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STUBBLE FIELD PLANT COMMUNITIES OF THE MAZOWIECKI LANDSCAPE PARK

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A b s t r a c t

The characteristics of communities found in unploughed stubble fields of the Mazowiecki Landscape Park and its agricultural buffer zone are presented in the paper. The association *Echinochloo-Setarietum* divided into a typical variant, the variant with *Galinsoga parviflora*, and the variant with *Bidens tripartite*, was the most frequently noted and floristically differentiated association. Patches of *Digitarietum ischaemi* were also frequently observed in stubble fields on the poorest habitats. Rarely, on fertile soils, small patches of floristically rich communities with *Veronica agrestis* were recorded. Periodically, excessively wet habitats were seldom occupied by the species-richest phytocoenoses of *Centunculo-Anthoceretum punctati*. Single patches of the community with *Setaria pumila,* the form with *Aphanes arvensis*, were observed only in the south-eastern part of the Park.

Key words: stubble field, weed communities, phytosociological characteristics, Mazowiecki Landscape Park

INTRODUCTION

Communities developing in unploughed stubble fields are distinguishable by their specific floristic composition. A few different groups of plants are found there: the remains of cereal agrophytocoenoses, weed species typical for root crops as well as taxa characteristic of ruderal and semi-natural communities (especially meadow ones). The species composition of these heterogeneous communities is closely related to habitat conditions (T r ą b a , 1993; S k r a j n a and S k r z y c z y ń s k a , 2002; R z y m o w s k a and S k r z y c z y ń s k a , 2006a,b). Favourable development conditions, which predominate in stubble fields, stimulate the growth of weeds that flower and fruit abundantly, enriching soil-seed reserves (P a w ł o w s k i et al. 1970; T r ą b a and Z i e m i ń s k a , 1994; J ę d r u s z c z a k , 1997).

The present paper is a part of a series on segetal vegetation of the Mazowiecki Landscape Park (Fig. 1) in which information concerning the classification and phytosociological characteristics of stubble field communities was published. Detailed data on the area and research methods were presented in the previous paper (S k r a j n a et al. 2009). The characteristics of stubble field phytocoenoses developing within the area of the Mazowiecki Landscape Park were determined on the basis of 114 phytosociological relevés made according to the B r a u n - B l a n q u e t method (P a w ł o w s k i , 1972). Systematics and nomenclature of plant associations are based on M a t u s z k i e w i c z (2001). Species nomenclature follows M i r e k et al. (2002).

RESULTS

Systematics of the distinguished stubble field associations and communities

Class: *Stellarietea mediae* Tx., Lohm. et Prst. 1950
Order: *Polygono-Chenopodietalia* (R.Tx. et Lohm. 1950) J. Tx.
Alliance: *Panico-Setarion Siss*. 1946
1. Association: *Digitarietum ischaemi* R. Tx. et Prsg (1942) 1950
   a. typical variant
   b. variant with *Anthoxanthum aristatum*
   c. variant with *Polygonum hydropiper*
   Community with *Setaria pumila*
   a. typical form
   b. form with *Aphanes arvensis*
2. Association: *Echinochloo-Setarietum* Krusem. et Vlieg. (1939) 1940
   a. typical variant
   b. variant with *Galinsoga parviflora*
   c. variant with *Bidens tripartita*

Alliance: *Polygono-Chenopodion*
   Community with *Veronica agrestis*

Class: *Isoëto-Nanojuncetea* Br.-Bl.et R. Tx. 1943
Order: *Cyperetalia fusci* (Klika 1935) Müller-Stoll et Pietsch 1961
Alliance: *Radiolion linoidis* (Rivas Goday 1961) Pietsch 1965
3. Association: *Centunculo-Anthoceretum punctati* (Koch 1926) Moor 1936
   a. typical variant
   b. variant with *Hypericum humifusum*
   c. variant with *Centaurium pulchellum*

Characteristics of the distinguished associations and communities

***Digitarietum ischaemi* R. Tx. et Prsg (1942) 1950**

Patches of *Digitarietum ischaemi* were noted in rye stubble fields on the poorest sandy soils of very weak and weak rye complex as well as cereal-fodder weak complex. The patches occurred equally frequently within the area of the Park and in its agricultural buffer zone. The association was characterized by 30 relevés, of which 10 represent the typical variant, 10 – the variant with *Anthoxanthum aristatum*, and 10 – the variant with *Polygonum hydropiper* (Table 1). The typical variant patches were noted in the poorest habitats from among all those occupied by that association. The characteristic species – *Digitaria ischaemum* – reached the highest cover index there. Phytocoenoses of the variant with *Anthoxanthum aristatum* were floristically poorest. The average plant cover was only 20%. The wet variant patches were recorded in stubble fields situated in local depressions, usually on periodically excessively wet areas. These phytocoenoses were distinguishable by the mass occurrence of hygrophilous weeds, e.g.: *Polygonum hydropiper* and *Bidens tripartita*. In total, 65 species were noted in all the plots of this association (38 in the typical variant, 28 in the variant with *Anthoxanthum aristatum*, and 57 in the variant with *Polygonum hydropiper*). The average number of species per relevé varied from 11 in the patches of the variant with *Anthoxanthum aristatum* to 21 in the wet variant.

Community with *Setaria pumila*

The community was frequently recorded in the stubble fields of the Mazowiecki Landscape Park and its buffer zone (Table 2). It was distinguishable by the mass occurrence of *Setaria pumila* and a high proportion of acidophilous weeds, e.g. *Spergula arvensis*, *Scleranthus annuus* and *Anthemis arvensis.* A low percentage of the species characteristic of the *Panico-Setarion* alliance was also noted. The typical form of the community was observed in the whole study area, mainly in rye stubble fields on poor sandy soil of weak rye complex. Patches with the mass occurrence of *Aphanes arvensis* were noted only in stubble fields situated in the following localities: Kąty, Skorupy, Augustówka, Łukowiec, and Gózd. Patches of this community were developing on sandy muck and silt-peaty soils of periodically excessively wet cereal-fodder weak complex, which resulted in a high proportion of hygrophilous weed species, e.g. *Polygonum hydropiper*, *Polygonum amphibium, Plantago intermedia, Gnaphalium uliginosum*. In this area, the impoverished association of *Aphano-Matricarietum* was observed in cereal crops.

***Echinochloo-Setarietum Krusem.* et Vlieg. (1939) 1940**

Patches of the association *Echinochloo-Setarietum* were observed most frequently in unploughed cereal stubble fields of the studied area (Table 3). Among the characteristic species, *Echinochloa crus-galli* occurred in large numbers, *Raphanus raphanistrum* was noted less frequently. Patches of this phytocoenosis developed in various trophic and moist conditions. Patches of the typical variant were usually recorded on good rye complex soils. They were floristically poorest among all identified variants of the association (on average, 21 species in one relevé) and marked by the highest cover of *Echinochloa crus-galli*.

In a close vicinity of buildings, on more fertile nitrogen-rich soils classified as good and very good rye complex, there were noted patches of the variant with the abundant occurrence of *Galinsoga parviflora.* A large proportion of weeds characteristic of the *Polygono-Chenopodion* alliance, which includes species with high nutrient demands, e.g.: *Veronica persica*, *Galinsoga ciliata* and *Chenopodium polyspermum,* was observed in these phytocoenoses.

The floristically richest patches of this association, classified as the variant with *Bidens tripartita*, were observed in stubble fields on soils developed from clayey soils and common dusts, classified as good and very good rye complex and strong cereal-fodder complex. They were distinguishable by the mass occurrence of hygrophilous weed species, e.g. *Bidens tripartita, Plantago intermedia, Polygonum hydropiper, Stachys palustris,* and *Sagina procumbens.* This variant comprised 92 taxa, on average 30 species in one relevé.

Community* with *Veronica agrestis

Patches of the community with *Veronica agrestis* were noted very seldom in stubble fields of the Mazowiecki Landscape Park and its buffer zone. The species characteristic of the *Polygono-Chenopodion* alliance, with high trophic and pH requirements, predominated in their floristic composition (Table 4). Apart from *Veronica agrestis* occurring in large numbers, a few other taxa occurred with a high constancy and cover, e.g. *Matricaria maritima* subsp. *inodora*,

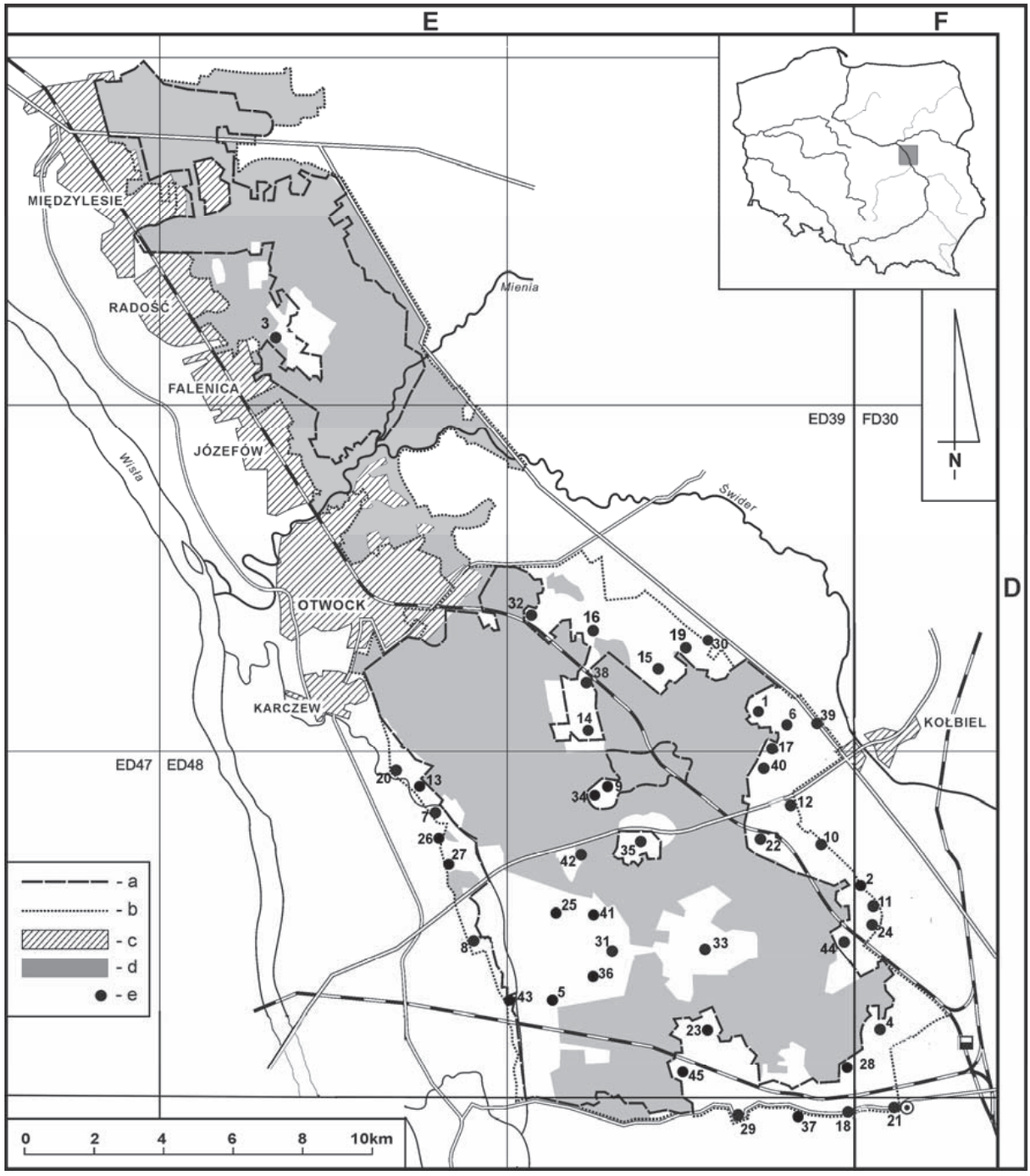

Fig. 1. Investigated area

a – borders of the Landscape Park; b – borders of the protected zone; c – building grounds
d – forest complexes; e – localities, inwestigated areas

1 – Anielinek, 2 – Antoninek, 3 – Aleksandrówka, 4 – Augustówka, 5 – Bąki, 6 – Bocian, 7 - Brzezinka, 8 – Całowanie, 9 – Celestynów, 10 – Chrosna, 11 – Chrząszczówka, 12 – Człekówka, 13 – Dąbrowa, 14 – Dąbrówka, 15 – Dyzin, 16 – Glina, 17 – Gózd, 18 – Grabianka, 19 – Jatne, 20 Janów, 21 – Jaźwiny, 22 – Karpiska, 23 – Kąciki, 24 – Kąty, 25 – Kominki, 26 – Kozłówka, 27 – Łukowiec, 28 – Ocznia, 29 – Osieck, 30 – Ostrowik, 31 – Podbiel, 32 – Pogorzel, 33 – Ponurzyca, 34 – Radzyń, 35 – Regut, 36 – Rosłańce, 37 – Rudnik, 38 – Stara Wieś, 39 – Stara Wieś II, 40 – Skorupy, 41 – Szatany, 42 – Tabor, 43 – Warszówka, 44 – Zabieżki, 45 – Zawada

Table 1

Digitarietum ischaemi R. Tx. et Prsg (1942) 1950

Variant	typical												with *Anthoxanthum aristatum*												with *Polygonum hydropiper*											
Relevé no. in table	1	2	3	4	5	6	7	8	9	10	Mean number of species per relevé		11	12	13	14	15	16	17	18	19	20	Mean number of species per relevé		21	22	23	24	25	26	27	28	29	30	Mean number of species per relevé	
Relevé no. in field	285	286	292	284	307	317	330	255	259	233			298	326	368	252	241	264	231	240	309	310			293	296	298	265	271	267	232	221	222	230		
Date: month	8	8	9	8	8	9	8	8	9	9			8	8	8	8	9	9	7	8	8	9			7	7	8	8	8	9	8	7	8	8		
year	.05	.03	.05	.04	.04	.05	.04	.03	.07	.06			.07	.06	.03	.05	.07	.06	.04	.05	.07	.06			.04	.05	.03	.07	.06	.03	.05	.03	.07	.06		
Location	32	32	34	31	35	38	42	10	11	3			39	40	21	9	6	17	3	5	36	36			7	38	39	19	22	21	3	1	1	2		
Weed cover in %	80	100	70	85	60	45	45	40	50	70			60	80	70	70	55	70	75	90	50	35			70	60	50	75	60	85	85	50	40	40		
Soil unit	7 Bw pl	7 Bw pl	6 Bw ps	7 Bw pl	6 Bw ps	7 Bw pl	6 Bw ps	6 Bw ps	7 Bw pl	7 Bw pl			7 Bw pl	6 M pgl.pl	7 Bw pl	7 Bw pl	7 Bw pl	6 Bw pgl:gl	7 Bw pl	7 Bw pl	7 Bw pl	7 Bw pl			6 F pgl.pl	6 M pgl.pl	9 M pgl:gl	6 Bw pgl.pl	9 Bw pgl	9 Bw pgl:gl	9 Bw pgl:gl	9 M pgl:gl	9 Bw pgl	9 Bw pgl:gl		
Number of weeds per relevé	18	17	11	14	13	11	11	13	14	12	13		13	10	8	11	12	12	11	10	8	13	11		26	23	24	19	22	18	21	16	24	17	21	
											S	D											S	D											S	D
I. Ch. ***Digitarietum ischaemi***																																				
Digitaria ischaemum	3	4	3	3	2	2	2	3	3	1	V	3175	3	3	3	2	2	2	1	4	1	1	V	2425	1	3	3	3	3	2	2	1	1	1	V	2050
II. Ch.D. P*anico-Setarion*																																				
Rumex acetosella	2	2	1	2	3	1	1	+	+	3	V	2445	+	+	+	+	2	1	2		2		IV	615	1	+	1			2	1	+		+	IV	355
Scleranthus annuus		+	+	+	1	1	+	+	+	1	V	210	+	+	1	+		1	1	+	+	+	V	210		+		+	+				+		II	40
Spergula arvensis			+	+	+					+	III	40	+			+		+	+		+		III	50	3	+	+	+	+	1	1	+	+	+	V	545
Setaria viridis	+	+	+		+		1	+			III	100						+					I	10										1	I	50
Setaria pumila		1		+	+						II	70	+					+		+		+	II	40		+			+				+		II	30
Raphanus raphanistrum									r		I	10					+			+	+	+	II	40						+	+		+	+	III	40
III. D. var with ***Polygonum hydropiper***																																				
Polygonum hydropiper														+		+							I	20	1	1	+	1	1	3	3	2	2	1	V	1370
Bidens tripartita																									+	1	1	2	1	+	+	1	+		V	415
Gnaphalium uliginosum																										+	+	+	+			+	+		III	60
Plantago intermedia																									+	+	+	+		+	+				III	60
Rorippa sylvestris																											+		+	+	+	+			III	50
Rorippa austriaca																									+	+			+	+				+	III	50

cd.Table 1

Juncus bufonius																									+			+		+	+	+			III	50
Potentilla anserina																									+	+		+						+	III	40
Spergularia rubra																						+		I	10	+	+				+	+			+	III	50
IV. D. var *Anthoanthum aristatum*																																				
Anthoxanthum aristatum		+			r	+					I	20	**2**	**3**	**2**	**3**	**1**	**2**	**2**	**1**	**1**	**1**	V	1650		+	+		+		+				II	40
V. Ch. *Stellarietea mediae*																																				
Arnoseris minima	1	+	+	+	+	1	1	+	+	1	V	260						+	1	+			II	70												
Viola arvensis			+	+	+	+			+		III	50	+	+	+	+	+	+				+	IV	70			+	+		+			+		II	40
Anthemis arvensis				1	+	+		+	+	+	III	100	+	+			+	+				+	III	50	+				+		+				II	30
Fallopia convolvulus		+		+	+		+			+	III	50	+			+		+	+	+		+	III	60		+	+		+			+	+		III	50
Conyza canadensis	+		2	+		+	+		+		III	225	+								+	+	II	30		+	+	+	+		+	+	+	+	IV	80
Galeopsis tetrahit	+			+				+	+		II	40	+	+	+	+	+					+	III	60		+	+				+		+		II	40
Rhinanthus serotinus		+				+	+	+			II	40																								
Vicia villosa	+		+						+		II	30																								
Centaurea cyanus		+	+			+	+	+	+		III	60													+	+		+	+		+		+	+	IV	70
Chenopodium album							+				I	10													+		+	+				+	+		III	50
Polygonum aviculare													+	+	+	+	+					+	III	60		+		+	+	+	+				III	50
VI. Companion species																																				
Achillea millefolium	+	+						+	+	+	III	50	+	+	+	+	+		+	+			IV	70		+	+	+			+	+	+		III	60
Elymus repens	1	+			+						II	70													+		+			+					II	30
Galeopsis ladanum	+	+							+		II	30																								
Plantago lanceolata	+		+	+				+			II	40													+	+	+		+				+		III	50
Equisetum arvense	+								+	+	II	30														+	+		+				+	+	III	50
Artemisia vulgaris	+						+		+		II	30																								

Sporadic species: II – *Echinochloa crus-galli* 20(+), 21(+); III – *Ranunculus repens* 11(+), 15(+); 21(+), 22(+), 24(+), 27(+); *Gypsophila muralis* 26(+), 29(+), 30(1); *Bidens frondosa* 23(+), 28(+); *Mentha arvensis* 26(+), 27(+); *Polygonym amophibium* 29(+); V – *Lapsana communis* 29(+), 30(+); *Capsella bursa-pastoris* 15(+), 17(+), 21(+); *Vicia angustifolia* 6(+), 8(+); *Oxalis dillenii* 21(+), 29(+); *Apera spica-venti* 9(+), 21(+), 28(+); VI – *Trifolium repens* 4(+), 23(+), 25(+), 27(+), 29(+); *Linaria vulgaris* 1(+), 21(+), 24(+), 29(+); *Cirsium arvense* 2(+), 18(+), 21(+), 24(+), 25(+); *Festuca ovina* 9(+), 16(+), 23(+), 30(+); *Polygonum persicaria* 2(+), 18(+), 21(+), 24(+); *Holcus lanatus* 8(+), 10(+), 17(+), 28(+); *Gnaphalium sylvaticum* 5(+), 11(+), 21(+); *Veronica arvensis* 1 (1), 24(+); *Agrostis stolonifera* 2(+), 26(1), 27(1); *Convolvulus arvensis* 1(+), 21(+), 23(+); *Polygonum lapathifolium subsp. lapathifolium* 28(+); *Taraxacum officinale* 1(+), 21(+); 29(+); *Knautia arvensis* 10(+), 23(+); *Erodium cicutarium* 1(+), 2(+); *Stellaria graminea* 15(+), 23(+); *Centaurea scabiosa* 17(+), 20(+); 25(+), 30(+); *Galeopsis bifida* 25(+); *Galeopsis pubescens* 25(+); *Solidago canadensis* 21(+), 22(+); *Erigeron acer* 30(+)

Comments: numbers after species names inform about the relevé number in the table. S – phytosociological constancy, D – coverage index

Table 2
Community with *Setaria pumila*

Form	typical												with *Aphanes arvensis*											
Relevé no. in table	1	2	3	4	5	6	7	8	9	10	Mean number of species per relevé		11	12	13	14	15	16	17	18	19	20	Mean number of species per relevé	
Relevé no. in field	270	332	297	318	313	306	281	120	121	256			274	262	263	236	237	379	321	322	323	324		
Date: month	7	9	9	8	9	8	8	8	7	9			8	8	8	8	7	7	9	9	8	9		
year	07.	06.	06.	06.	08.	07.	05.	06.	07.	06.			08.	07.	05.	07.	06.	07.	06.	06.	06.	05.		
Locality	22	44	39	39	37	35	29	1	1	10			24	17	17	4	4	27	40	40	40	24		
Soil unit	6Bkps: pl	6Mps	9Mpgl. pl	6Bwps: pl	6Apgl:pl	6Mps	5Apgl:gl	9 Fpłz. psp	9 Fpłz. psp	6Apgl:pl			6Mps	6Epli.pl	9Mpgl. pl	6Mps	9Mpgl. pl	9Mpgl. pl	6Epli.pl	9Mpgl. pl	6Bkps: pl	6Epli.pl		
Weed cover in %	70	50	70	85	70	95	45	80	70	50			95	85	85	100	100	95	100	90	90	95		
Number of weeds per relevé	20	17	19	21	15	21	17	20	18	17	18		29	19	27	13	27	26	23	22	23	22	23	
											S	D												
I. D . *Setaria pumila*																								
Setaria pumila	**3**	**3**	**2**	**4**	**4**	**4**	**2**	**3**	**3**	**3**	**V**	**4250**	**3**	**3**	**2**	**4**	**3**	**2**	**2**	**2**	**3**	**1**	**V**	**2550**
II. D. *Aphanes arvensis*													3	3	3	4	4	2	4	3	2	3	V	4250
III. D.Hygrophilous species																								
Polygonum hydropiper													+	1	+	+	1	+	1		+	+	V	210
Polygonym amphibium													+	1		+			1		+		V	130
Plantago intermedia													1		+	1	+	+	1	+	+		IV	200
Gnaphalium uliginosum								+	+		I	20	+				2	+		2		1	III	420
Sagina procumbens														+	1	+			+		+	2	III	265
Bidens tripartita													1	1		+	+		+	1			III	180
Potentilla anserina													1			+	+	+	1		1		III	180
Mentha arvensis															+			2		1		+	II	245
Phragmites australis														+				2		2	2		II	535
Stachys palustris									+	+	I	20				+			1	1		2	II	285
Juncus bufonius									+		I	10		1	1	+		+					II	120
Peplis portula														+			+			+		+	II	40
Spergularia rubra													2						+	+			II	195
IV. Ch.D. *Panico-Setarion, Polygono-Chenopodietalia*																								
Spergula arvensis		1	2	2	+		1		2	+	IV	645	+	+	+			+			+	+	III	60
Scleranthus annuus	+		2	+	+	1			1		III	305			+	+	+						II	30
Setaria viridis	1	+	+	+	+			+			III	100	+					+	+	+			II	40
Digitaria ischaemum	+	+	+		+				+		III	50			+		+			+			II	30

cd.Table 2

Rumex acetosella	2		+				+		+	II	205	+		1	+	+	1					III	130
Chenopodium album			+	+		+			+		II	40			+	+	+	+	+	+	+	+	IV	80
Echinochloa crus-galli				+		+			+		II	30				+					+	+	II	30
V. Ch. Stellarietea mediae																								
Anthemis arvensis			+	+		2	1	2	+	+	IV	440	+	1					+					II	70
Fallopia convolvulus	+	+	+	+						+	III	50	1		+	+	+	+		+	+	1	IV	160
Viola arvensis			+	+	+		+	+			III	50	+	+	+	+	+	+		+	+		IV	80
Capsella bursa-pastoris		+				+		+		+	II	40			+	+	+	+			+		III	50
Anthoxanthum aristatum	+		+			+		+			II	40	+		+		+			+			II	40
Arnoseris minima	+			+		+			+		II	40	+										I	10
Geranium pusillum						+		+	+	+	II	40												
Centaurea cyanus	+			+				+			II	30	+			+	+	+					II	40
Vicia hirsuta		+	+				+	+			II	40	+										I	10
Conyza canadensis		+	+		+		+				II	40	+		+	+	+	+					III	50
Polygonum aviculare	+						+				I	20		+	+	+	+	+				+	III	60
Myosotis arvensis																			+	+	+	+	II	40
VI. Companion species																								
Convolvulus arvensis		+	+		+	+			+	+	III	60			+		+						I	20
Equisetum arvense	+	+	+		+	+	+			1	IV	100	+		+	+	+	+					III	50
Cirsium arvense	+	+					+	+	+		III	50	+							+	+	+	II	30
Achillea millefolium	+			+			+	+			II	40	+			+	+	+		+			III	50
Elymus repens	+		1					+			II	70			+				+			+	II	30
Trifolium repens		r	+			+		+			II	30			+		+					+	II	30
Leontodon autumnalis		+	+		+	+				+	II	40					+	+	+				II	30
Poa annua	+	+		+				+			II	40		+					+			+	II	30
Plantago lanceolata			+	+		+			+		II	40	+	r		+	+						II	30
Polygonum lapathifolium subsp. lapathifolium			+	+				2			II	195					+						I	10
Erodium cicutarium	+	+		+					+	+	II	40	+										I	10

Sporadic species: III – *Bidens frondosa* 13(+), *Ranunculus repens* 12(+), 14(+), 16(+); *Gypsophila muralis* 12(+), 14(+), 16(+); *Rorippa sylvestris* 14(+), 19(+); *Rorippa amphibia* 15(+), 19(+); IV – *Raphanus raphanistrum* 1(+), 5(+); V – *Anagallis arvensis* 5(+), 7(+), 17(+), 19(+), 20(+); *Matricaria maritima subsp. inodora* 2(+), 10(+), 17(+), 19(+), 20(+); *Stellaria media* 4(+), 8(+), 11(+), 19(+), 20(+); *Galeopsis tetrahit* 2(+), 9(+), 15(+), 1(+); *Lapsana communis* 5(1), 7(+); *Oxalis dillena* 17(+), 18(+), 19(+); *Rumex crispus* 12(+); VI – *Polygonum persicaria* 1(+), 7(+), 10(+); *Trifolium pratense* 1(+), 6(+), 10(+); *Tanacetum vulgare* 6(+), 7(+), 8(+); *Erysimum cheiranthoides* 1(+), 2(1), 7(+); *Veronica arvensis* 8(2), 9(+), 11(+), 15(+), 18)+); *Galeopsis ladanum* 1(+), 5(+), 11(+), 12(+); *Hypericum perforatum* 4(+), 6(+), 13(+), 15(+); *Artemisia vulgaris* 4(+), 6(+), 16(+), 20(+); *Daucus carota* 5(+), 10(+), 17(+), 19(+); *Cerastium holosteoides* 4(+), 10(+), 17(+); *Plantago major* 4(+), 6(+), 17(+), 19(+); *Taraxacum officinale* 6(+), 10(+); *Solidago canadensis* 7(+), 9(+); *Rumex acetosa* 4(+), 6(+); *Sisymbrium officinale* 4(+), 7(+); *Stellaria graminea* 13(+), 15(+); *Agrostis stolonifera* 11(+), 12(+), 14(+); *Melandrium album* 12(+), 13(+); *Glechoma hederacea* 12(+), 19(+); *Lysimachia nummularia* 7(+);
Comments: numbers after species names inform about the relevé number in the table
S – phytosociological constancy, D – coverage index

Table 3
Echinochloo-Setarietum Krusem. et Vlieg. (1939) 1940

Variant	typical											with *Galinsoga parviflora*											with *Bidens tripartita*										
Relevé no. in table	1	2	3	4	5	6	7	8	9	10		11	12	13	14	15	16	17	18	19	20		21	22	23	24	25	26	27	28	29	30	
Relevé no. in field	314	319	299	333	260	257	254	126	123	282		127	124	250	258	301	311	316	331	312	315		251	302	294	295	315	320	327	329	128	125	
Date: month	9	8	8	8	9	9	9	8	8	7		7	7	8	9	9	7	8	8	9	8		7	7	8	8	8	7	9	8	8	9	
year	05.	07.	06.	05.	06.	07.	05.	06.	07.	04.		03.	07.	06.	05.	08.	07.	05.	07.	07.	04.		03.	05.	06.	07.	06.	07.	05.	06.	07.	07.	
Locality	37	39	43	44	12	11	10	2	1	29		2	1	9	11	34	36	38	43	37	37		9	34	35	36	37	39	41	42	2	1	
Weed cover in %	40	45	70	50	80	85	70	85	85	80		70	95	85	90	80	90	85	95	85	85		95	75	70	70	100	100	50	95	70	100	
Soil unit	5Bw pgl.gl	5Bw pgl.gl	4Fplz.ps	5Bw pgl.gl	5Bw pgl.gl	5Bw pgl.gl	5Bw pgl.gl	5Bw pgl.gl	4 Bw plz:gl	4Bw pgm:ps	Mean number of species per relevé	4Bw pgm:ps	2 Bw gl	4Dz pglp.gl	4Bw pgm:ps	4 Bw plz:gl	4Dplz.ps	2Dplz:ps	5 Bw pgl.gl	2 Bw gl	8 Dz pgmp.ps	Mean number of species per relevé	4Dplz.ps	4Dplz.ps	4Fplz.ps	8 Dz pgmp.ps	9 Bw pgl:pl	5 Bw pgl.gl	8 Dz pgmp.ps	5 Bw pgl.gl	8 Dz pgmp.ps	8Dz plz.ps	Mean number of species per relevé
Number of weeds per relevé	29	23	22	24	19	20	21	17	18	19	21	25	31	34	34	27	27	20	27	21	20	27	34	33	30	29	30	32	33	30	26	28	30
I. Ch. *Echnochloo-Setarietum*																																	
Echinochloa crus-galli	2	2	2	2	3	4	3	3	3	1	V 2875	1	1	4	3	3	2	1	2	2	2	V 2225	1	1	2	2	2	2	2	3	2	3	V 1900
Raphanus raphanistrum		+	+					1	1	1	III 170												+	+	1	1							II 120
II. D. with *Galinsoga parviflora*																																	
Galinsoga parviflora	+								+		I 10	3	4	1	2	1	2	3	2	3	3	V 2700	+										I 10
III. D. var with *Bidens tripartita*																																	
Bidens tripartita																							3	1	1	+	3	2	1	1	+	2	V 1320
Plantago intermedia													+	+	+							II 30	+		+	1	2	+	+	1	+	2	V 450
Polygonum hydropiper																							2	2		+	2	+	+	1		+	IV 615
Stachys palustris																	+					I 10		+	+	+	2	2			+	2	IV 565
Sagina procumbens																							+	1		1	1	+	+	+		+	IV 200
Juncus bufonius																							+		+	+		1		1	+	+	IV 150
Gnaphalium uliginosum													+		2							I 185		1			+	1	+	1		+	III 180
Potentilla anserina															+					+	+	I 30	+		+				1	1			II 120
Polygonym amphibium																							+	+		1			+				II 80
IV. Ch.D. *Panico-Setarion*																																	
Spergula arvensis	1	1	1	+				+	+		III 180									+	+	I 20	+	+	2	+	+	+				+	IV 235
Setaria viridis	+			+		+	+			+	III 50			+	+							I 20											
Rumex acetosella	+	+		+	+						II 40		+				+					I 20			2	2			+		2		II 535
Digitaria ischaemum	+					+				+	II 30							+				I 10	+	+		+				+	+		III 50
Setaria pumila	+					+	+			1	II 80	1	+	+	+			1				III 130	+	+	+	+	+	+	+		+	+	V 90
V. Ch. D. *Polygono-Chenopodion*																																	
Polygono-Chenopodietalia																																	
Veronica persica							+				I 10	+	+	+	+	1	+		1			IV 150											
Galinsoga ciliata					+		+				I 20	1	1	+	+		+					III 130											
Chenopodium album	+	1	1	1	1	+	+	2	2	2	V 755	+	1	+	+	+	1	1	+	2	+	V 385	1		+	+	3	3	+	+	+	3	V 1225
Stellaria media	+	+	+	+		+	+	1	1	1	V 210	+	+		+	+		+	+		3	IV 435	+	+	+		+	+	+	+		+	IV 80
Matricaria maritima subsp. inodora	+	+	+	1	+	1	+		1	+	V 210	1	1	1	+	2	+	+	2			IV 530	+		+	+			+	2	+		III 225
Capsella bursa-pastoris		+	+		+	+				+	III 50		+	+	2	+	+	+	+		+	IV 245					+		+	+			II 30
Sonchus arvensis							+				I	+	+	+	+		2				1	III 265	+									+	I 10
VII. Ch. *Stellarietea mediae*																																	

cd.Table 3

Anthemis arvensis	+	+	2		+	+		2	2	2	V	740	+	+	+			+			2	2	III	390	1	1	+	+	+	+			+	+	IV	160
Polygonum aviculare		+	+			+	+	+	+	1	IV	110			+	+	+		+	+	+	+	IV	70	1		+	1	1	1		+		1	IV	270
Myosotis arvensis	+	+	+		2	+	+		+	+	IV	235	+	1	+	+	1	2	+	1			IV	365					+	+	+	1		+	III	90
Fallopia convolvulus	+			+	+	+	+	+	+	+	IV	80			+	+	+	+	+	+			III	60	+	+		1			+	+			III	90
Viola arvensis	+	+	+	+			+	+	+		IV	70		+		+					+	+	II	40	+	+			+	+	+			+	III	60
Elymus repens	+	+	+			+			+		III	50		+	+		+			+	1		III	90								+			I	10
Centaurea cyanus	+	+	+	+				+			III	50										+	I	10												
Conyza canadensis	+			+				+		+	II	40								+		+	I	10	+									I	10
Lapsana communis						+	+		+		II	30			+	+							I	10	+									I	10
Galeopsis tetrahit		+	+					+	+		II	40									+	+	I	10	+	+								I	10
Anagallis arvensis													1		+		+	+		+		+	III	100							+	+			I	10
Vicia tetrasperma									+		I						+			+			I	10					+	+	+	+		+	III	50
VIII. *Companion species*																																				
Equisetum arvense	+	1		+	1			1		+	III	180	+					1	+				II	70	+	+		+	+	+				+	III	60
Leontodon autumnalis		+	+			+		+	+		III	50			+						+		I	10		+			+	+				+	II	40
Cirsium arvense				+			+		+		II	30	1	+		+	+			+	1		III	140		+	+	+	1	+	+	+	+	+	V	130
Ranunculus repens		+	+			+		+	+		II	50			+						+	+	II	30			+	+	+		+		+		III	50
Poa annua			+	+		+					II	30		+	+		+			+	+		III	50	+	+			1			+			II	80
Polygonum lapathifolium subsp. lapathifolium	+						+				I		1	1		+	+		+	+	+		IV	150	+	+		+	+	+	+	+		+	IV	80
Erodium cicutarium				+	+					+	II	30						+	+								+			+					I	20
Polygonum persicaria	+				+	+					II	30		+	+			+					II	30				+					+		I	20
Convolvulus arvensis	+				+					+	II	30		+				+	+				II	30				+	+						I	20
Erysimum cheiranthoides				+				1		1	II	110							1				I	50												
Cerastium holosteoides			1	+	+						II	70			+			+					I	20							+				I	10
Achillea millefolium		+	+	+			+				II	40		+		+							I	20												
Veronica arvensis				+			+				I	20		1		+	+		1	+	+		III	140		+			+	+	+	+		+	III	60
Taraxacum officinale					+		+				I	20	+	+		+	+	+		+			III	60	+	+			+	+		+		+	III	60
Trifolium repens	+										I	10	+	+			+			+			II	40	+	+			+	+		+		+	III	60
Plantago major		+				+					I	20	+		+		+			+			II	40						+	+	+			II	30
Artemisia vulgaris							+	+			I	20				+	+			+			II	30		+					+	+			II	30
Plantago lanceolata	+			+							I	20													+	+			+		+		+	+	III	60

Sporadic species: III – *Phragmites australis* 9(+), 13(+), 19(+), 20(+); *Mentha arvensis* 3(+); *Rorippa palustris* 14(+), 23(+), 29(+); *Rorippa amphibia* 3(1); *Rorippa sylvestris* 16(+), 7(+); *Bidens frondosa* 21(+); *Peplis portula* 21(+), 24(+); IV – *Scleranthus annuus* 6(+), 21(+), 22(+), 29(+); V – *Lamium purpureum* 5(+), 6(+), 13(+), 16(+), 27(+), 29(+); *Chenopodium polyspermum* 15(+), 18(+); *Veronica polita* 15(+), 18(+), 22(+); *Lamium amplexicaule* 16(+); *Euphorbia helioscopia* 24(+); *Veronica agrestis 25(+), 26(+),* 29(+); *Polygonum lapathifolium subsp. pallidum* 7(+), 14(+), 23(+), 24(+), 26(1), 30; *Atriplex patula* 13(+), 25(+), 28(+); *Solanum nigrum* 26(+); VII – *Oxalis dillenii* 6(+), 7(+), 13(+), 14(+), 17(+); 23(+), 24(+), 25(+), 29(+); *Geranium pusillum* 5(+), 9(+), 11(+), 12(+), 16(+), 22(+), 27(+); *Avena strigosa* 1(+), 6(+), 13(+), 25(+), 30; *Vicia hirsuta* 1(+), 4(+), 12(+), 28(1); *Apera spica-venti* 23(+), 24(+), 29(+); *Anthoxanthum aristatum* 1(+), 4(+); *Arnoseris minima* 4(+); *Vicia angustifolia* 2(+), 3(+), 22(+); *Aethusa cynapium* 7(+), 14(+), 27(+); *Vicia villosa* 1(+), 8(+), 24(+), 25(+); *Rumex crispus* 4(+), 22(+); *Anchusa arvensis* 16(+); *Vicia sativa* 11(+), 12(+); VIII – *Spergularia rubra* 7(+), 10(+), 11(+), 23(+), 24(+), 29(+); *Stellaria graminea* 2(+), 3(+), 13(+), 25(+), *26(+),* 30(+); *Melandrium album* 7(+), 14(+), 15(+), 18(+); *Glechoma hederacea* 6(+), 13(+), 15(+), 18(+), 28(+); *Daucus carota* 5(+), 16(+), 22(+), 25(+), 27(+); *Galium aparine* 7(+), 9(+), 14(+), 23(+), 30(+); *Gypsophila muralis* 2(+), 21(+), 25(+), 30(+); *Ranunculus flammula* 23(+), 24(+); *Gnaphalium sylvaticum* 23(+), 29(+); *Symphytum officinale* 25(+), 26(+); *Trifolium pratense* 5(+), 11(+), 16(+), 22(+); *Pimpinella saxifraga* 7(+), 14(+), 21(+), 22(+); *Hypochoeris glabra* 1(+); *Tanacetum vulgare* 1(+), 11(+)*; Malva neglecta* 10(+), 17(+); *Prunella vulgaris* 6(+), 13(+); *Euphorbia lucida* 7(+), 14(+); *Amaranthus retroflexus* 11(+); *Centaurea jacea* 12(+); *Sisymbrium officinale* 11(+), 12(+); *Torylis japonica* 15(+), 18(+); *Galeopsis pubescens* 19(+); *Hypericum perforatum* 5(+), 8(+); *Agrostis stolonifera* 19(+), 20(+); *Lysimachia nummularia* 13(+); *Jasione montana* 19(r); *Galeopsis ladanum* 19(+), 20(+); *Oxalis fontana* 11(2);

Comments: numbers after species names inform about the relevé number in the table

S – phytosociological constancy, D – coverage index

Table 4
Community with *Veronica agrestis*

Relevé no. in table	1	2	3	4	5	6	7	8	9	10	11	Mean number of species per relevé	
Relevé no. in field	303	288	304	289	300	280	305	291	281	290	334		
Date: month	8	8	8	9	8	8	9	9	9	8	8		
year	07.	05.	06.	05.	06.	07.	05.	03.	07.	04.	07.		
Locality	35	33	35	33	33	29	35	33	29	33	45		
Weed cover in %	100	100	100	95	80	100	60	80	80	100	95		
Soil unit	2Bwpgl:gs	8Bwpłz:pgl	2Bw pgm.gs	2Bwpłzgl	2Bw pgm.gs	8Dzpgm:gl	2Bwgl	8Dzpgm	2Fpli:pl	8Dzgl:gs	8Dzpgl:gl		
Number of weeds per relevé	35	35	34	30	35	30	31	30	30	30	33	32	
												S	D
I. Ch. *Polygono-Chenopodion Polygono-Chenopodietalia*													
Veronica agrestis	2	3	1	2	1	3	1	2	2	2	1	V	1825
Matricaria maritima subsp. *inodora*	2	+	3	+	+	2		+	+	2	2	V	1175
Sonchus arvensis	+	2	+	+	1		1	2		+	+	V	500
Chenopodium album	1	1	+		+	+		1	+	2	2	V	540
Chenopodium polyspermum	1	+	2	1		1	1	+	+	1	+	V	465
Euphorbia helioscopia	2		1		+	1		+	1	+		IV	355
Lamium purpureum	1	+	1		+		1	+		1	1	IV	280
Lamium amplexicaule		+	1	1	+	1		+		1		IV	230
Veronica polita	+			1	+	+	+	1	1		+	IV	200
Galinsoga parviflora	1	+		+	+		+			+	1	IV	150
Atriplex patula		+	1	+		+	+		+	+	+	IV	120
Veronica persica	+	+	+			1		+		+	+	IV	110
Echinochloa crus-galli	1		+			+	+		+	+	+	IV	110
II. D. *Hygrophilous species*													
Rorippa sylvestris	2	+	1	1	1	1	+	+	+		+	V	425
Mentha arvensis	1	1		+			1	+	1	2		IV	395
Potentilla anserina	2	2	1	1	1	+	1	1		+		IV	62
Stachys palustris		+		1		2		+	+			III	255
Sagina procumbens	1		1		+					+	+	III	130
Polygonym amphibium	2	2			+			1				II	410
III. Ch. *Stellarietea mediae*													
Anagallis arvensis	1	+	2	1	+	+	1			1	+	V	415
Elymus repens	+	2	2	2	1	+		1	1	3	1	V	1120

cd.Table 4

Stellaria media	+	3	2	+	+	1	1	1	1	+	+	V	800
Chaenorhinum minus	2		+	1	2			+	1		1	IV	520
Solanum nigrum	2	2	+	1	+		1			1	+	IV	530
Galinsoga ciliata		+		1		1		+	1		1	III	220
Myosotis arvensis	1	1	+	+	+	1				+	+	IV	200
Melandrium noctiflorum	1	+	+	1	+		1		+	+		IV	200
Viola arvensis		+	+	+			+	1	+	+	+	IV	120
Fallopia convolvulus		+	+			+	+	+		1	+	IV	110
Aethusa cynapium		1	1	1				+	+			III	170
Oxalis fontana			+		1	1	+		+			III	130
Vicia tetrasperma				+	+					+	+	II	40
Polygonum lapathifolium subsp. pallidum	+		+		+				+			II	40
Capsella bursa-pastoris	+	+						+				II	30
Polygonum aviculare				+				+		+		II	30
Geranium pusillum		+	+					+				II	30
IV. Companion species													
Taraxacum officinale	+		+			+	+	+	+	+		IV	70
Polygonum lapathifolium subsp. lapathifolium	1				+	+	+			+	+	III	100
Cirsium arvense	+			+	+	+			+		+	III	60
Veronica arvensis			+		+	+				+	+	III	50
Galium aparine	1				1	+			+			II	120
Equisetum arvense		+				+	+				+	II	40
Trifolium repens			+			+	+				+	II	40
Polygonum persicaria	+	+						+	+			II	40
Galeopsis bifida		+				+	+	+				II	40
Daucus carota					+			+		+		II	30
Plantago major			+		+	+						II	30
Gypsophila muralis				+			+				+	II	30
Poa annua	+					+	+					II	30

Sporadic species: I – *Setaria pumila* 1(+), 10(+); II – *Polygonum hydropiper* 5(+); III – *Vicia hirsuta* 1(+); *Conyza canadensis* 4(+), 7(+); *Centaurea cyanus* 4(+); 2(+), *Anthemis arvensis* 2(+), 11(+); *Anchusa arvensis* 2(+); *Apera spica-venti* 9(+); IV – *Erodium cicutarium* 2(+); *Leontodon autumnalis* 11(+); *Rorippa palustris* 9(10); *Veronica serpyllifolia* 5(+); *Convolvulus arvensis* 2(+), 9(+); *Achillea millefolium* 2(+), 5(+); *Cerastium holosteoides* 2(+), 5(+); *Ranunculus flammula* 9(+); *Galeopsis tetrahit* 7(+); *Galeopsis pubescens* 6(+); *Avena strigosa* 5(+); *Symphytum officinale* 3(+), 10(+); *Spergularia rubra* 9(+); *Stellaria graminea* 10(+), 11(+); *Ranunculus repens* 5(+), 9(+); *Melandrium album* 5(+); *Trifolium pratense* 3(+), 8(+); *Lapsana communis* 7(+); *Rumex obtusifolius* 7(+); *Rumex acetosa* 7(+); *Pimpinella saxifraga* 7(+); *Erysimum cheiranthoides* 4(+); *Sisymbrium officinale* 1(+), 3(+);
Comments: numbers after species names inform about the relevé number in the table
S – phytosociological constancy, D – coverage index

Table 5

Centunculo-Anthoceretum punctati (Koch 1926) Moor 1936

Variant	with *Hypericum humifusum*									typical								with *Centaurium pulchellum*							
Relevé no. in table	1	2	3	4	5	6	7	Mean number of species per relevé		9	10	11	12	13	14	Mean numbers of species relevé		15	16	17	18	19	20	21	Mean number of species per relevé
Relevé no. in field	272	238	269	161	235	308	239			325	227	234	242	283	273			275	228	276	266	245	328	244	
Date: month	8	8	8	9	7	8	9			9	9	8	8	8	9			9	9	9	9	9	9	8	
year	07.	07.	07.	06.	04.	05.	06.			05.	05.	06.	07.	06.	04.			05.	07.	06.	04.	07.	06.	04.	
Locality	24	5	22	17	4	36	5			41	26	4	7	31	24			25	26	25	20	8	42	8	
Weed cover in %	75	80	60	60	90	75	80			95	90	100	100	100	70			75	70	60	100	70	85	85	
Soil unit	6 M ps.pl	6 M ps.gl	6 A pgl.ps	9 M ps.pl	9Fplz.psp	9 M ps.pl	6 A pgl.ps			8Dzplz:pl	8Dzpgm:gl	8Fplz:psp	8Fpli:ps	8Dzpgm	2Fpli:pl			8Dzplz:pl	8Dzpgm:gl	2Bwpgm	8Fplz:psp	2bwplzgl	8Dzpgm	2Dzpgmp. gs	
Number of weeds per relevé	33	31	29	32	32	29	29	31	32	31	35	31	34	34	34	33		38	33	33	34	35	33	31	34
								S								S									S
I. CH. D. *Isoëto Nanojuncetea*																									
Radiolion linoidis																									
Centunculus minimus	+	+	+	+	+	r	+	V	1	1	1	1	1	1	1	V		1	+	+	+	+	+	+	V
Hypericum humifusum	2	1	3	2	1	3	2	V				+	+		+		III				+		+		II
Plantago intermedia	+		+	1	1		+	IV	1	1	2	3				+	IV		+	1		+		1	III
Peplis portula	+		+	+				III	+	2	+	1	2	3			V	+	+				2	1	III
Juncus bufonius		1	+			+		III	1	1		1		1	+	IV		1	+	2	1	1		2	V
Gnaphalium uliginosum	+			+		+		III				+		+		II		+			3	1	2	1	IV
Sagina procumbens	1	2	+		2			III			+	+	1		1	III		1	+	+		+		+	IV
Radiola linoides			+		+			II	+	+	1	+	1	+	+	V				+				+	II
Juncus capitatus			+		1			II	1	+	+	1	1			IV		+	1		r			+	III
Anthoceros punctatus			+	+				II		+	1		+			III			+						I
Gypsophila muralis		+		+	+	+	+	IV																	
Gnaphalium luteo-album		+		+		+	1	III																	
Centaurium pulchellum																		1	2	1	1	1	1	2	V
II. D. Hygrophilous species																									
Polygonum hydropiper	1	2	+	+	+	1	1	V	2	1	2	+	1	1	1	V		+			1	1		1	III
Veronica serpyllifolia			1	1	+	1	1	IV	1					+		II			+	+		+		+	III
Lysimachia nummularia		+	+		2	1	1	IV						+	1	II			+			+			II
Bidens tripartita		+	+		1			III	2	2	+	1			+	IV		+	+			+	+		III
Polygonym amphibium	1	+			1		1	III	1	+	+	2				III		1	+		+		+	+	IV
Stachys palustris			+			+		II	+	+		1	+	2	+	V				+		+			II
Rorippa sylvestris	+							I	+			+	+	1		IV				+	+		+	+	III
Mentha arvensis				+				I	+	1			+	+	+	IV		+	2	+	+	1	+		V
Ranunculus repens			+		+			II							+	I			+	+		+	+	+	IV
III. Ch. *Polygono-Chenopodion*																									
Polygono-Chenopodietalia																									
Geranium pusillum	+	+				+	+	III																	
Chenopodium album			+		+	+		III	1	1		1	1		+	IV				+				+	II
Capsella bursa-pastoris	+		+				+	III					+	+		II		+		+				+	III
Matricaria maritima subsp. inodora			+		+			II	1	2	2	+	+	1	+	V		+	+	+		1	+	1	V
Lamium purpureum		+			1			II	+	+			+	1	+	IV			+		+	+			III
Chenopodium polyspermum					+			I	+	+			1		2	III				+		+	1		III
Sonchus arvensis	+			+				I	1	+	+	+	2			IV				+					I
Galinsoga parviflora					+			I	1	1	1		+			III		1			1		1		III

cd.Table 5

Fumaria officinalis									+	+		+			+	III	1	+		2	+	1		IV
Veronica agrestis											+	+			+	III	+			+	1	+		III
Veronica persica										1	+	1	+			III			+	+	1		+	III
Euphorbia helioscopia									+			1		1		III					+	+		II
Lamium amplexicaule									1	1	+		+			III	+		+	1	+			III
Veronica polita										+		+				II	+	+						II
IV. Ch. *Stellarietea mediae*																								
Digitaria ischaemum	1	1	+	+	+	1	1	V																
Anthemis arvensis		+	+	+	1	+	1	V																
Spergla arvensis	1	1	1	+	+	1	+	V																
Rumex acetosella	+	+			+	1	1	IV																
Scleranthus annuus	+	+			+	+	+	IV																
Oxalis dillenii		1				+	+	III							+	I								
Viola arvensis		+		+	+	+	1	IV			+	+				II	+	+		+		+		III
Fallopia convolvulus		+				+	+	III			+		+	+		III	+							I
Stellaria media	+	+		+				III	1	2	2	2		+		IV	+	+	+		1		+	IV
Polygonum aviculare	1	1	+	1	+		1	V		+					1	II				+		+	+	III
Elymus repens	+		+	1		+	1	IV		+		2	1		1	III		1	+					II
Myosotis arvensis				+		+		II	1		+		2	+	+	IV	+	+		+		+	+	IV
Melandrium noctiflorum									+	+		+	1	+		IV	+		1		1	+	+	IV
Chaenorhinum minus									+		+				1	III	1	+		+	+	+	+	V
Solanum nigrum											1	1			+	III	1				+			II
Anagallis arvensis									+	+			+		+	III			+	1	+	+		III
Galinsoga ciliata									+	+						II		+	+			+		III
Aethusa cynapium													+			I		+	+		+	+	+	IV
Consolida regalis														+			+			+	+			III
Lathyrus tuberosus																	+			+	+			III
Kickxia elatine																			+	+				II
V. Companion species																								
Equisetum arvense	+	+			1	+		III		+	+					II	+			+		+		III
Trifolium repens	+	+		+			+	III			+					II			+	+		+	+	III
Veronica arvensis	+			+		+		III						+		I	+						+	II
Poa annua	+	+						II			+			+		II	+						+	II
Cirsium arvense	+							I						+	+	II	+					+		II
Glechoma hederacea							+	I	+	+		1	+	1	+	V								
Melandrium album														+		I	+		+	1	+	+		IV
Erysimum cheiranthoides													+			I		+		+		+		III

Sporadic species: I – *Ricia sp.* 1(+), 5(+); 9(+), 14(+), 16(+); II – *Rorippa amphibia* 4(+), 14(+), 15(+); *Phragmites australis* 1(+), 5(+), 7(1), 18(+); *Bidens frondosa* 1(+), 2(+), 8(+), 11(+), 17(+), 21(+); *Rorippa austriaca* 2(+), 3(+), 18(+), 20(+); *Rorippa palustris* 3(+), 14(+), 17(+), 21(+); *Potentilla anserina* 5(+), 7(+), 8(+),16(+), 19(+); *Spergularia rubra* 1(+), 3(+), 15(+), 17(+), 19(+); III – *Rumex crispus* 13(+); *Atriplex patula* 14(+), 20(+); *Conyza canadensis* 7 10(+), 13(+), 21(+); *Vicia angustifolia* 7(+), 15(+), 19(+); *Vicia hirsuta* 1(+), 13(+), 15(+), 17(+); *Centaurea cyanus* 13(+), 15(+); *Polygonum lapathifolium subsp. pallidum* 2(+), 3(+), 14(+), 17(+), 18(+); *Apera spica-venti* 16(+), 18(+), 19(+); *Galeopsis tetrahit* 5(+), 10(+), 16(+), 19(+); *Anchusa arvensis* 12(+), 17(+), 20(+); *Lapsana communis* 2(+), 10(+),*Agrostemma githago* 14(+); *Vicia tetrasperma* 11(+); *Alectorolophus glaber* 16(+); *Polygonum lapathifolium subsp. lapathifolium* 2(+), 4(+); 10(+); *Polygonum persicaria* 12(+), 14(+); 5(+), *Convolvulus arvensis* 1(+), 14(+); *Galeopsis bifida* 2(+), 4(+), 13(+); *Taraxacum officinale* 1(+), 2(+), 10(+), 12(+); *Oxalis fontana* 1(+), 2(+), 10(+); *Epilobium roseum* 17(+), 21(+); *Lysimachia vulgaris* 5(r), 16(+), 19(+); *Stellaria graminea* 18(+); *Cerastium holosteoides* 13(+), 15(+); *Achillea millefolium* 1(+), 7(+), 13(+), 15(+); *Leontodon autumnalis* 3(+), 16(+), 18(+), 20(+); *Agrostis stolonifera* 5(+), 14(+); *Symphytum officinale* 3(+), 4(+); *Daucus carota* 11(+), 12(+); *Galium aparine* 3(+), 21(+); *Malva neglecta* 13(+); *Malva alcea* 12(r); *Hypochoeris radicata* 12(+); *Prunella vulgaris* 4(+); *Rumex obtusifolius* 4(+), 10(+); *Amaranthus retroflexus* 4(+); *Trifolium pratense* 12(+); *Plantago lanceolata* 10(+); *Erodium cicutarium* 7(+), 12(+); *Medicago lupulina* 17(+)

Comments: numbers after species names inform about the relevé number in the table. S – phytosociological constancy

Chenopodium polyspermum, Chenopodium album, Euphorbia helioscopia, Veronica persica, Lamium purpureum, Lamium amplexicaule. Moreover, some species of higher syntaxonomic units were frequently noted, e.g.: *Stellaria media, Elymus repens, Anagallis arvensis, Chaenorchinum minus, Solanum nigrum, Melandrium noctiflorum, Galinsoga ciliata.* In the floristic composition, a high percentage of hygrophilous species was also observed, e.g.: *Rorippa sylvestris, Mentha arvensis, Potentilla anserina, Stachys palustris,* while locally *Polygonum amphibium* and *Sagina procumbens.* The phytocoenoses developing on rich soils of good wheat and strong cereal-fodder complex had optimal growth conditions. They were observed in the vicinity of Regut village (Polana Ponurzycka) and in Osieck. This phytocoenosis was represented by 11 vegetation patches. It is one of the floristically richest stubble field communiies in the studied area. In total, 80 species were noted in it, on average 32 in one relevé.

Centunculo-Anthoceretum punctati (Koch 1926) Moor 1936

In cereal stubble fields of the Mazowiecki Landscape Park and its buffer zone, patches of the association dominated by small therophytes and few mosses were rarely noted (Table 5). They were mainly recorded in local depressions and furrows. These small-area phytocoenoses developed in various habitat conditions that resulted in their floristic diversity and, as a consequence, in the division into lower syntaxa (variants). Patches of the variant with *Hypericum humifusum* were distinguishable by a low cover of *Centunculus minimus* – the species characteristic of this association and – the mass occurrence of *Hypericum humifusum* (differential species). A high proportion of acidophilus species was also observed, e.g. *Spergula arvensis, Rumex acetosella, Digitaria ischaemum, Scleranthus annuus,* and *Anthemis arvensis*. The community was noted on soils developed from muck sands classified as weak rye and weak cereal-fodder complexes.

Patches of the typical variant were noted in stubble fields on compact soils included in the strong cereal-fodder complex. They were characterized by the largest cover of *Centunculus minimus* and the numerous occurrence of the species characteristic for higher syntaxonomic units: *Radiola linoides, Peplis portula, Plantago intermedia, Juncus bufonius, Juncus capitatus* and *Sagina procumbens*. Moreover, their physiognomy was highly affected by strongly expanding, deep-root, hygrophilous species, e.g. *Polygonum hydropiper, Bidens tripartita, Polygonum amphibium, Stachys palustris, Veronica serpyllifolia,* as well as by nitrophilous species, e.g. *Matricaria maritima subsp. inodora, Chenopodium album, Chenopodium polyspermum, Lamium purpureum,Euphorbia helioscopia, Solanum nigrum, Fumaria officinalis*. Patches with the mass occurrence of *Centaurium pulchellum* were observed in similar habitats, differing in a higher concentration of $CaCO_3$. Apart from the numerous occurrence of nitrophilous weeds, they were marked by the highest cover of moderately calciphilous taxa, e.g.: *Consolida regalis, Aethusa cynapium, Melandrium album*, *Chaenorhinum minus,* as well as the occurrence of *Lathyrus tuberosus* and *Kickxia elatine* – species not recorded in other stubble field phytocoenoses under investigation.

Centunculo-Anthoceretum punctati was floristically the richest association from among the identified syntaxa, comprising 114 species. The average number of species varied from 31 in the variant with *Hypericum humifusum* to 34 in the variant with *Centaurium pulchellum.*

DISCUSSION

Cereal stubble fields situated in the agricultural areas of the Mazowiecki Landscape Park and its buffer zone are frequently left unploughed. Floristically rich communities developing there reflect different trophic and moist habitat conditions. Data on high floristic biodiversity of stubble field communities have been reported from many regions of Poland and from abroad (Jędruszczak, 1990; Pawłowski and Jędruszczak, 1986; Wnuk, 1988; Pawłowski et al. 1994; Trąba, 1991, 1993; Warcholińska, 1994; Skrajna and Skrzyczyńska, 2002; Rzymowska and Skrzyczyńska, 2006a,b; Dierschke, 2010). Extensive agriculture and diversified habitat conditions in the studied area have resulted in great internal differentiation of the developing communities. The floristically richest patches of the *Centunculo-Anthoceretum punctati* association, rarely recorded in this region and considered to be in danger of extinction in Poland (Ćwikliński, 1982; Głowacki et al. 2003; Trąba, 1993; Warcholińska, 1988; Skrajna, 2006), were seldom observed within the Park area. Phytocoenoses of another floristically rich community with *Veronica agrestis* were also only sporadically noted in the studied stubble fields. The occasional occurrence of these phytocoenoses results from a low proportion of fertile soils in the study area. In their floristic composition, these plots resemble the phytocoenoses classified as the communities with *Veronica persica*, frequently occurring in stubble fields of the Lublin region (Jędruszczak et al. 1989), southeastern Poland (Trąba, 1991; Trąba, 1993), the western part of the Siedlce region (Skrzyczyńska and Rzymowska, 1997), the Kałuszyńska Upland (Skrajna and Skrzyczyńska, 2005), as well

as the Podlaski Przełom Bugu mesoregion (Rzymowska and Skrzyczyńska, 2006b). Patches of the community with *Setaria pumila*, the form with *Aphanes arvensis*, were also rarely noted. They were distinguishable by the mass occurrence of *Aphanes arvensis*, the species found outside its geographical range. On the other hand, the typical form of the community with *Setaria pumila* was frequently noted in the studied area. This community is considered to be common and species diversified in stubble fields in other regions of Poland (Pawłowski and Trąba, 1987; Trąba, 1991, 1993; Jędruszczak et al. 1990; Skrajna and Skrzyczyńska, 2002; Rzymowska and Skrzyczyńska, 2006b). *Echinochloo-Setarietum* is considered the most common and, floristically, most diversified weed community of root crops in Poland and abroad. In the studied area, this association was also frequently noted in stubble fields on fertile soils, whereas in the poorest habitats the *Digitarietum ischaemi* association was predominant (Wnuk, 1988; Jędruszczak et al., 1989; Anioł-Kwiatkowska, 1990; Jędruszczak, 1990b; Pawłowski et al. 1991; Trąba, 1993; Warcholińska, 1994; Skrzyczyńska and Rzymowska, 1997; Mochnacky, 2000; Skrajna and Skrzyczyńska, 2002; Skrajna and Skrzyczyńska, 2005; Rzymowska and Skrzyczyńska, 2006, 2006a; Pinke and Pal, 2008). The frequent occurrence of the floristically poorest variant of the association with *Anthoxanthum aristatum* within the Park area is also noteworthy. The mass occurrence of *Anthoxanthum aristatum* in the patches affects the floristic composition of the phytocoenoses, which results in significant degeneration of the community. A similar process was previously observed in the patches of *Arnoserido-Scleranthetum*, var. with *Anthoxanthum aristatum*, in cereal crops (Skrajna et al., 2009). Information on the impoverishment of communities due to the intensive occurrence of *Anthoxanthum aristatum* was also reported by Warcholińska (1994) from Piotrków Plateau.

CONCLUSIONS

1. Three plant associations classified into lower syntaxonomic units (variants): *Digitarietum ischaemi, Echinochloo-Setarietum, Centunculo-Anthoceretum punctati,* and two communities with *Setaria pumila* and with *Veronica agrestis.* were identified in the unploughed stubble fields of the Mazowiecki Landscape Park.
2. Well-developed patches of the association *Centunculo-Anthoceretum punctati* and the community with Veronica agrestis were seldom noted in the studied stubble fields.
3. The associations *Echinochloo-Setarietum* on fertile soils and *Digitarietum ischaemi* in poor habitats were commonly observed.
4. Patches of the community *Setaria pumila* with *Aphanes arvensis* were sporadically noted in the south-eastern part of the Park.

REFERENCES

Anioł-Kwiatkowska J., 1990. Zbiorowiska segetalne Wału Trzebnickiego. Florystyczno-ekologiczne studium porównawcze. / Segetal comunities of the Trzebnica Moralne Belt. A floristic and ecological comparative study. Wyd. Univ. Wrocław. Prace Bot.: 46-230 (in Polish).

Ćwikliński E., 1982. Zespoły ścierniskowe Mińskiego Obszaru Chronionego Krajobrazu w województwie siedleckim. / Stubble-field communities in the Mińsk Protected Landscape Area in Siedlce Voivodship. Zesz. Nauk. WSR-P w Siedlcach, Rolnictwo, (1): 275-288 (in Polish).

Dierschke H., 2010. Über 80 Jahre wissenschaftliche Begleitung phlanzensoziologischer Feldforchung in Mitteleuropa-Übersicht der in den Mitteilungen und in Tuexenia publizierten Vegetationsaufnahmen (1928-2009). Texenia, 30: 319-348.

Głowacki Z., Falkowski M., Krechowski J., Marciniuk J., Marciniuk P., Nowicka-Falkowska K., Wierzba M., 2003. Czerwona lista roślin naczyniowych Niziny Południowopodlaskiej. / The red list of vascular plants of South Podlasie Lowland. Chrońmy Przyrodę Ojczystą 59 (2): 5-41 (in Polish).

Jędruszczak M. Pawłowski F., Wójcik Z., 1989. Zbiorowiska roślinne ściernisk Lubelszczyzny. Cz. I. Zbiorowiska siedlisk ubogich. / Plant communities of stubble fields in the Lublin Region. P. I. Plant communities of poor sites. Acta Agrobot. 42 (1, 2): 207-228 (in Polish).

Jędruszczak M., 1990. Zbiorowiska roślinne Lubelszczyzny. Cz. III. Zbiorowiska siedlisk bogatych i wilgotnych. / Plant communities of stubble fields in the Lublin Region, P. III. Plant communities of rich and humid sites. Acta. Agrobot. 43 (1, 2): 155-172.

Jędruszczak M., 1997. Reprodukcja generatywna chwastów na ścierniskach po jęczmieniu jarym. / Generative reproduction of weeds in stubble fields after spring barley. Mat. XXI Kraj. Konf. „Zachwaszczenie wtórne roślin okopowych i ściernisk". IUNG Puławy: 135-144 (in Polish).

Matuszkiewicz W., 2001. Przewodnik do oznaczania zbiorowisk roślinnych Polski. Państwowe Wydawnictwo Naukowe, Warszawa (in Polish).

Mirek Z., Piękoś-Mirkowa H., Zając M., 2002. Flowering plants and peridophytes of Poland. A checklist. Kraków: 1-442.

Mochnacky S., 2000. Syntaxonomy of segetal communities of Slovakia. Thaiszia 9: 149-204.

Pawłowski B., 1972. Skład i budowa zbiorowisk roślinnych oraz metody ich badania. [In:] Szata roślinna Polski. Państwowe Wydawnictwo Naukowe, 1: 237-268.

Pawłowski F., Kapeluszy J., Kolasa A., Lecyk Z., 1970. Płodność chwastów na ścierniskach w woj. Lubelskim. / Fertility of weeds in stubble fields of the Lublin Province. Ann. UMCS, E, XXV(4): 49-59 (in Polish).

Pawłowski F., Trąba Cz., Wójcik, 1991. Zbiorowiska roślinne ściernisk na nizinnych kompleksach glebowo-rolniczych południowo-wschodniej Polski. Cz. I. Zbiorowiska związku *Panico-Setarion*. / Stubble-field plant communities in lowland agricultural soil complexes in South-Eastern Poland. P. I. Plant communities of the Panico-Setarion alliance. Acta Agrobot. 44 (1-2): 87-111 (in Polish).

Pawłowski F., Jędruszczak M., Bojarczyk M., Majda J., 1994. Chwasty ściernisk zbożowych na różnych glebach Kielecczyzny. Cz I. Gleby bielicowe i brunatne wytworzone z piasków i glin. / Weeds of cereal stubble fields on various soils in the Kielce region. P. I. Podzolic and brown soils developed from sands and loams. Acta Agrobot. 47 (2): 13-26 (in Polish).

Pawłowski F., Jedruszczak M., 1986. Zachwaszczenie ściernisk zbożowych Lubelszczyzny. / Weed infestation of cereal stubble fields in the Lublin region. Acta Agrobot. 39 (1): 143-164 (in Polish).

Pawłowski F., Trąba Cz., 1987. Zachwaszczenie ściernisk zbożowych na niektórych glebach w południowowschodniej Polsce. Cz. I. Gleby terenów nizinnych. / Weed infestation of cereal stubble fields on selected soil types in south-eastern Poland. Part I. Soils of lowland regions. Ann. UMCS, E, XLII (9): 83-98 (in Polish).

Pinke G., Pal R., 2008. Phytosociological and conservational study of the arable weed communities in western Hungary. Plant Biosystems, 142 (3): 491-508.

Rzymowska Z., Skrzyczyńska J., 2006 a. Zbiorowiska roślinne pól uprawnych Podlaskiego Przełomu Bugu. Cz. III. Zbiorowiska ścierniskowe gleb piaszczystych. / Plant communities of cultivated fields of the Podlaski Przełom Bugu mesoregion. Part.3 Stubble-field communities on sandy soils. Acta Agrobot. 59 (2): 393-419 (in Polish).

Rzymowska Z., Skrzyczyńska J., 2006 b. Zbiorowiska roślinne pól uprawnych Podlaskiego Przełomu Bugu. Cz. IV. Zbiorowiska ścierniskowe gleb zwięzłych. / Plant communities of cultivated fields of the Podlaski Przełom Bugu mesoregion. Part.4 Stubble-field communities on compact soils. Acta Agrobot. 59 (2): 421-440 (in Polish).

Skrajna T., Skrzyczyńska J., 2002: Roślinność ściernisk gminy Grębków. / The vegetation of stubble fields of the Grębków commune. Zesz. Nauk. AP, Siedlce, ser: Rolnictwo, 61: 5-14 (in Polish).

Skrajna T., Skrzyczyńska J., 2003. Chwasty ściernisk Wysoczyzny Kałuszyńskiej. / Weeds of stubble fields of the Kałuszyńska Upland. Zesz. Nauk AP Siedlce, ser Rolnictwo, 63: 59-69 (in Polish).

Skrajna T., 2006. Zbiorowiska roślinne agrocenoz gminy Korytnica (województwo mazowieckie). Cz. II. Zbiorowiska i zespoły ściernisk. / Plant communities in agrocenoses of Korytnica commune (Mazovian voivodeship). Part. II Stubble-field communities and associations. Zesz. Nauk AP, Siedlce, ser. Rolnictwo 74-75: 75-86 (in Polish).

Skrajna T,, Skrzyczyńska J., Ługowska M., 2009. Segetal communities of cereal crops of the Mazowiecki Landscape Park. Acta Agrobot. 62 (1): 171-186.

Skrzyczyńska J,, Rzymowska Z., 1997. Zbiorowiska roślinne w zachodniej części woj. siedleckiego. [In:] Zachwaszczenie wtórne roślin okopowych i ściernisk. Materiały Krajowej Konferencji IUNG, Wrocław, Wydawnictwo IUNG Puławy: 153-161 (in Polish).

Trąba Cz., 1991. Zbiorowiska roślinne ściernisk w południowo-wschodniej Polsce. Cz. IV. Zbiorowiska ze związku Nanocyperion flavescentis. / Stubble-field plant communities in south-eastern Poland. P. I. Plant communities of the *Nanocyperion flavescentis alliance*. Acta. Agrobot., 44 (1, 2): 171-193 (in Polish).

Trąba Cz., 1993. Zbiorowiska roślinne ściernisk w południowo-wschodniej Polsce. Cz. V. Charakterystyka porównawcza zbiorowisk ścierniskowych. / Stubble-field plant communities in south-eastern Poland. Part V. The comparative characteristics of stubble-field plant communities. Acta. Agrobot. 46 (1): 99-127 (in Polish).

Trąba Cz., Ziemińska M., 1994. Nie podorane ścierniska źródłem zachwaszczenia pól uprawnych. / Unploughed stubbles as a source of weed infestation of cultivated fields. Mat. XVII Kraj. Konf. „Przyczyny i źródła zachwaszczenia pól uprawnych", Wyd. ART Olsztyn-Bęsia: 101:108 (in Polish).

Warcholińska A. U., 1988. Roślinność segetalna terenów rolniczych Puszczy Bolimowskiej i jej współczesne przemiany. / Segetal vegetation of agricultural areas of Bolimów Primeval Forest and its contemporary transformations. Acta. Agrobot. 41 (2): 369-452 (in Polish).

Warcholińska A. U., 1994. Zmiany roślinności segetalnej Równiny Piotrkowskiej w ostatnich 22 latach. Cz. III. Zbiorowiska chwastów ściernisk. / Changes in segetal vegetation of the Piotrków Plain during the last 22 years. Part III. Weed communities of stubble fields. Acta. Agrobot. 47 (1): 55-65 (in Polish).

Wnuk Z., 1988. Zbiorowiska segetalne Wyżyny Częstochowskiej na tle zbiorowisk segetalnych Polski. / Segetal communities of the Częstochowa Upland against the background of segetal communities in Poland. Zesz. Nauk. Akademii Rol. im. H. Kołłątaja w Krakowie, rozp. nr 125: 1-33 (in Polish).

Zbiorowiska roślinne ściernisk Mazowieckiego Parku Krajobrazowego

Streszczenie

W pracy przedstawiono charakterystykę zbiorowisk wykształcających się na niezaoranych ściniskach Mazowieckiego Parku Krajobrazowego i w jego rolniczej otulinie. Najczęściej notowanym i zróżnicowanym florystycznie był zespół *Echinochloo-Setarietum*, w którym wyróżniono wariant typowy, wariant z *Galinsoga parviflora* i wariant z *Bidens tripartita*. Częstymi fitocenozami badanego terenu były również płaty *Digitarietum ischaemi* porastające ścierniska na najuboższych siedliskach. Rzadko i na niewielkich powierzchniach, na glebach żyznych spotykano bogate florystycznie płaty zbiorowiska z *Veronica agrestis*. Gleby okresowo nadmiernie uwilgotnione porastały rzadko spotykane i najbogatsze gatunkowo fitocenozy *Centunculo-Anthoceretum punctati*. Jedynie w południowo-wschodniej części Parku występowały pojedyncze płaty zbiorowiska z *Setaria pumila* postać z *Aphanes arvensis*.