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Macromycetes occurring in the *Violo odoratae-Ulmetum campestris* in the Bielinek Reserve on the Odra river

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B u j a k i e w i c z A.: *Macromycetes occurring in the Violo odoratae-Ulmetum campestris in the Bielinek Reserve on the Odra river.* Acta Mycol. 32 (2): 189-206, 1997.

In the paper the results of a 3-year mycocoenological study carried out on 2 permanent plots marked in the *Violo odoratae-Ulmetum* association are presented and several ecological groups of fungi as regards substratum are discussed. Moreover, records made accidentally on macrofungi in the xerothermophilous *Lithospermo-Quercetum* Br.-Bl. 1932 and the *Linosyridi-Stipetum pulcherrimae* (Libb. 1932/1933) Filipek 1974 communities are mentioned.

Key words: mycocoenology, *macromycetes*, *Violo odoratae-Ulmetum campestris*, nature reserve Bielinek.

INTRODUCTION

First mycological data from the reserve at Bielinek on the Odra river can be found in the works of Š m a r d a (1957) and C e l i ń s k i and F i l i p e k (1958a, b). The data concern the sites of rare species of fungi, mainly those associated with xerothermophilous vegetation. Later data included in chorological and taxonomic works as well as in notes, namely in those of S k i r g i e ł ł o (1970, 1976, 1984), W o j e w o d a (1979), F r i e d r i c h (1991) and R u d n i c k a-J e z i e r s k a (1991) are of a similar character. So far over 40 species of fungi have been found in this area.

Until now the alluvial forest *Violo odoratae-Ulmetum* (Weevers 1940) H. Doing 1962 in Poland has not been a subject of extensive mycocoenological studies. First general information on the occurrence of macromycetes on patches of this forest community in the Bielinek Reserve were compiled in

two summing up papers of the author (1989, 1992). Two-year observations in this community in the Wielkopolski National Park were also carried out by S u s i c k a (1994). In her work she compared her observations with earlier studies carried out in this Park (in the same reserve) in the elm alluvial forest classified at that time as the *Fraxino-Ulmetum* slope variant (C e l i ń s k i 1969) or as the *Fraxino-Ulmetum* variant with *Ulmus* (B u j a k i e w i c z 1973).

The present paper is the first comprehensive mycocoenological study on the *Violo odoratae-Ulmetum* alluvial forest growing in the Bielinek Reserve on the Odra river.

I would like to express my cordial thanks to all the people who helped me in my work. I am particularly grateful to the late Prof. Teofil Wojterski who inspired the research and marked off the permanent plots to be observed. I direct my thanks for valuable help in determination of some fungi to Prof. W. Wojewoda, Dr. V. Demoulin, Prof. M. Lisiewska, Dr. A. Chlebicki and the late Prof. K. Kříž (Brno). I would also like to thank Dr. A. Brzeg for phytosociological consultations and K. Szambelańczyk, M. A., for making draught.

GENERAL PHYSIOGRAPHY

The Bielinek Reserve on the Odra river lies around 60 km south-west of Szczecin and is situated on the edge of the ravined valley between Bielinek and Lubiechów Dolny (Fig. 1). Steep slopes of the Odra proglacial stream valley, elevated to around 70 m above the valley's bottom, extend from the west to the east around 5 km from Bielinek. The Reserve was established in 1957 to protect forest-steppe vegetation. In 1993 it was incorporated into the Cedynia Landscape Park.

The Reserve lies between 52°55′ north latitude and 14°10′ east longitude. Its relief is diversified with numerous, relatively deep ravines (and flat-bottomed accumulation valleys) cutting the slopes of the proglacial stream valley. The forms of the contemporary ravines were shaped in the diluvial period. The exposition of the slopes ranges from southern to south-eastern and south-western, and the inclination from 10° to 45°. Most of the ravines assume the shape of a niche and are not drained by streams (C e l i ń s k i and F i l i p e k 1958a).

The slopes of the Odra proglacial stream valley within the Reserve are built of boulder loam of ground moraine. The substratum is rich in calcium carbonates and most of the soils are of brown soil type with weakly formed humus horizon which is overgrown by xerothermophilous swards.

Soils in the ravines are formed from light loams and belong to deep humic soils. Their reaction is close to neutral. These are soils of intermediate character between brown soil and forest black earth (C e l i ń s k i and F i l i p e k 1958a).

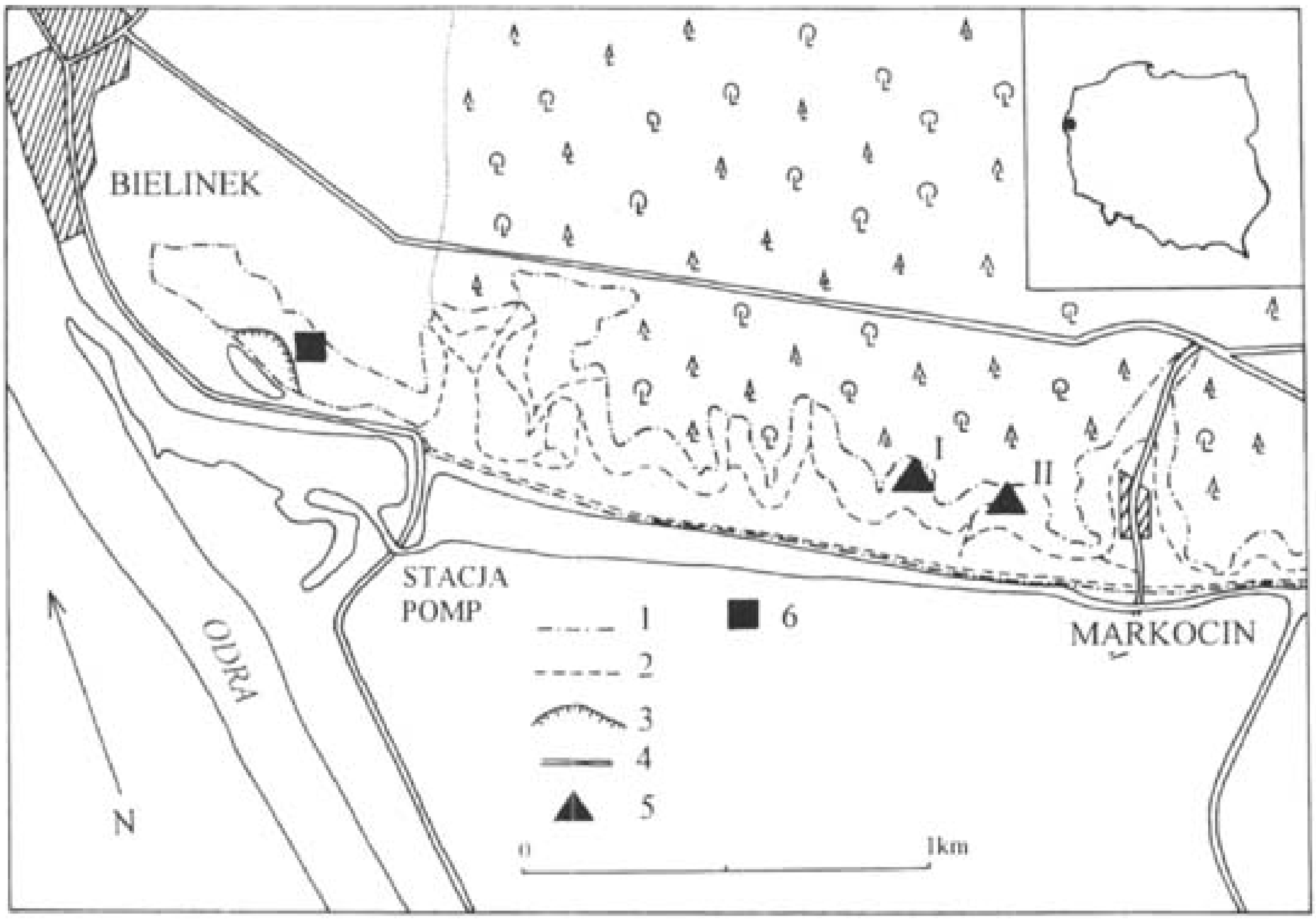

Fig. 1. Distribution of permanent plots in the Bielinek Reserve: 1 – boundaries of the Reserve; 2 – paths, 3 – claypit, 4 – roads, 5 – permanent plots, 6 – locality of *Geastrum melanocephalum* (Czern.) Stanek

According to the climatic regionalisation of Poland (W o ś 1996), the discussed area lies within the boundaries of West Pomerania. It is a region with relatively the smallest number of days with ground-frost, moderately cold with precipitation (10 days in a year) and with the smallest number of days with moderately frosty weather with precipitation (7 days in a year). The Reserve is located on the north-west edge of the Wielkopolska Lowland where the total annual precipitation in the years 1950-1980 amounted to less than 550 mm. According to C e l i ń s k i and F i l i p e k (1958a) total annual precipitation in the reserve equals 480 mm. The annual mean air temperature in the vicinity of the study area equals 8.4°C (W o ś 1994).

Microclimatic conditions on open slopes and in shaded ravines are totally different and they determine the occurrence of two different plant formations, swards and forests. Xerothermophilous swards concentrate on strongly insolated open slopes with considerable oscillations of temperature within a day and day and night. In the shady ravines the amount of light is limited and the temperatures are more stable. Relative moisture on the slopes on sunny days amounts to 20-30%, while in the ravines it rarely falls below 60% (C e l i ń s k i and F i l i p e k 1958a).

According to Poland's geobotanic division (M a t u s z k i e w i c z 1993) the area studied lies within the Pomerania Divide in the Szczecin Province and the Cedynia District. The province is distinguished due to the occurrence in some sites of thermophilous oak forests and of steppe sward communities.

The vegetation landscape of the reserve in Bielinek on the Odra river is dominated by xerothermophilous swards which form here the largest concentration in Pomerania (C e l i ń s k i and F i l i p e k 1958a; F i l i p e k 1974). They form communities close to the *Linosyridi-Stipetum pulcherrimae* (Libb. 1932/1933) Filipek 1974, which, at present, undergo a constant intensive process of overgrowing with *Robinia pseudacacia*, *Prunus spinosa* and *Acer campestre*.

Large areas, particularly on southern and eastern slopes, are occupied by phytocoenoses of xerothermophilous forest-scrub community *Lithospermo--Quercetum* Br. Bl. 1932 (= *Lithospermo-Quercetum subboreale* Mat. 1955). On the slopes and on the bottom of larger ravines (Markocin) the beech-ash tree stands occur.

The elm alluvial forests with *Viola odorata* are a peculiar forest community in the Reserve. In Poland they were described for the first time in this area by Celiński and Filipek under the name *Fraxino-Ulmetum* (Tx. ap. Lohm.) Oberd. 1953 *violetosum odoratae*. These slope alluvial forests are the subject of the mycocoenological investigation in the present paper.

METHODS OF RESEARCH

In the patches of the alluvial elm forest overgrown with *Viola odorata* two permanent plots of 400 sq.m each were established (Fig.1). On each plot during three years of study (1974-1976) 18 mycocoenological surveys were carried out from April to November. In each observation period the presence and the number of epigeous sporocarps in the quadrat as well as the colonised substratum were noted.

The composition and diversity of vascular associations were determined with the Brown-Blanquet method (Table 1).

Three main ecological groups of macrofungi were distinguished with regard to their substratum (Table 2). The first number in the column represents the number of records and the letter in power exponent denotes the estimate abundance (acc. to J a h n et. al. 1976). Records made outside the plots, but within the alluvial elm forest are marked with parentheses.

Sporadic collections of macrofungi were also made in the xerothermophilous swards, *Linosyridi-Stipetum pulcherrimae* and in the scrub-forest, *Lithospermo-Quercetum*.

The nomenclature of macrofungi agrees, in most respects, with those used by the following authors: D e n n i s (1978), H a n s e n and K n u d s e n

(1992), J ü l i c h (1984), M o s e r (1983) and W a t l i n g (1984). The collection of macrofungi was deposited in the Herbarium of the Department of Plant Ecology and Environment Protection at Adam Mickiewicz University in Poznań (POZM).

DESCRIPTION OF THE STUDIED FOREST

The *Violo odoratae-Ulmetum* association is the eutrophic alluvial scrub-forest with sub-Atlantic distribution range, growing on steep slopes of proglacial stream valleys and cliffs. P i o t r o w s k a (1985) noted this association in the Wolin Island and B r z e g (1989) in the Prosna and Warta Interfluve. In Poland phytocoenoses of this association seem to be recognised with an increasing frequency. They can occur in a natural form on steep scarps of river valleys, and these are the conditions they probably find in the ravines of the Bielinek Reserve on the Odra river. This type of alluvial forest may also form patches of anthropogenic character transformed from phytocoenoses of the *Ficario-Ulmetum campestris* alluvial elm forest or from the eutrophised oak-hornbeam forest habitats.

In the Bielinek Reserve the alluvial forest grows in ravines above the scarps of the Odra proglacial stream valley located in a considerable distance from the present river bed. It occurs on the slopes and on the bottom of rather deeply incised ravines (300-500 metres long) on fertile, highly humic soils.

Violo odoratae-Ulmetum is a community of nitrophilous-thermophilous character. It belongs to the *Alno-Padion* alliance. In the tree-stand of the studied alluvial forest *Ulmus campestris*, *Acer campestre*, *Quercus robur* and *Fraxinus excelsior* prevail (Table 1).

On the permanent plot in the Elm Ravine compact scrubs of *Ulmus campestris* var. *suberosa* occurred. On the bottom of the forest there were many elm logs, fallen as a result of the Dutch elm disease.

The observation plot in the Wild Service Ravine was characterised by a high share of the oak in the tree-stand. Outside this plot only rare, individual service trees (*Sorbus torminalis*) and pine trees (*Pinus sylvestris*) grew. Only a small quantity of decaying wood was found in this plot.

In the studied alluvial forest there is a large admixture of the representatives of the *Rhamno-Prunetea* class (Table 1). The herb layer is highly uniform and relatively loose, especially in summer and in autumn. From among the species characteristic of and distinctive for the alluvial forest association nitrophilous species e.g. *Viola odorata*, *Veronica hederifolia* and *Galium aparine* are the most numerous ones.

Table 1

Violo odoratae-Ulmetum campestris in the Bielinek Reserve on the Odra river

Successive number		1	2
Number of plot		I	II
Date		3.06.1976	3.06.1976
Exposition		W	W
Inclination		20	10
Density			
	a_1	40	50
	a_2	60	40
	b	100	50
Cover			
	c	100	80
	d	20	–
Area of record in sq.m.		400	400
Height of trees in m		25	25
Average diameter in cm		53	60
Number of species		22	30
Ch. D. *Violo odoratae-Ulmetum* ass.			
Viola odorata	c	2,3	2,2
Veronica hederifolia		2,2	2,2
Galium aparine		1,1	2,2
Primula officinalis		+	+
Adoxa moschatellina		.	1,2
Allium cfr. schoenoprassum		.	1,2
Alliaria officinalis		.	+
Ch. *Alno-Padion, Fagetalia, Querco-Fagetea*			
Ulmus campestris	a_1	2,2	.
Ulmus campestris	a_2	4,4	.
Ulmus campestris	b	4,4	.
Ulmus campestris	c	2,3	.
Fraxinus excelsior	a_1	+	3,3
Fraxinus excelsior	a_2	.	1,1
Fraxinus excelsior	b	1,1	+
Fraxinus excelsior	c	+	1,1
Acer platanoides	b	.	+
Acer platanoides	c	+	.
Acer pseudoplatanus	c	.	+
Acer campestre	b	1,1	4,4
Acer campestre	c	1,1	+
Quercus robur	a	.	3,3
Quercus robur	c	.	+
[1] *Ficaria verna*		5,5	4,4
Brachypodium silvaticum		2,2	1,2
Agropyron canium		1,2	+
Circaea lutetiana		+	.
Viola mirabilis		.	1,1

Poa nemoralis		.	1,2
Dryopteris filix-mas		.	+
Fagus silvatica		.	+
Sanicula europaea		.	+
Ch. *Rhamno-Prunetea*			
Crataegus monogyna	a_2	.	1,1
Crataegus monogyna	c	.	+
Crataegus oxyacantha	b	.	+
Evonymus europaea	c	+	+
Sambucus nigra	c	1,1	.
Rhamnus cathartica	c		+
Towarzyszące (Accompanying)			
Lamium maculatum	c	2,3	1,1
Geum urbanum		2,2	+
Urtica dioica		1,2	1,1
Moehringia trinervia		+	+
Arctium sp.		+	+
Aegopodium podagraria		.	4,4
Polygonum convolvulus		.	1,1
Eurhynchium hians	d	2,2	.
Fissidens taxifolius		1,2	.

Explanation:
[1] – data from April 1976
I – permanent plot marked in so called Elm Ravine (*Ulmus campestris*)
II – permanent plot marked in so called Wild Service Ravine (*Sorbus torminalis*)

MACROFUNGI OF THE *VIOLO ODORATAE-ULMETUM* ASSOCIATION AND THE ADJACENT VEGETATION

The list of macromycete species recorded in the phytocoenoses of the studied alluvial forest is not long. Similarly to the riverside alluvial forest of the *Ficario-Ulmetum campestris* type the group of epigeous fungi is the least numerous (Table 2). It is very likely that in the case of the studied phytocoenoses the low numbers of macromycetes noted result also from the specific character of the habitats occupied by the slope alluvial forest. These habitats are small forest islands surrounded with the xerothermophilous scrub-forest and sward vegetation. Dry vegetation periods in the years of observations (1974-1976) were an additional inhibiting factor.

Majority of the macromycete species occurring in the *Violo odoratae-Ulmetum* alluvial forest are fungi commonly noted in the broad-leaved forests of *Querco-Fagetea* type and the *Alno-Padion* alliance. Among the species characteristic of this alliance (B u j a k i e w i c z 1989) in the studied phytocoenoses from litter saprotrophs group *Marasmius torquescens*, *Mycena speirea* and *Hymenoscyphus albidus*, and from the wood-dwelling

Table 2

Macromycetes occurring in phytocoenoses of the *Violo odoratae-Ulmetum campestris* in the Bielinek Reserve on the Odra river

Number of plot	I	II
Area of plot in sq.m.	400	400
Number of observations	18	18
Number of taxa	71	72
I. Humicolous saprotrophs and suspected mycorrhizal fungi		
Conocybe ambigua Watl.	1r	
Lepiota cristata (Bolt.: Fr.) Kummer	(1r)	
Lepiota setulosa Lange	1r	
Russula cyanoxantha (Schaeff.) Fr.	1r	
Cystolepiota seminuda (Lasch) Bon	3r	1r
Macrolepiota procera (Scop.: Fr.) Sing.	3r	2r
Phallus impudicus L.: Pers.	2r	1r
Conocybe mesospora (Kühn.:) Kühn. et Watl.		4r
°*Bovista aestivalis* (Bonord.) Demoulin		2r
Xerocomus subtomentosus (L.: Fr.) Quél.		2r
Agrocybe praecox (Pers.: Fr.) Fay.		1r
Boletus luridus Schaeff.: Fr.		1r
Conocybe subovalis (Kühn.:) Kühn. et Watl.		1r
Inocybe asterospora Quél.		1r
Inocybe geophylla (Sow.: Fr.) Kummer v. *lilacina* (Peck) Gill.		1r
Lepiota castanea Quél.		1r
Morchella esculenta Pers.: St-Am.		1r
Tricholoma album (Fr.) Kummer		1r
Xerocomus rubellus (Krbh.) Mos.		(1r)
II. Litter saprotrophs		
°*Marasmius torquescens* Quél.	7n	
Mycena speirea (Fr.: Fr.) Gill.	5r	
Marasmius rotula (Scop.: Fr.) Fr.	4r	
Coprinus impatiens (Fr.) Quél.	2r	
Collybia confluens (Pers.) Kummer.	1r	
Mycena cfr. *flavoalba* (Fr.) Quél.	1r	
Psathyrella candolleana (Fr.: Fr.) Maire	1n	
Marasmius scorodonius (Fr.: Fr.) Fr.	1r	
Mycena amicta (Fr.) Quél.	1r	
Mycena galopus (Pers.: Fr.) Kummer v. *nigra* (Fl. Dan.)	1r	
Mycena tenella (Fr.) Quél.	1r	
Mycena zephirus (Fr.: Fr.) Kummer	1r	
Pluteus phlebophorus (Ditm.: Fr.) Kummer	1r	
Psathyrella subnuda (Karst.) A. H. Smith	1r	
Psathyrella cf. *tephrophylla* (Romagn.) Bon	1r	
Mycena galopus (Pers.: Fr.) Kummer	7n	2r
Mycena vitilis (Fr.) Quél.	5n	6n
Mycena filopes (Bull.: Fr.) Kummer	3r	2n
Tubaria furfuracea (Pers.: Fr.) Gill.	3r	2r
Clitocybe gibba (Pers.) Kummer	2r	1n

Collybia dryophila (Bull.) Quél.	2r	3r
Lepista nuda (Bull.: Fr.) Cooke	1r	1r
Collybia butyracea (Bull.) Quél.	1r	1r
Mycena pura (Pers.: Fr.) Kummer	1r	3r
Hymenoscyphus fructigenus (Bull.: Fr.) S. F. Gray		4a
Collybia peronata (Bolt.) Sing.		4r
Cyathus striatus (Huds.) Willd.		2n
Marasmius bulliardii Quél.		2n
Lepista nebularis (Batsch: Fr.) Harmaja		2r
Hydropus subalpinus (Hoehn.) Sing.		(2r)
Hymenoscyphus albidus (Roberge) Phill.		1r
Hymenoscyphus caudatus (Karst.) Dennis		1a
Mycena polyadelpha (Lasch) Kühn.		1a
Clitocybe langei Sing.: Hora		1n
Clitocybe fragrans (With.: Fr.) Kummer		1r
Collybia asema (Fr.) Kummer		1r
Coprinus domesticus (Bolt.: Fr.) S. F. Gray		1r
Coprinus plicatilis (Curt.) Fr.		1r
Crocicreas cyathoideum (Bull.) Carpenter		1r
Psathyrella trepida (Fr.) Gill.		1r
Strobilurus tenacellus (Pers.) Sing.		1r
III. Lignicolous saprotrophs		
Hirneola auricula-judae (Bull.: St-Am.) Berk.	16a	
Pluteus atricapillus (Secr.) Sing.	4r	
Coprinus silvaticus Peck.	3n	
Exidia plana (Wigg.: Schleich.) Donk	3n	
Flammulina velutipes (Curt.) Sing.	3n	
**Coniophora puteana* (Schum.: Fr.) P. Karst.	2n	
**Dacrymyces capitatus* Schw.	2n	
Polyporus arcularius (Batsch): Fr.	2n	
**Radulomyces confluens* (Fr.) Christ.	2n	
**Dacrymyces stillatus* Ness.: Fr.	2r	
Polyporus badius (Pers.) Schw.	2r	
**Cylindrobasidium evolvens* (Fr.) Jül.	1n	
Galerina unicolor (Fr.) Sing.	1n	
**Byssomerulius corium* (Fr.) Parm.	1r	
Clitocybe lignatilis (Pers.: Fr.) Karst.	1r	
Encoelia furfuracea (Roth.) P. Karst.	(1r)	
Ganoderma applanatum (Pers.) Pat.	1r	
Hymenoscyphus calyculus (Sow.: Fr.) Phill.	1r	
Mycena acicula (Schaeff.: Fr.) Kummer	1r	
Mycena debilis (Fr.) Quél.	1r	
Mycena olida Bres.	1r	
Oudemansiella radicata (Relh.) Sing.	(1r)	
**Phellinus ferruginosus* (Schrad.: Fr.) Pat.	1r	
Pluteus semibulbosus (Lasch ap. Fr.) Gill.	1r	
Psathyrella cf. *storea* (Fr.) s. K. et R.	1r	
Simocybe reducta (Fr.) Karst.	1r	
Stereum rugosum (Pers.) Fr.	1r	

cont. Table 2

Number of plot	I	II
Area of plot in sq.m.	400	400
Number of observations	18	18
Number of taxa	71	72
Stropharia caerulea Kreisel	1r	
Postia subcaesia (David) Jülich	4n	1r
Coprinus micaceus (Bull.: Fr.) Fr.	5a	2n
Xylaria hypoxylon (L.) Grev.	4n	2n
Tubercularia vulgaris Tode: Fr.	2n	1n
**Steccherinum fimbriatum* (Pers.: Fr.) J. Erikss.	2r	1n
Hapalopilus rutilans (Pers.: Fr.) P. Karst.	2r	1r
**Dacrymyces minor* Peck	1r	1r
Mycena haematopus Pers.: Fr.) Kummer	1r	1r
Psathyrella gracilis (Fr.: Fr.) Quél.	1r	(1n)
Mycena galericulata (Scop.: Fr.) S. F. Gray	1r	3r
+Diatrypella quercina (Pers.: Fr.) de Not. ex Cooke		5a
Trametes versicolor (L.) Pil.		4a
Armillaria mellea (Vahl.: Fr.) Kummer		4n
**Peniophora quercina* (Pers.: Fr.) Cooke		2r
Pluteus pseudorobertii Moser et Stangl		2r
Steccherinum ochraceum (Pers. in Gmelin.: Fr.) S. F. Gray		2r
Sphaerobolus stellatus Tode.: Pers.		1a
**Hyphoderma setigerum* (Fr.) Donk	1r	
Bulgaria inquinans Fr.		1r
Calocera cornea (Batsch) Fr.		1r
Clitopilus hobsonii (Berk. et Br.) Orton		1r
Hohenbuehelia reniformis (Fr.) Sing.		(1r)
Hymenochaete rubiginosa (Dicks.) Lév.		1r
Hypholoma sublateritium (Fr.) Quél.		1r
Hypoxylon fragiforme (Pers.: Fr.) Kickx		1r
Mycena polygramma (Bull.: Fr.) S. F. Gray		1r
Megacollybia platyphylla (Pers.: Fr.) Kotl. et Pouz.		1r
**Peniophora limitata* (Chaill.: Fr.) Cooke		1r
Polyporus varius (Pers.) Fr. v. *elegans*		1r
Schizopora paradoxa (Schrad.) Donk		1r
Polyporus squamosus (Huds.) ex Fr.		1n
IV. Fungi on living trees		
Mycena pseudocorticola Kühn.	1r	
Psathyrella spadicea (Schaeff.) Sing.	1r	

Explanations:

I, II — permanent plots (compare Tab. 1)

a.n.r. — degree of abundance (Jahn et al. 1967)

a — abundant

n — numerous

r — rare

* — det. W. Wojewoda

° — det. V. Demoulin

+ — det. A. Chlebicki

' — rev. M. Lisiewska

fungi *Polyporus squamosus* and *Mycena pseudocorticola*, were recorded. Arnolds et al. (1995) associate with *Alno-Padion* also *Steccherinum fimbriatum*.

The composition of macromycetes in the studied alluvial forest is close to the *Ficario-Ulmetum campestris* alluvial forest, which would confirm both Celiński's and Filipek's (1958a) as well as Piotrowska's (1983) opinion on the floristic and ecological affinity of these two types of alluvial forests.

The group of humicolous saprotrophs and ectomycorrhizal fungi comprises 19 species and has 60% of taxa in common with the *Ficario-Ulmetum campestris* alluvial forest. From the species characteristic of the *Ficario-Ulmetum campestris* (Bujakiewicz 1989) the following ones occur in the studied alluvial forest: *Morchella esculenta*, *Cystolepiota seminuda* and *Xerocomus rubellus*.

The main components of the tree-stand: the elm, ash tree and maple tree do not form ectomycorrhizae but a large number of ectomycorhizal fungi is usually developed by the oak (Watling 1995). However, in the studied alluvial forest there is a small quantity of fungi associated with that tree (*Inocybe asterospora*, *Tricholoma album*). They occur in greater numbers in *Lithospermo-Quercetum* forest, e.g. *Amanita phalloides*, *Boletus impolitus*, *B. luridus*, *Lactarius quietus*.

A group distinguishing the studied phytocoenoses of the *Violo odoratae-Ulmetum* is the group of humiculous and litter saprotrophs associated with light forests and grassy forest edges, e.g. *Macrolepiota procera* and related to base soils and to the presence of calcium carbonate, e.g. *Lepiota castanea* (Enderle and Kriegelsteiner 1989) as well as those growing on grassy swards, such as *Bovista aestivalis* noted also on *Tortulo-Phleetum* swards and *Marasmius scorodonius* (Arnolds et al. 1995).

The nitrophilous character of the studied alluvial slope forest is confirmed by the occurrence of *Lepiota cristata*, which grows also in synanthropic habitats (Kreisel 1987), as well as *Conocybe ambigua*, *C. mesospora* and *C. subovalis* (Watling 1982) and *Coprinus micaceus*.

Among litter saprotrophs (41 species) constant elements were *Marasmius torquescens* and *Clitocybe gibba* and *Lepiota nebularis* forming „fairy-rings".

Outside of the study area *Hydropus subalpinus* occurred. It is a species rarely found in Poland (Gumińska 1994), associated with beech litter and with soils rich in calcium carbonate (Kreisel 1987).

In the group of lignicolous saprotrophs (59 species) a constant and abundant occurrence of *Hirneola auricula-judae* attracts our attention (Fig. 2). In the studied Reserve this fungus, which is associated mainly with *Sambucus nigra* and usually accompanies man, occurs exclusively on elms. According to

W o j e w o d a's (1977) opinion it is not found in natural plant communities. The constant presence of this species in the studied alluvial forest might confirm the further presumption of this author that in the past the fungus probably occurred as a natural element in alluvial forests. In certain regions of Poland *Hirneola auricula-judae* is a common species and reaches in our country its north-eastern boundary of distribution (W o j e w o d a 1979).

Also *Dacrymyces capitatus* deserves our special attention. It shows proper vitality, forming numerous fruit-bodies on decorticated elm logs covered with mosses (*Hypnum cupressiforme* v. *uncinatulum*). They were noted on 9. July 1974 and 18. October 1976. In Poland the fungus is regarded as endangered. F r i e d r i c h (1991) recorded it in the Bielinek Reserve protection zone. According to R e i d (1974) it is a cosmopolitan fungus, prefering the wood of broad-leaved trees.

In the alluvial forest phytocoenoses in which oak occurred *Diatrypella quercina*, *Peniophora quercina* and *Hymenochaete rubiginosa* were noted closely related to this tree (W a t l i n g 1974). A relatively low occurrence of rarely found in Poland *Peniophora limitata* accompanying elm was recorded (W o j e w o d a 1974). It is an endangered species (W o j e w o d a and Ł a w r y n o w i c z 1992).

The occurrence of fruit bodies of *Mycena pseudocorticola* on the bark of live elms seems to be a distinguishing characteristics of the *Violo odoratae-Ulmetum* alluvial forest. This relationship was observed in the Wielkopolski National Park (B u j a k i e w i c z 1973).

The comparison of the composition of macromycetes occurring in the *Violo odoratae-Ulmetum* alluvial forest in Bielinek with the data from Wielkopolski National Park (B u j a k i e w i c z 1973; S u s i c k a 1994) indicates a group of species which at the present stage of research can be treated as species distinctive for this association. These are *Cystolepiota seminuda*, *Lepiota cristata*, *Marasmius torquescens*, *Mycena speirea* and *Mycena pseudocorticola*.

In the Bielinek Reserve in the *Violo odoratae-Ulmetum* association the occurrence of *Scutellinia* cf. *scutellata* (L.) Lambotte and on silt and clayey soil, *Greletia planchonis* Dun. ex Boud. (=*Smardaea p.* Dun. ex Boudier, Korf et W.-y. Zhuang) were noted (leg. et det. H. Dissing, Copenhagen P.81.50 and P.81.49, Dissing personal communication). *Greletia planchonis* is an epigeous saprotroph occurring for instance on the Canary Islands (K o r f et al. 1991).

On the slopes of the forested Markocin ravine, under beech (*Fagus sylvatica*) and ash (*Fraxinus excelsior*) the following macrofungi were noted: *Cyathus striatus* (Huds.) Willd., *Exidia truncata* Fr. (det. W. Wojewoda), *Marasmius torquescens* Quél., *M.* cf. *wynnei* Bk. et Br. (det. M. Lisiewska),

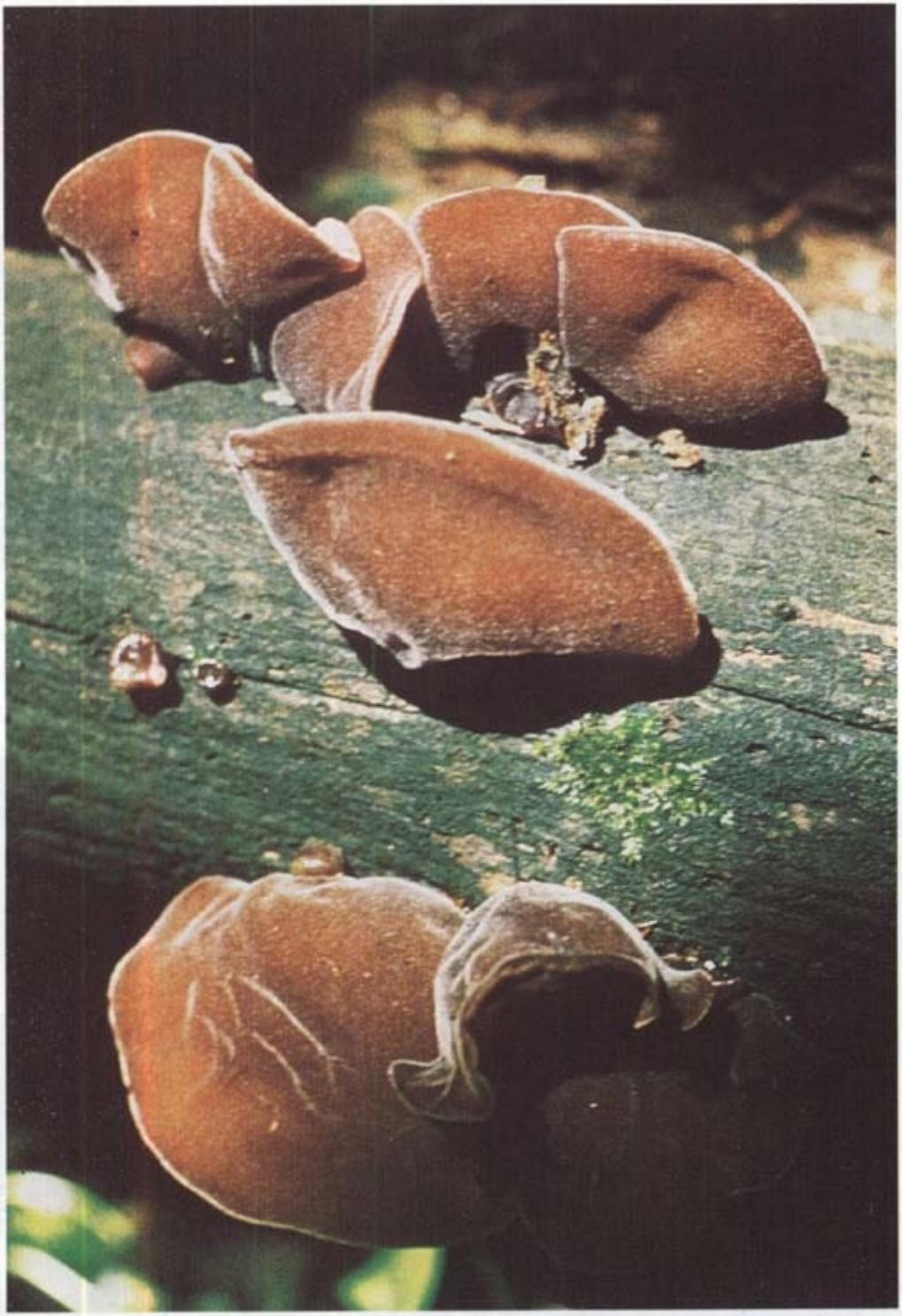

Fig. 2. *Hirneola auricula-judae* on dead decorticated elm (*Ulmus campestris*) in the *Violo odoratae-Ulmetum* association in the Bielinek Reserve on the Odra river (Phot. A. Bujakiewicz)

Fig. 3. *Geastrum melanocephalum* in the forest community resembling the dry form of the *Violo odoratae-Ulmetum* association in the Bielinek Reserve on the Odra river (Phot. A. Bujakiewicz)

Fig. 4. *Geastrum minimum* in the xerothermophilous sward *Linosyridi-Stipetum* in the Bielinek Reserve on the Odra river (Phot. A. Bujakiewicz)

Oudemansiella radicata (Relh.) Sing., *Mycena inclinata* (Fr.) Quél. and *Phallus impudicus* L.: Pers. On burnt soil, in litter and among mosses *Antracobia macrocystis* (Cke.) Boud. was noted.

In a similar forest, on beech logs Celiński and Filipek (1958a) recorded *Oudemansiella mucida* (Schrad.: Fr.) v. Hoehn and *Craterellus cornucopioides* L. in litter. They also noted *Geastrum fimbriatum* Fr. Later Skirgiełło (1984) mentioned *Inocybe patouillardii* Bres. Neither of those species was recorded by the author again.

Sporadic records of macrofungi were also made in phytocoenoses of the peculiar *Lithospermo-Quercetum* association whose only locality in Poland is the one found in the studied area. They are as follows. *Ascomycota*: *Diatrype disciformis* (Hoff.: Fr.) Fr. (det. A. Chlebicki), *Otidea onotica* (Pers.) Fuck. *Basidiomycota*: *Amanita phalloides* (Vaill.: Fr.) Secr., *Boletus impolitus* Fr., *B. luridus* Fr., *Bovista aestivalis* (Bonord.), Demoulin, *Byssomerulius corium* (Fr.) Parm., *Calocybe gambosa* (Fr.) Donk, *Calvatia excipuliformis* (Schaeff.: Pers.) Perd., *Clavulina cinerea* (Fr.) Schroet., *Collybia butyracea* (Bull.: Fr.) Quél., *C. dryophilla* (Bull.: Fr.) Kummer, *C. peronata* (Bolt.: Fr.) Sing., *Crinipellis stipitarius* (Fr.) Pat., *Geastrum rufescens* Pers. (det. K. Kříž), *Geastrum melanocephalum* (Czern.) Stanek, *Hygrophorus eburneus* (Bull.: Fr.) Fr., *Inocybe asterospora* Quél., *I. dulcamara* (Alb. et Schw.: Pers.) Kummer, *Lactarius piperatus* (L.) F. Gray, *L. quietus* Fr., *Marasmius bulliardii* Quél., *M. oreades* (Bolt.: Fr.) S. F. Gray, *Mycena polygramma* (Bull.: Fr.) S.F. Gray, *M. pura* (Pers.: Fr.) Kummer, *M. sanguinolenta* (Alb. et Schw.: Fr.) Kummer, *M. zephirus* (Fr.: Fr.) Kummer, *Polyporus arcularius* (Batsch) ex Fr., *P. brumalis* (Pers.) ex Fr., *Russula cyanoxantha* Schaeff.: Fr., *R. foetens* Fr., *Scleroderma verrucosum* (Bull.) ex Pers. (det. K. Kříž), *Suillus granulatus* (L.: Fr.) O. Kuntze, *Trametes hirsuta* (Wulf.: Fr.) Pil. and *Xerocomus subtomentosus* (L.: Fr.) Quél.

Geastrum melanocephalum (Fig. 3), a fungus of continental (pontic) distributional type was recorded in Bielinek by Celiński and Filipek (1958a, b) and all their collections (June 12.1954, July 17.1955, Oct. 10. 1955) are kept in the POZM. Fruit-bodies observed by the author on 6. July, 1976 and 10. September, 1981 were growing at the same locality as indicated in the former records: near Bielinek settlement, on the south-western slope, above the claypit (Fig. 1) in the xerothermic forest and scrub with *Ulmus campestris*, *Prunus spinosa*, *Quercus sessilis* and *Lithospermum purpureo-coeruleum*, in the forest community resembling *Violo-Ulmetum* (Bujakiewicz 1989). The present distribution of this species in Poland is given by Lisiewska (1997).

Kreisel (1987) recorded *Amanita caesarea* in Bielinek without specifying the habitat. It is a fungus ecotomycorrhizal with the oak (*Quercus*)

and with chestnut (*Castanea*) growing in southern Europe. Due to the thermophilous character of the forests in the Bielinek Reserve the occurrence of this species is highly probable. However, during the studies in the years 1974-1976 it was not recorded.

Several records of macrofungi were made also in phytocoenoses resembling the *Linosyridi-Stipetum pulcherrimae*, namely: *Crinipellis stipitaria* (Fr.) Pat., *Gastrosporium simplex* Matt. (rev. K. Kříž), *Geastrum minimum* Schwein. (det. K. Kříž) and *Mycena epipterygia* (Scop.: Fr.) S.F. Gray.

Gastrosporium simplex was recorded for the first time in Poland from Bielinek Reserve by Š m a r d a (1957). Specimens collected by the author on 31 May 1975 and 24 May 1976 were growing in the soil among the roots of *Stipa capillata*, together with *Anthericum liliago*, *Salvia pratensis*, *Orobanche* sp. and *Fissidens cristatus*. The fungus is probably a parasite (K r e i s e l 1987).

Geastrum minimum grew among *Hieracium pilosella*, *Calamintha vulgaris*, *Vincetoxicum officinale*, *Anthoxanthum odoratum* and *Fissidens cristatus* on 27. November 1974 and 21. September 1976 (Fig. 4).

Both *Gastrosporium simplex* and *Geastrum minimum* are constant elements of xerothermophilous swards. In the recent years these fungi were noted in the phytocoenoses of *Sisymbrio-Stipetum capillatae* in the vicinity of Busko Zdrój (Ł u s z c z y ń s k i and Ł u s z c z y ń s k a 1991-1992). *Geastrum minimum* occurs with much higher frequency, for instance in *Festucetum pallentis* in the Ojców National Park (W o j e w o d a 1975).

F r i e d r i c h (1991) points out that the search for *Gastrosporium simplex* undertaken by him repeatedly both in the Bielinek Reserve and within Cedynia Landscape Park were not successful. Even in the past as close as the years 1975 and 1976 fruit-bodies of *Gastrosporium simplex* were found frequently during the studies carried out at that time. Overgrowing of swards with scrubs and trees in the Bielinek Reserve may be a factor responsible for the less frequent occurrence of this fungus. It represents the group of endangered species (W o j e w o d a and Ł a w r y n o w i c z 1992).

D ö r f e l t (1974) described a fungi alliance accompanying swards in Halle and Magdeburg District and named it *Tulostomato* (*brumali*) -*Gastrosporietum* (*simplicis*) Dörfelt (Dörfelt 1977). The distribution range of this group of fungi extends probably further to the east.

Crinipellis stripitaria shows a larger distribution range. It grows on roots and grass remnants, both in xerothermous swards (W o j e w o d a 1979; S a ł a t a and O s t a s 1975; F l i s i ń s k a and S a ł a t a 1991) and in the forest (B u j a k i e w i c z 1995), though it seems to have been brought there. The occurrence of this species in ruderal communities and on the roadsides was noted by K r e i s e l (1987).

The site of a rare thermophilous species *Montagnea arenaria* (DC.) Zeller in the steppe reserve in Bielinek given by S k i r g i e ł ł o (1976) and R u d n i c k a-J e z i e r s k a (1991) deserves also our attention. The occurrence of this species was not noted again.

Steppe swards in the Bielinek Reserve deserve a separate mycological study.

RESULTS AND REMARKS

– In the course of mycological studies carried out in the Bielinek Reserve on the Odra river in the years 1974-1976 the total number of 149 macromycete species was noted.

– Mycocoenological studies carried out in phytocoenoses of the *Violo odoratae-Ulmetum* association showed the occurrence of fruit-bodies of 121 species, from which only 22 (17%) occurred on both permanent study areas. The numbers indicate the differentiation of the niches inhabited by fungi with simultaneous uniformity of habitats in the slope alluvial forest. The analysis of ecological groups of fungi shows the prevalence of lignicolous and litter saprotrophs (84%) (Table 2). The composition of macromycetes in the *Violo odoratae-Ulmetum* alluvial forest is close to *Ficario-Ulmetum campestris* which supports the hypothesis of the floristic and ecological affinity of these forest associations. The phytocoenoses of the *Violo odoratae-Ulmetum* in the Bielinek Reserve are exceptional due to a group of species indicating a nitrophilous-thermophilous character of this forest community. These species are: *Bovista aestivalis*, *Conocybe ambigua*, *C. mesospora*, *C. subovalis*, *Lepiota castanea*, *L. cristata*, *Macrolepiota procera* and *Marasmius scorodonius*.

– Among the species noted in the *Lithospermo-Quercetum* phytocoenoses there were *Boletus impolitus*, *B. luridus* and *Geastrum rufescens*. The species noted in the *Potentillo-Stipetum* swards include *Gastrosporium simplex* and *Geastrum minimum*. These are mostly calciphilous fungi.

– Some species rarely found in Poland, such as: *Gastrosporium simplex*, *Geastrum melanocephalum* (Fig. 3), *Hydropus subalpinus*, *Peniophora limitata*, *Xerocomus rubellus* and *Clitopilus hobsonii* were noted.

– Some of the recorded species are endangered in the whole territory of Poland (W o j e w o d a and Ł a w r y n o w i c z 1992). These are: *Boletus impolitus*, *Dacrymyces capitatus*, *Gastrosporium simplex*, *Geastrum melanocephalum* and *G. rufescens*, and – from the group of less endangered species – *Conocybe ambigua*, *Geastrum minimum*, *Hehenbuehelia reniformis*, *Lepiota setulosa*, *Macrolepiota procera*, *Peniophora limitata* and *Pluteus pseudorobertii*.

– The alluvial elm forest, *Violo odoratae-Ulmetum* represents a fertile, nitrophilous-thermophilous wing of alluvial forests. These habitats require further more thorough mycocoenological studies based on phytocoenoses well described with regard to their geneses.

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Macromycetes fitocenoz zespołu *Violo odoratae-Ulmetum* w rezerwacie w Bielinku nad Odrą

Streszczenie

Studia mikocenologiczne przeprowadzono w latach 1974-1976 na dwóch stałych powierzchniach w łęgu *Violo odoratae-Ulmetum* (Weevers 1940) H. Doing 1962. Skład *macromycetes* tego łęgu zbliżony jest do łęgu wiązowego *Ficario-Ulmetum campestris*. Wyróżnia go grupa grzybów wskazująca na nitrofilno-termofilny charakter siedliska, a mianowicie: *Bovista aestivalis*, *Conocybe ambigua*, *C. mesospora*, *C. subovalis*, *Lepiota castanea*, *L. cristata*, *Marasmius scorodonius*, *Macrolepiota procera*.

Sporadyczne obserwacje poczyniono również w lasach *Lithospermo-Quercetum* oraz w murawach *Linosyridi-Stipetum pulcherrimae*. Potwierdzono występowanie na tym terenie rzadko notowanych w Polsce gatunków kserotermofilnych wapieniolubnych, np. *Boletus impolitus* i *Gastrosporium simplex*. Odnotowano również znane z tego terenu stanowisko *Geastrum melanocephalum*.