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Macromycetes of xerothermic swards of the Western Pomerania (NW Poland)

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The paper presents results of mycocoenological studies conducted in 2 nature reserves (Brodogóry and Stary Przylep) located in the Western Pomerania. The research was carried out in 1995-2001 within patches of 2 plant associations: *Potentillo-Stipetum capillatae* and *Adonido-Brachypodietum pinnati* (*Festuco-Brometea* class). Regarding mycological aspects, the communities studied consist of low number of taxa. Among macrofungi found during these studies are particularly interesting: *Calvatia candida, Disciseda candida, Gastrosporium simplex, Geastrum schmidelli, Tulostoma fimbriatum* and *T. brumale*.

Key words: macrofungi, mycocoenology, *Potentillo-Stipetum capillatae*, *Adonido-Brachypodietum pinnati*, nature reserve

INTRODUCTION

Xerothermic swards are found in the southern and north-western Poland in the areas where edaphic and microclimatic conditions approximate those prevailing on steppes and forest-steppes adequate for them (Matuszkiewicz 2001). In Western Pomerania, these are steep slopes of river valleys, e.g. of Odra and Płonia rivers, exposed to the south or the west (e.g. Celiński 1953; Jasnowska 1973; Filipek 1974; Bacieczko and Wołejko 1997).

Mycological studies on xerothermic swards found on the territory of our country have been conducted occasionally, except for the Ojców National Park (Wojewoda 1974, 1975, 1977). Therefore, the data on that subject are contained in few papers only, e.g. Zabłoccy (1951); Šmarda (1957); Sałata and Ostas (1975); Skirgiełło (1976 (1977); Sałata (1977); Flisińska and Sałata (1991); Łuszczyński and Łuszczyńska (1991/1992); Wojewoda (1996); Bujakiewicz (1997); Stasińska (2002), Stasińska and Prajs (2002, 2003); Ławrynowicz et al. (2004), among other. Up to the present time, regular mycocoenological studies have been carried out only in patches of three plant associations: *Festucetum pallentis* (Kozł. 1928) Kornaś 1950, *Origano-Brachypodietum*

Medw.-Korn. et Kornaś 1963 and *Koelerio-Festucetum rupicolae* Kornaś 1952 (Wojewoda 1975).

The paper present results of mycocoenological studies conducted in plant associations of xerothermic swards: *Potentillo-Stipetum capillatae* Libb. 133 em. Krausch 1960 and *Adonido-Brachypodietum pinnati* (Libb. 1933) Krausch 1960, occurring on steep slopes in the Płonia river valley in Western Pomerania.

STUDY AREA

Xerothermic slopes in the Płonia river valley, where studies were conducted, have been under protection for many years in the form of reserves. The Stary Przylep Reserve (2.13 ha) has come into being in 1974, whereas the Brodogóry Reserve (5.27 ha) in 1957 but its area has been under protection long before the II World War. Both objects are situated about 8 km the north-east from Pyrzyce (Fig. 1). The Stary Przylep Reserve adjoins from the south a field way running from Kol. Stary Przylep settlement to meadows in the Płonia river valley, while the Brodogóry Reserve is located in the immediate vicinity of Grędziec village farm buildings. The area of both

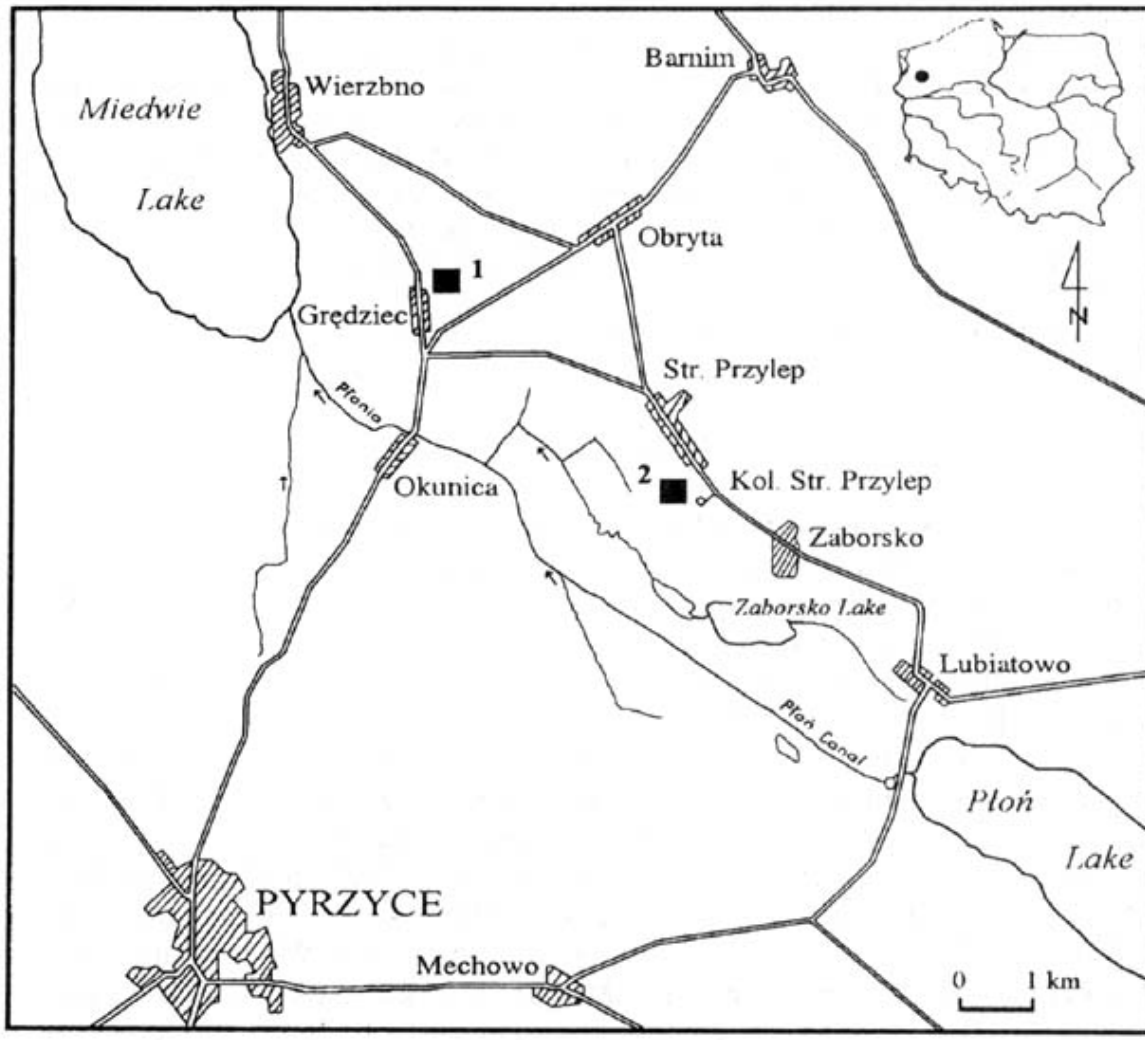

Fig. 1 Localization of nature reserves: 1 – Brodogóry; 2 – Stary Przylep. According to Głazek 1971, modified.

reserves is surrounded by plough-lands and is distinguished by prominent elevations in relation to the surroundings and large valley-side slope angle towards the south, south-west or south-east (Celiński 1953; Głazek 1971).

Out of plant communities found in the Stary Przylep Reserve, worth mentioning is *Potentillo-Stipetum capillatae*, which has survived in the western part of the object. On the other hand, a plant community with the prevalence of *Betula pendula* has developed in the eastern part.

In the Brodogóry Reserve the most interesting plant communities at present are *Adonido-Brachypodietum pinnati* and *Sileno otitis-Festucetum* Libb. 1933. They have survived in the form of different size patches distributed mosaically in the reserve. In the central and southern parts are found brushwood communities of undetermined syntaxonomic affiliation. Best developed patches of sward *Potentillo-Stipetum capillatae* are found at present outside the reserve, on the slopes bordering upon the north-western part of this object (Kochanowska et al. 1997; Prajs 2003).

METHODS

Regular mycological studies were carried out in 1995-2001 on 5 permanent plots, 50-120 m^2 each, marked out in the patches of *Potentillo-Stipetum capillatae* and *Adonido-Brachypodietum pinnati* communities.

Within the examined patches, phytosociological relevés were made with Braun-Blanquet's method. The nomenclature of communities was taken from Matuszkiewicz (2001). The nomenclature of vascular plants was adopted after Mirek et al. (2002).

Mycological observations were performed mainly once a month from April to November. Mycocoenological relevés were arranged in the table. Species of fungi were listed as bioecological groups and arranged according to the frequency and abundance of their occurrence. The number of records and abundance were given for each taxon based on the scale of Jahn et al. (1967).

The species nomenclature of *Ascomycota* follows Hansen and Knudsen (2000), whereas the species nomenclature of *Basidiomycota* was taken, among the others, from Kreisel (1987), Bas et al. (1990-1995), Rudnicka-Jezierska (1991(1992)), Gumińska (1997) and Skirgiełło (1999).

The collection of macromycetes was deposited in the herbarium of the Department of Botany and Nature Conservation, University of Szczecin (SZUB).

PHYTO- AND MYCOCOENOLOGIAL CHARACTERISTICS OF PLANT COMMUNITIES

Mycocoenological observations were conducted within patches of 2 plant associations of *Festuco-Brometea* Br. Bl. et R.Tx. 1943 class:

Festucetalia valesiacae Br.-Bl. et R.Tx. 1943

Festuco-Stipion (Klika 1931) Krausch 1961

1. *Potentillo-Stipetum capillatae* Libb. 133 em. Krausch 1960

Cirsio-Brachypodnion pinnati Hadač et Klika 1944 em. Krausch 1961

2. *Adonido-Brachypodietum pinnati* (Libb. 1933) Krausch 1960

Phytosociological characteristic of studied communities

Potentillo-Stipetum capillatae develops on soils reach in humus and calcium carbonate (2-10%), which resemble typical steppe black-earths (Celiński 1953; Głazek 1971). Surface coverage by vegetation ranges 70 to 90%. In the floristic composition prevail quantitatively *Bromus inermis, Euphorbia cyparisias, Falcaria vulgaris, Koeleria gracilis, K. glauca, Medicago falcata, Oxytropis pilosa, Potentilla arenaria, Stipa capillata* and *Salvia pratensis*. In some patches, in particular in the Brodogóry Reserve, meadow species are of considerable participation, e.g. *Dactylis glomerata*.

The association of ***Adonido-Brachypodietum pinnati*** develops the best in the southern and the central part of the Brodogóry Reserve on soils with well developed humus horizon and calcium carbonate content amounting approximately to 0.3%. The vegetation coverage of this plant association comes up to 100% and forms high, colourful sward of several layers. Particularly valuable patches of this phytocoenoses in respect of floristic composition are found on a steep slope situated in the southern part of the reserve. Apart from *Anthericum liliago* that forms rich population, here grow also, among other, *Achillea pannonica, Asperula tinctoria, Brachypodium pinnatum, Salvia pratensis, Stachys recta* and *Thalictrum minus*. The phytocoenoses *Adonido-Brachypodietum pinnati* that develop in other parts of the reserve are distinguishable by participation of meadow species, *Dactylis glomerata*, *Tragopogon pratensis* and *Poa angustifolia* among other, and shrubs, *Crataegus monogyna* and *Prunus spinosa* (Prajs 2003).

Mycocoenologial characteristic of plant communities

The patches of ***Potentillo-Stipetum capillatae*** are characterized by very poor species composition of macromycetes (Tab. 1). Altogether, only 5 species of macrofungi were found in three plots. Most abundant and most frequent was *Crinipellis sabellus*, growing on steams of different grass species. Underground, among *Stipa capillata* roots, its basidiocarps developed *Gastrosporium simplex* (Stasińska 2002). *Gastrosporium simplex* was also noted in associations of *Linosyridi-Stipetum pulcherrimae* (Libb. 1932/1933) Filipek 1974 (Bujakiewicz 1997) and *Sisymbrio-Stipetum capillatae* (Dziub. 1925) Medwecka-Kornaś 1959 (Łuszczyński and Łuszczyńska 1991/1992).

Moreover, in the patches of *Potentillo-Stipetum capillatae* in the Stary Przylep Reserve grew *Calvatia candida* (Rostk.) Hollós, *Disciseda candida* (Schwein.) Lloyd, *Geastrum schmidelii* Vitt., *Tulostoma fimbriatum* Fr. and *T. brumale* Pers.: Pers., although outside the marked out plots. These are species connected with xerothermic biotopes, noted also in steppe swards, *Festucetum pallentis*, *Sisymbrio-Stipetum capillatae* and *Thalictro-Salvietum pratensis* Medw.-Korn. 1959 among other (Zabłoccy 1951; Šmarda 1957; Wojewoda 1975; Flisińska and Sałata 1991; Łuszczyński and Łuszczyńska 1991/1992).

Within the patches ***Adonido-Brachypodietum pinnati*** 12 fungi species were stated altogether (Tab. 1). Only *Crinipellis sabellus* was observed in both examined plots. The vicinity of plough-lands caused *Cyathus olla* to be relatively frequent in one of the plots. Other species, *Agrocybe praecox, Calocybe gambosa, Calvatia utriformis, Hygrocybe acutoconica, H. nigrescens, Marasmius oreades* and *Volvariela pusilla* among

Table 1
Macromycetes in the associations of *Festuco-Brometea* Br. Bl. et R.Tx. 1943 class in Western Pomeranian (NW Poland)

Successive umber	1	2	3	4	5
Community	*Potentillo-Stipetum capillatae*			*Adonido-Brachypodietum pinnati*	
Reserve	P	B	B*	B	B
Number of plot	1	5	4	3	2
Plot size [m²]	100	50	80	120	60
Exposition/Inclination	W / 30	SW / 35	SW / 40	SW / 30	SW / 45
Number of observations	29	31	31	31	31
Total number of species	4	3	1	10	3
Saprotrophic fungi					
a) on humus					
Agrocybe praecox (Pers.: Fr.) Fay.	3[r]	.	.	2[r]	.
Calvatia utriformis (Bull.: Pers.) Jaap	.	.	.	5[r]	.
Volvariela pusilla (Pers.: Fr.) Sing.	.	.	.	4[r]	.
Hygrocybe nigrescens (Quél.) Kühn.	.	.	.	3[r]	.
Calocybe gambosa (Fr.) Sing.	.	.	.	2[n]	.
Marasmius oreades (Bolt.: Fr.) Fr.	.	.	.	2[n]	.
Hygrocybe acutoconica (Clements) Sing.	.	.	.	1[r]	.
Morchella esculenta (L.: Fr.) Pers.	.	.	.	1[r]	.
Helvella lacunosa Afzel.: Fr.	1[r]	.	.	.	.
b) on litter					
Crinipellis sabellus (A. & S.) Murrill	14[r-a]	12[r-n]	9[r]	11[r-n]	6[r]
Cyathus olla (Batsch): Pers.	.	.	.	.	5[r-n]
Hymenoscyphus scutula (Pers.: Fr.) Phill.	.	.	.	.	3[r-n]
Hemimycena sp.	.	1[n]	.	.	.
Parasitic fungi					
Gastrosporium simplex Mattir.	13[r]	3[r]	.	.	.
Epichloe typhina (Pers.: Fr.) Tul. & C. Tul. s.l.	.	.	.	1[r]	.

Explanations: degree of abundance (acc. to Jahn et al. 1967): a – abundant, n – numerous, r – rare;
B – Brodogóry reserve, B* – near Brodogóry reserve, P – Stary Przylep reserve.

other, grew in the plot situated in the central part of the Brodogóry Reserve. In the majority, these are species occurring among grasses, among other on meadows and pastures (Gumińska 1997; Skirgiełło 1999). *Calocybe gambosa, Calvatia utriformis, Crinipellis sabellus, Cyathus olla, Hygrocybe acutoconica* and *Marasmius oreades* were also noted in the patches of *Origano-Brachypodietum* (Wojewoda 1975).

The described plant communities belong to rich ones in respect of floristic composition, but poor in terms of mycological composition. Similar relationships are showed by Wojewoda (1975), who carried out observations in xerothermic swards in the Ojców National Park. The scarcity of fungi is caused in particular by unfavourable conditions of biotope, high temperatures and low precipitation (below 550 mm of per year). Moreover, large valley-side slope angle causes water to flow on steep slopes, in particular during heavy rainfall, or evaporate quickly under the large inso-

lation. The most favourable time periods for development of macromycetes in the described xerothermic swards were early spring and late autumn. On the other hand, a dry weather occurred in general in summer (in particular in July and August), during which no fungi were found.

Also large vegetation coverage of surface and deposition of large amounts of dead, non-decayed vegetation, could affect unfavourably the occurrence of macrofungi in the examined plant associations. This was noticeable in particular in the plot number 2, set out in the patch *Adonido-Brachypodietum pinnati* (Tab. 1).

Most of fungi found in the examined communities of steppe swards are species with a rather broad ecological scale. They grow in biotopes both rich and poor in calcium (Ca). Out of species that prefer soils rich in calcium, here occurred *Gastrosporium simplex*.

In respect of trophic preferences, saprotrophic species prevailed in the examined swards, growing on ground or on vegetation matter under different level of decomposition. The most abundant and the most frequent species was *Crinipellis sabellus* (Tab. 1).

Endangerment

Xerothermic swards are semi-natural communities that survive only due to their extensive exploitation (Matuszkiewicz 2001). The desistance from using them, which takes place in many nature reserves, contributes to their overgrowing (Prajs 2003; Ceynowa-Giełdon et al. 2004). The overgrowing of xerothermic swards by brushwood and forest communities is a natural process (Ceynowa-Giełdon et al. l.c.), which leads to alteration of biotope conditions. This affects unfavourably the species and quantitative composition of steppe fungi (Stasińska 2003).

Anthropogenic factors produce similar effects. The eutrofication of slopes by frequent fertilizer runoffs from plough-lands as well as grassland burning make a large danger for steppe fungi. This leads very frequently to irreversible changes, the consequence of which is species replacement – post-fire fungi emerge in these places where xerothermic species grew before.

CONCLUSION

Xerothermic swards in the Płonia river valley belong to plant associations that are very poor in respect of mycological composition. In the patches *Potentillo-Stipetum capillatae* 10 fungi species were found, whereas 12 in the patches *Adonido-Brachypodietum pinnati*. In both examined communities 20 fungi species were stated altogether, including 15 species on permanent plots.

Basing on several-years long observations it was stated that species composition, diversity, frequency and abundance of macromycetes of that area is influenced considerably by: a) specific microclimatic conditions, in particular low precipitation and high temperatures; b) large calcium carbonate content in soil; c) natural succession of vegetation; d) anthropogenic factors (e.g. grassland burning, biogenic inflows from plough-lands).

Among the fungi that occur in the examined swards are species endangered in Poland and placed on the red list of macrofungi (Wojewoda and Ławrynowicz 1992). These are: *Calvatia candida, Disciseda candida, Gastrosporium sim-*

plex, Geastrum schmidelli, Tulostoma fimbriatum and *T. brumale*. Species covered by legal protection are *Morchella esculenta, Tulostoma fimbriatum* and *T. brumale* (Rozporządzenie MŚ).

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Macromycetes muraw kserotermicznych Pomorza Zachodniego (NW Polska)

Streszczenie

Praca przedstawia wyniki obserwacji mikosocjologicznych prowadzonych w latach 1995-2001 w zespołach muraw kserotermicznych: *Potentillo-Stipetum capillatae* Libb. 133 em. Krausch 1960 i *Adonido-Brachypodietum pinnati* (Libb. 1933) Krausch 1960 (klasa *Festuco-Brometea* Br. Bl. et R.Tx. 1943), w rezerwatach przyrody: Brodogóry i Stary Przylep, na Pomorzu Zachodnim.

Badane zbiorowiska są ubogie pod względem mikologicznym. W płatach *Potentillo-Stipetum capillatae* stwierdzono 10, a w *Adonido-Brachypodietum pinnati* - 12 gatunków grzybów makroskopowych. W obu zespołach odnotowano łącznie 20 gatunków grzybów, w tym tylko 15 gatunków na stałych powierzchniach. Wśród grzybów występujących w badanych murawach na uwagę zasługują, m.in.: *Calvatia candida, Disciseda candida, Gastrosporium simplex, Geastrum schmidelli, Tulostoma fimbriatum* i *T. brumale*.

Na podstawie kilkuletnich obserwacji stwierdzono, że na występowanie grzybów w omawianych zespołach muraw kserotermicznych znaczący wpływ mają: a) specyficzne warunki mikroklimatyczne (w szczególności mała ilość opadów i wysokie temperatury); b) duża zawartość węglanu wapnia w podłożu; c) naturalna sukcesja roślinności; d) czynniki antropogeniczne (np. wypalanie, dopływ biogenów z pól uprawnych).