

STUBBLE FIELD PLANT COMMUNITIES OF THE MAZOWIECKI LANDSCAPE PARK

Teresa Skrajna, Maria Ługowska

The Agricultural Ecology Department of the University of Podlasie in Siedlce,
B. Prusa 14, 08-110 Siedlce, Poland, e-mail: ekorol@ap.siedlce.pl

Received: 15.08.2010

Abstract

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 tripartita*, 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-Anthozeretum 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 agrophytoenoses, 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 (Trąba, 1993; Skrajna and Skrzyczyńska, 2002; Rzymowska and Skrzyczyńska, 2006a,b). Favourable development conditions, which predominate in stubble fields, stimulate the growth of weeds that flower and fruit abundantly, enriching soil-seed reserves (Pawłowski et al. 1970; Trąba and Ziemińska, 1994; Jędruszcak, 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 (Skrajna 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 Braun-Blanquet method (Pawłowski, 1972). Systematics and nomenclature of plant associations are based on Matuszkiewicz (2001). Species nomenclature follows Mirek 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 *Centaureum 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: Kały, 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*,

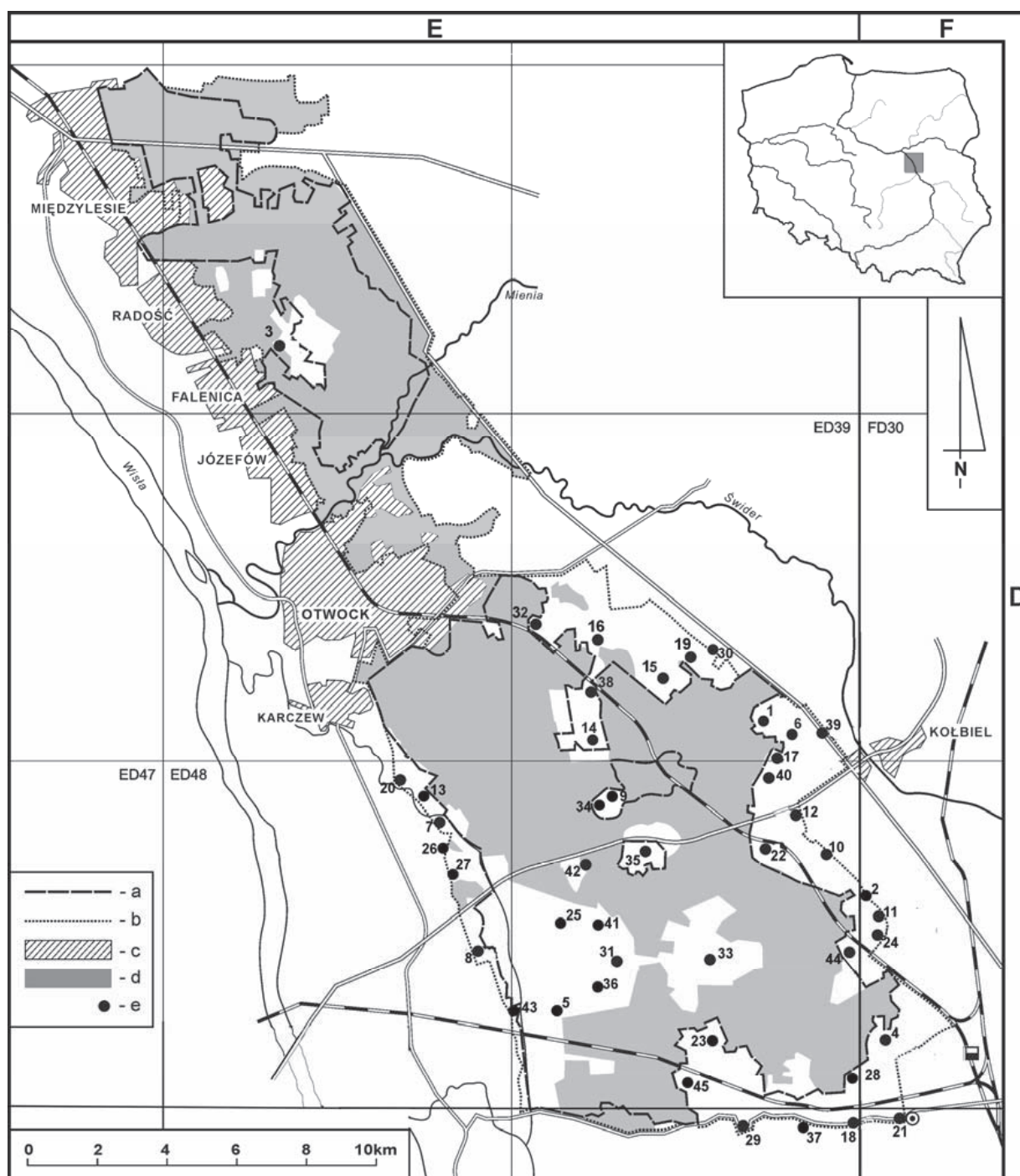


Fig. 1. Investigated area

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

1 – Anielinek, 2 – Antoninek, 3 – Aleksandrówka, 4 – Augustówka, 5 – Bąki, 6 – Bocian, 7 – Brzezinka, 8 – Całowanie, 9 – Celestynów, 10 – Chrosna, 11 – Chrzęszczówka, 12 – Człekówka, 13 – Dąbrowa, 14 – Dąbrówka, 15 – Dyżin, 16 – Glina, 17 – Gózd, 18 – Grabianka, 19 – Jatne, 20 – Janów, 21 – Jażwiny, 22 – Karpiska, 23 – Kąciki, 24 – Kąty, 25 – Kominki, 26 – Kozłówka, 27 – Łukowiec, 28 – Ocznia, 29 – Osieck, 30 – Ostrowik, 31 – Podbiel, 32 – Pogorzal, 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
Digitaria ischaemi R. Tx. et Prsg (1942) 1950

Variant	typical										with <i>Anthoxanthum aristatum</i>										with <i>Polygonum hydropiper</i>															
	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 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	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	9 Bw pgl	9 M pgl:gl	9 Bw pgl:gl	9 Bw pgl:gl	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				
												S	D										S	D								S	D			
I. Ch. <i>Digitaria ischaemi</i>																																				
<i>Digitaria ischaemum</i>	3	4	3	3	2	2	2	3	3	1	V	3	3	3	2	2	1	4	1	1	1	V	2	4	2	2	1	1	1	V	2	0	50			
II. Ch.D. <i>Panico-Setarion</i>																																				
<i>Rumex acetosella</i>	2	2	1	2	3	1	1	+	+	3	V	2	4	4	+	+	2	1	2	2	IV	6	15	1	+	1	2	1	+	+	IV	3	5			
<i>Sceleranthus annuus</i>	+	+	+	1	1	+	+	+	1	V	2	10	+	+	1	+	+	1	+	+	V	2	10	+	+	+	+	+	+	+	II	4	0			
<i>Spergula arvensis</i>	+	+	+	+	+	+	+	+	+	+	III	4	+	+	+	+	+	+	+	+	III	5	0	+	+	+	+	+	+	+	V	5	4			
<i>Setaria viridis</i>	+	+	+	+	+	1	+	+	+	III	1	0	+	+	+	+	+	+	+	+	I	1	0	+	+	+	+	+	+	I	1	5	0			
<i>Setaria pumila</i>	1	+	+	+	+	+	+	+	+	II	7	+	+	+	+	+	+	+	+	+	II	4	+	+	+	+	+	+	+	II	3	0				
<i>Raphanus raphanistrum</i>										r	I	1	0	+	+	+	+	+	+	+	II	4	+	+	+	+	+	+	+	III	4	0				
III. D. var with <i>Polygonum hydropiper</i>																																				
<i>Polygonum hydropiper</i>										+	+									I	2	0	1	1	+	1	1	3	2	2	1	V	1	3	7	0
<i>Bidens tripartita</i>																					+	1	1	2	1	+	+	1	+	+	V	4	1	5		
<i>Gnaphalium uliginosum</i>																					+	+	+	+	+	+	+	+	+	+	III	6	0			
<i>Plantago intermedia</i>																					+	+	+	+	+	+	+	+	+	+	III	6	0			
<i>Rorippa sylvestris</i>																					+	+	+	+	+	+	+	+	+	+	III	5	0			
<i>Rorippa austriaca</i>																					+	+	+	+	+	+	+	+	+	+	III	5	0			

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

Variant	typical										with <i>Galinsoga parviflora</i>										with <i>Bidens tripartita</i>																			
	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	31	32	33	34	35	36	37	38	39	40
Relevé no. in table	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	7	7	8	8	7	9	8	8	9	9
Date: month	9	8	8	8	9	9	9	8	8	7	7	7	8	9	9	7	8	8	9	8	03.	05.	06.	07.	05.	06.	07.	05.	06.	07.	07.	07.	07.	07.	07.	07.	07.	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	95	75	70	70	100	100	50	95	70	100
Weed cover in %	40	45	70	50	80	85	70	85	85	80	4Bw pgn:ps	2 Bw gl	4Dz pgl:ps	4Bw pgn:ps	4Bw pgl:ps	4Bw pgl:ps	4Bw pgl:ps	4Bw pgl:ps	4Bw pgl:ps	4Bw pgl:ps	4Dpz:ps	4Dpz:ps	4Fpz:ps	8Dz pgn:ps	5 Bw pgl:gl	8Dz pgn:ps	5 Bw pgl:gl	8Dz pgn:ps	5 Bw pgl:gl	9 Bw pgl:pl	8Dz pgn:ps	5 Bw pgl:gl	8Dz pgn:ps	5 Bw pgl:gl	8Dz pgn:ps	8Dz pgl:ps	8Dz pgn:ps	8Dz pgl:ps	8Dz pgl:ps	
Soil unit	4Bw pgl:gl	5Bw pgl:gl	5Bw pgl:gl	5Bw pgl:gl	5Bw pgl:gl	5Bw pgl:gl	5Bw pgl:gl	5Bw pgl:gl	5Bw pgl:gl	4Bw pgl:gl	4Bw pgn:ps	2 Bw gl	4Dz pgl:ps	4Bw pgn:ps	4Bw pgl:ps	4Bw pgl:ps	4Bw pgl:ps	4Bw pgl:ps	4Bw pgl:ps	4Bw pgl:ps	4Dpz:ps	4Dpz:ps	4Fpz:ps	8Dz pgn:ps	5 Bw pgl:gl	8Dz pgn:ps	5 Bw pgl:gl	8Dz pgn:ps	5 Bw pgl:gl	9 Bw pgl:pl	8Dz pgn:ps	5 Bw pgl:gl	8Dz pgn:ps	5 Bw pgl:gl	8Dz pgl:ps	8Dz pgl:ps	8Dz pgl:ps			
Mean number of species 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	30	26	28	30	30		
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	30	26	28	30	30		
I. Ch. Echinochloo-Setarietum																																								
<i>Echinochloa crus-galli</i>																																								
<i>Raphanus raphanistrum</i>																																								
II. D. with Galinsoga parviflora																																								
<i>Galinsoga parviflora</i>																																								
III. D. var with Bidens tripartita																																								
<i>Bidens tripartita</i>																																								
<i>Plantago intermedia</i>																																								
<i>Polygonum hydropiper</i>																																								
<i>Stachys palustris</i>																																								
<i>Sagina procumbens</i>																																								
<i>Juncus bufonius</i>																																								
<i>Gnaphalium uliginosum</i>																																								
<i>Potentilla anserina</i>																																								
<i>Polygonum amphibium</i>																																								
IV. Ch.D. Panic-Setarion																																								
<i>Spergula arvensis</i>																																								
<i>Setaria viridis</i>																																								
<i>Rumex acetosella</i>																																								
<i>Digitaria ischaemum</i>																																								
<i>Setaria pumila</i>																																								
V. Ch. D. Polygono-Chenopodion																																								
Polygono-Chenopodiata																																								
<i>Veronica persica</i>																																								
<i>Galinsoga ciliata</i>																																								
<i>Chenopodium album</i>																																								
<i>Stellaria media</i>																																								
<i>Maoricaria maritima</i> subsp. <i>inodora</i>																																								
<i>Capsella bursa-pastoris</i>																																								
<i>Sonchus arvensis</i>																																								
VII. Ch. Stellarietea mediae																																								

cd. Table 3

<i>Anthemis arvensis</i>	+	+	2	+	+	+	+	+	+	2	III	390	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	IV	160									
<i>Polygonum aviculare</i>	+	+	+	+	+	+	+	+	+	+	+	IV	70	I	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	IV	270								
<i>Myosotis arvensis</i>	+	+	+	2	+	+	+	1	2	+	1	IV	365												IV	60	+	+	+	+	+	III	90							
<i>Fallopia convolvulus</i>	+	+	+	+	+	+	+	+	+	+	+	III	60	+	+										III	60	+	+	+	+	+	III	90							
<i>Viola arvensis</i>	+	+	+	+	+	+	+	+	+	+	+	IV	70	+	+										II	40	+	+	+	+	+	+	III	60						
<i>Elymus repens</i>	+	+	+	+	+	+	+	+	+	+	+	III	50	+											III	90							I	10						
<i>Centaurea cyanus</i>	+	+	+	+	+							III	50																											
<i>Conyza canadensis</i>	+											II	40	+																				I	10					
<i>Lapsana communis</i>		+	+	+	+	+	+		+	+		II	30																						I	10				
<i>Galeopsis tetralix</i>	+	+		+	+	+	+					II	40																						I	10				
<i>Anagallis arvensis</i>																																				I	10			
<i>Vicia tetrasperma</i>																																				I	10			
VIII. Companion species																																								
<i>Equisetum arvense</i>	+	1	+	1								III	180	+		1	+								II	70	+	+	+	+	+	+	+	+	+	III	60			
<i>Leonodon autumnalis</i>	+	+		+								III	50												I	10									+	+	II	40		
<i>Cirsium arvense</i>	+		+									II	30	1	+										III	140	+	+	+	+	+	+	+	+	+	+	V	130		
<i>Ranunculus repens</i>	+	+	+	+	+	+	+					II	50													II	30								+	+	III	50		
<i>Poa annua</i>		+	+	+	+	+	+	+	+	+	+	II	30												III	50	+	+	+	+	+	+	+	+	+	+	+	II	80	
<i>Polygonum lapathifolium</i> subsp. <i>lapathifolium</i>												I	1	1	+	+	+	+	+	+	+	+	+	+	IV	150	+	+	+	+	+	+	+	+	+	+	IV	80		
<i>Erodium cicutarium</i>													II	30																							I	20		
<i>Polygonum persicaria</i>	+	+	+	+	+							II	30		+	+	+							II	30		II	30						+	+	+	+	I	20	
<i>Convolvulus arvensis</i>	+											II	30		+	+	+							II	30		II	30							+	+	+	I	20	
<i>Erysimum cheiranthoides</i>												I	1	1	1	1	1	1	1	1	1	1	1															I	10	
<i>Cerastium holosteoides</i>	1	+	+	+	+	+	+					II	70																											
<i>Achillea millefolium</i>	+	+	+									II	40																											
<i>Veronica arvensis</i>		+	+	+	+	+	+					I	20	1	+	+	+	1	+	+	+	+		III	140	+		+	+	+	+	+	+	+	+	+	+	III	60	
<i>Taraxacum officinale</i>												I	20	+	+	+	+	+	+	+	+	+		III	60	+	+	+	+	+	+	+	+	+	+	+	+	+	III	60
<i>Trifolium repens</i>												I	10	+	+	+	+	+	+	+	+	+		II	40	+	+	+	+	+	+	+	+	+	+	+	+	+	III	60
<i>Plantago major</i>	+											I	20	+										II	40		II	40										II	30	
<i>Artemisia vulgaris</i>												I	20		+	+	+	+	+	+	+	+		II	30		II	30										II	30	
<i>Plantago lanceolata</i>												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(+); *Pepelis 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; *Arriplex 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(+); *Armoeris 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(+); *Symphlytum 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(+); *Galeopsis ladanum* 19(+), 20(+); *Oxalis fontana* 11(+);

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	8Bwpplz:pgl	2Bw pgm.gs	2Bwplz:gl	2Bw pgm.gs	8Dzpgm:gl	2Bwgl	8Dzpgm	2Fpl:pl	8Dzgl:gs	8Dzpgl:gl		
Number of weeds per relevé	35	35	34	30	35	30	31	30	30	30	33		S D
I. Ch. <i>Polygono-Chenopodion</i>													
<i>Polygono-Chenopodietalia</i>													
<i>Veronica agrestis</i>	2	3	1	2	1	3	1	2	2	2	1		V 1825
<i>Matricaria maritima</i> subsp. <i>inodora</i>	2	+	3	+	+	2		+	+	2	2		V 1175
<i>Sonchus arvensis</i>	+	2	+	+	1		1	2		+	+	V 500	
<i>Chenopodium album</i>	1	1	+		+	+		1	+	2	2	V 540	
<i>Chenopodium polyspermum</i>	1	+	2	1		1	1	+	+	1	+	V 465	
<i>Euphorbia helioscopia</i>	2		1		+	1		+	1	+		IV 355	
<i>Lamium purpureum</i>	1	+	1		+		1	+		1	1	IV 280	
<i>Lamium amplexicaule</i>		+	1	1	+	1		+		1		IV 230	
<i>Veronica polita</i>	+			1	+	+	+	1	1		+	IV 200	
<i>Galinsoga parviflora</i>	1	+		+	+		+			+	1	IV 150	
<i>Atriplex patula</i>		+	1	+		+	+		+	+	+	IV 120	
<i>Veronica persica</i>	+	+	+			1		+		+	+	IV 110	
<i>Echinochloa crus-galli</i>	1		+			+	+		+	+	+	IV 110	
II. D. <i>Hygrophilous species</i>													
<i>Rorippa sylvestris</i>	2	+	1	1	1	1	+	+	+		+	V 425	
<i>Mentha arvensis</i>	1	1		+			1	+	1	2		IV 395	
<i>Potentilla anserina</i>	2	2	1	1	1	+	1	1		+		IV 62	
<i>Stachys palustris</i>		+		1		2		+	+			III 255	
<i>Sagina procumbens</i>	1		1		+					+	+	III 130	
<i>Polygonum amphibium</i>	2	2			+			1				II 410	
III. Ch. <i>Stellarietea mediae</i>													
<i>Anagallis arvensis</i>	1	+	2	1	+	+	1			1	+	V 415	
<i>Elymus repens</i>	+	2	2	2	1	+		1	1	3	1	V 1120	

cd.Table 4

<i>Stellaria media</i>	+	3	2	+	+	1	1	1	1	+	+	V	800
<i>Chaenorhinum minus</i>	2		+	1	2			+	1		1	IV	520
<i>Solanum nigrum</i>	2	2	+	1	+		1			1	+	IV	530
<i>Galinsoga ciliata</i>		+		1		1		+	1		1	III	220
<i>Myosotis arvensis</i>	1	1	+	+	+	1				+	+	IV	200
<i>Melandrium noctiflorum</i>	1	+	+	1	+		1			+	+	IV	200
<i>Viola arvensis</i>		+	+	+			+	1	+	+	+	IV	120
<i>Fallopia convolvulus</i>		+	+			+	+	+		1	+	IV	110
<i>Aethusa cynapium</i>		1	1	1				+	+			III	170
<i>Oxalis fontana</i>			+		1	1	+		+			III	130
<i>Vicia tetrasperma</i>				+	+					+	+	II	40
<i>Polygonum lapathifolium subsp. pallidum</i>	+		+		+				+			II	40
<i>Capsella bursa-pastoris</i>	+	+						+				II	30
<i>Polygonum aviculare</i>				+				+		+		II	30
<i>Geranium pusillum</i>		+	+					+				II	30
IV. Companion species													
<i>Taraxacum officinale</i>	+		+			+	+	+	+	+		IV	70
<i>Polygonum lapathifolium subsp. lapathifolium</i>	1				+	+	+			+	+	III	100
<i>Cirsium arvense</i>	+			+	+	+			+		+	III	60
<i>Veronica arvensis</i>			+		+	+				+	+	III	50
<i>Galium aparine</i>	1				1	+			+			II	120
<i>Equisetum arvense</i>		+				+	+				+	II	40
<i>Trifolium repens</i>			+			+	+				+	II	40
<i>Polygonum persicaria</i>	+	+						+	+			II	40
<i>Galeopsis bifida</i>		+				+	+	+				II	40
<i>Daucus carota</i>					+			+		+		II	30
<i>Plantago major</i>			+		+	+						II	30
<i>Gypsophila muralis</i>				+			+				+	II	30
<i>Poa annua</i>	+					+	+					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(+); *Achusa 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-Anthoereturum punctati (Koch 1926) Moor 1936

Variant	with <i>Hypericum humifusum</i>							typical							with <i>Centaurium pulchellum</i>							Mean number of species per relevé
	1	2	3	4	5	6	7	9	10	11	12	13	14	15	16	17	18	19	20	21	Mean number of species per relevé	
Relevé no. in table	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	9 Fplz-psp	9 M ps-pl	6 A pgl-ps	8 Dzplz-pl	8 Dzpgm-gl	8 Fplz:psp	8 Fplz:ps	8 Dzpgm	2 Fplz:pl	8 Dzplz:pl	8 Dzpgm-gl	2 Bwpgm	8 Fplz:psp	2 bwpzgl	8 Dzpgm	2 Dzpgmp-gl		
Mean number of species per relevé	31	31	29	32	32	32	29	31	35	31	34	34	34	33	33	33	34	35	33	31	34	
Number of weeds per relevé	33	31	29	32	32	32	29	31	32	31	34	34	34	33	33	33	34	35	33	31	34	
	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
I. CH. D. Isoëto Nanojuncetea																						
<i>Radiolion linoideis</i>																						
<i>Centunculus minimus</i>	+	+	+	+	+	+	+	V	1	1	1	1	1	V	1	+	+	+	+	+	V	
<i>Hypericum humifusum</i>	2	1	3	2	1	3	2	V	+	+	+	+	+	III	+	+	+	+	+	+	II	
<i>Plantago intermedia</i>	+	+	+	+	+	+	+	IV	1	1	2	3	+	IV	+	1	+	+	+	1	III	
<i>Peplis portula</i>	+	+	+	+	+	+	+	III	+	2	+	1	2	V	+	+	+	2	1	2	III	
<i>Juncus bufonius</i>	+	1	+	+	+	+	+	III	1	1	1	1	+	IV	1	+	2	1	1	2	V	
<i>Gnaphalium uliginosum</i>	+	+	+	+	+	+	+	III	+	+	+	+	+	II	+	+	+	3	1	2	IV	
<i>Sagina procumbens</i>	1	2	+	+	2	+	+	III	+	1	1	1	+	IV	1	+	+	+	+	+	IV	
<i>Radiola linoideis</i>	+	+	+	+	+	+	+	II	+	1	1	1	+	V	+	+	+	+	+	+	III	
<i>Juncus capitatus</i>	+	+	+	+	+	+	+	II	1	+	1	1	+	IV	1	+	r	+	+	+	II	
<i>Anthoceros punctatus</i>	+	+	+	+	+	+	+	II	+	1	+	+	+	III	+	+	+	+	+	+	I	
<i>Gypsophila muralis</i>	+	+	+	+	+	+	+	IV	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Gnaphalium luteo-album</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Centaurium pulchellum</i>	+	+	+	+	+	+	+	III	+	+	+	+	+	+	+	+	+	+	+	+	+	
II. D. Hygrophilous species																						
<i>Polygonum hydroper</i>	1	2	+	+	+	+	+	V	2	1	2	+	1	V	+	+	+	1	1	1	III	
<i>Veronica serpyllifolia</i>	+	1	1	1	1	1	1	IV	1	1	1	1	+	II	+	+	+	+	+	+	III	
<i>Lysimachia nummularia</i>	+	+	+	+	2	1	1	IV	2	1	1	+	1	II	+	+	+	+	+	+	III	
<i>Bidens tripartita</i>	+	+	+	+	1	+	+	III	2	2	+	1	+	IV	+	+	+	+	+	+	III	
<i>Polygonum amphibium</i>	1	+	+	+	1	1	1	III	1	+	+	2	+	III	1	+	+	+	+	+	IV	
<i>Stachys palustris</i>	+	+	+	+	+	+	+	II	+	+	+	2	+	V	+	+	+	+	+	+	IV	
<i>Rorippa sylvestris</i>	+	+	+	+	+	+	+	I	+	+	+	1	+	IV	+	+	+	+	+	+	III	
<i>Mentha arvensis</i>	+	+	+	+	+	+	+	I	+	1	+	+	+	IV	+	2	+	+	+	+	V	
<i>Ranunculus repens</i>	+	+	+	+	+	+	+	II	+	+	+	+	+	I	+	+	+	+	+	+	IV	
III. Ch. Polygono-Chenopodion																						
<i>Polygono-Chenopodietalia</i>																						
<i>Geranium pusillum</i>	+	+	+	+	+	+	+	III	+	+	+	+	+	IV	+	+	+	+	+	+	II	
<i>Chenopodium album</i>	+	+	+	+	+	+	+	III	1	1	1	1	+	IV	+	+	+	+	+	+	III	
<i>Capsella bursa-pastoris</i>	+	+	+	+	+	+	+	III	+	+	+	+	+	II	+	+	+	+	+	+	V	
<i>Marricaria maritima subsp. inodora</i>	+	+	+	+	+	+	+	II	1	2	2	+	+	IV	+	+	+	1	+	1	III	
<i>Lamium purpureum</i>	+	+	+	+	+	+	+	II	+	+	+	+	+	IV	+	+	+	+	+	+	III	
<i>Chenopodium polyspernum</i>	+	+	+	+	+	+	+	I	+	+	+	1	2	III	+	+	+	+	+	+	III	
<i>Sonchus arvensis</i>	+	+	+	+	+	+	+	I	1	1	1	+	+	IV	+	+	+	+	+	+	I	
<i>Galinsoga parviflora</i>	+	+	+	+	+	+	+	I	1	1	1	+	+	III	1	+	+	1	1	1	III	

cd. Table 5

<i>Fumaria officinalis</i>								+	+				III	I	+	2	+	1	IV
<i>Veronica agrestis</i>								+	+				+	III	+		+	1	III
<i>Veronica persica</i>								1	+	1	+		III		+	+	1	+	III
<i>Euphorbia helioscopia</i>								+				I	III				+	+	II
<i>Lamium amplexicaule</i>								1	1	+	+		III	+			1	+	III
<i>Veronica polita</i>								+					II	+					II
IV. Ch. Stellarietea mediae																			
<i>Digitaria ischaemum</i>	I	I	+	+	+														
<i>Anthemis arvensis</i>			+	+	+	I	+	I	V										
<i>Spergula arvensis</i>	I	I	I	+	+	I	+	V											
<i>Rumex acetosella</i>	+	+	+	+	+	I	I	IV											
<i>Scleranthus annuus</i>	+	+	+	+	+	+	+	IV											
<i>Oxalis dillenii</i>	I							III					+	I					
<i>Viola arvensis</i>	+	+	+	+	+	I	IV						II	+	+	+		+	III
<i>Fallopia convolvulus</i>	+	+	+	+	+	+	III						III	+					I
<i>Stellaria media</i>	+	+	+	2	2	2						IV	+	+	+	1		+	IV
<i>Polygonum aviculare</i>	I	I	+	I	+		V					I	II			+	+	+	III
<i>Elymus repens</i>	+	+	+	+	+	2	1	IV				1	III	1	+				II
<i>Myosotis arvensis</i>						+	+	II					IV	+	+	+	+	+	IV
<i>Melandrium noctiflorum</i>						+	+						IV	+	+	1		+	IV
<i>Chaenorhizum minus</i>						+	+						III	I	+		+	+	V
<i>Solanum nigrum</i>								1	I				III	I			+	+	II
<i>Anagallis arvensis</i>						+	+						III		+	1	+	+	III
<i>Galinogosa ciliata</i>						+	+						II		+	+			III
<i>Aethusa cynapium</i>													I		+	+	+	+	IV
<i>Consolida regalis</i>														+		+	+	+	III
<i>Lathyrus tuberosus</i>														+		+	+	+	III
<i>Kickxia elatine</i>																	+		II
V. Companion species																			
<i>Equisetum arvense</i>	+	+				1	+	III					II	+		+	+	+	III
<i>Trifolium repens</i>	+	+				+	+	III					II			+	+	+	III
<i>Veronica arvensis</i>	+	+				+	+	III				+	I	+				+	II
<i>Poa annua</i>	+	+				+	+	II					II	+				+	II
<i>Cirsium arvense</i>	+							I					II		+			+	II
<i>Glechoma hederacea</i>							+	I	+		+		V						
<i>Melandrium album</i>														+		1	+	+	IV
<i>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(+); *Symphylum officinale* 3(+), 4(+); *Daucus carota* 11(+), 12(+); *Galium aparine* 3(+), 21(+); *Malva neglecta* 13(+); *Malva alcea* 12(r); *Hypochoeris radicata* 12(+); *Prunella vulgaris* 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*, *Chaenorhinum 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 communities 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 acidophilous 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 helio-*

scopia, *Solanum nigrum*, *Fumaria officinalis*. Patches with the mass occurrence of *Centaurium pulchellum* were observed in similar habitats, differing in a higher concentration of CaCO₃. 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), south-eastern 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 syn-taxonomic units (variants): *Digitarietum ischaemi*, *Echinochloo-Setarietum*, *Centunculo-Anthocerotum 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-Anthocerotum 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 communities 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 Feldforschung 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. Reprodukcyjność 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., Zajac 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., Jędruszczyk M., Bojarczyk M., Majda J., 1994. Chwasty ściernisk zbożowych na różnych glebach Kielecczyny. Cz. I. Gleby bielcowe 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., Jędruszczyk 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 południowo-wschodniej 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 conservation 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 związanych. / 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 flavescens*. / Stubble-field plant communities in south-eastern Poland. P. I. Plant communities of the *Nanocyperion flavescens* 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 ścierniskach 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 fitocenozy 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-Anthocerotum punctati*. Jedynie w południowo-wschodniej części Parku występowały pojedyncze płaty zbiorowiska z *Setaria pumila* postacią z *Aphanes arvensis*.

