Orton) M.M. Moser– V; on peat, among *Sphagnum* spp.; *Cala*, *EaSp*, *ErSp*, *Spma*, *VuBe*; 13 loc.: 1, 5, 7, 9, 10, 12, 21-22, 88, 90, 92, 104, 124; VIII-IX 2001-2009; Stasińska & Sotek (2003, 2004a); Sotek *et al.* (2004).
Hypholoma capnoides (Fr.: Fr.) P. Kumm. – on stumps; *VuPn*; 6 loc.: 2, 7, 20, 52, 63, 78; IX-XI 2006-2009.
Hypholoma elongatum (Pers.) Ricken – R; among *Sphagnum* spp. and other mosses; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 125 loc.: 1-40, 42-51, 53-97, 100-103, 106-108, 111-121, 123-134; VIII-XI 1999-2009; Stasińska (2004); Stasińska & Sotek (2003, 2004a); Sotek *et al.* (2004); Stasińska *et al.* (2004).
Hypholoma fasciculare (Huds.: Fr.) P. Kumm. var. ***fasciculare*** – on stumps and trunks of birch; *VuPn*, *VuBe*; 20 loc.: 1-2, 7, 10, 13, 21, 41, 45, 52, 61-62, 69, 73, 78-79, 90, 96, 122, 126, 131; VI, VIII-IX 2001, 2004-2009; Stasińska *et al.* (2004).
Hypholoma lateritium (Schaeff.: Fr.) P. Kumm. – on stumps; *VuPn*, *VuBe*; 7 loc.: 20-21, 52, 61, 90, 96, 127; V, IX-X 2005, 2008.
Hypholoma myosotis (Fr.: Fr.) M. Lange [= *Pholiota myosotis* (Fr.: Fr.) Singer] – V; on peat and among *Sphagnum* spp., under willow and birch; *VuBe*; 3 loc.: 1-2, 108, VIII-IX 2006, 2008.
Hypholoma udum (Pers.: Fr.) Kühner – R; on peat and among *Sphagnum* spp.; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 123 loc.: 1-23, 26, 28-40, 42, 45, 47-49, 50-59, 61-67, 69-97, 100-110, 111-134; VIII-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).
Inocybe geophylla (Fr.: Fr.) P. Kumm. – on soil; *VuBe*; 2 loc.: 1, 45; VIII-IX 2003, 2008.
Inocybe lacera (Fr.: Fr.) P. Kumm. var. ***lacera*** – on soil; *VuPn*; 5 loc.: 52, 63, 100, 130, 131; IX 2007.
Inocybe lanuginosa (Bull.: Fr.) P. Kumm. – on peat, under Scots pine; *VuPn*, *VuBe*; 11 loc.: 2, 7-8, 20-21, 23, 52, 63, 74, 129, 131; IX-X 2001, 2004-2005, 2007-2009.
Inocybe napipes J.E. Lange – on peat and among *Sphagnum* spp.; *Spma*, *VuPn*, *VuBe*; 17 loc.: 2, 6-8, 10, 21, 23, 56, 63, 89-90, 111, 120, 128-131; IX-X 2001-2009.
Kuehneromyces mutabilis (Schaeff.: Fr.) Singer & A.H. Sm. [= *Pholiota mutabilis* (Schaeff.: Fr.) P. Kumm.] – on stumps; *VuBe*; 8 loc.: 1-2, 7, 21, 52, 63, 69, 79; VIII-X 2005-2007, 2009.
Laccaria amethystina Cooke – on soil; *VuBe*; 2 loc.: 20-21; IX-X 2005, 2008-2009.
Laccaria lacccata (Scop.: Fr.) Berk. & Broome – on soil; *VuBe*; 5 loc.: 1-2, 21, 79, 131; VIII-IX, XI 2004-2005, 2008.
Laccaria proxima (Boud.) Pat. – on peat and among *Sphagnum* spp.; *Cali*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 121 loc.: 1, 3-18, 20-36, 38, 40-46, 48, 50-54, 56-75, 77-79, 81-97, 100-108, 110-123, 125-134; V-XI 1999-2009; Stasińska &Sotek (2003, 2004a); Stasińska *et al.* (2004).
Lepista flaccida (Sowerby: Fr.) Pat. – on soil; *VuPn*, *VuBe*; 11 loc.: 2, 7-8, 20-21, 52, 81, 83, 124, 126, 131; IX-X 2002, 2005.
Lichenomphalia umbellifera (L.: Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys [= *Omphalina ericetorum* (Fr.: Fr.) M. Lange] – R; on mosses, often *Sphagnum* spp. and decayed wood or on peaty soil; *ErSp, Spma, VuPn, VuBe*; 24 loc.: 2, 4, 7-10, 13, 16, 20-21, 25, 45, 63, 98-100, 102-103, 110, 124-125, 128-129, 131; VII-X 2001-2002, 2003-2009; Stasińska *et al.* (2004).

Lycoperdon perlatum Pers. – on soil; *VuBe*; 4 loc.: 1, 20, 21, 61; VIII-X 2005, 2008-2009.
Lycoperdon pyriforme Schaeff. – on decayed stumps; *VuBe*; 6 loc.: 2, 20-21, 41, 61, 64, VIII-XI 2005-2006, 2009.
Lyophyllum palustre (Peck) Singer [= *Tephrocybe palustris* (Peck) Donk] – V; on *Sphagnum* spp.; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 132 loc.: 1-40, 42-121, 123-134; V-XI 1999-2009 Stasińska (2004); Stasińska & Sotek (2003, 2004a); Sotek *et al.* (2004); Stasińska *et al.* (2004).
Marasmius epiphyllus (Pers.: Fr.) Fr. – on leaves; *EaSp*, zb*Ev*; 2 loc.: 12, 16; IX-X 2002-2003; Stasińska & Sotek (2004a).
Macrotyphula fistulosa (Holmsk.) R.H. Petersen [= *Clavariadelphus fistulosus* (Holmsk.) Corner] – R; on dead twigs of birch; *VuBe*; 5 loc.: 1-2, 21, 45, 61; IX-X 2000, 2005, 2007, 2009.
Megacollybia platyphylla (Pers.: Fr.) Kotl. & Pouzar – on wood; *VuBe*; 6 loc.: 2, 7, 21, 46, 61, 69; VII-IX 2004-2008.
Mycena acicula (Schaeff.) P. Kumm. – on soil and among mosses; *VuBe*; 3 loc.: 2, 7, 52; IX 2005, 2008.
Mycena adonis (Bull.: Fr.) Gray var. ***adonis*** – R; on peat and among mosses, often *Sphagnum* spp.; *EaSp, ErSp, Spma,* zb*Ev, VuPn, VuBe*; 17 loc.: 1-2, 6-10, 12, 20, 21, 22, 23, 78-79, 103, 111, 129; IX-XI 2001-2009; Stasińska & Sotek (2004a).
Mycena cinerella (P. Karst.) P. Karst. – on litter and among mosses; *VuPn*; 10 loc.: 2, 7-8, 10, 20-21, 23, 79, 111, 129; X-XI 2001-2002, 2004-2009.
Mycena epipterygia (Scop.: Fr.) Gray var. ***epipterygia*** – on litter and among mosses; *Cali*, *EaSp*, *Cala*, *ErSp*, *Spma,* zb*Ev*, *VuPn*, *VuBe*; 82 loc.: 1-18, 20-28, 30-36, 38, 41, 43, 45, 46, 49-50, 52, 56-57, 60-64, 68-69, 72-73, 75, 77-79, 91, 98-100, 102-103, 109-111, 115-118, 120-131; IX-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).
Mycena filopes (Bull.: Fr.) P. Kumm. – on litter; *VuPn*; 2 loc.: 20-21; VIII-XI 2005, 2008-2009.
Mycena galericulata (Scop.: Fr.) Gray – on stumps, fallen branches and trunks of birch; *ErSp*, zb*Ev*, *VuPn, VuBe*; 34 loc.: 1, 3, 5, 7, 9-18, 20-21, 24-26, 41, 45-46, 52, 60-61, 63-64, 68-69, 79, 90, 115, 118, 126; VII-XI 1999-2002, 2004-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Mycena galopus (Pers.: Fr.) P. Kumm. – on litter and among *Sphagnum* spp.; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 129 loc.: 1- 42, 45, 46, 48-69, 71-134; VIII-XI 2000-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).
Mycena haematopus (Pers.: Fr.) P. Kumm. – on stumps and fallen trunks of birch; *VuBe*; 4 loc.: 13, 20-21, 111; VIII-IX 2002, 2005-2006, 2009; Stasińska *et al.* (2004).
Mycena megaspora Kauffman [= *Mycena permixta* (Britzelm.) Sacc.] – V; on *Sphagnum* spp.; *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 7 loc.: 1-2, 4, 10, 20-21, 72; VIII-IX 2005-2009.
Mycena pura (Pers.: Fr.) P. Kumm. – on litter; *VuBe*; 1 loc.: 21; X 2006.
Mycena sanguinolenta (Alb. & Schwein.: Fr.) P. Kumm. – on humus and litter, *EaSp*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 92 loc.: 1-10, 12-18, 20-29, 32-34, 38, 40, 43, 49, 50, 52, 54-57, 61-65, 68, 73-74, 77-79, 81-85, 87-91, 94-96, 100-106, 109, 111-119, 121-131; VIII-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).
Mycena stipata Maas Geest. & Schwöbel [= *Mycena alcalina* (Fr.: Fr.) P. Kumm. s. auct. p.p.] – on decayed branches and stumps of Scots pine; *VuPn, VuBe*; 9 loc.: 2, 7, 8, 20-21, 52, 63, 83, 122; IX-XI 2002, 2004-2009.
Mycena zephirus (Fr.: Fr.) P. Kumm. – on peat and fallen needles, among litter and mosses; *VuPn, VuBe*; 15 loc.: 3, 7, 8, 10, 20-21, 41, 45, 52, 61, 63, 69, 83, 90, 118; X-XI 2001, 2004-2009.
Mycena vitilis (Fr.) Quél. – on dead, fallen twigs of deciduous trees; *ErSp, VuPn, VuBe*; 8 loc.: 1-2, 20, 53, 61, 63, 69, 115; VIII-XI 2008-2009.
Mycena vulgaris (Pers.: Fr.) P. Kumm. – on peat and fallen needles; *ErSp, Spma, VuPn*; 10 loc.: 1- 2, 7-9, 20-21, 23, 63, 111; X-XI 2001-2002, 2004-2005, 2007-2009.
Nidularia deformis (Willd.) Fr. – R; on decayed wood, among mosses; 1 loc.: 60; X 2002.
Panaeolus papilionaceus (Bull.: Fr.) Quél. var. ***papilionaceus*** – R; on dung; *ErSp*; 1 loc.: 2; IX 2008.
Panellus mitis (Pers.: Fr.) Singer – on dead twigs and branches; *Spma*; *VuPn*; 5 loc.: 3, 7, 10, 52, 115; X-XI 2001-2002, 2004-2005.

Phaeomarasmius erinaceus (Fr.: Fr.) Kühner – R; on dead branches of birch and willow; *VuBe*; 21 loc.: 1-3, 5, 12-13, 15, 17-18, 20, 22, 24-27, 34-35, 44-45, 60, 68; VI-X 1999-2002, 2007-2009; Stasińska (2004); Stasińska & Sotek (2003); Sotek *et al.* (2004); Stasińska *et al.* (2004).
Pholiota flammans (Batsch: Fr.) P. Kumm. – on stumps; *VuPn*; 3 loc.: 2, 103, 106; IX 2006-2008.
Pluteus cervinus (Schaeff.) P. Kumm. [= *Pluteus atricapillus* (Batsch) Fayod] – on decaying stumps and trunks of birch; *VuPn*, *VuBe*; 12 loc.: 1-2, 5, 7, 10, 18, 20-21, 24, 61, 78, 115; VII, IX 2001-2002, 2004-2009; Stasińska & Sotek (2003).
Psathyrella sphagnicola (Maire) J. Favre – on *Sphagnum* spp.; *VuPn*; 3 loc.: 101, 102, 103; IX 2006, 2007.
Psilocybe coprophila (Bull.: Fr.) P. Kumm. – R; on dung; *ErSp*, *VuBe*; 2 loc.: 1-2; IX 2008.
Resupinatus trichotis (Pers.) Singer – on decayed log; 1 loc.: 24; X 2002.
Rhodocollybia butyracea (Bull.: Fr.) Lennox f. ***butyracea*** – on peat and among mosses; *VuPn, VuBe*; 10 loc.: 2, 7, 20-21, 52, 63, 90, 115-116, 118; X-XI 2005-2006, 2008-2009.
Rhodocollybia maculata (Alb. & Schwein.: Fr.) Singer var. ***maculata*** – on peat; *ErSp*, *VuPn, VuBe*; 30 loc.: 2, 7, 8, 10, 20, 21, 23, 52, 61, 62-63, 73, 79, 83-84, 87, 89-91, 102, 103, 114-116, 118, 126, 128-129, 130-131; IX-XI 1999, 2001, 2004-2008.
Schizophyllum commune Fr.: Fr. – on stumps and branches; *VuBe*; 15 loc.: 2, 5, 13, 16, 18, 24, 26, 41, 53, 60-61, 63, 69, 79, 115; VIII-XI 1999-2002, 2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Roridomyces rorida (Scop.: Fr.) Rexer [= *Mycena rorida* (Scop.: Fr.) Quél.] – on fallen leaves, needles and twigs; *VuPn*; 1 loc.: 7; X 2005.
Strobilurus tenacellus (Pers.: Fr.) Singer – on cones of Scots pine; *VuPn*; 10 loc.: 2, 7, 20-21, 28, 52, 56, 63, 79, 129; IV-VI 2004-2009.
Strobiluru stephanocystis (Hora) Singer – on cones of Scots pine; *VuPn*; 7 loc.: 2, 7, 20-21, 28, 52, 61; IV-V 2005-2009.
Stropharia aeruginosa (Curtis: Fr.) Quél. – on soil; *VuPn*, *VuBe*; 6 loc.: 2, 7, 21, 62-63, 115; IX 2004-2005, 2009.
Stropharia semiglobata (Batsch: Fr.) Quél. – on dung; *VuBe*; 1 loc.: 10; IX 2005.
Tapinella panuoides (Fr.: Fr.) E.-J. Gilbert f. ***panuoides*** [= *Paxillus panuoides* (Fr.: Fr.) Fr.] – on branches and cones of Scots pine; 4 loc.: 3, 79, 83, 90; X 2002.
Tricholoma fulvum (DC.: Fr.) Sacc. [= *Tricholoma flavobrunneum* (Fr.) P. Kumm.] – on peat, under *Betula* sp.; *VuBe*; 3 loc.: 1, 21, 61; IX-X 2004-2005, 2007-2009.
Tricholomopsis rutilans (Schaeff.: Fr.) Singer – on stumps; *VuPn*; 6 loc.: 2, 7, 52, 63, 90, 111; IX 2006, 2009.
Xeromphalina cauticinalis (Fr.) Kühner et Maire var. ***cauticinalis*** [= *Xeromphalia fellea* Maire & Malenç.] – among coniferous litter; *VuPn*; 5 loc.: 2, 52, 63, 102, 104; VIII-IX 2006, 2007.

Boletales

Chroogomphus rutilus (Schaeff.: Fr.) O.K. Mill. var. ***rutilus*** – on peat and among mosses; *ErSp, VuPn*; 16 loc.: 2, 7, 8, 20-21, 23, 52, 88, 94-95, 111, 126, 128-131; IX-X 2001, 2004-2009.
Gomphidius roseus (Fr.: Fr.) P. Karst. – R; on peat, under Scots pine; *VuPn*, *VuBe*, 6 loc.: 2, 7, 20-21, 26, 63; X IX-X 2002, 2004-2005, 2007-2009.
Hygrophoropsis aurantiaca (Wulfen: Fr.) Maire – on peat; *VuPn*, *VuBe*; 9 loc.: 2, 7, 20-21, 23, 52, 63, 79, 100; IX-XI 2002, 2005-2009.
Leccinum niveum (Fr.) Rauschert [= *Leccinum holopus* (Rostk.) Watling] – V; on peat, among *Sphagnum* spp., under birch; *Cali*, *Rhal*, *Cala*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 70 loc.: 1-3, 5-18, 20-22, 24-28, 33-36, 43, 45, 50, 63-64, 68, 73, 78, 81-82, 84, 86-96, 97, 101, 105, 107, 110-113, 115, 117-120, 127-129, 131-133; VII-X 1999-2009; Stasińska (2004); Stasińska & Sotek (2003, 2004a); Sotek *et al.* (2004); Stasińska *et al.* (2004).
Leccinum scabrum (Bull.: Fr.) Gray – on peat, under birch; *VuPn*, *VuBe*; 15 loc.: 1-2, 5, 18, 20-21, 26, 29, 38, 45, 52, 63, 69, 123, 126; VIII-XI 2000-2001, 2005-2009; Stasińska & Sotek (2003).

Leccinum variicolor Watling – on peat and among *Sphagnum* spp., under birch; *VuBe*; 3 loc.: 1, 2, 10; IX-X 2006, 2008-2009.
Leccinum versipelle (Fr.) Snell – on peat, under birch; *VuBe*; 8 loc.: 1-2, 7, 20, 61, 63, 88, 131; VIII-X 2006-2009.
Paxillus involutus (Batsch: Fr.) Fr. – on peat, under birch and Scots pine; *Cali*, *Cala*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 51 loc.: 2-10, 12-18, 20-23, 25-26, 41, 45, 52, 61-63, 79, 83, 88-91, 94-96, 98-103, 106, 118, 126-131; VIII-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).
Scleroderma citrinum Pers. – on peat and among mosses; *VuPn, VuBe*; 24 loc.: 2, 7, 8, 10, 13, 20-21, 25, 28, 45-46, 52, 56, 61-63, 79, 88, 107, 115, 123-124, 126-127; VIII-XI 2000-2002, 2004-2009; Stasińska *et al.* (2004).
Suillus bovinus (L.: Fr.) Roussel – on peat, under Scots pine; *ErSp*, *VuPn*, *VuBe*; 41 loc.: 2, 7-8, 10, 13, 20-21, 23, 26, 50, 52, 56, 62-63, 78, 82-90, 95-96, 100, 103, 106, 111-112, 114, 118, 121-122, 126-131; IX-XI 2000-2002, 2004-2009; Stasińska *et al.* (2004).
Suillus flavidus (Fr.: Fr.) J. Presl – E, §; on peat, under Scots pine; *ErSp*, *Spma*, *VuPn*; 15 loc.: 10, 15, 20-21, 23, 82, 89, 90, 102, 111-112, 128-131; IX-X 2001-2005, 2007-2009.
Suillus variegatus (Sw.: Fr.) Kuntze – on peat, under Scots pine; *Cali*, *Cala*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 62 loc.: 2, 4, 5, 6, 7, 8, 9, 10, 12-15, 17-18, 20-23, 25-26, 28, 50, 52, 56-57, 62-67, 73, 78, 81-85, 87-91, 95-96, 98, 100, 102-103, 109, 111-115, 118, 120-121, 126-127, 129, 131; VIII-X 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).
Tylopilus felleus (Bull.: Fr.) P. Karst – on peat, under Scots pine; *VuBe*; 6 loc.: 2, 20, 21, 52, 63, 111; IX-X 2006-2009.
Xerocomus parasiticus (Bull.: Fr.) Quél. – R, §; on *Scleroderma citrinum* Pers.; *VuPn*, *VuBe*; 4 loc.: 2, 20-21, 25; IX-X 2002, 2005, 2009.

Cantharellales

Clavulina coralloides (L.) J. Schröt. [= *Clavulina cristata* (Holmsk.) J. Schröt.] – on soil; *VuBe*; 2 loc.: 20-21; X 2006-2007.

Geastrales

Sphaerobolus stellatus Tode – on decayed wood; *VuPn*; 5 loc.: 2, 7, 20, 24, 61; IX-XI 2002, 2004, 2007, 2009.

Gomphales

Ramaria stricta (Pers.) Quél. – on decayed logs of birch; *VuBe*; 2 loc.: 1, 21; IX-X 2004, 2007-2009.

Hymenochaetales

Hymenochaete tabacina (Sowerby) Lév. – R; on dead and living trunks of willow; 18 loc.: 1-2, 3, 5, 12-13, 16-18, 24, 26-28, 36, 45, 60, 68, 129; IV-XI 2000-2002, 2007-2009; Stasińska *et al.* (2004).
Inonotus obliquus (Fr.) Pilát – R, §; on dead and living trunks of birch; *VuBe*; 6 loc.: 1-2, 7, 20, 52, 61; IV-XI 2004-2009.
Rickenella fibula (Bull.: Fr.) Raithelh. – on mosses; *Cali*, *EaSp*, *Cala*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 79 loc.: 1-13, 15-16, 18, 20-28, 36-38, 39-41, 45-46, 49-50, 52, 60-64, 66, 68, 72-75, 77-79, 81-84, 87-91, 94-96, 101-103, 105, 109-111, 114-118, 125, 126, 129-131; VIII-XI 2000-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).

Polyporales

Bjerkandera adusta (Willd.) P. Karst. – on dead and dying wood; *VuBe*; 14 loc.: 1-2, 7, 20-21, 41, 45-46, 52, 61, 64, 114-115, 124; V-XI 2001, 2005-2009.
Daedaleopsis confragosa (Bolton) J. Schröt. – on dead trunks of birch and on *Myrica gale* L.; *VuBe*; 33 loc.: 1-2, 3, 5, 7, 10, 12-18, 20-21, 24-26, 41, 45-46, 50, 52-53, 60-61, 64, 68-69, 96, 111, 118, 129; IV-XI 1999-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).

Fomes fomentarius (L.) J.J. Kickx – on branches and trunks of birch; *VuPn, VuBe*; 45 loc.: 1-3, 5, 7, 10, 12-14, 17-18, 20-21, 24, 26, 29, 35, 38, 41, 45-46, 50, 52, 56-57, 60-64, 69, 73, 78-79, 91, 111, 115-116, 118, 126-131; III-XI 1999-2002, 2004-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Fomitopsis pinicola (Sw.) P. Karst. – on logs and dead trunks of birch and Scots pine, *VuPn*; 22 loc.: 2, 7, 13, 20, 29, 46, 52, 61-63, 79, 90-91, 111, 115-116, 118, 127-131; IV-XI 2004-2009; Stasińska *et al.* (2004).
Phaeolus schweinitzii (Fr.) Pat. – on roots of Scots pine; *VuPn*; 1 loc.: 7; IV-XI 2004-2006.
Phlebia radiata Fr. – on stumps; *VuBe*; 15 loc.: 1-2, 13, 16, 20-21, 41, 45-46, 52, 61, 63-64, 115, 124; XI 2000, 2002, 2005, 2008-2009; Stasińska *et al.* (2004).
Phlebia tremellosa (Schrad.) Burds. & Nakasone – on decayed trunks of birch; *VuBe*; 13 loc.: 1-2, 7, 10, 13, 20-21, 45, 61, 69, 90, 118, 126; VIII-XI 1999-2002, 2004-2008; Stasińska *et al.* (2004).
Piptoporus betulinus (Bull.) P. Karst. – on trunks and logs of birch; zb*Ev, Spma, VuPn*, *VuBe*; 65 loc.: 1-3, 5, 7-8, 10, 12-14, 16-18, 20-21, 24-29, 34-36, 38-39, 41, 45-46, 48, 50-53, 56-57, 60-64, 68-69, 73, 78-79, 88-91, 111-112, 115-116, 118, 121-124, 126-131; IV-XI 1999-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Polyporus ciliatus Fr. – on twigs of birch; *VuPn*, *VuBe*; 17 loc.: 1-2, 5, 7, 10, 13, 15, 16, 18, 20-21, 26, 41, 45, 73, 78, 115; V-VI, IX-X 2000-2006; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Postia caesia (Schrad.) P. Karst. [= *Oligoporus caesius* (Schrad.) Gilb. & Ryvarden] – on dead or decayed branches of Scots pine; *VuPn*; 8 loc.: 2, 7-8, 20, 23, 52, 63, 115; VI-XI 2001, 2008-2009.
Sparassis crispa (Wulfen) Fr. – R, §; on roots of Scots pine; *VuPn*: 2 loc.: 7, 84; IX 2004-2006.
Trametes hirsuta (Wulfen) Pilát – on fallen branches of birch; *ErSp*, *VuPn*, *VuBe*; 22 loc.: 2-3, 5, 7, 13, 16, 18, 20-21, 26, 46, 52, 61, 69, 79, 81, 90, 115, 121-122, 126, 129; IV-XI 2000-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Trametes versicolor (L.) Pilát – on stumps and fallen branches of birch; *VuBe*; 12 loc.: 1, 2, 7, 13, 28, 41, 50, 52, 61, 64, 69, 115; IV-XI 2002, 2005-2009; Stasińska *et al.* (2004).
Trichaptum abietinum (Pers.) Ryvarden – on stumps and decayed logs of Scots pine; *ErSp, VuBe*; 13 loc.: 2-3, 5, 8-9, 12-14, 26, 28, 46, 63, 109; III-XI 2000-2002, 2004-2009; Stasińska & Sotek (2003); Stasińska *et al.* (2004).
Trichaptum fuscoviolaceum (Ehrenb.) Ryvarden – on stumps and fallen logs of Scots pine; *Spma, VuPn*, *VuBe*; 13 loc.: 6-7, 10, 20-21, 23, 46, 52, 61-62, 115, 126, 130; IV-XI 2002-2006.

Russulales

Auriscalpium vulgare Gray – on cones of Scots pine; *VuBe*, *VuPn*; 23 loc.: 1-3, 7, 20-21, 50, 52, 57, 61-62, 79, 115-116, 118, 121-122, 126-131; IV-XI 2001, 2004-2009.
Heterobasidion annosum (Fr.) Bref. – on stumps of Scots pine; *VuPn*; 3 loc.: 2, 7, 52; IV-XI 2005-2006, 2008-2009.
Lactarius deliciosus (L.: Fr.) Gray – on peat, under Scots pine; *VuPn*, *VuBe*; 4 loc.: 20-21, 89, 90; IX 2005-2008.
Lactarius glyciosmus (Fr.: Fr.) Fr. – on peat, under birch; *Cala*, *Cali*, *EaSp*, zb*Ev*, *VuBe*; 31 loc.: 1-3, 5, 7, 10, 12-18, 20, 22, 24-27, 35-36, 38, 43, 45, 60, 63-64, 78, 113, 118, 123; VIII-X 2000-2005, 2007-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).
Lactarius helvus (Fr.: Fr.) Fr. – on peat and among *Sphagnum* spp., under Scots pine; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 98 loc.: 1-31, 33, 38, 43, 45, 48, 50-52, 56-57, 60-68, 73, 78-79, 81-96, 99, 101-106, 109-123, 126-131, 134; VII-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Sotek *et al.* (2004); Stasińska *et al.* (2004).
Lactarius lacunarum Hora – E; on peat, under birch and alder: *VuBe*; 1 loc.: 20; IX 2008.
Lactarius necator (Bull.: Fr.) Pers. – on peat, under birch; *VuPn*, *VuBe*; 22 loc.: 1-2, 7, 20-21, 28, 45, 50, 52, 61, 63, 69, 73, 88, 106, 118, 123, 127-131; IX 2004-2009.
Lactarius pubescens (Schrad.) Fr. – on peat, under birch; *VuBe*; 6 loc.: 1, 7, 21, 45, 61, 63; IX-X 2001, 2004-2009.

Lactarius rufus (Scop.: Fr.) Fr. – on peat, under Scots pine; *Spma,* zb*Ev, VuPn, VuBe*; 51 loc.: 3, 5-8, 10, 12-14, 17-18, 21-26, 43, 50, 52, 57, 62-63, 78-79, 82-84, 87, 90-91, 98, 100, 102-103, 107, 109, 111-112, 115-116, 118, 120-122, 126-131; VII-XI 1999-2009; Stasińska & Sotek (2003); Sotek *et al.* (2004); Stasińska *et al.* (2004).

Lactarius tabidus Fr. [= *Lactarius theiogalus* (Bull.: Fr.) Gray s. auct.] – on peat and among *Sphagnum* spp., under birch; *Cali*, *Rhal*, *EaSp*, *Cala*, *Caro*, *ErSp*, zb*Ev*, *VuPn*, *VuBe*; 79 loc.: 1-3, 5, 7-18, 20-22, 24-29, 33-35, 38, 43, 45, 50, 52, 53, 60-61, 63-64, 69, 73-72, 78-79, 81-82, 84, 86-91, 100, 102-113, 115-120, 123-124, 126-131; VIII-X 1999-2009; Stasińska & Sotek (2003); Sotek *et al.* (2004); Stasińska *et al.* (2004).

Lactarius vietus (Fr.: Fr.) Fr. – on peat, under birch; *Spma,* zb*Ev, VuPn, VuBe*; 11 loc.: 1-2, 6-8, 10, 12, 21, 63, 111, 129; VIII-XI 2002-2006, 2008-2009.

Lentinellus cochleatus (Pers.: Fr.) P. Karst. – on stumps; *VuBe*; 3 loc.: 20, 21, 63; IX 2004, 2007-2008.

Peniophora cinerea (Pers.) Cooke – on dead twigs of birch; *VuBe*: 9 loc.: 1, 2, 7, 21, 41, 45, 61, 63, 129; VI-XI 2000, 2004, 2008-2009.

Russula aeruginea Lindblad – on peat, under birch; *VuBe*; 8 loc.: 1-2, 7, 21, 45, 61, 64, 115; IX-X 2001, 2004-2009.

Russula betularum Hora – on peat, under birch; *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 30 loc.: 1, 2, 5-12, 14, 16-18, 20-21, 29, 41, 45, 61, 63-64, 97, 102-103, 108, 110-111, 126, 131; VIII-IX 2000-2009; Stasińska & Sotek (2003).

Russula claroflava Grove – on peat, under birch; *Spma, VuPn, VuBe*; 15 loc.: 1-2, 6-7, 10, 16, 20-21, 45, 61, 63, 64, 73, 88, 115; VIII-X 2000-2009.

Russula decolorans (Fr.: Fr.) Fr. – on peat, under Scots pine; *Spma*, *VuPn*, *VuBe*; 18 loc.: 7-8, 21-20, 23, 63, 97, 103-108, 110, 89-90, 111, 127; IX-X 2001-2003, 2005-2007, 2009.

Russula emetica (Schaeff.: Fr.) Pers. s. l. – on peat and among *Sphagnum* spp., under Scots pine; *Cali*, *EaSp*, *Cala*, *ErSp*, *Spma*, zb*Ev*, *VuPn*, *VuBe*; 57 loc.: 1, 2, 3, 5, 6, 7, 8, 9, 10, 12-15, 17, 20-26, 28, 52, 57, 61-63, 78, 85, 89-91, 94-96, 97, 100, 102-104, 107, 110, 111-116, 118, 121, 122, 126-131; VIII-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Sotek *et al.* (2004); Stasińska *et al.* (2004).

Russula fragilis (Pers.: Fr.) Fr. – on peat, under birch; *VuBe*; 3 loc.: 2, 7, 21, IX-X 2004-2006, 2008.

Russula ochroleuca Pers. – on soil; 4 loc.: 52, 103, 104, 110; VIII-IX 2006.

Russula paludosa Britzelm. – on peat, under Scots pine; *ErSp*, *Spma, VuPn*; 13 loc.: 2, 6-8, 10, 20, 23, 52, 63, 84, 90, 103, 127; IX-X 2000-2006, 2008-2009.

Russula xerampelina (Schaeff.) Fr. s. str. – on peat, under Scots pine; *ErSp*, *VuPn*; 10 loc.: 2, 7-8, 20-21, 23, 52, 61, 103, 118; IX-X 2000-2001, 2004-2006, 2008-2009.

Stereum hirsutum (Willd.) Gray – on fallen and decayed branches of birch; *VuPn*; *VuBe*; 14 loc.: 1, 2, 5, 7, 14, 18, 20-21, 26, 41, 46, 61, 63, 115; V-X 2000-2002, 2004-2009; Stasińska & Sotek (2003).

Stereum rugosum (Pers.) Fr. – on stumps of birch; *VuBe*; 6 loc.: 1-2, 7, 20, 61, 115; IV-XI 2006-2009.

Stereum sanguinolentum (Alb. & Schwein.) Fr. – on fallen and decayed branches of Scots pine; *VuPn*; 8 loc.: 2, 7, 20-21, 28, 52, 63, 115; IV-XI 2004-2009.

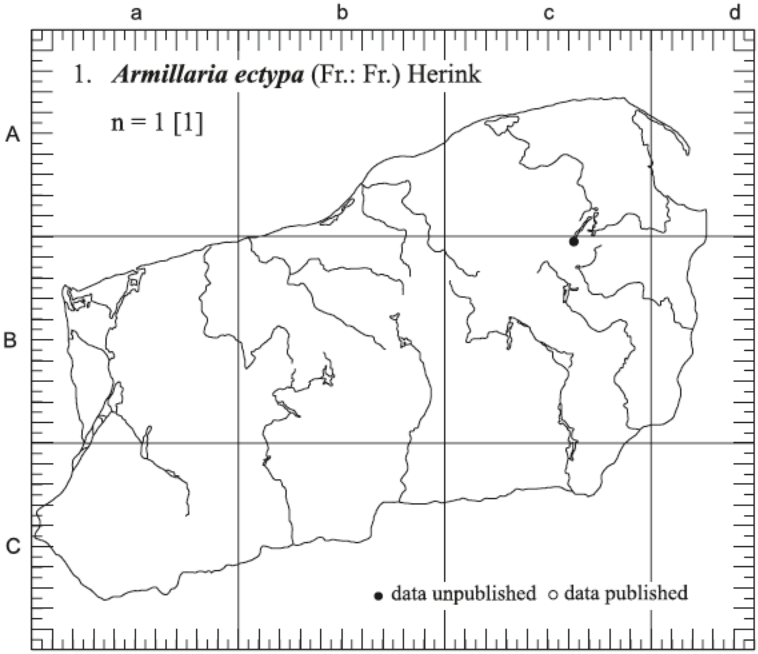
Stereum subtomentosum Pouzar – on fallen trunks and branches; *VuBe*; 5 loc.: 1-2, 20-21, 63; VI-XI 2006-2009.

Thelephorales

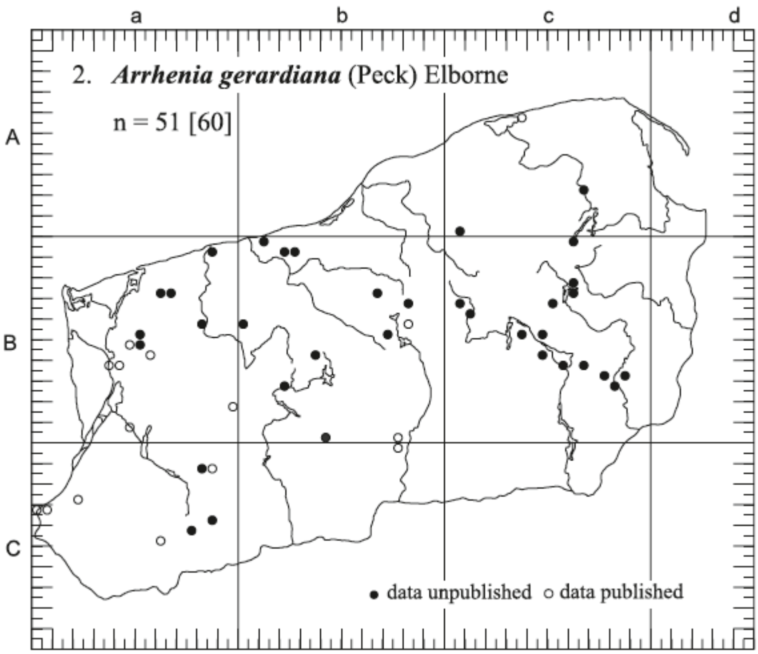
Thelephora terrestris Ehrh. – on peat, among *Sphagnum* spp., on stems of *Carex* sp., *Eriophorum* sp. and *Typha* sp.; *EaSp, ErSp, Spma,* zb*Ev, VuPn, VuBe*; 83 loc.: 2-3, 5, 7-15, 18, 20-29, 36-38, 45, 50-52, 56-57, 60-68, 72-74, 77-79, 81-82, 84-85, 87-91, 93-96, 100, 102-103, 106, 109, 112-113, 115-118, 120-131; VIII-XI 1999-2009; Stasińska & Sotek (2003, 2004a); Stasińska *et al.* (2004).

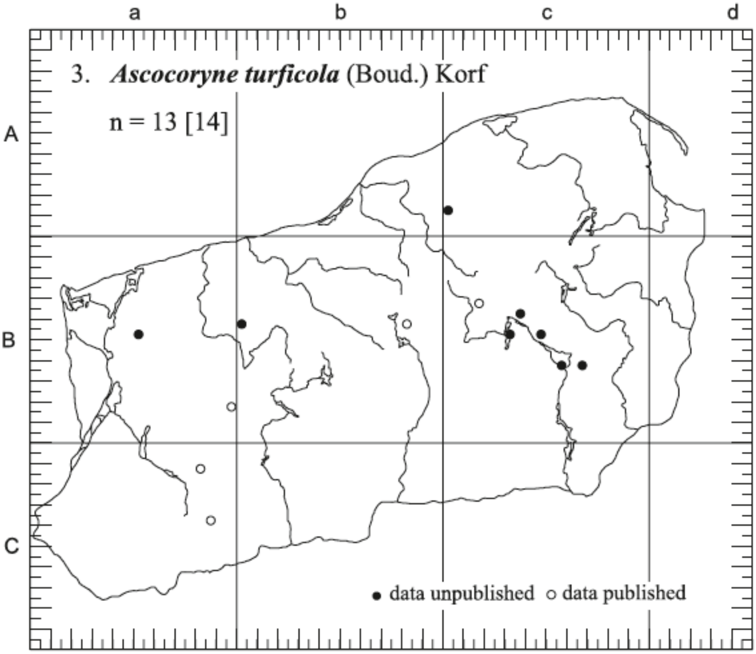
Appendix 3

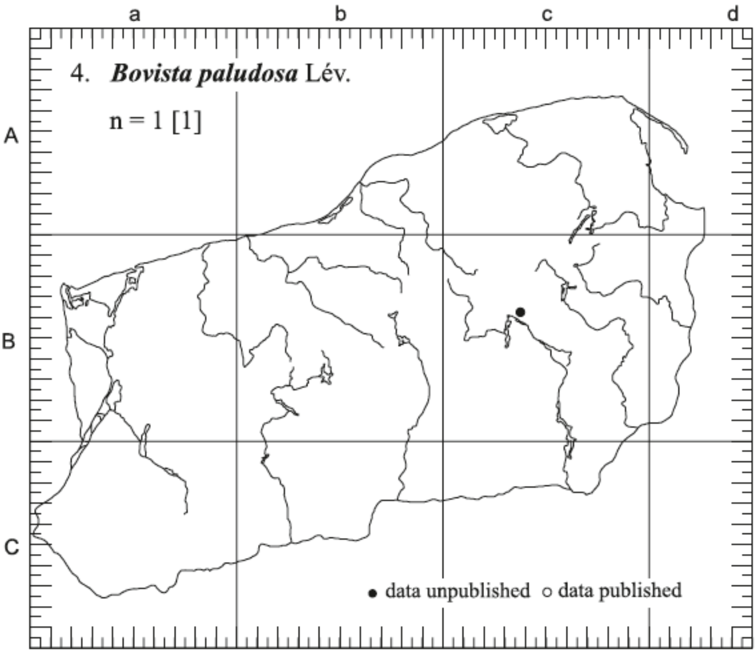
Cartogram maps of distribution of macroscopic fungi of raised and transitional bogs in Pomerania



n = total number of 5 × 5 km squares [total number of localities examined]
(see Figure 1 and Table 1)




a
b
c
d
A
B
C
3. *Ascocoryne turficola* (Boud.) Korf
n = 13 [14]
● data unpublished ○ data published


a
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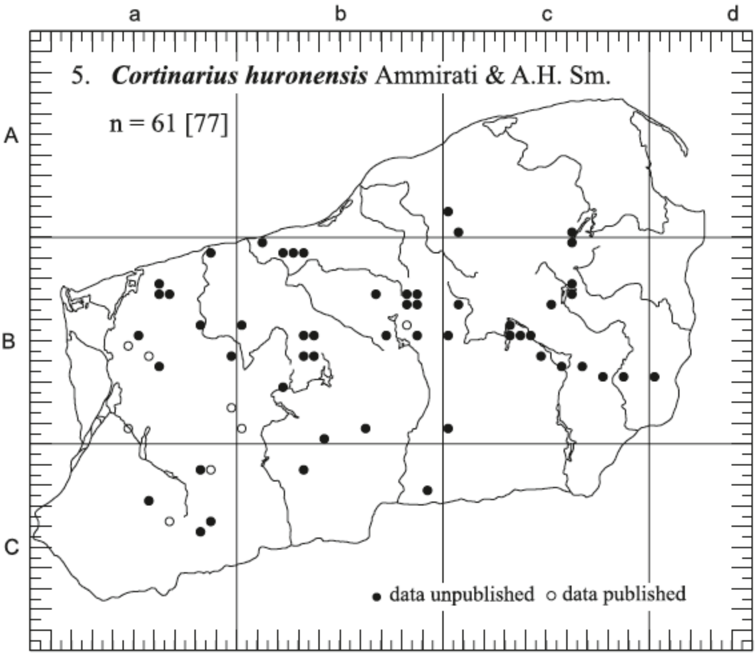
A
B
C
4. *Bovista paludosa* Lév.
n = 1 [1]
● data unpublished ○ data published


a
b
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A
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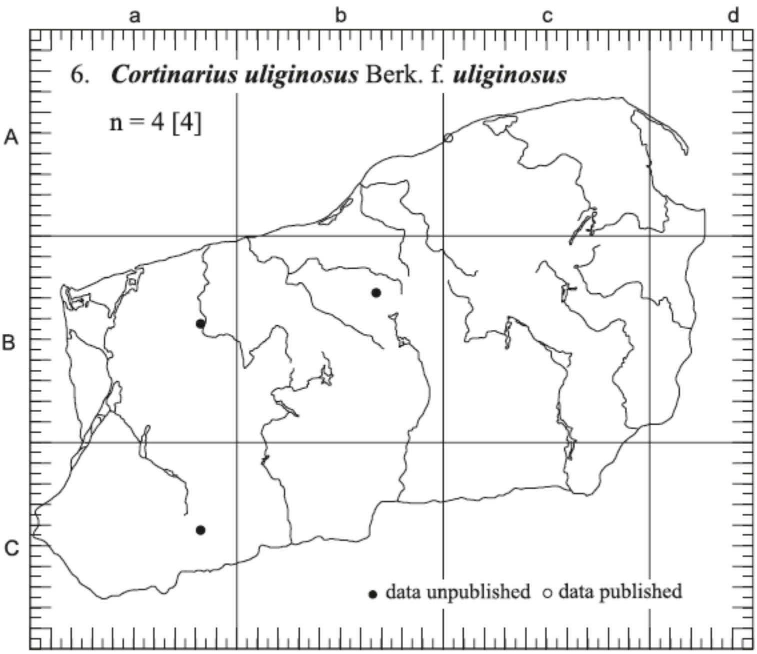
C
5. *Cortinarius huronensis* Ammirati & A.H. Sm.
n = 61 [77]
● data unpublished ○ data published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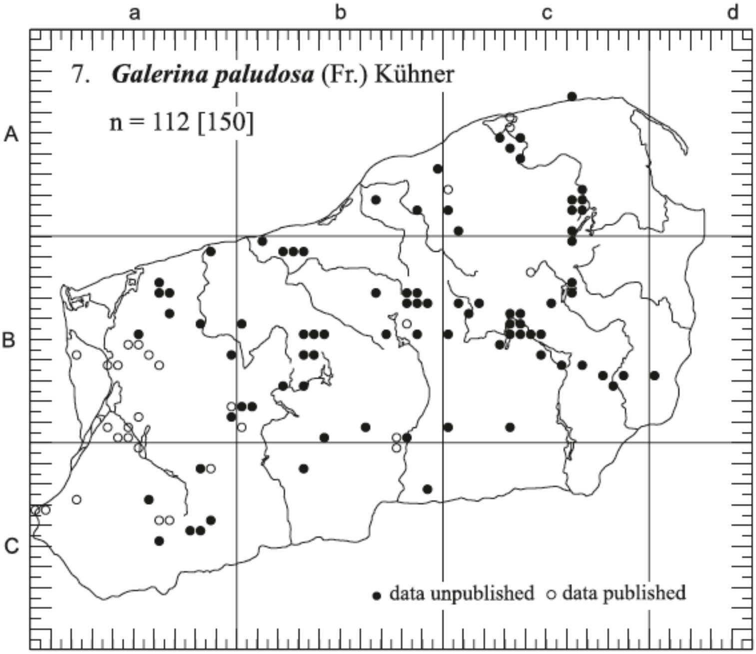
C
6. *Cortinarius uliginosus* Berk. f. *uliginosus*
n = 4 [4]
● data unpublished ○ data published


a
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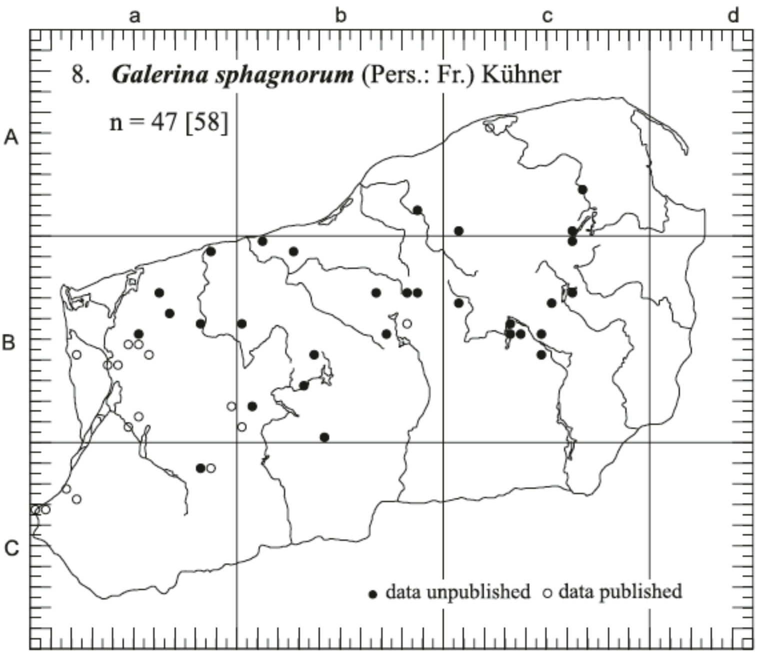
A
B
C
7. Galerina paludosa (Fr.) Kühner
n = 112 [150]
data unpublished
data published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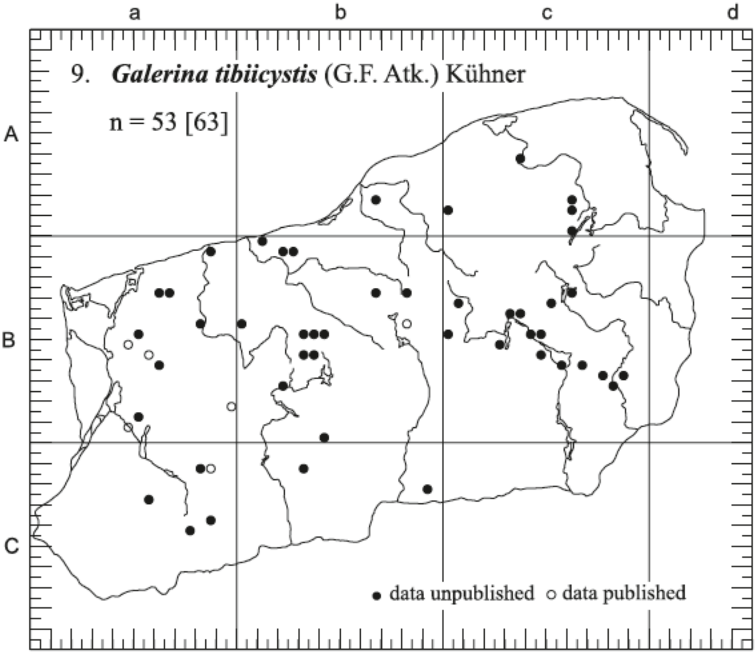
C
8. Galerina sphagnorum (Pers.: Fr.) Kühner
n = 47 [58]
data unpublished
data published


a
b
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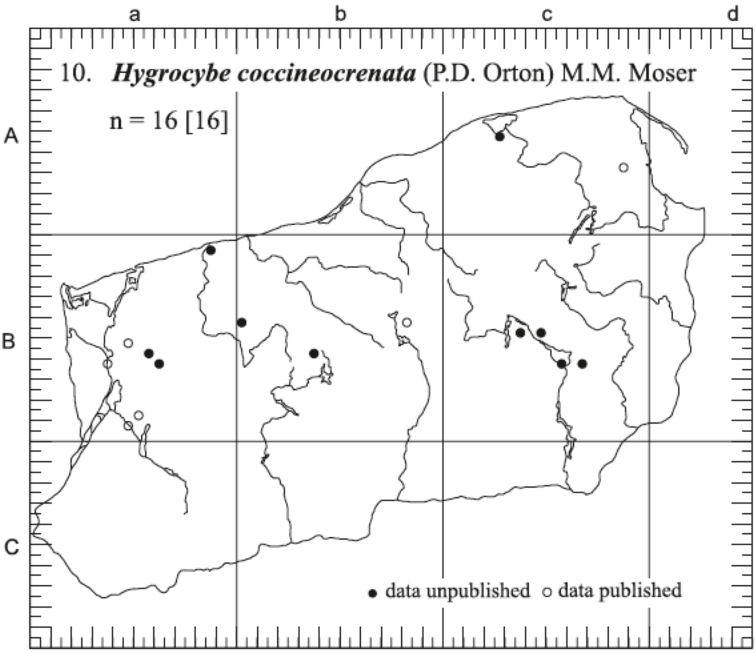
C
9. *Galerina tibiicystis* (G.F. Atk.) Kühner
n = 53 [63]
● data unpublished ○ data published


a
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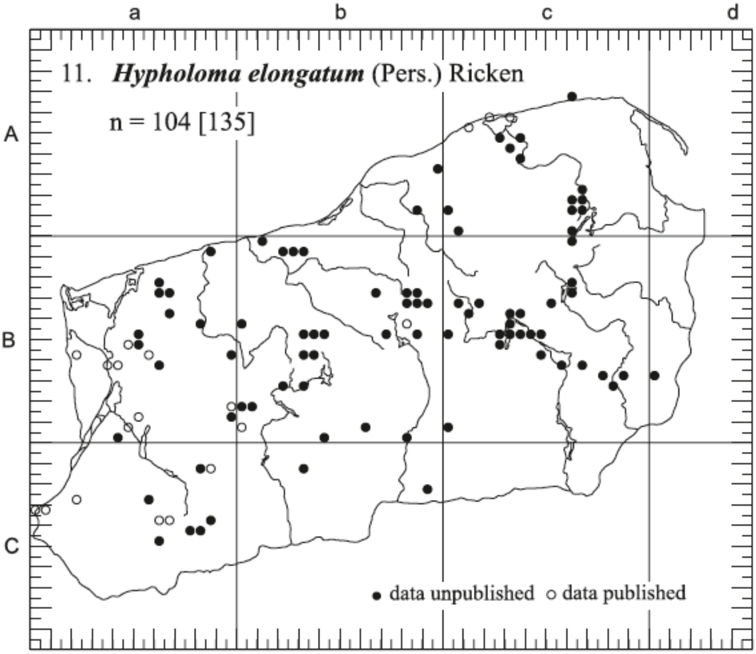
C
10. *Hygrocybe coccineocrenata* (P.D. Orton) M.M. Moser
n = 16 [16]
● data unpublished ○ data published


a
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c
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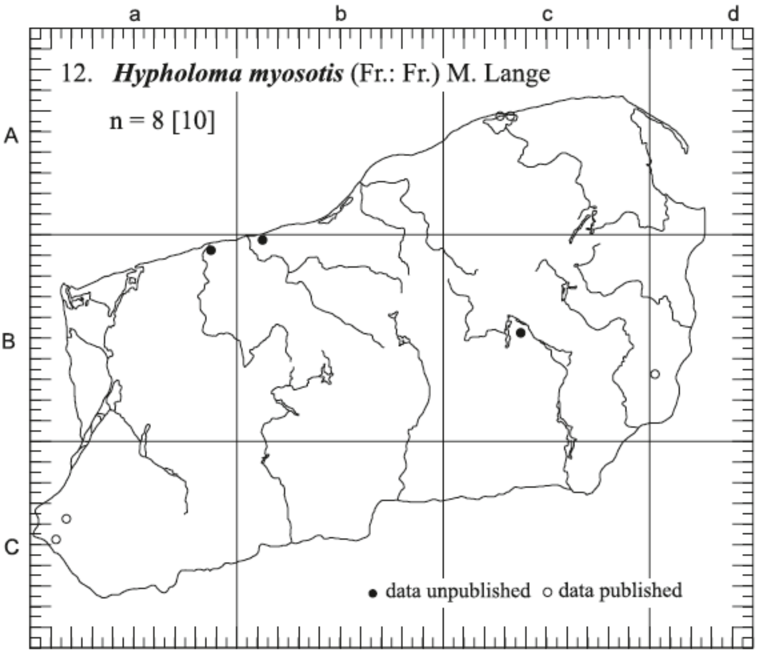
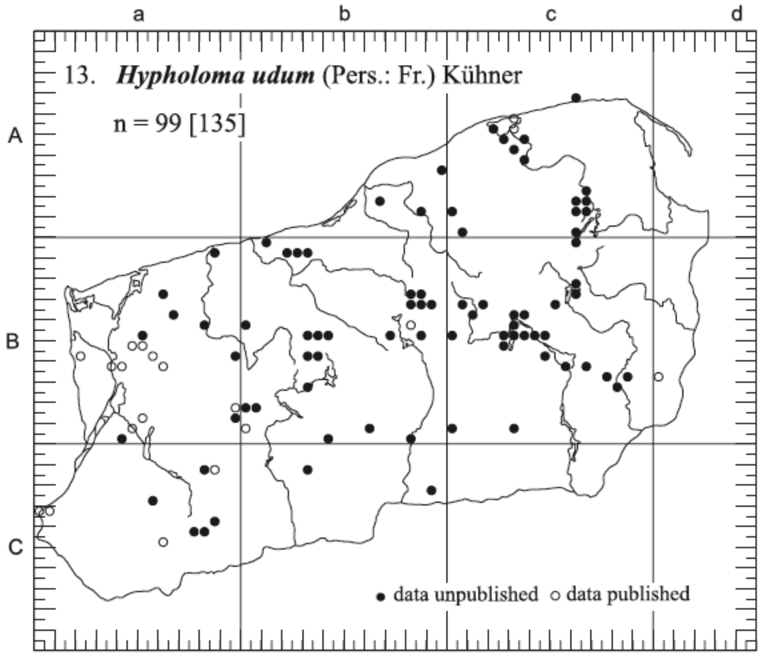
11. Hypholoma elongatum (Pers.) Ricken
n = 104 [135]
A
B
C
● data unpublished ○ data published


a
b
c
d
12. Hypholoma myosotis (Fr.: Fr.) M. Lange
n = 8 [10]
A
B
C
● data unpublished ○ data published


a
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A
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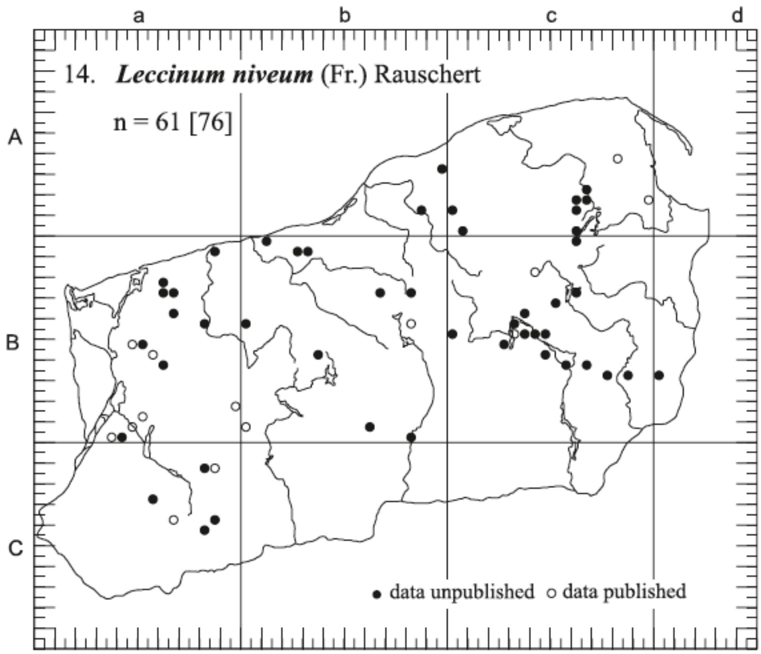
C
13. Hypholoma udum (Pers.: Fr.) Kühner
n = 99 [135]
data unpublished
data published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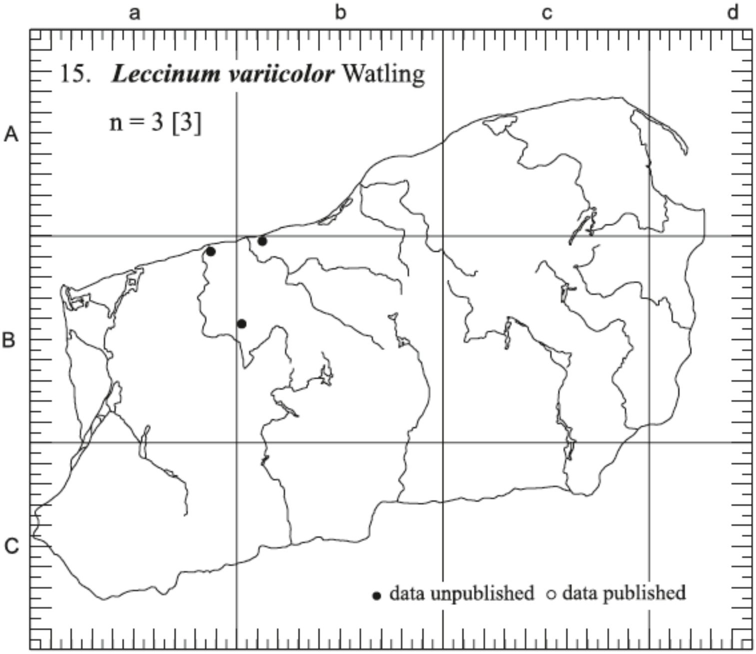
14. Leccinum niveum (Fr.) Rauschert
n = 61 [76]
data unpublished
data published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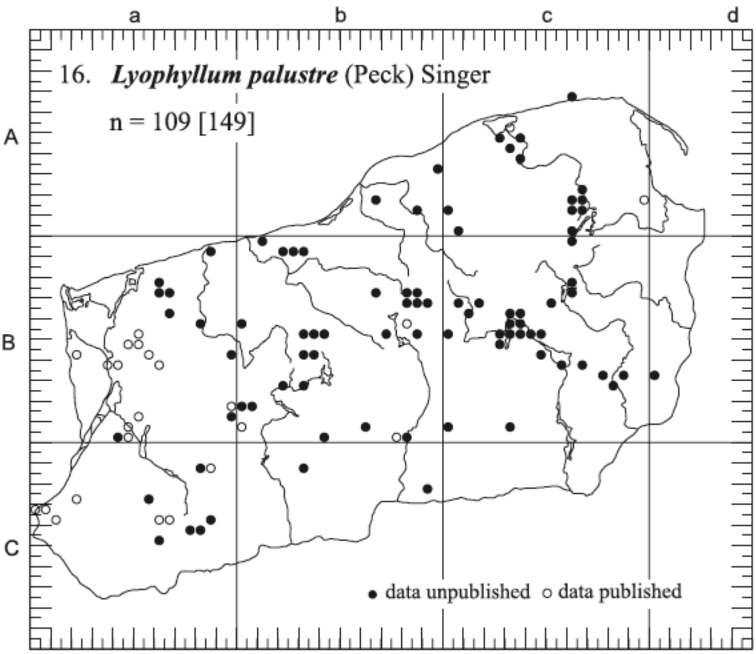
15. *Leccinum variicolor* Watling
n = 3 [3]
● data unpublished ○ data published


a
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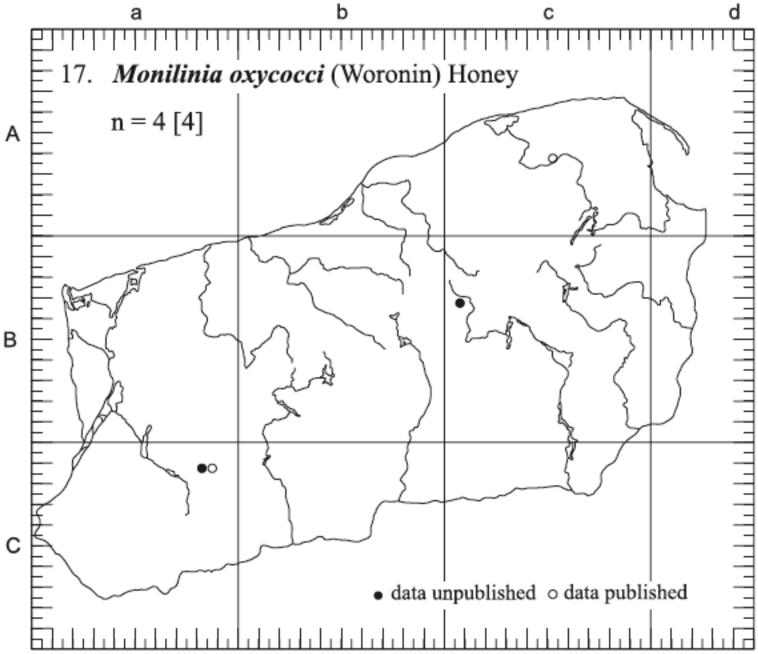
C
16. *Lyophyllum palustre* (Peck) Singer
n = 109 [149]
● data unpublished ○ data published


a
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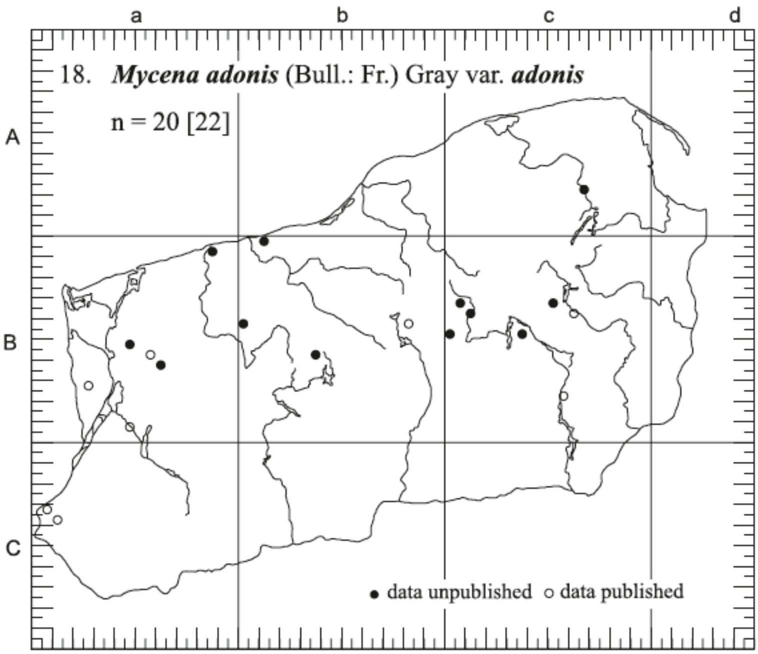
17. ***Monilinia oxycocci*** (Woronin) Honey
n = 4 [4]
• data unpublished ○ data published


a
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C
18. ***Mycena adonis*** (Bull.: Fr.) Gray var. ***adonis***
n = 20 [22]
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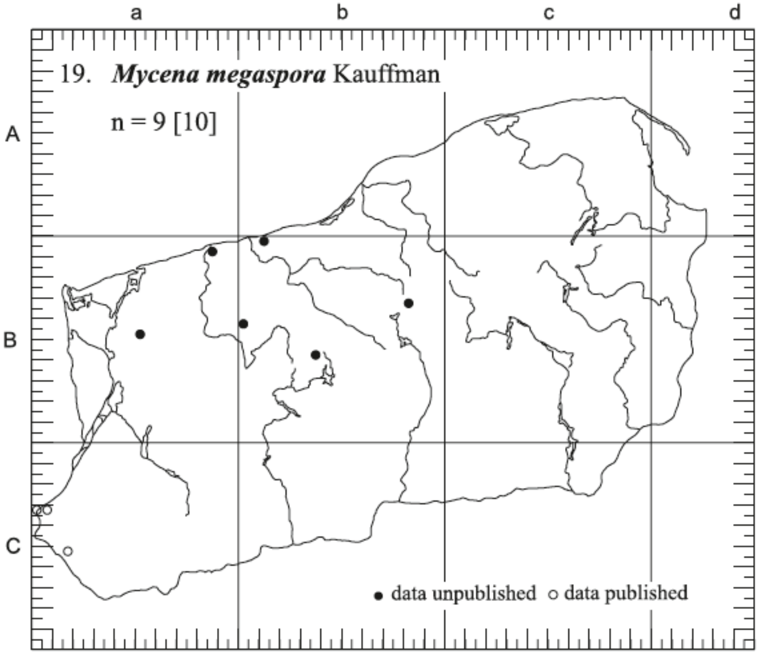

a
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A
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19. *Mycena megaspora* Kauffman
n = 9 [10]
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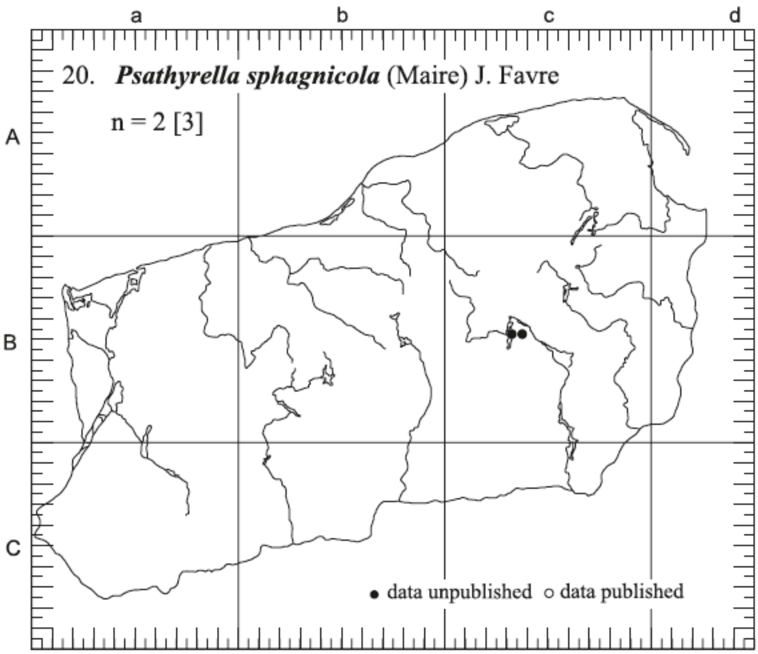

a
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A
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C
20. *Psathyrella sphagnicola* (Maire) J. Favre
n = 2 [3]
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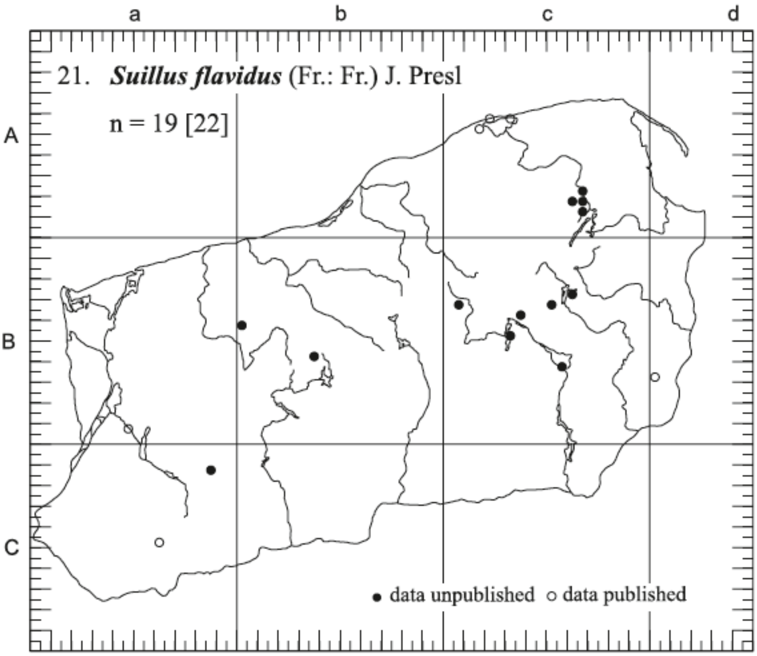
a
b
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A
B
C
21. Suillus flavidus (Fr.: Fr.) J. Presl
n = 19 [22]
• data unpublished ○ data published

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