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ORIGINAL RESEARCH PAPER

Spergulo-Chrysanthemetum segeti (Br.-Bl. et de Leeuw 1936) R. Tx. 1937 in the Drawsko Lakeland (Western Pomerania)

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Abstract
The species richness and structure of *Spergulo-Chrysanthemetum segeti* have been assessed on the basis of 25 phytosociological relevés made by the Braun-Blanquet method in the Drawsko Lakeland (Poland). Two variants have been distinguished, *Spergulo-Chrysanthemetum segeti chamomilletosum* typicum and *Spergulo-Chrysanthemetum segeti chamomilletosum* with *Plantago intermedia*. The paper presents the distribution and analytical characteristics of this subatlantic association against the background of habitat conditions.

Keywords
segetal community; soil units; Pomerania region; Drawsko Lakeland

Introduction

The paper constitutes a continuation of a chorological study of the *Spergulo-Chrysanthemetum segeti* association in the area of the eastern part of Western Pomerania. In the first paper, the ecological and biotope characteristics of the *Spergulo-Chrysanthemetum segeti* association in the Słupsk Plain and the Damnica Upland were presented, in the second one – in the Słowińskie Coast, and in the subsequent one in the Bytów Lakeland and the Białogard Plain [1–4].

The Drawsko Lakeland is dominated by brown acidified and leached soils. The valleys of the rivers Parsęta, Rega, Stara Rega, Brzeźniczka, and Dębnica are covered with boggy soils. In the Drawa River Valley, south of Drawsko, alluvial soils are found. In the vicinity of Czaplinek and Rydzewo, black (D) and degraded meadow black earth (Dz) occurs [5].

In terms of agricultural land suitability, the soils of rye complexes (which cover 78% of the arable land in total) dominate the Drawsko Lakeland. Worth mentioning are the soils of wheat complexes (15% of arable land), which larger patches are found between Gudowo and Lubieszewo on Lake Lubie as well as between Karsino and Wełnica. Larger homogeneous areas of the good wheat complex (2) developed from particulate sediment material originating from marginal lakes. They occur on gentle clay slopes in the area of Dalewo, Darskowo, and Suliszewo. The defective wheat complex (3) is represented by soils formed from clays and particulate material sediments. The larger outlines of that complex cover the slopes of moraine mounds in Dziwogóra, Ogrodno and Ostropole. 56% of the area of the rye complexes comprise very good (4) and good rye (5) complexes. A smaller area is covered by cereal-fodder complexes – (6%) strong (8) and (5%) weak (9) [6].

The Drawsko Lakeland belongs to the Baltic region and the mesoregion of the Drawsko – Bytów Lakeland. Soils developed on clays and sands on clays predominate. Forestation in this lake district is relatively low and amounts to 24%. Beech wood forests occur most frequently and they usually develop on clay soils difficult to plough, situated on steep slopes of end moraines [7] in the areas difficult got cultivation.

According to the geobotanical division of Poland, the Drawsko Lakeland is situated in the Pomeranian Divide. A substantial part of this mesoregion is situated in the region of Central Pomeranian Lakelands, in the Świdwin District and the Drawsko Lakeland. A small southeastern part is situated in the Wałcz Province and the Drawa River Valley region [8].

Detailed research on crop-related species was not done. The data concerning the occurrence of some species associated with the Drawsko Lakeland are provided by German botanists [9–11]. More information concerning the distribution of field weeds in this area is found in the studies of Młynkowiak [12] and Sobisz [13].

The aim of the study was to describe the ecological and phytosociological characteristics of *Spergulo-Chrysanthemetum segeti* in the Drawsko Lakeland, with particular attention to its diversity against biotope conditions.

Material and methods

A field study was conducted in 2012–2014; 52 phytosociological relevés were made by the Braun-Blanquet method widely used in Poland. In this paper, 25 relevés sampled in 18 places are analyzed. The soil classification is based on Mocek [14]. The phytosociological table contains information on soil complex, type of soil and its texture. The soil conditions in crop fields were established on the basis of the soil-agricultural maps at a scale of 1:5000 made available by the Marshall's Office in Szczecin. The soil samples were taken from every stand of *Chrysanthemum segetum*. The pH in H_2O and 1 M KCl was determined by the potentiometric method [15]. In the phytosociological table, the degree of constancy (S) was also taken into consideration, while the cover coefficient (D) was calculated according to Pawłowski [16].

For each stand of *Chrysanthemum segetum*, its location in ATPOL squares was given, according to the principles specified in the "Atlas of distribution of vascular plants in Poland" [17]. The numbering of the ATPOL grid squares and the sites of *Chrysanthemum segetum* is in accordance with Sobisz [18,19]. The sites of *Chrysanthemum segetum* written in italics were not included in the phytosociological table. The distribution of the stands is shown in Fig. 1: BB43 – Dziwogóra (Dz); BB51 – Pęczerzyno (Pe); BB52 – Rycerzewko, Stare Resko (SR); BB53 – Dobino, Gawroniec (Ga), Toporzyk, Zajączkowo (Za); BB54 – Brusno, Kocury (Kc), Ogrodno (Og); BB55 – Gonne Małe, Juchowo (Ju), Ostropole (Os), Stary Grabiąż (SG); BB62 – Donatowo (Do), Ostrowice; BB63 – Stare Worowo (SW); BB64 – Kluczewo (Kl); BB72 – Darskowo (Da), Kosobudy (Ks); BB73 – Bobrowo, Siemczyno (Si); BB74 – Pławno (Pł).

The classification and terminology of syntaxons is in accordance with Ratyńska et al. [20]. The nomenclature of weed species is given according to Mirek et al. [21], whereas crop plant nomenclature follows Jasińska and Kotecki [22].

Results

Phytocenoses of *Spergulo-Chrysanthemetum segeti* were found in spring crops (barley, oats, wheat and their mixtures, buckwheat) and root plant crops (potatoes, rutabaga, and fodder beet). In total, 101 species were found in the entire data set. The relevés comprise from 11 to 42 species (30 on average).

The patches of *Spergulo-Chrysanthemetum segeti* are characterized by an unusual color, especially at the turn of June and July. *Chrysanthemum segetum* sometimes appears facially (Tab. 1, rel. 1–4) and makes up many hectares of "yellow carpets". The floristic diversity of this association also depends on the species from the *Stellarietea*

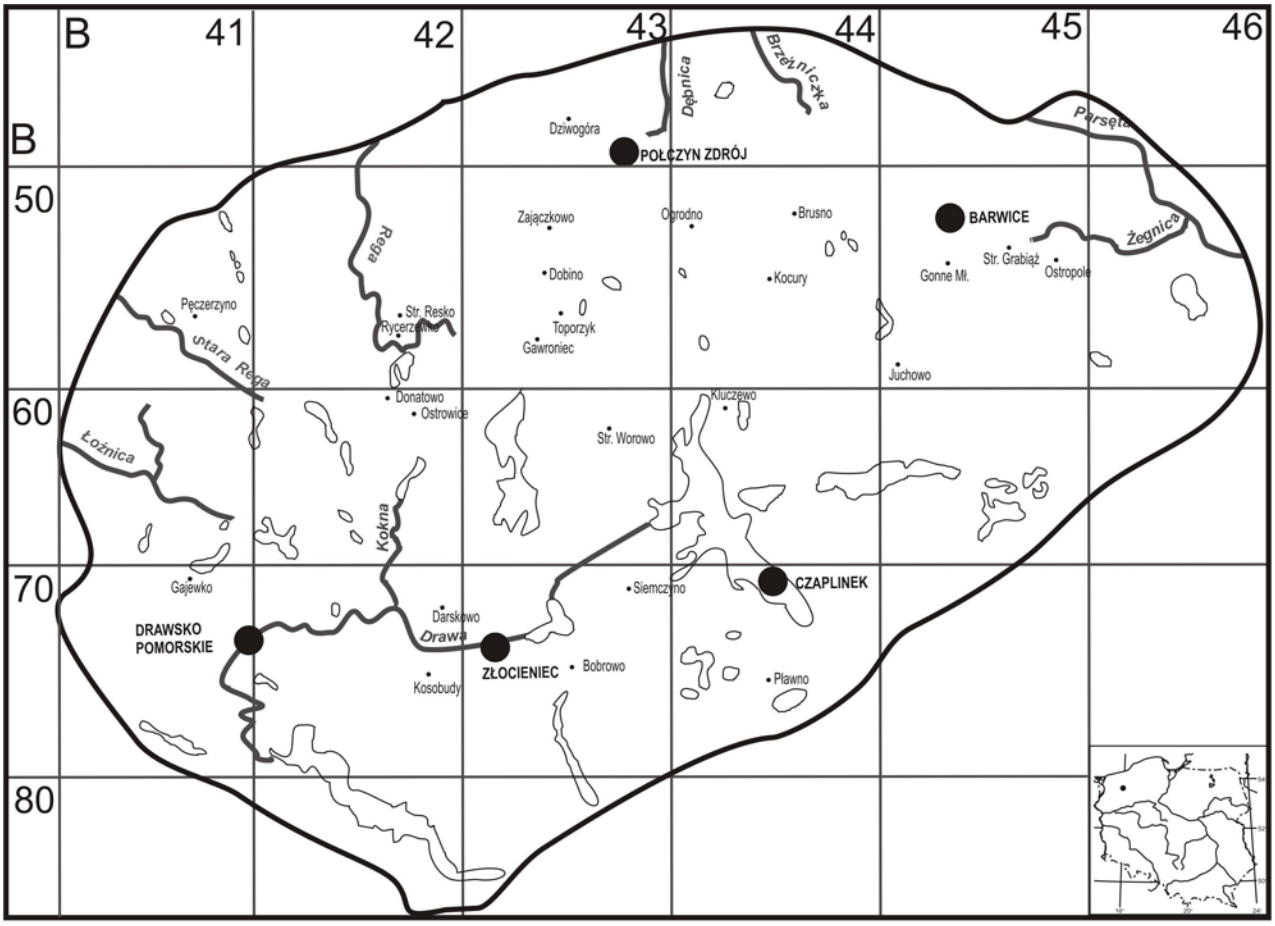

Fig. 1 Study area.

mediae class: *Matricaria maritima* subsp. *inodora*, *Chenopodium album*, classified in constancy class V, *Fallopia convolvulus*, *Stellaria media* (constancy class IV), and *Chamomilla recutita* which is a phytoindicator of neutral soil pH and biotopes with nitrogen presence [23]. Two variants: *Spergulo-Chrysanthemetum segeti chamomilletosum* typicum (Tab. 1, rel. 1–12) and *Spergulo-Chrysanthemetum segeti chamomilletosum* with *Plantago intermedia* (Tab. 2, rel. 1–13), can be distinguished. The patches formed on proper brown soil and leached soils with a slightly acidic reaction ($pH_{(1M\ KCl)}$ = 5.7) developed from clayey sands and clays (the typicum variant) as well as on proper black and degraded soils, rarely on alluvial soils and peat and mineral soils with an acidic reaction ($pH_{(1M\ KCl)}$ = 5.1) developed from clay clayey sands (the variant with *Plantago intermedia*). *Spergulo-Chrysanthemetum segeti chamomilletosum* typicum is most often noted in the soils of the very good rye complex (4), good wheat complex (2) and wheat defective complex (3), while the variant with *Plantago intermedia* – in the soils of the crop and cereal-fodder complex – strong (8) and weak (9).

Spergulo-Chrysanthemetum segeti chamomilletosum typicum lacks hygrophilous species and a substantial proportion of oligotrophic species and acidophilous species from the *Aperetalia spicae-venti* order is characteristic of this association. The most frequent ones are *Apera spica-venti* (constancy class V) and *Vicia hirsuta*, *Centaurea cyanus* (constancy class IV). In its patches, 11 to 32 species were noted (24 on average). *Spergulo-Chrysanthemetum segeti chamomilletosum* typicum covers the slopes of moraine hills of with a western and northwestern exposure. The variant with *Plantago intermedia* develops on excessively moist soils. It is characterized by a larger number of species (from 32 to 42, on average 36) and a substantial proportion of shallow rooted therophytes of the *Isoëto durieui-Juncetea bufonii* class (*Plantago intermedia*, *Gnaphalium uliginosum*, and *Juncus bufonius*) and other species associated with moist biotopes, among others *Mentha arvensis*, *Sonchus arvensis*, *Stachys palustris*, *Polygonum*

Tab. 1 *Spergulo-Chrysanthemetum segeti* (Br.-Bl. et de Leeuw 1936) R. Tx. 1937 *chamomilletosum*.

Variant	typical													
Successive number of phytosociological relevé	1	2	3	4	5	6	7	8	9	10	11	12		
Date (day, month, year)	23, 07, 2010	28, 06, 2009	16, 07, 2009	02, 07, 2010	12, 07, 2011	29, 06, 2011	28, 06, 2009	29, 06, 2011	03, 07, 2010	19, 07, 2011	22, 07, 2010	29, 06, 2009		
Sites	SR	Og	Ga	Da	Dz	Kc	Za	Si	SW	Ju	Os	Si		
Soil complex, type, subtype of soil	4B	3B	2B	4B	3B	2B	4F	2B	2Bw	2B	3B	2B		
Soil texture	pgm .gs	płi	płi	pgm :gl	płi	glp .gs	pgm .gl	glp .gl	pgm .gs	glp .gl	płi	płi		
Exposure	N	NW	-	W	W	NW	SW	-	NW	SW	N	N		
Tilt angle of slope (degrees)	10	20	-	5	25	15		-	10	10	15	8	Average	
pH – in H_2O (0–20 cm)	6.3	6.3	6.2	6.2	6.5	6.5	6.5	6.2	6.4	6.3	6.5	6.5	6.4	
pH – in 1M KCl (0–20 cm)	5.7	5.7	5.3	5.6	5.8	5.8	5.7	5.6	5.7	5.7	5.8	5.9	5.7	
Coverage of cultivated plants (%)	40	45	40	40	60	60	60	45	50	70	60	90	55	
Coverage of weeds (%)	100	90	100	95	65	80	90	95	95	85	100	70	89	
Number of species per relevé	11	12	13	11	32	30	27	30	28	31	32	35	24	
													S	D
Cultivated plants														
Hordeum vulgare	3.3	3.4	3.3	3.3	.	.	4.4	3.3	.	.	.	5.4		
Avena sativa	+	.	.	.	.	4.4	.	.	3.3	.	4.4	.		
Triticum vulgare (spring)	.	.	.	1.1	.	.	.	.	3.3	.	.	+		
Fagopyrum esculentum	.	.	.	.	.	.	.	1.1	.	.	.	.		
Solanum tuberosum	.	.	.	.	4.4	.	.	.	.	.	.	.		
Brassica napus var. *napobrassica*	.	.	.	.	.	.	.	.	.	4.4	.	.		
Beta vulgaris var. *crassa*	.	.	.	.	.	.	.	.	.	1.1	.	.		

Tab. 1 Continued

Successive number of phytosociological relevé	1	2	3	4	5	6	7	8	9	10	11	12	S	D
I. ChAss. *Spergulo-Chrysanthemetum segeti*														
Chrysanthemum segetum	5.5	5.5	5.4	5.5	3.3	2.2	3.3	2.2	4.4	2.2	3.3	2.2	V	4958
II. D. SubAss. *chamomilletosum*														
Chamomilla recutita	1.1	+.2	1.2	+.2	2.2	3.3	3.3	3.3	+.2	3.4	3.3	3.4	V	2129
III. D. Regional form														
Anchusa arvensis	1.1	1.2	+.2	+	+.2	1.2	1.1	.	.	+.2	1.2	+	V	250
Galeopsis tetrahit var. *arvensis*	.	.	.	.	+	1.1	+.2	+	.	.	+	1.1	III	117
Lapsana communis	.	.	.	.	1.1	.	+	+	1.1	+	.	.	III	108
Galeopsis ladanum	.	.	.	.	.	.	.	1.1	.	.	+.2	.	I	50
IV. ChO. *Aperetalia spicae-venti*														
Apera spica-venti	1.1	+.2	1.1	+	+	1.1	1.2	2.2	+	1.2	1.2	+.2	V	437
Rumex acetosella	.	.	.	.	1.1	.	+	+	.	1.2	+	1.1	III	150
Vicia hirsuta	.	.	.	.	+	1.1	+.2	1.1	.	+	.	1.2	III	150
Spergula arvensis	.	.	.	.	.	+	+	.	.	1.1	+2	+	III	75
Centaurea cyanus	.	.	.	.	.	+	+	+	+	.	+	+.2	III	50
Scleranthus annuus	.	.	.	.	+	.	.	1.1	.	+	1.1	.	II	100
Vicia angustifolia	.	.	.	.	+	.	.	.	+.2	+	1.1	.	II	67
Arabidopsis thaliana	.	.	.	.	+	.	.	.	+	+	.	.	II	25
Anthemis arvensis	.	.	.	.	.	.	.	.	.	+	.	+	I	16
Crepis tectorum	.	.	.	.	.	.	+	.	+	.	.	.	I	16
V. ChO. *Papaveretalia rhoeadis*, * ChAll. *Veronico-Euphorbion*														
Sinapis arvensis	.	+	1.2	+	+.2	+	1.1	.	+	1.1	+	1.1	V	217
* *Veronica persica*	.	.	.	.	.	+	.	+	+	+	+.2	+	III	100

Tab. 1 Continued

Successive number of phytosociological relevé	1	2	3	4	5	6	7	8	9	10	11	12	S	D
* *Lamium purpureum*	.	.	.	.	.	+	+	.	+	.	+	+	III	42
Thlaspi arvense	.	.	.	.	.	+	.	+.2	.	.	+	+	II	33
* *Euphorbia helioscopia*	.	.	.	.	+	.	+	.	+	.	.	.	II	25
* *Lamium amplexicaule*	.	.	.	.	.	.	.	.	+	+	.	+	II	25
Papaver rhoeas	.	.	.	.	+	.	.	.	.	.	+	.	I	17
Avena fatua	.	.	.	.	.	+	.	.	+	.	.	.	I	17
Fumaria officinalis	.	.	.	.	.	.	.	.	.	+	.	.	I	8
VI.ChCl. *Stellarietea mediae*														
Matricaria maritima subsp. *inodora*	1.1	+.2	+.2	1.1	1.1	+.2	+	+	1.1	.	1.1	+	V	258
Chenopodium album	+.2	1.1	.	+.2	+	1.2	+	1.1	+.2	+	1.2	+.2	V	225
Fallopia convolvulus	.	.	.	.	+	+	+	+	+	2.2	+	+	IV	204
Stellaria media	.	.	.	.	+	+	1.1	1.1	1.2	+	+	+	IV	158
Polygonum lapathifolium subsp. *lapathifolium*	.	.	.	.	+	+	.	+	+	.	.	+	III	50
Myosotis arvensis	.	.	.	.	+	+	+	+.2	.	.	+.2	+	III	50
Veronica arvensis	.	.	.	.	.	+		+	+	+	+	.	III	42
Capsella bursa-pastoris	.	.	.	.	+	.	+	.	.	+	.	+	II	33
Polygonum aviculare	.	.	.	.	+.2	+.2	.	.	+	+	.	.	II	33
Viola arvensis	.	.	.	.	.	+	.	+	.	+	.	+.2	II	33
VII. ChCl. *Artemisietea vulgaris*														
Elymus repens	1.1	1.1	+.2	+	+.2	1.1	+	+.2	1.2	.	+	+	V	225
Equisetum arvense	.	.	.	.	+	1.1	+	+	1.1	.	1.1	.	III	150
Cirsium arvense	.	.	.	.	.	+	1.1	+	+	+	+	+	III	92

Tab. 1 Continued

Successive number of phytosociological relevé	1	2	3	4	5	6	7	8	9	10	11	12	S	D
Artemisia vulgaris	.	.	.	.	+	.	.	+	.	.	.	+	II	38
Erysimum cheiranthoides	.	.	.	.	.	.	+.2	.	.	.	+.2	+	II	38
Convolvulus arvensis	.	.	.	.	.	.	.	+	.	+.2	.	+.2	II	38
VIII. ChCl. *Molinio-Arrhenatheretea*														
Poa annua	+	+.2	.	.	+.2	+	.	+	.	.	+.2	+	III	58
Achillea millefolium	.	.	+.2	+	.	.	+.2	.	+	+	.	+	III	50
Taraxacum officinale	.	.	.	.	+	.	.	.	.	.	+	.	I	17
Trifolium repens	.	.	.	.	.	+.2	.	.	.	.	+.2	.	I	17
Chamomilla suaveolens	.	.	.	.	.	.	.	+	.	+	.	.	I	17
Plantago major	.	.	.	.	.	.	.	.	+	.	.	+	I	17
IX. Accompanying species														
Arenaria serpyllifolia	+.2	+	+	.	+	.	.	+.2	.	+.2	+	.	III	58
Erodium cicutarium	.	.	+	.	+.2	.	+	.	+.2	.	.	+.2	III	42

Species occurring only in constancy class I: III – *Galeopsis bifida* 10(+); IV – *Agrostemma githago* 12(+), *Aphanes arvensis* 5(1.1), *Bromus secalinus* 2(1.2), *Vicia grandiflora* 4(+), *Vicia sativa* 1(+.2); V – *Sherardia arvensis* 11(1.2), *Valerianella dentata* 10(+), *Veronica agrestis* 4(+); VI – *Geranium pusillum* 2(+), *Senecio vulgaris* 5(+.2), *Sonchus oleraceus* 10(+); VII – *Medicago lupulina* 8(+), *Solidago canadensis* 12(+); VIII – *Daucus carota* 3(+), *Rumex acetosa* 6(+.2); IX – *Betula pendula* c 11(+), *Erigeron acris* 5(+), *Senecio jacobaea* 3, *Populus tremula* c 7, *Stellaria graminea* 6(+), *Trifolium arvense* 9(+). Soil agricultural complexes: 2 – good wheat complex; 3 – defective wheat complex; 4 – very god rye complex. Types and subtypes of soils: B – proper brown soils; Bw – leached and acid brown soils; F – alluvial soils. Soil species: gl – light loam; glp – silty sandy loam; gs – sandy clay loam; pgm – heavy loamy sand; płi – silty loam; " . " – subsoil lies shallow (up to 50 cm); " : " – subsoil lies medium deeply (50–100 cm).

Tab. 2 *Spergulo-Chrysanthemetum segeti* (Br.- Bl. et de Leeuw 1936) R. Tx. 1937 *chamomilletosum*.

Variant	with *Plantago intermedia*														
Successive number of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13		
Date (day, month, year)	12, 07, 2011	16, 07, 2010	02, 07, 2010	12, 07, 2011	29, 06, 2009	19, 07, 2011	29, 06, 2009	02, 07, 2010	29, 06, 2011	03, 07, 2010	16, 07, 2010	12, 07, 2011	29, 06, 2011		
Sites	Gj	SW	Ks	Ga	SG	Kl	Do	Og	Pł	Za	SG	SR	Pe		
Soil complex, type, subtype of soil	9Bw	9D	8F	9F	8F	9M	8F	8Bw	8D	9Dz	8D	8F	8D		
Soil texture	płi	pgl .pl	płi	pgl :pl	płi	ps :i	płi	pgm :gl	pgm :gs	pgl .pl	pgm :gl	płi :pl	Pgm :gl	Average	
pH – in H_2O (0–20 cm)	5.5	5.9	5.7	5.7	5.9	6.5	6.1	5.9	6.4	6.5	5.5	5.9	6.2	6.0	
pH – in 1M KCl (0–20 cm)	4.6	5.1	4.8	4.8	5.1	5.7	5.4	5.2	5.8	5.6	4.6	5.1	5.4	5.1	
Coverage of cultivated plants (%)	95	90	65	40	40	60	100	60	45	60	65	60	65	59	
Coverage of weeds (%)	55	50	60	80	95	95	60	45	100	70	45	85	60	69	
Number of species per relevé	33	37	37	36	35	41	42	33	38	35	40	33	32	36	
														S	D
Cultivated plants															
Hordeum vulgare	.	5.5	4.5	.	1.1	4.4	5.5	4.4	.	4.4	4.4	.	.		
Avena sativa	.	.	.	3.3	.	.	1.1	.	1.1	.	+	4.4	.		
Triticum vulgare (spring)	5.5	.	.	1.1	.	.	.	.	.	.	.	.	.		
Fagopyrum esculentum	.	.	.	.	.	.	.	.	.	.	.	.	.		
Solanum tuberosum	.	.	.	.	.	.	.	.	3.4	.	.	.	.		
Brassica napus var. *napobrassica*	.	.	.	.	3.3	.	.	.	.	.	.	.	.		
Beta vulgaris var. *crassa*	.	.	.	.	.	.	.	.	.	.	.	.	4.3		
I. ChAss. *Spergulo-Chrysanthemetum segeti*															
Chrysanthemum segetum	2.2	2.2	2.2	3.3	3.4	3.3	2.2	2.2	3.3	3.3	2.2	3.4	3.3	V	2827
Successive number of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	S	D

Tab. 2 Continued

II. D. SubAss. *chamomilletosum*															
Chamomilla recutita	1.2	+.2	+.2	1.1	2.2	1.2	+	+.2	1.2	+	+.2	2.2	1.2	V	508
III. D. var. *Plantago intermedia*															
Plantago intermedia	2.2	1.2	1.1	1.2	2.2	1.2	1.1	+	1.1	1.1	1.2	1.2	2.2	V	758
Mentha arvensis subsp. *arvensis*	1.1	+.2	.	1.1	1.1	+	+.2	2.2	1.1	+.2	+.2	1.1	+	V	373
Juncus bufonius	+	+	+.2	+	+	+.2	+	1.1	1.1	+	+	+	+.2	V	161
Ranunculus repens	+	+.2	+	1.1	+	+	+	.	+	+.2	+	1.1	+.2	V	161
Sonchus arvensis	+.2	.	+	+	+	+	+	.	.	+	+	+	+	IV	77
Stachys palustris	+	.	+	+	+	+.2	+	.	.	+	+	+		IV	69
Polygonum hydropiper	.	+	+	+	.	+	.	.	+	+	+	+	+	IV	69
Gnaphalium uliginosum	.	+	.	+	+	.	+	.	+	.	+.2	+	+	IV	61
Phragmites australis	.	.	+	.	.	+	.	+	+	.	.	.	+	II	58
Polygonum amphibium f. *terrestre*	.	.	+	.	+.2	+	+	.	.	.	.	.	.	II	31
Mentha arvensis subsp. *austriaca*	.	.	.	+	.	+	+	.	.	.	.	+	.	II	31
Bidens tripartita	.	.	.	.	+	+	+	.	.	.	.	.	.	II	23
Symphytum officinale	.	.	.		.	.	.	.	.	.	+		+	II	23
IV. D. Subvar. *Galeopsis speciosa*															
Galeopsis speciosa	1.2	+.2	+	+	1.2	2.2	1.1	+	+.2	+	1.2	.	.	V	335
V. D. Regional form															
Anchusa arvensis	+	+	.	1.2	+	2.2	1.2	+.2	2.2	+.2	.	+	1.1	V	431
Galeopsis tetrahit var. *arvensis*	+.2	+	.	+	1.1	1.1	+	+	+	+.2	1.1	1.1	+	V	215
Lapsana communis	1.1	+	+	1.1	.	+	1.1	+	.	1.1	+	.	.	IV	192
Galeopsis ladanum	.	.	1.1	.	.	.	.	1.2	.	.	+	.	.	II	85
Successive number of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	S	D

Tab. 2 Continued

VI. ChO. *Aperetalia spicae-venti*															
Apera spica-venti	+	+.2	.	+.2	.	+	1.1	.	+.2	1.1	+.2	.	.	IV	161
Rumex acetosella	.	1.2	+	.	+.2	.	.	.	.	+	.	+.2	.	III	69
Vicia hirsuta	+	+	.	+	1.1	+	+	+	+	+	+	1.1	+	V	154
Spergula arvensis	.	+.2	+	.	.	.	+	.	1.2	.	1.1	.	+.2	III	108
Centaurea cyanus	.	+	+	+	+	+	.	+	.	+.2	+	+	+	IV	77
Scleranthus annuus	.	+	+	.	.	.	+	.	.	.	+	.	+	II	38
Vicia angustifolia	+	+	1.1	.	.	.	+.2	.	.	.	+	.	+	III	77
Arabidopsis thaliana	.	+	.	+	.	.	.	.	.	+	.	.	.	II	23
Anthemis arvensis	.	.	.	+	.	+	.	+	+	.	.	.	.	II	31
Crepis tectorum	.	.	.	+	.	.	+	.	.	.	.	.	+	II	23
VII. ChO. *Papaveretalia rhoeadis*, * ChAll. *Veronico-Euphorbion*															
Sinapis arvensis	1.1	+	1.1	+	+	1.1	+	+.2	1.1	+	1.1	+	+	V	254
* *Veronica persica*	.	1.1	1.1	.	+	1.1	1.1	+	1.2	.	+	.	+	IV	116
* *Lamium purpureum*	.	+	+	.	.	.	.	.	.	.	+	.	.	II	23
Thlaspi arvense	+	1.1	+	+.2	+.2	+	.	+	+	1.1	+	+.2	1.1	V	185
* *Euphorbia helioscopia*	.	.	.	+	.	+	.	+	.	+	.	+	.	II	38
* *Lamium amplexicaule*	.	.	+	.	.	+	.	+	.	.	.	.	.	II	23
Papaver rhoeas	.	.	.	.	.	.	+	.	+	.	.	.	+	I	23
Avena fatua	.	.	.	+	.	.	+	.	+	.	.	+	.	II	31
Fumaria officinalis	.	.	.	.	+	.	.	.	+	.	+	.	.	I	23
VIII.ChCl. *Stellarietea mediae*															
Matricaria maritima subsp. *inodora*	+	1.1	2.2	1.2	1.1	+	1.2	+	2.2	1.1	1.2	+.2	+.2	V	538
Successive number of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	S	D

Tab. 2 Continued

Chenopodium album	+.2	1.1	+	+	1.1	+	+.2	+	+	+	+	+	+.2	V	161
Fallopia convolvulus	+	1.1	+	.	+	.	1.1	.	1.1	.	+	.	+	IV	154
Stellaria media	+	+	+	1.2	+	+	+	+	.	1.1	+	1.2	.	V	92
Polygonum lapathifolium subsp. *lapathifolium*	+	.	+	.	+	+	.	+	+	.	+	.	+	IV	61
Myosotis arvensis	+	+	.	.	.	.	+	.	.	.	.	.	.	II	23
Veronica arvensis	.	+	.	+	.	+.2	+	.	+	+	.	+	+	IV	61
Capsella bursa-pastoris	.	.	.	.	+	.	+	.	+	.	+.2	.	.	II	31
Polygonum aviculare	.	.	.	.	.	+.2	.	.	+	+.2	.	+	.	II	31
Viola arvensis	.	.	.	.	.	.	+	+	.	+	.	.	.	II	23
IX. ChCl. *Artemisietea vulgaris*															
Elymus repens	+	+	+	1.2	+	+	1.2	+	1.1	1.2	+	1.2	+.2	V	254
Equisetum arvense	+	1.2	+	.	+.2	1.2	.	1.2	+	.	+	.	+	IV	161
Cirsium arvense	.	+	1.2	+	+	+	+	+	1.2	+	+	+	+	V	154
Artemisia vulgaris	+	.	+	+	.	+	.	+	.	+	+	+	.	IV	61
Erysimum cheiranthoides	.	.	+	+	1.1	+	1.1	+	+	+	+	+	.	IV	138
Convolvulus arvensis	+	.	.	.	.	.	.	.	.	.	.	.	.	I	7
X. ChCl. *Molinio-Arrhenatheretea*															
Poa annua	+	+.2	.	+	+.2	.	.	+	.	+.2	+	+	.	IV	61
Achillea millefolium	.	.	.	+	.	.	+	.	+	+	.	.	.	II	31
Taraxacum officinale	+	.	.	+	.	+	.	.	.	+	.	.	.	II	31
Trifolium repens	+	.	+.2	.	+	+	.	+	.	.	.	+	+	III	53
Chamomilla suaveolens	.	+	.	.	.	.	+	.	+	.	.	.	.	I	23
Plantago major	.	.	+	.	.	.	.	.	+	.	.	.	.	I	15
Successive number of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	S	D

Tab. 2 Continued

XI. Accompanying species																		
Arenaria serpyllifolia	+	.	.	.	.	+	.	.	+	.	+	.	.	II	31
Erodium cicutarium	.	.	+	.	+	.	.	.	.	.	.	+	.	II	23

Species occurring only in constancy class I: III – *Agrostis stolonifera* 1(+), *Lotus uliginosus* 2(1.2), *Myosurus minimus* 8(+), *Rorripa sylvestris* 9(+), *Sagina procumbens* 1(+), *Spergularia rubra* 8(+); V – *Galeopsis bifida* 6(+), *Galeopsis pubescens* 3(+); VI – *Neslia paniculata* 7(+), *Vicia sativa* 19(+); VII – *Anagallis arvensis* 6(+); VIII – *Polygonum persicaria* 5(+); IX – *Cichorium intybus* subsp. *intybus* 9(r), *Glechoma hederacea* 13(+), *Melandrium album* 11(+.2); X – *Cerastium holosteoides* 2(+.2), *Plantago lanceolata* 13(+), *Trifolium pratense* 4(+); XI – *Populus tremula* c 10 (+), *Senecio jacobaea* 12 (+). Soil agricultural complexes: 8 – cereal-fodder strong complex; 9 – cereal-fodder weak complex. Types and subtypes of soils: Bw – leached and acid brown soils; D – proper meadow black earth; Dz – degraded meadow black earth; F – alluvial soils; M – muck-mineral soils. Soil species: gl – light loam; gs – sandy clay loam; i – clay; pgl – light loamy sand; pgm – heavy loamy sand; pli – silty loam; ps – slightly loamy sand; ". – subsoil lies shallow (up to 50 cm); ": – subsoil lies medium deeply (50–100 cm).

hydropiper, and *Ranunculus repens*. Similar moisture relationships in spring crops with the participation of *Chrysanthemum segetum* were observed in Rhineland-Westphalia by Hüppe [24]. Within the variant with *Plantago intermedia*, a subvariant with *Galeopsis speciosa* was distinguished (Tab. 2, rel. 1–11). *Galeopsis speciosa* has a narrow spectrum of ecological requirements and occurs exclusively in soils which are periodically excessively moist in the complex 8 and 9 [25].

The local form of this association is distinguished by the presence of hempnettles, a species of low thermal requirement [26]. They are accompanied by *Anchusa arvensis* and *Lapsana communis*. Regional forms of the association with the participation of *Galeopsis* sp. div. from the plateau areas of northern Poland were described, among others, by Sobisz [27].

Discussion

Chrysanthemum segetum is a Mediterranean species with subatlantic features [28]. It is fairly common in England, the Netherlands, and in the German and French lowlands. The corn marigold is somewhere rare in Central Europe, North Africa and on the Caspian Sea coasts. Its northern range reaches Ireland, Scotland, Sweden as well as southern Norway and Finland. Individuals of *Ch. segetum* have been recorded in the northern part of the Iberian Peninsula, in the Balkans, in southern Ukraine and also in single localities in western Syria [29].

The first information about the occurrence of *Ch. segetum* within the present boundaries for Poland was reported by Lucas in 1860, who recorded it in Przytor and Warnowo on Wolin Island. In Poland 352 localities of *Ch. segetum* (210 ATPOL grids) have been identified until now. Most localities are concentrated in the north, west and northwest of the country. It is found in segetal (325 sites) and ruderal habitats (27 sites). The northernmost locality for this plant is Karwia, whereas the southernmost one is Zakopane [18]. In the present study, 25 new stands of the species have been identified.

In the territory of central and eastern Germany, *Ch. segetum* is recognized as threatened with extinction [30,31]. Nationwide, it is critically threatened with extinction [32], in Opole Silesia – vulnerable [33,34], in Greater Poland – little endangered [35,36], and in Lower Silesia – endangered with extinction [37]. For the first time, it was presented and described in the Kashubian Lakeland by Passarge [38], and later by Herbich [39]. The subsequent studies come from the Myślibórz Lakeland [40], the Elbląg Heights, the Warmińska Plain and the Górowskie Heights [41], the Iława Lakeland [42], the Odra River valley [43], the Olsztyn Lakeland [44], and the Słupia River valley [45].

Spergulo-Chrysanthemetum segeti is a rare syntaxon in Poland and can be found in the western and northwestern part of Poland [46]. *Chrysanthemum segetum* is a species characteristic for the association [47]. It is especially found in the stands of crop plants, rarely in ruderal stands [48–50]. The center of the range of this subatlantic syntaxon is in Western Europe [51–55]. The association of *Spergulo-Chrysanthemetum segeti* reaches in Poland its eastern range, occurring especially on the South Baltic coast and in the part the Eastern Baltic Lakelands [56].

Comparing the occurrence of the *Spergulo-Chrysanthemetum segeti* stands with the map of potential natural flora of the Western Pomeranian Lakeland [57], a clear relationship is noticeable between the occurrence of *Spergulo-Chrysanthemetum segeti* with the

dominance of fertile beech wood, the "Pomeranian type" *Melico uniflorae-Fagetum sylvaticae*, and subatlantic lowland oak and hornbeam wood *Stellario holosteae-Carpinetum betuli*.

Spergulo-Chrysanthemetum segeti occurs in the northern part of Poland in a series of moraine belts along the lake district located in a relatively cool and moist climate. Both in Western Europe and in the northwestern part of Poland, due to the participation of weeds of low trophic requirements, it has been so far included in the alliance of *Panico-Setarion* [58]. At present, it seems that the higher participation of taxa from the alliance of *Veronico-Euphorbion* (= *Eu-Polygono-Chenopodion*) allows us to classify it in the latter.

Conclusions

- *Spergulo-Chrysanthemetum segeti*, the association reaching in Poland the eastern limit of its range, was studied in the Drawsko Lakeland mesoregion. *Spergulo-Chrysanthemetum segeti* was only found in spring cereals (wheat, barley, oat and their mixtures, buckwheat) and in root crops (beets, rutabaga, potatoes).
- The association *Spergulo-Chrysanthemetum segeti* has a clear regional character because of the presence of *Galeopsis* sp. div., species that have low thermal requirements.
- Two variants were distinguished: *Spergulo-Chrysanthemetum segeti chamomilletosum* typicum (Tab. 1, rel. 1–12) and *Spergulo-Chrysanthemetum segeti chamomilletosum* with *Plantago intermedia* (Tab. 2, rel. 1–13). The patches of the subassociation occur on leached brown soils, developed from loamy sands and clays (variant typicum), or they develop on brown soils, podzolic soils and black soils containing light loam (the variant with *Plantago intermedia*). The soil optimum for *Spergulo-Chrysanthemetum segeti chamomilletosum* typicum is the good wheat complex (2) and very good rye complex (4), while for the variant with *Plantago intermedia* the cereal-fodder complex – strong (8) and weak (9).
- The ecological optimum of *Chrysanthemum segetum* has shifted towards rich habitats (the dynamic circle of subatlantic lowland oak-hornbeam wood and fertile beech wood of "Pomeranian type"), hence the placement of *Spergulo-Chrysanthementum segeti* in *Veronico-Euphorbion* alliance is justified.

References

1. Sobisz Z. *Spergulo-Chrysanthemetum segeti* (Br. Bl. et de Leeuw 1936) R. Tx. 1937 na Równinie Słupskiej i Wysoczyźnie Damnickiej. Badania Fizjograficzne nad Polską Zachodnią. Botanika. 1996;45:159–166.
2. Sobisz Z. *Spergulo-Chrysanthemetum segeti* (Br. Bl. et de Leeuw 1936) R. Tx. 1937 on the Słowińskie Coast. Roczniki Akademii Rolniczej w Poznaniu. Botanika-Steciana. 2006;10:165–176.
3. Sobisz Z. *Spergulo-Chrysanthemetum segeti* (Br. Bl. et de Leeuw 1936) R. Tx. 1937 na Pojezierzu Bytowskim. Słupskie Prace Biologiczne. 2007;4:109–122.
4. Sobisz Z. *Spergulo-Chrysanthemetum segeti* (Br. Bl. et de Leeuw 1936) R. Tx. 1937 na Równinie Białogardzkiej. Słupskie Prace Biologiczne. 2012;9:143–154.
5. Mrozowski J. Rolnicza przydatność gleb Polski. Województwo koszalińskie. Puławy: Instytut Uprawy Nawożenia i Gleboznawstwa; 1974. (Prace Zakładu Gleboznawstwa i Kartografii Gleb, A; vol 6).
6. Witek T. Waloryzacja rolniczej przestrzeni produkcyjnej Polski według gmin. Puławy: Instytut Uprawy Nawożenia i Gleboznawstwa; 1981.
7. Trampler T, Kliczkowska A, Dmyterko E, Sierpińska A. Regionalizacja przyrodniczo-leśna na podstawach ekologiczno-fizjograficznych. Warszawa: Państwowe Wydawnictwa Rolnicze i Leśne; 1990.

8. Matuszkiewicz JM. Krajobrazy roślinne i regiony geobotaniczne Polski. Wrocław: Zakład Narodowy im. Ossolińskich; 1993. (Prace Geograficzne; vol 158).
9. Müller W. Flora von Pommern. Stettin: Verlag von Johs. Burmeister; 1898.
10. Scholz JB. Die Pflanzengenossenschaften Westpreussens. Schriften Der Naturforschenden Gesellschaft In Danzig. 1905;11(3):125–296.
11. Leick E. Die Pflanzendecke der Provinz Pommern: eine pflanzengeographische Übersicht. Berlin: Hartmann; 1926.
12. Młynkowiak E. Zróżnicowanie szaty roślinnej wybranych biotopów śródpolnych w zachodniej części Pojezierza Drawskiego [PhD thesis]. Szczecin: Akademia Rolnicza; 2002.
13. Sobisz Z. Materiały do rozmieszczenia kalcyfilnych gatunków segetalnych wschodniej części Pomorza Zachodniego. Słupskie Prace Przyrodnicze. Seria Botanika. 2002;1:49–62.
14. Mocek A. Gleboznawstwo. Warszawa: Wydawnictwo Naukowe PWN; 2014.
15. Bednarek R, Dziadowiec H, Pokojska U, Prusinkiewicz Z. Badania ekologiczno-gleboznawcze. Warszawa: Wydawnictwo Naukowe PWN; 2005.
16. Pawłowski B. Skład i budowa zbiorowisk roślinnych oraz metody ich badania. In: Szafer W, Zarzycki K, editors. Szata roślinna Polski. Tom 1. Warszawa: Pánstwowe Wydawnictwo Naukowe; 1977. p. 237–269.
17. Zając A. Założenia metodyczne "Atlasu rozmieszczenia roślin naczyniowych w Polsce". Wiad Bot. 1978;22(3):145–155.
18. Sobisz Z. The distribution of *Chrysanthemum segetum* L. (Asteraceae) in Poland. Plant Breeding and Seed Science. 2010;61:3–14. http://dx.doi.org/10.2478/v10129-010-0009-3
19. Sobisz Z. Nowe stanowiska *Chrysanthemum segetum* L. we wschodniej części Pomorza Zachodniego. Acta Botanica Silesiaca. 2011;7:197–207.
20. Ratyńska H, Wojterska M, Brzeg A, Kołacz M. Multimedialna encyklopedia zbiorowisk roślinnych Polski. Ver. 1.1 [CD]. Bydgoszcz: Instytut Edukacyjnych Technologii Informatycznych. 2010.
21. Mirek Z, Piękoś-Mirkowa H, Zając A, Zając M. Flowering plants and pteridophytes of Poland. A checklist. Cracow: W. Szafer Institute of Botany, Polish Academy of Sciences; 2002. (Biodiversity of Poland; vol 1).
22. Jasińska Z, Kotecki A, editors. Szczegółowa uprawa roślin. Wrocław: Wydawnictwo Akademii Rolniczej; 2003.
23. Ellenberg H, Weber HE, Düll R, Wirth V, Werner W, Paulissen D. Zeigerwerte von Pflanzen in Mitteleuropa. Göttingen: Goltze; 1991. (Scripta Geobotanica; vol 18).
24. Hüppe J. Die Ackerunkrautgesellschaften in der Westfälischen Bucht. Münster: Landschaftsverband Westfalen-Lippe; 1987. (Abhandlungen aus dem Westfälischen Museum für Naturkunde; vol 49,1).
25. Karlsson LM, Ericsson JAL, Milberg P. Seed dormancy and germination in the summer annual *Galeopsis speciosa*. Weed Res. 2006;46:353–361. http://dx.doi.org/10.1111/j.1365-3180.2006.00546.x
26. Hochół T. Flora i zbiorowiska chwastów zbóż w Beskidzie Wyspowym w zależności od usytuowania siedlisk w rzeźbie terenu. Fragmenta Agronomica. 2001:3(71):7–122.
27. Sobisz Z. Zróżnicowanie zbiorowisk segetalnych na tle warunków siedliskowych pól północnej części Pojezierza Krajeńskiego [PhD thesis]. Szczecin: Akademia Rolnicza; 1997.
28. Perring FH, Walters SM. Atlas of the British Flora. 3rd ed. London: Botanical Society of the British Isles; 1990.
29. Hultén E, Fries M. Atlas of north European vascular plants. 3. Königstein: Koeltz; 1986.
30. Haeupler H, Muer T. Bildatlas der Farn- und Blütenpflanzen Deutschlands. Stuttgart: Eugen Ulmer; 2007.
31. Albrecht H. Changes in the arable weed flora of Germany during the last five decades. In: Proceedings of the 9th EWRS (European Weed Research Society) Symposium "Challenges for Weed Science in a Changing Europe"; 1995 Jul 10–12; Budapest, Hungary. Budapest: EWRS Hungary; 1995. p. 41–48.
32. Zając M, Zając A, Tokarska-Guzik B. Exinct and endangered archaeophytes and the dynamice of their diversity in Poland. Biodivers Res Conserv. 2009;13:17–24. http://dx.doi.org/10.2478/v10119-009-0004-4

33. Nowak S, Nowak A. Chwasty zagrożone i ginące województwa opolskiego. Opole: Urząd Marszałkowski Województwa Opolskiego; 2011.
34. Nowak A, Nowak S, Spałek K. Red list of vascular plants of Opole Province. Nature Journal. 2008;41:141–158.
35. Jackowiak B, Celka Z, Chmiel J, Latowski K, Żukowski W. Red list of vascular flora of Wielkopolska (Poland). Biodivers Res Conserv. 2007;5–8:95–127.
36. Czarna A. Rośliny naczyniowe środkowej Wielkopolski. Poznań: Wydawnictwo Uniwersytetu Przyrodniczego; 2009.
37. Stefańska-Krzaczek E, Anioł-Kwiatkowska J. *Chrysanthemum segetum* (Asteraceae) – zanikający gatunek Dolnego Śląska. Acta Botanica Silesiaca. Supplementum. 2011;1:102–104.
38. Passarge H. Beobachtungen über Pflanzengesellschaften Landwirtschaftlicher Nutzflächen in nordlichen Polen. Feddes Repert. 1963;140(5):27–69.
39. Herbich J. Przestrzenno-dynamiczne zróżnicowanie roślinności dolin w krajobrazie młodoglacjalnym na przykładzie Pojezierza Kaszubskiego. Łódź: Polskie Towarzystwo Botaniczne; 1994. (Monographiae Botanicae; vol 76). http://dx.doi.org/10.5586/mb.1994.001
40. Pawlak G, Balcerkiewicz S. Roślinność synantropijna obszaru wybitnie rolniczego na przykładzie okolic wsi Kłodzino w województwie szczecińskim. Warszawa: Państwowe Wydawnictwo Naukowe; 1981. (Prace Komisji Biologicznej; vol 56).
41. Szmeja K. Cropfield-weed communities of northern Poland on the eastern and western sides of the Vistula. Acta Agrobot. 2000;53(2):105–115. http://dx.doi.org/10.5586/aa.2000.019
42. Hołdyński C. Rozmieszczenie niektórych interesujących gatunków segetalnych na Pojezierzu Iławskim. Acta Academiae Agriculturae ac Technicae Olstenensis. Agricultura. 1986;43:21–29.
43. Anioł-Kwiatkowska J, Dajdok Z, Kącki Z. Walory przyrodnicze projektowanego Parku Krajobrazowego "Dolina Odry II". Acta Universitatis Wratislaviensis. Prace Botaniczne. 1998;74:201–233.
44. Błocki K. *Spergulo-Chrysanthemetum segeti* (Br. Bl. et Leeuw 1936) R.Rx. 1937 – nowy dla obszaru Pojezierza Olsztyńskiego zespół chwastów polnych. Acta Agrobot. 2001;54(2):141–150. http://dx.doi.org/10.5586/aa.2001.030
45. Ratuszniak I, Sobisz Z. Zbiorowiska segetalne Parku Krajobrazowego "Dolina Słupi". Część III. Badania Fizjograficzne nad Polską Zachodnią. Botanika. 2004;53:39–57.
46. Zając A, Zając M, editors. Atlas rozmieszczenia roślin naczyniowych w Polsce. Kraków: Pracownia Chorologii Komputerowej Instytutu Botaniki Uniwersytetu Jagiellońskiego; 2001.
47. Matuszkiewicz W. Przewodnik do oznaczania zbiorowisk roślinnych Polski. 2nd ed. Warszawa: Wydawnictwo Naukowe PWN; 2001. (Vademecum Geobotanicum).
48. Scheuermann R. Beitrag zur Adventivflora in Pommern. Decheniana. 1956;108(2):169–196.
49. Kutyna I. Zachwaszczenie roślin uprawnych oraz zbiorowiska segetalne zachodniej części Kotliny Gorzowskiej i terenów przyległych. Szczecin: Wydawnictwo Akademii Rolniczej; 1988. (Rozprawy; vol 116).
50. Ziarnek K. Notatki florystyczne z Pomorza Zachodniego. Przegląd Przyrodniczy. 1997;8(4):79–84.
51. Tutin TG, Heywood VH, Burges NA, Moore DM, Valentine DH, Walters SM, et al. Flora Europaea. Vol. 4. Plantaginaceae to Compositae (and Rubiaceae). Cambridge: Cambridge University Press; 1976.
52. Hegi G. Spermatophyta. Berlin: P. Parey; 1987. [Illustrierte Flora von Mitteleuropa; vol 6(4)].
53. Vestergaard P, Hansen K. Distribution of vascular plants in Denmark. Copenhagen: Council for Nordic Publications in Botany; 1989. (Opera Botanica; vol 96).
54. Oosterveld E. Akkerkruiden in Dronthe en Twente, naar een effective beschetming. Die Levende Natuur, 1999;100(1), 22–26.
55. von Drachenfels O. Kartierschlüssel für Biotoptypen in Niedersachsen unter besonderer Berücksichtigung der gesetzlich geschützten Biotope sowie der Lebensraumtypen von Anhang I der FFH-Richtlinie, Stand März 2011. Hannover: Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz; 2011. (Naturschutz und Landschaftspflege in Niedersachsen; vol A/4).

56. Sobisz Z. Zróżnicowanie szaty roślinnej biotopów śródpolnych i pól Pobrzeża Koszalińskiego. Słupsk: Wydawnictwo Naukowe Akademii Pomorskiej; 2012.
57. Jasnowski M, Ćwikliński E, Markowski S. Pobrzeże Szczecińskie i Pojezierze Zachodniopomorskie. In: Matuszkiewicz W, Faliński JB, Kostrowicki AS, Matuszkiewicz JM, Olaczek R, Wojterski T, editors. Potencjalna roślinność naturalna Polski. Arkusz 3. Skala 1:300 000. Warszawa: Instytut Geografii i Przestrzennego Zagospodarowania PAN; 1995.
58. Gehu JM, Gehu M. Données sur l'association á *Spergula arvensis* et á *Chrysanthemum segetum* dans le Nord de la France. Documents Phytosociologiques. 1973;4:35–40.

***Spergulo-Chrysanthemetum segeti* (Br.-Bl. et de Leeuw 1936) R. Tx. 1937 na Pojezierzu Drawskim (Pomorze Zachodnie)**

Streszczenie

Celem pracy było rozpoznanie oraz ekologiczno-fitosocjologiczna charakterystyka *Spergulo-Chrysanthemetum segeti* na Pojezierzu Drawskim, ze szczególnym uwzględnieniem jego zróżnicowania na tle warunków siedliskowych.

Podano ważniejsze cechy florystyczne wyróżnionej agrofitocenozy, jej wewnętrzne zróżnicowanie i powiązania z warunkami siedliskowymi. Do oceny niektórych z nich oznaczono pH w H_2O i 1 M KCl metodą potencjometryczną. W obrębie *Spergulo-Chrysanthemetum segeti chamomilletosum* wyróżniono dwa warianty: typowy i z *Plantago intermedia*. Płaty wariantu typowego wykształcają się na glebach brunatnych właściwych i wyługowanych o odczynie słabo kwaśnym wytworzonych z piasków gliniastych i glin. Płaty wariantu z *Plantago intermedia* rozwijają się na czarnych ziemiach właściwych i zdegradowanych, rzadziej na madach i glebach murszowych. Wariant typowy podzespołu występuje najczęściej na glebach kompleksu żytniego bardzo dobrego (4), pszennego dobrego (2) i pszennego wadliwego (3), natomiast wariant z *Plantago intermedia* i subwariant z *Galeopsis speciosa* – na glebach kompleksów zbożowo-pastewnych – mocnego (8) i słabego (9).

Cechą charakterystyczną opisanego syntaksonu jest znaczny udział gatunków z rodzaju *Galeopsis*, którym towarzyszą *Anchusa arvensis* i *Lapsana communis*. Częste występowanie tych taksonów upodabnia omawiane zbiorowiska do agrofitocenoz występujących na obszarach wysoczyznowych, pogórzu i w górach.