

## Early medieval fortified settlements at Kałdus and Płutowo (Chełmno land, northern Poland) – places of plant invasion and refuges

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**Abstract.** This study presents the results of research conducted at two early-medieval fortified settlements situated on the border of Wysoczyzna Chełmińska (Chełmińska Upland) and neighbouring areas. Phytosociological surveys were performed on site and compared with literature data concerning analogous plant communities from less synanthropised areas. The influence of ancient colonisation on expansion and survival of steppe relicts was underscored. The Kałdus settlement was presented as a place of refuge for plants connected with ancient colonisation, and a place to which some of the neighbouring steppe relicts arrived. The Płutowo settlement was included to demonstrate the natural process of forest regeneration in anthropogenic habitats.

**Keywords:** medieval settlements, relicts, steppe species, anthropopressure.

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### 1. Introduction

The settlements at Kałdus and Płutowo are situated on the main route of plant migration in Poland and within the largest concentration of xerothermic vegetation in the area of the lower Wisła River. This community has long been influenced by Man, who contributed to the endurance and secondary expansion of steppe species. First steppe plants arrived in the area of Central and Northern Poland already in the first periods after the glacier recession. They survived subsequent changes of weather and climate as well as expansion of forests, receding to relict stands – undermined river valley-sides – which guaranteed good lighting and thermal conditions. Intensified settlement and clearing of forests growing on the valley-sides, which were then turned into pastures,

contributed to improvement of the conditions for development of steppe plants and their renewed migration. In the area of Kałdus they did not only enter the natural habitats, but also settled in the environment exposed to strong pressure of Man. It is justified by a small patch of *Potentillo-Stipetum capillatae* Libb. 1933 em. Krausch 1960 persisting on the rampart of the settlement. Its stability is due to burning and tending of the greens, a practice so frequent in the past (Ceynowa 1971). Extensive use is a prerequisite for the sustenance of grass communities. When tending discontinues forests may be regenerated. As an example, the area of the settlement at Płutowo is a woodland. Long-lasting utilisation of medieval cities resulted in formation of specific soils, characterised by a higher content of phosphorus and nitrogen (Cook, Heizer 1965; Ceynowa 1968). Such settlements are

also peculiar environmental islands which enable – thanks to extensive use – survival of many vanishing and rare species and relict crops (Buliński 1993; Celka 1999, 2002). Therefore, it is interesting to compare the vegetation cover of the settlements with their nearest vicinity and to demonstrate the influence of ancient colonisation on its development.

## 2. Materials and methods

The subject of the research was the vegetation cover of two neighbouring early-medieval settlements, situated on the edge of the upland of Wysoczyzna Chełmińska, south-west of Chełmno (fig. 1).

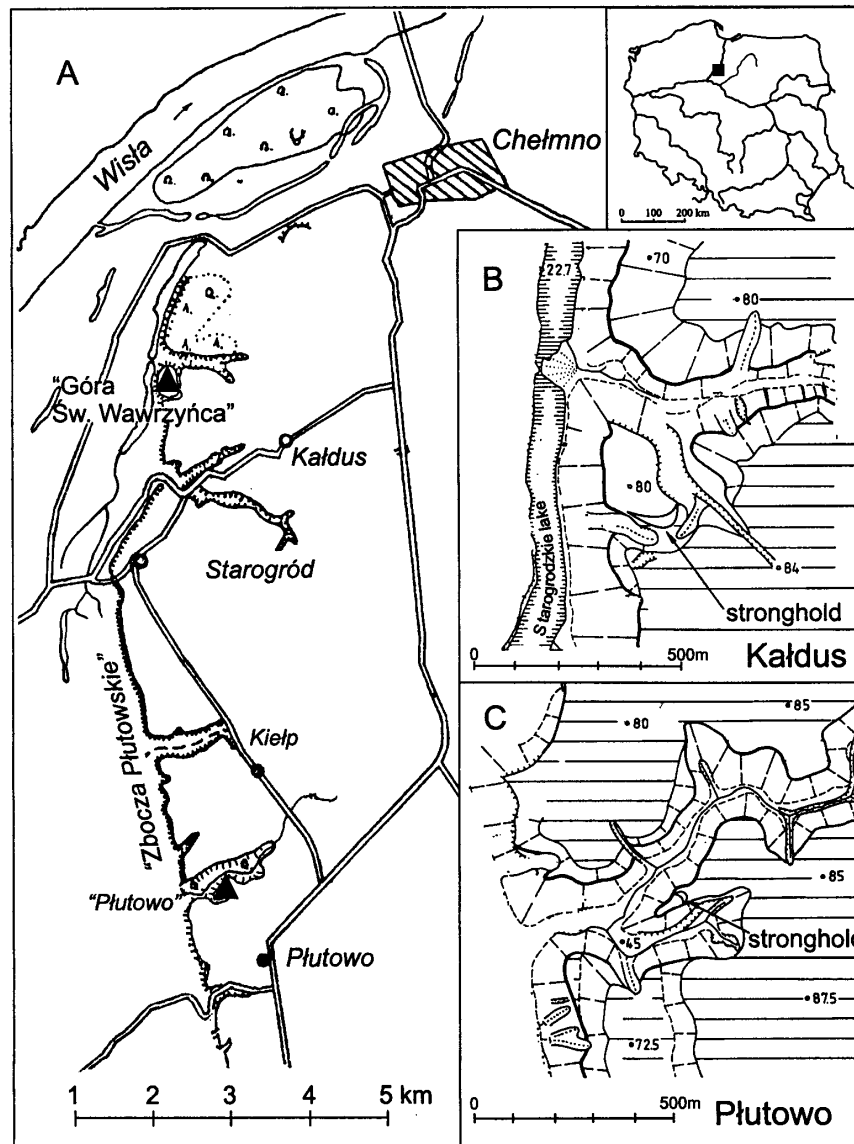


Figure 1. Localization of research places

**The Kałdus settlement** is situated 3 km from Chełmno and covers approximately 27,000 m<sup>2</sup>. The good conditions for colonisation are provided at Kałdus by steep natural slopes, protecting the settlement area from three sides, and a high rampart built onto the existing dune which ensured defence from the Upland (fig. 1A, B). Traces of colonisation in the area of the settlement date back to the period from Hallstatt and Neolithic Age to late Middle Ages. Especially intensive colonisation was connected with a large administrative centre functioning there in the early Middle Ages (Chudziakowa 1997; Chudziak 1996). From the early-medieval period until half of the 20<sup>th</sup> century the valley-sides of the Wisła Valley and the denudation valley were deforested and used as grazing land (Preuss 1912; Sulma, Walas 1963). At present, they witness reconstruction of a dry-ground forest. Only on the south slope of the rampart some grass communities survived. The rampart is protected as a reserve of xerothermic vegetation called "Góra św. Wawrzyńca".

**The Płutowo settlement** is situated about 10 km south of the settlement at Kałdus. This one also lies on a headland formed by an erosional dissection of the edge of Wysoczyzna Chełmińska (fig. 1A, C), however its surface is smaller – 4500 m<sup>2</sup>. The settlement, with an adjoining open colony, was populated between 9<sup>th</sup> and 12<sup>th</sup> centuries (Chudziakowa 1997). Functioning of the settlement, in the same way as at Kałdus, was associated with deforestation of that area. Nevertheless, when the settlement was deserted the land was not used any longer, which enabled regeneration of a forest community with natural characteristics. The area of the old settlement and the nearby denudation valley is protected as a woodland reserve called "Płutowo".

In the years 2001–2002 phytosociological surveys were carried out on the settlements using the Braun-Blanquet approach. The surveys were compared with literature data concerning analogous plant communities occurring in the vicinity. Plant nomenclature was assumed from *Flora Europaea* (Rutkowski 1998).

### 3. Results

**Kałdus.** The most valuable plant community present on the south slope of the rampart at Kałdus

is *Potentillo-Stipetum capillatae* association. It is principally formed by tufts of *Stipa capillata* L., which could easily come to the settlement from the neighbouring sides of the Wisła Valley already in early Middle Ages. Beside *Stipa capillata* L. the following steppe species grow in the area: *Carex supina* Willd. ex Wahlb., *Carex praecox* Schreber, *Hieracium echinoides* L., and *Achillea pannonica* Schelle (tab. 1). It is a small group of steppe species characterised by the highest resistance to anthropopressure. Other steppe plants have survived mainly on natural slopes and do not tend to occupy settlements which are strongly exposed to human transformation. A few examples of species which have not advanced from the neighbouring valley-sides to the settlement are: *Adonis vernalis* L., *Anemone silvestris* L., *Campanula sibirica* L., *Oxytropis pilosa* (L.) DC., *Scorzonera purpurea* L., *Filipendula vulgaris* Moench and *Stachys recta* L., occurring in the patches of the described association from the nearby steppe reserve "Zbocza Płutowskie" (Ceynowa 1968) and observed in the direct proximity of the settlement (Preuss 1912; Sulma, Walas 1963). Neither were they observed in the patches described on the range embankments at Chełmno (tab. 1). The patch of the plant association from Kałdus is richer in nitrophilous species: *Falcaria vulgaris* Bernh., *Coryza canadensis* (L.) Cronq, *Silene latifolia* Poiret ssp. *alba* (Miller) Greuter et Burdet, *Viola arvensis* Murray, and *Trifolium arvense* L. The presence of *Lavathera thuringiaca* L. growing at Kałdus in the northern border of occurrence is especially noteworthy, since this species is regarded as a relict of old crops (Celka 1999). Other species, such as *Asparagus officinalis* L., *Verbascum densiflorum* Bertol., *Chondrilla juncea* L. and *Origanum vulgare* L. are also connected with ancient colonisation. When the old practice of utilisation was abandoned, *Acer platanoides* L. and *Quercus robur* L. bushes and trees started overgrowing the xerothermic grass on the rampart. Other species – unrecorded here in the past – also entered this area. These included *Arabis glabra* (L.) Bernh., *Dactylis glomerata* L., *Silene latifolia* ssp. *alba*, *Thalictrum minus* L., *Viola arvensis* Murray, and *Vicia hirsuta* (L.) S. F. Gray (tab. 1). From the neighbouring slope in the west, the expansively-spreading trees of *Robinia pseudacacia* L. enter the rampart.

Table 1. Comparison of phytocoenosis *Potentillo-Stipetum capillatae* Libbert 1933 em. Krausch 1960 from settlement in Kaldus (1), nature reserve "Zbocza Płutowskie" (2) (from Ceynowa 1968) and Chelmo city (3) (from Ceynowa 1968)

No.	1				2	3
	Settlement in Kaldus					
Place					Nature reserve "Zbocza Płutowskie" (11 relevés)	Chelmo (6 relevés)
Date	08.08.1960	08.08.1960	05.07.2002	17.07.2001		
Relevé area (m <sup>2</sup> )	150	100	100	100		
Cover total (%)	80	70	80	70		
Exposition	S	S	S	S		
<b>ChAss ChAII ChO Potentillo-Stipetum capillatae, Festuco-Stipion, Festucetalia valesiaceae</b>						
<i>Stipa capillata</i>	4	4	3	4	V <sup>3-4</sup>	V <sup>2-4</sup>
<i>Potentilla arenaria</i>	2	3	2	2	V <sup>+3</sup>	V <sup>+3</sup>
<i>Achillea pannonica</i>	+	+	+	+	V <sup>+</sup>	V <sup>+</sup>
<i>Hieracium echinoides</i>	+	1	+	.	I <sup>+</sup>	IV <sup>+</sup>
<i>Asparagus officinalis</i>	+	.	+	.	II <sup>+</sup>	.
<i>Carex supina</i>	.	+	.	.	IV <sup>+</sup>	.
<i>Carex praecox</i>	+	+	.	+	I <sup>+</sup>	.
<i>Stipa joannis</i>	.	.	.	.	I <sup>2</sup>	I <sup>+</sup>
<i>Oxytropis pilosa</i>	.	.	.	.	V <sup>+1</sup>	I <sup>+</sup>
<i>Medicago minima</i>	.	.	.	.	II <sup>+</sup>	I <sup>+</sup>
<i>Campanula sibirica</i>	.	.	.	.	III <sup>+</sup>	.
<i>Scabiosa ochroleuca</i>	.	.	.	.	II <sup>+</sup>	.
<i>Adonis vernalis</i>	.	.	.	.	I <sup>1-2</sup>	.
<i>Alyssum montanum</i>	.	.	.	.	.	II <sup>+</sup>
<i>Pulsatilla pratensis</i>	.	.	.	.	.	I <sup>+</sup>
<i>Toninia coeruleo-nigricans</i>	.	.	.	.	IV <sup>+2</sup>	.
<b>ChCI Festuco Brometea</b>						
<i>Phleum phleoides</i>	+	+	2	3	V <sup>+2</sup>	V <sup>+1</sup>
<i>Dianthus carthusianorum</i>	+	+	1	+	IV <sup>+1</sup>	I <sup>+</sup>
<i>Centaurea stoebe</i>	+	+	+	+	III <sup>+</sup>	V <sup>+</sup>
<i>Euphorbia cyparissias</i>	+	+	+	.	V <sup>+2</sup>	V <sup>+</sup>
<i>Artemisia campestris</i>	1	1	.	.	V <sup>+2</sup>	V <sup>+2</sup>
<i>Carex caryophyllea</i>	1	.	.	.	I <sup>+</sup>	I <sup>+</sup>
<i>Allium oleraceum</i>	.	+	+	.	II <sup>+</sup>	II <sup>+</sup>
<i>Salvia pratensis</i>	.	.	+	+	V <sup>+1</sup>	.
<i>Veronica spicata</i>	.	.	.	.	I <sup>+1</sup>	IV <sup>+1</sup>
<i>Acinos arvensis</i>	.	.	.	.	V <sup>+1</sup>	.
<i>Koeleria gracilis</i>	.	.	.	.	V <sup>+1</sup>	.
<i>Poa compressa</i>	.	.	.	.	III <sup>+</sup>	I <sup>+</sup>
<i>Pimpinella saxifraga</i>	.	.	.	.	III <sup>+</sup>	I <sup>+</sup>
<i>Thuidium abietinum</i>	.	.	.	.	II <sup>+</sup>	III <sup>+3</sup>
<i>Pterygonerum cavifolium</i>	.	.	.	.	I <sup>+</sup>	IV <sup>+2</sup>
<i>Camphothecium lutescens</i>	.	.	.	.	I <sup>+</sup>	I <sup>+</sup>
<i>Filipendula vulgaris</i>	.	.	.	.	II <sup>+</sup>	.

Table 1. Continuation

<i>Brachypodium pinnatum</i>	.	.	.	.	II <sup>+</sup>	.
<i>Petrorhagia prolifera</i>	.	.	.	.	II <sup>+</sup>	.
<i>Stachys recta</i>	.	.	.	.	I <sup>+</sup>	.
<i>Avenula pratense</i>	.	.	.	.	I <sup>+</sup>	.
<i>Thymus pulegioides</i>	.	.	.	.	I <sup>+</sup>	.
<i>Saxifraga tridactylites</i>	.	.	.	.	I <sup>+</sup>	.
<i>Pterygonerum sessile</i>	.	.	.	.	I <sup>+</sup>	.
<b>Companions</b>	.	.	.	.	.	.
<i>Galium verum</i>	2	2	1	2	V <sup>+1</sup>	I <sup>+</sup>
<i>Falcaria vulagris</i>	+	+	+	.	IV <sup>+</sup>	III <sup>+</sup>
<i>Anchusa officinalis</i>	+	.	1	+	I <sup>+</sup>	II <sup>+</sup>
<i>Festuca trachyphylla</i>	.	.	2	1	IV <sup>+3</sup>	I <sup>1</sup>
<i>Bromus inermis</i>	1	+	.	.	IV <sup>+2</sup>	III <sup>+2</sup>
<i>Medicago sativa ssp. falcata</i>	+	+	.	.	V <sup>+</sup>	III <sup>+1</sup>
<i>Verbascum densiflorum</i>	+	.	1	.	II <sup>+</sup>	IV <sup>+</sup>
<i>Conyza canadensis</i>	+	.	+	.	III <sup>+</sup>	III <sup>+</sup>
<i>Helichrysum arenarium</i>	+	+	.	.	I <sup>+</sup>	I <sup>+</sup>
<i>Camelina microcarpa</i>	+	.	+	.	I <sup>+</sup>	I <sup>+</sup>
<i>Chondrilla juncea</i>	.	+	.	+	.	III <sup>+</sup>
<i>Rumex acetosella</i>	.	+	+	.	.	III <sup>+</sup>
<i>Trifolium arvense</i>	.	+	+	.	.	II <sup>+</sup>
<i>Lavatera thuringiaca</i>	+	.	+	+	.	.
<i>Arabis glabra</i>	.	.	+	+	.	.
<i>Potentilla anserina</i>	.	.	2	.	.	.
<i>Convolvulus arvensis</i>	1	.	.	.	I <sup>+</sup>	I <sup>+</sup>
<i>Cynoglossum officinale</i>	+	.	.	.	I <sup>+</sup>	II <sup>+</sup>
<i>Vicia tetrasperma</i>	+	.	.	.	.	I <sup>+</sup>
<i>Bilderdykia convolvulus</i>	.	+	.	.	.	II <sup>+</sup>
<i>Viola arvensis</i>	.	.	+	.	I <sup>+</sup>	I <sup>+</sup>
<i>Dactylis glomerata</i>	.	.	+	.	I <sup>+</sup>	.
<i>Silene alba</i>	.	.	+	.	.	.
<i>Vicia hirsuta</i>	.	.	+	.	.	.
<i>Thalictrum minus</i>	.	.	+	.	.	.
<i>Acer platanoides</i> (c)	.	.	+	.	.	.
<i>Cirsium arvense</i>	.	.	.	+	.	.

**Plutowo.** The area of the Plutowo settlement and the adjacent denudation valley area covered with a dry-ground forest (*Tilio-Carpinetum* Tracz. 1962) with natural features. It regenerated in early Middle Ages on a deforested area, which was not cultivated in later periods. A sub association from *Corydalis cava* Schweigg & Körte developed in the settlement (Rejewski 1974). Comparison of the floral composition of phytocenoses from the im-

mediate vicinity of the settlement with data collected from natural habitats of the whole Chełmno land (Rejewski 1971) does not reveal any significant variance (tab. 2). Nowhere but in a patch from the settlement itself higher coverage values reached by synanthropic species of *Urtica dioica* L. and *Sambucus nigra* L. were noted, together with the presence of *Astragalus glycyphyllos* L., unrecorded in the respective patches from the Chełmno land.

At the same time, there are no species which very frequently occur in natural habitats, e.g. *Corydalis intermedia* (L.) Mérat, *Gagea minima* (L.) Ker

Gawl, *Carpinus betulus* L., *Tilia cordata* Mill., *Stellaria holostea* L., *Aegopodium podagraria* L., or *Oxalis acetosella* L. (tab. 2).

Table 2. Comparison of phytocoenosis *Tilio-Carpinetum corydaletosum* Tracz. 1962 from settlement in Płutowo (1), nature reserve "Płutowo" (2) (from Rejewski 1974) and Chełmno land (3) (from Rejewski 1971)

No.	1	2	3
Place	Settlement in Płutowo	Nature Reserve "Płutowo" (6 relevés)	Chełmno land (14 relevés)
Date	11. 07. 2002		
Relevé area (m <sup>2</sup> )	100		
Cover total (%)	90		
<b>ChAss Tilio-Carpinetum corydaletosum</b>			
<b>ChAll Carpinion betuli</b>			
<i>Carpinus betulus</i> (a)	.	V <sup>1-4</sup>	V <sup>1-3</sup>
<i>Carpinus betulus</i> (b)	.	III <sup>1-2</sup>	IV <sup>+3</sup>
<i>Carpinus betulus</i> (c)	.	II <sup>+1</sup>	II <sup>3</sup>
<i>Tilia cordata</i> (a)	.	III <sup>1-2</sup>	III <sup>1-3</sup>
<i>Tilia cordata</i> (b)	.	III <sup>+1</sup>	IV <sup>+2</sup>
<i>Tilia cordata</i> (c)	.	.	IV <sup>+</sup>
<i>Stellaria holostea</i>	.	II <sup>+1</sup>	IV <sup>+1</sup>
<i>Euonymus verrucosus</i> (b)	.	.	II <sup>+</sup>
<i>Campanula latifolia</i>	.	IV <sup>+1</sup>	.
<i>Viola mirabilis</i>	.	II <sup>+</sup>	.
<i>Chaerophyllum temulentum</i>	+	III <sup>+</sup>	.
<b>DsAss</b>			
<i>Corydalis cava</i>	3	V <sup>3</sup>	V <sup>3-4</sup>
<i>Gagea lutea</i>	+	V <sup>+1</sup>	V <sup>+2</sup>
<i>Gagea minima</i>	.	V <sup>1-2</sup>	V <sup>+2</sup>
<i>Corydalis intermedia</i>	.	V <sup>+3</sup>	IV <sup>+2</sup>
<b>ChO Fagetalia sylvaticae</b>			
<i>Ulmus glabra</i> (a)	.	II <sup>2-3</sup>	II <sup>2-4</sup>
<i>Ulmus glabra</i> (b)	.	IV <sup>+1</sup>	III <sup>+3</sup>
<i>Ulmus glabra</i> (c)	.	I <sup>+</sup>	II <sup>+</sup>
<i>Ulmus minor</i> (a)	.	II <sup>1-4</sup>	II <sup>1-4</sup>
<i>Ulmus minor</i> (b)	.	IV <sup>+2</sup>	III <sup>+3</sup>
<i>Acer pseudoplatanus</i> (a)	.	I <sup>1</sup>	I <sup>3</sup>
<i>Acer pseudoplatanus</i> (b)	.	II <sup>+</sup>	I <sup>+</sup>
<i>Acer pseudoplatanus</i> (c)	+	.	.
<i>Fagus sylvatica</i> (a)	.	.	I <sup>1-2</sup>
<i>Fagus sylvatica</i> (b)	.	.	I <sup>+</sup>
<i>Alnus glutinosa</i> (a)	.	.	I <sup>1-2</sup>
<i>Mercurialis perennis</i>	4	IV <sup>+2</sup>	III <sup>+2</sup>
<i>Lamium galeobdolon</i>	3	V <sup>+2</sup>	V <sup>+3</sup>
<i>Asarum europaeum</i>	1	V <sup>+2</sup>	V <sup>+3</sup>

Table 2. Continuation

<i>Pulmonaria obscura</i>	1	IV <sup>+2</sup>	IV <sup>+3</sup>
<i>Adoxa moschatellina</i>	+	V <sup>+2</sup>	V <sup>+2</sup>
<i>Anemone ranunculoides</i>	+	V <sup>+2</sup>	V <sup>+2</sup>
<i>Stachys sylvatica</i>	+	IV <sup>+1</sup>	III <sup>+2</sup>
<i>Galium odoratum</i>	+	.	I <sup>1</sup>
<i>Polygonatum multiflorum</i>	.	IV <sup>+1</sup>	IV <sup>+2</sup>
<i>Prunus padus</i> (a)	.	I <sup>1</sup>	I <sup>2</sup>
<i>Prunus padus</i> (b)	.	III <sup>+1</sup>	II <sup>+1</sup>
<i>Prunus padus</i> (c)	.	.	II <sup>+</sup>
<i>Ranunculus ficaria</i>	.	V <sup>2-4</sup>	V <sup>1-4</sup>
<i>Actaea spicata</i>	.	II <sup>+</sup>	I <sup>1</sup>
<i>Lathyrus vernus</i>	.	I <sup>+</sup>	II <sup>+1</sup>
<i>Chaerophyllum aromaticum</i>	.	II <sup>+1</sup>	.
<i>Milium effusum</i>	.	II <sup>+</sup>	.
<i>Dryopteris filix-mas</i>	.	.	III <sup>+2</sup>
<i>Stellaria nemorum</i>	.	.	I <sup>+</sup>
<i>Ranunculus lanuginosus</i>	.	I <sup>+</sup>	III <sup>+1</sup>
<i>Viola reichenbachiana</i>	.	III <sup>+1</sup>	II <sup>+1</sup>
<i>Paris quadrifolia</i>	.	I <sup>+</sup>	III <sup>+</sup>
<i>Scrophularia nodosa</i>	.	II <sup>+</sup>	.
<i>Oxalis acetosella</i>	.	I <sup>+1</sup>	III <sup>+1</sup>
<b>ChCI Quercus-Fagetea</b>			
<i>Fraxinus excelsior</i> (a)	3	I <sup>1</sup>	I <sup>1</sup>
<i>Fraxinus excelsior</i> (b)	+	I <sup>+</sup>	I <sup>+</sup>
<i>Fraxinus excelsior</i> (c)	+	I <sup>+</sup>	.
<i>Acer platanoides</i> (a)	.	III <sup>1-3</sup>	II <sup>1-3</sup>
<i>Acer platanoides</i> (b)	.	I <sup>1</sup>	III <sup>+1</sup>
<i>Acer platanoides</i> (c)	.	I <sup>+</sup>	.
<i>Euonymus europaeus</i> (b)	1	II <sup>+1</sup>	II <sup>+1</sup>
<i>Euonymus europaeus</i> (c)	.	III <sup>+</sup>	III <sup>+</sup>
<i>Corylus avellana</i> (b)	+	II <sup>+</sup>	III <sup>+3</sup>
<i>Corylus avellana</i> (c)	.	II <sup>1</sup>	.
<i>Lonicera xylosteum</i> (b)	+	II <sup>+</sup>	III <sup>+1</sup>
<i>Lonicera xylosteum</i> (c)	.	III <sup>+</sup>	.
<i>Aegopodium podagraria</i>	.	IV <sup>+3</sup>	IV <sup>+2</sup>
<i>Poa nemoralis</i>	.	III <sup>+2</sup>	II <sup>+2</sup>
<i>Hepatica nobilis</i>	.	.	III <sup>+2</sup>
<i>Carex digitata</i>	.	.	II <sup>+1</sup>
<i>Lathraea squamaria</i>	.	.	III <sup>+</sup>
<i>Melica nutans</i>	.	II <sup>+1</sup>	.
<b>Companions</b>			
<i>Quercus robur</i> (a)	3	I <sup>3</sup>	III <sup>1-4</sup>
<i>Quercus robur</i> (b)	.	.	I <sup>+</sup>
<i>Lamium maculatum</i>	3	II <sup>2</sup>	I <sup>+</sup>

Table 2. Continuation

<i>Sambucus nigra</i> (b)	3	III <sup>+1</sup>	III <sup>+2</sup>
<i>Sambucus nigra</i> (c)	.	V <sup>+1</sup>	III <sup>+1</sup>
<i>Galium aparine</i>	2	V <sup>+2</sup>	III <sup>+</sup>
<i>Urtica dioica</i>	2	I <sup>1</sup>	III <sup>+2</sup>
<i>Geum urbanum</i>	1	I <sup>1</sup>	II <sup>+1</sup>
<i>Geranium robertianum</i>	+	I <sup>1</sup>	II <sup>+1</sup>
<i>Chelidonium majus</i>	+	I <sup>+</sup>	II <sup>+</sup>
<i>Astragalus glycyphyllos</i>	+	.	.

#### 4. Summary and conclusions

1. Man's activities in the area of Kałdus in the early settlement periods were connected with deforestation. It improved the conditions of growth and triggered off the process of secondary expansion of steppe species.
2. Certain steppe species, e.g. *Stipa capillata*, moved out of their relict stands situated on the sides of the Wisła Valley to new places of growth and have survived until the present on the settlement rampart at Kałdus, heavily transformed by Man.
3. The patch of the steppe association *Potentillo-Stipetum* on the rampart at Kałdus is more deficient in steppe species as compared with respective patches of the same association in the natural habitats of the Wisła Valley.
4. Alongside with steppe relicts the xerothermic grass of the Kałdus settlement includes relicts of ancient crops.
5. In the Kałdus settlement, the natural process of succession was restrained until present times through burning and tending of the greens. A lack of human activities in the settlement of Phutowo enabled regeneration of the forest.
6. The forest community developed in the area of the Phutowo settlement does not contain many forest species which are common in the neighbourhood.
7. The vegetation covers of both investigated settlements reveal significantly bigger participation of nitrophilous species in comparison with their neighbouring areas.

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