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Differentiation of the plant cover on slopes of the Noteć valley near Ślesin (northern Poland)

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Abstract: The south-facing slopes of the Noteć river valley near Ślesin are known as a refuge of xerothermic steppe species, relicts of the early Holocene. Part of the area is protected as the Nature Reserve 'Skarpy Ślesińskie'. Floristic and phytosociological investigations of the plant complexes of the xerothermic grasslands, meadows, pastures and groves were carried out on the slopes between Ślesin and Trzeciewnica, including the nature reserve. In 25 plant complexes, 314 vascular plant species and 48 plant communities are found. The plant complexes of xerothermic grasslands are the richest floristically, while the meadows and pastures are the poorest. Spontaneous plants dominate in all units of plant landscape, reaching 80% of species, and more than half of plant communities are natural, almost exclusively auxochoric (i.e. composed of native species but occupying mainly anthropogenic sites). *Adonis vernalis*, *Anemone sylvestris*, *Asperula tinctoria*, *Campanula sibirica*, *Gentiana cruciata*, *Potentilla rupestris, Scorzonera purpurea, Stachys recta*, *Stipa joannis*, and *Vicia tenuifolia*, are the most noteworthy and protected plant species. They enter into well-developed, but small patches of *Scorzonero purpureae-Stipetum joannis* and *Adonido-Brachypodietum*. The communities deserve special protection and conservation.

Key words: flora, vegetation, grassland, xerothermic communities, thermophilous species, nature reserve, Skarpy Ślesińskie, Poland

1. Introduction

The northern edge of the Noteć river valley, elevated in some places even more than 50 m above the bottom of the valley, is the well-recognized limit between 2 important Polish geobotanical units: the Belt of Maritime Plains and Pomeranian Plateaus, and the Belt of Great Valleys (Szafer 1972). This area is characterized by a very rich flora and a high diversification of vegetation, mainly due to the south-facing, partly abrupt slopes dissected with gorges and stream valleys, and also the close proximity of the large river valley, flat and to a large extent covered by wetlands.

One of the most peculiar features of this area is the occurrence of xerothermic, steppe species, which are rare in Poland. For this reason, slopes of the Noteć valley were floristically investigated from the first years of the 19th century, and was early recognized as deserving protection (Preuss 1912). The steppe plants in that region of Europe are considered to be relicts of the first (Pre-Boreal) period of the Holocene (Czubiński 1950). They survive there due to the specific microclimate characteristic for the abrupt slopes and human activities, such as cutting down woody plants, pasturing, and frequent burning down the remains of vegetation in spring (Czubiński 1950; Ceynowa 1968). Floristic data from the vicinity of Ślesin, reported by several botanists, were summarized by Sulma & Walas (1963). The vegetation was characterized by Ceynowa (1968), and supplemented in the description of the project of the Nature Reserve 'Skarpy Ślesińskie' (Ceynowa 1961; Ceynowa-Giełdon 1991). Floristically the richest parts of the terrain are preserved within the reserve established in 2001.

The lack of more recent data concerning the present state of the plant cover of this nature reserve and its surroundings (mostly meadows, pastures and groves on the more inclined slopes) was a reason for floristic and phytosociological studies in that area. The main aim of the present work is to show the differentiation of plant complexes on the escarpments of the Noteć valley between Ślesin and Trzeciewnica, with particular reference to the thermophilous species and communities, and their dynamics.

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2. Material and methods

The Nature Reserve 'Skarpy Ślesińskie' includes 7 abrupt slopes separated from each other by local depressions. The protected area extends along the Noteć valley ridge (Fig. 1) over a distance of 1200 m, and covers 13.82 ha (Komendarczyk 1993). The southern limit of the reserve follows the railway line between Bydgoszcz and Piła. The construction of railroad in the mid-19th century, when the natural escarpments were additionally undercut (Komendarczyk 1993), contributed considerably to the preservation and even local expansion of thermophilous plant species. The formation of the strictly southern slopes, excluded for a long time from intensive agriculture because of its high inclination, allowed the survival and spread of thermophilous plant communities, which previously were probably more restricted. The present-day utilization of the area surrounding the reserve is not intensive. The gently inclined slopes are used as meadows and/or pastures, while those more inclined (mostly western and eastern escarpments) are covered with groves, which present various degenerative or regenerative phases of forest communities.

The field investigations were carried out in the growing seasons of 2003 and 2004, supplemented in the spring of 2005. In order to describe landscape diversification, we distinguished 25 plant complexes, divided on the basis of land use into 3 groups: (1) xerothermic grasslands; (2) pastures and meadows; and (3) naturally developed groves. The floristic composition and phytocoenotic relations of every complex were analysed. Names of plants follow Mirek *et al*. (2002), while plant communities were classified according to Brzeg & Wojterska (2001).

3. Results

The vascular flora of our study area includes 314 species of 198 genera and 58 families. The largest numbers of species represented the genera *Vicia* (7 species), *Carex* (6) and *Trifolium* (6), and the families Asteraceae (38 species), Poaceae (35), Fabaceae (28) and Rosaceae (23). The 10 most diverse families include nearly 61% of the species.

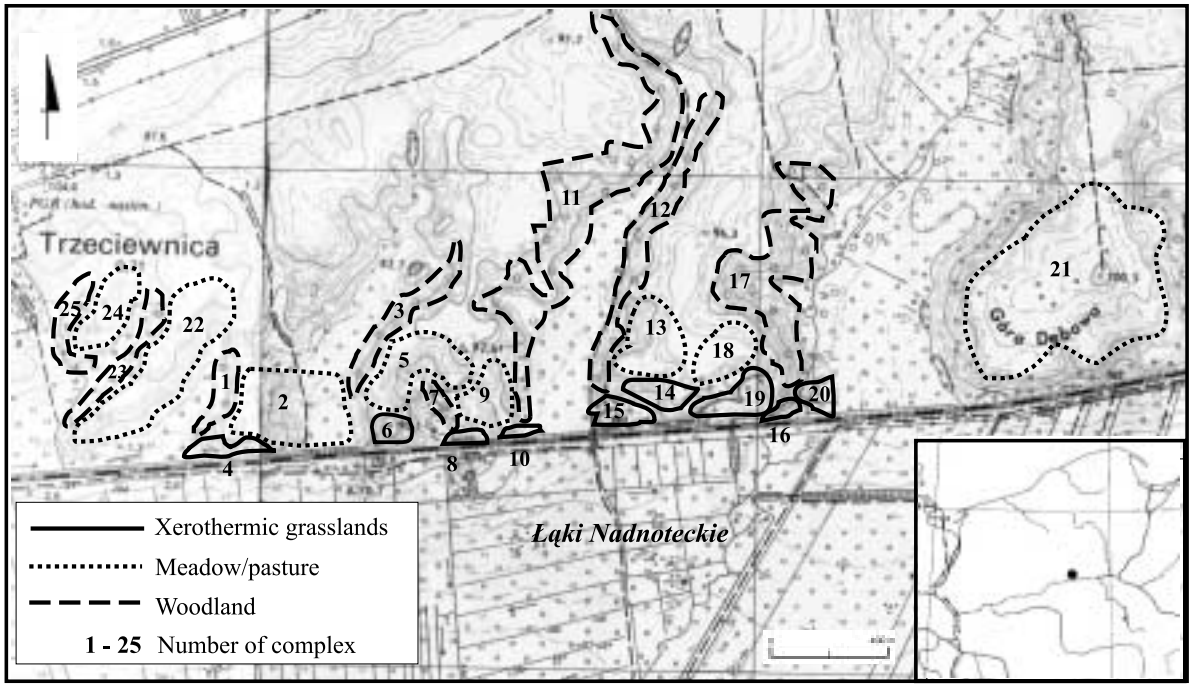

Fig. 1. Study area and distribution of the distinguished plant complexes

Spontaneophytes, which dominate in all 3 groups of plant complexes, account for about 80% of all taxa found. Archaeophytes are the most numerous anthropophytes in the study area (Table 1). Among Raunkiaer's plant life-forms, hemicryptophytes prevail, as they include about 50% of species, but proportions of phanerophytes (16%) and therophytes (19%) are also very high (Table 1).

The species represent 15 phytosociological classes (Table 1), mostly *Molinio-Arrhenatheretea* and *Artemisietea* (jointly over 31% of species), and the thermophilous *Festuco-Brometea*, *Koelerio-Corynephoretea* and *Trifolio-Geranietea* (jointly about 22% of species).

The species that are rare in Poland are represented in the reserve by quite large populations and are the most important peculiarities of the study area. These include first of all *Adonis vernalis*, *Anemone sylvestris*,

Campanula sibirica, *Stachys recta*, *Stipa joannis*, *Vicia tenuifolia*, but also *Asperula tinctoria*, *Gentiana cruciata*, *Scorzonera purpurea* and *Potentilla rupestris*. Floristically the richest is the group of plant complexes of xerothermic grasslands, where 233 species are found, while 191 were recorded in the groves and 167 in the meadows and pastures.

The flora of xerothermic grasslands includes 43 species of anthropophytes (18.4%), compared to 38 (19.9%) in the groves and 34 (20.4%) in the meadows and pastures (Table 1).

Thermophilous species occur most abundantly in xerothermic grasslands, where 67 such taxa are found, while in the sunlight groves on some of slopes, only 25. The forest species characteristic for the class *Querco-Fagetea* are represented by 23 taxa in the groves, while only 12 taxa in the grasslands (Table 1).

In total, 48 phytocoenoses are found in all plant complexes of the landscapes, including 31 in the grasslands, 22 in the groves and only 15 in the meadows and pastures. More than half of plant communities are natural, almost exclusively auxochoric, i.e. composed of native species

Table 1. The vascular flora differentiation of the plant complexes

Species groups	Total number of species	%	Number of species in plant complexes		
			xg	mp	wc
Geographical-historical groups					
Non-synanthropic spontaneophytes	112	35.8	78	49	71
Apophytes	138	43.9	112	84	82
Archaeophytes	36	11.5	24	22	18
Kenophytes	22	7.0	15	10	15
Diaphytes	6	1.9	4	2	5
Raunkiaer's plant life-forms					
Megaphanerophytes	28	8.9	18	12	25
Nanophanerophytes	23	7.3	14	12	21
Chamaephytes	9	2.9	9	5	3
Woody chamaephytes	9	2.9	8	4	4
Hemicryptophytes	153	48.7	123	86	85
Geophytes	31	9.9	19	15	21
Hydrophytes and helophytes	1	0.3	0	0	1
Therophytes	60	19.1	42	33	31
Socio-ecological groups					
Molinio-Arrhenatheretea	50	15.9	34	36	28
Festuco-Brometea	32	10.2	33	19	10
Artemisietea vulgaris	26	8.0	22	18	19
Artemisietea vulgaris – Convoluletalia sepium	22	7.0	13	7	19
Stellarietea mediae – Sisymbrietalia	10	3.2	8	4	5
Stellarietea mediae – Aperetalia spicae-venti, Papaveretalia rhoeadis	29	9.2	19	21	15
Querco-Fagetea	23	7.3	12	8	23
Trifolio-Geranietea sanguinei	22	7.0	20	15	13
Koelerio-Corynephoretea	15	4.8	14	5	2
Rhamno-Prunetea	13	4.1	11	8	13
Epilobietea angustifolii	7	2.2	5	3	5
Phragmitetea australis	4	1.3	2	2	2
Calluno-Ulicetea	2	0.6	1	0	1
Salicetea purpureae	2	0.6	1	0	1
Vaccinio-Piceetea	2	0.6	1	0	2
Alnetea glutinosae	1	0.3	0	0	1
Betulo-Adenostyletea	1	0.3	0	0	1
Others	54	16.9	37	21	31

Explanations: xg – xerothermic grasslands; mp – meadows and pastures; wc – woodland communities

Among Raunkiaer's plant life-forms, hemicryptophytes dominate in all 3 types of plant complexes distinguished. Therophytes rank second and are the most diverse in the xerothermic grasslands (Table 1), where chamaephytes are also represented by the highest numbers of species. The highest numbers of phanerophytes and geophytes are found in the groves.

but occupying mostly anthropogenic sites. The frequency of natural auxochoric communities is the highest in the groves and lowest in the meadows and pastures (Table 2).

Only 23% of plant communities represent ruderal vegetation. The 7 ruderal plant associations are observed in the grasslands, and only 4 in the groves. Among ruderal communities the most frequent are those composed of

grasses or therophytes. The ruderal communities as a rule do not cover large areas.

The 25 plant complexes distinguished include 10 complexes of xerothermic grasslands, 7 of meadows or pastures and 8 of woodland communities (including forest and shrub communities).

a higher number of anthropophytes (see Ceynowa-Giełdon & Waldon 2001). Also the phytosociological composition of the vegetation of that reserve is comparable but not so rich as on the slopes of the Noteć valley.

The plant cover of the slopes of the Noteć river valley between Ślesin and Trzeciewnica is very rich, mostly

Table 2. Comparison of shares of autogenic and anthropogenic communities in particular groups of plant complexes

Types of communities	Number of communities	%	xg	mp	wc
Natural auxochoric communities (whose acreage increases due to human activity)	25	52.1	15	4	14
Natural perdochoric communities (whose acreage decreases due to human activity)	1	2.1	1	1	1
Other natural communities	2	4.2	2	0	0
Seminatural communities	6	12.5	4	4	2
Ruderal communities	8	16.7	5	5	4
Specialized ruderal communities	3	6.2	2	1	0
Xenospontaneous communities (anthropogenic but invading undegraded habitats)	3	6.2	2	0	1

For explanations, see Table 1

4. Discussion

Similar site conditions as in the study area on slopes of Noteć river valley are found in several parts of the Vistula river valley. In those sites also many thermophilous plant species and similar vegetation types have survived (Czubiński 1950; Sulma & Walas 1963; Ceynowa-Giełdon & Waldon 2001). Those that are the most interesting floristically are protected in nature reserves, and their plant cover is well documented and described. In the Nature Reserve 'Parowy Ostnicowe Gruczna' on the Vistula valley slopes, which covers an area of 23.82 ha, a similar number of species was found, but with a lower number of spontaneophytes and as a result of site differentiation and less intensive agriculture. Several taxa and plant communities that are rare and valuable in Poland have survived there, mostly in the Nature Reserve 'Skarpy Ślesińskie', but also outside its borders. For that reason, and in order to preserve the area with the most valuable plant cover more effectively, the reserve should be subject to active protection. To conserve the grassland communities, the woody plants should be removed periodically. Particularly the patches of the xerothermic grassland communities *Scorzonero purpureae-Stipetum joannis* and *Adonido-Brachypodietum*, here well-developed, deserve to be carefully conserved.

References

Brzeg A. & Wojterska M. 2001. Zespoły roślinne Wielkopolski, ich stan poznania i zagrożenie. In: M. Wojterska (ed.). Szata roślinna Wielkopolski i Pojezierza Poludniowopomorskiego. Przewodnik sesji terenowych 52. Zjazdu PTB, pp. 39-110. Bogucki Wyd. Nauk., Poznań.

Ceynowa M. 1968. Zbiorowiska roślinności kserotermicznej nad dolną Wisłą. Stud. Soc. Sc. Tor. B 8(4): 1-156.

Ceynowa-Giełdon M. & Waldon B. 2001. Flora i zbiorowiska roślinne rezerwatu stepowego w Grucznie. Zesz. Nauk. Akad. Bydg. Studia Przyrodnicze 15: 5-96.

Ceynowa M. 1961 (mscr.). Roślinność rezerwatu stepowego między Nakłem a Ślesinem, pp. 1-8. Biuro Woj. Konserwatora Przyrody, Bydgoszcz.

Ceynowa-Giełdon M. 1991 (mscr.). Projektowany rezerwat roślinności stepowej 'Skarpy Ślesińskie', pp. 1-16. Biuro Woj. Konserwatora Przyrody, Bydgoszcz.

Czubiński Z. 1950. Problemy geobotaniczne Pomorza. Bad. Fizjogr. Pol. Zach. 2(4): 339-658.

Komendarczyk A. 1993. Dokumentacja projektowanego rezerwatu stepowego 'Skarpy Ślesińskie' położonego w gminie Nakło n. Notecią w województwie bydgoskim wg stanu na 01.01.1993, pp. 1-18. Biuro Usług Technicznych, Toruń.

Mirek Z., Piękoś-Mirkowa H., Zając A. & Zając M. 2002. Flowering plants and pteridophytes of Poland. A checklist. In: Z. Mirek (ed.). Biodiversity of Poland 1, 442 pp. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

Preuss H. 1912. Die pontischen Pflanzenbestände im Weichselgebiet. Beitr. z. Naturdenkmalpflege 2: 350-517.

Sulma T. & Walas J. 1963. Aktualny stan rezerwatów roślinności kserotermicznej w obszarze Dolnej Wisły. Ochrona Przyr. 28: 269-329.

Szafer W. 1972. Geobotaniczny podział Polski. Mapa 1:2 mln. In: W. Szafer & K. Zarzycki (ed.). Szata roślinna Polski, 1. PWN, Warszawa.