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## **RARE ELEMENTS OF THE SEGETAL FLORA PRESERVED IN ABANDONED VILLAGES IN THE KAMPINOS NATIONAL PARK (CENTRAL POLAND)**

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*Key words: rare species, segetal flora, ruderal habitats, abandoned vil-  
lages, Kampinos National Park*

**Abstract.** Floristic studies were conducted in 15 abandoned villages in the Kampinos National Park during the years 1992–1995 and 2004–2007. This paper presents interesting segetal species found in these areas. Thirty four rare segetal taxa were found, including 25 threatened and vulnerable species. In the field margin habitats 110 species were found. Apophytes constituted the major group of species (about 47 %) and archaeophytes were less numerous (about 38 %). The aims of the present study were to determine whether the surveyed sites can function as a potential source of diaspores of rare segetal species and to establish if abandoned villages are important for biodiversity preservation.

### **Introduction**

The extinction of segetal species is nowadays a common effect of growing anthropogenic pressure. In the Kampinos National Park (hereinafter KNP), Central Poland, we observed other processes exerting adverse effects on the segetal flora of this area.

The KNP to a large extent is almost free from long-term antropic pressure. Since the mid–1970s the National Park Management has been repurchasing buildings and agricultural lands located within the park boundaries. Due to this activity, as well as to the natural secondary successions, the disappearance of traditional countryside landscapes becomes progressively frequent.

The aim of the present study was to survey rare elements of the ruderal flora in abandoned villages within KNP. The second goal of this paper was to determine whether the surveyed sites can function as a potential source of diaspores of rare segetal species.

### **Material and methods**

The material for this study was collected during 1992–1995 and 2004–2007 on ruderal sites in abandoned villages in the Kampinos National Park (KNP). Fifteen villages with an advanced depopulation process were selected. Most of them were situated in the central part of the park, isolated by vast areas of forests and meadows, far away from transportation and communication routes, and rarely visited by tourists. In the recent years consecutive purchase of properties by the Park Management has caused a decrease or disappearance of human population in most of these villages. The Park

Management actively re-naturalizes abandoned areas by destroying buildings, transforming arable lands, and reforestation.

Observations were conducted in the following types of ruderal habitats: roadsides, proximity of houses and fences, in the yards of abandoned households, or in places where households used to be; on roadsides, in ruins, on rubble heaps, dumping sites, and in the field plots adjacent to the mentioned sites, conventionally described here as *field margins*. *Field margins* refer here to narrow strips of intermediate habitats on the boundary of segetal and ruderal sites, being a mosaic of these two. In this paper I characterize the flora of these transition zones in order to distinguish rare elements of the segetal flora in abandoned villages of KPN.

In all these villages floristic inventories were made, with a special focus on the frequency of occurrence of species. The term «site» was used when a given species was observed in some spots, regardless of its population size. I considered all naturally occurring species, including those which used to be planted and now tend to escape from cultivation. Nomenclature of plant species is given according to the checklist of flowering plants and pteridophytes of Poland (Mirek et al., 2002).

In accordance with the aim of this work, a list of rare segetal taxa found in all investigated sites is presented. It is based on the most up-to-date publications: «Rare, endangered and protected plant species of synanthropic flora of the Kampinos National Park» (Kirpluk, Bomanowska, 2008) and «Endangered and threatened segetal plants of Kampinoski National Park» (Bomanowska, 2008).

Floristic lists were made on the basis of the collected data concerning the occurrence of species in *field margins* and their phytosociological affinity (Kropac, Mochnecky, 2009, Matuszkiewicz, 2001; Zarzycki et al., 2002). The results were compared with the data on threatened species of segetal habitats in KNP (Bomanowska, 2008) and with the existing floristic lists (Bomanowska, 2001).

## Results and discussion

The flora of *field margins* encompassed 110 species, with a slight domination of apophytes (47.3 %) over archaeophytes (38.2 %) in terms of species number. Epocophytes (10 %) as well as ergasiophygophytes (4.5 %) constituted a rather small fraction of the flora. Alien species were slightly predominant over native species.

According to Bomanowska (2006), the majority of species of the segetal flora of KPN were native (67.2 %), whereas the remaining species were of alien origin (32.8 %). Archaeophytes constituted the largest fraction of the total segetal flora (19.06 %). This is also true for abandoned villages in the KNP area. The total ruderal flora of the 15 studied villages comprised 500 species. Apophytes (about 64 % of the total flora) dominated over anthropophytes (36 %), within which archaeophytes prevailed (14%) (Kirpluk 1996, 2003). For example, in the surroundings of the Roztocze National Park (which has a segetal flora typical of Poland) the composition of synanthropic groups of segetal species was as follows: apophytes – 57.1 %, archaeophytes – 34.3 %, epocophytes – 5.6 %, and ergasiophygophytes – 3 % (Ziemiecka-Smyk, 2006). A high proportion of archaeophytes is noteworthy, as well as the dominance of native species.

Table 1. List of species found in the *field margins*, according to their synanthropic group

Apophytes	Archaeophytes	Epoecophytes	Ergasiophygophytes
52	42	11	5
<i>Achillea millefolium</i>	<i>Agrostemma githago</i>	<i>Amaranthus hybridus</i>	<i>Avena sativa</i>
<i>Agrimonia eupatoria</i>	<i>Anchusa arvensis</i>	<i>Amaranthus retroflexus</i>	<i>Lupinus luteus</i>
<i>Anthoxanthum odoratum</i>	<i>Anchusa officinalis</i>	<i>Anthemis ruthenica</i>	<i>Ornithopus sativus</i>
<i>Arnoseris minima</i>	<i>Anthemis arvensis</i>	<i>Chamomilla suaveolens</i>	<i>Phacelia tanacetifolia</i>
<i>Artemisia campestris</i>	<i>Apera-spica-venti</i>	<i>Chenopodium strictum</i>	<i>Secale cereale</i>
<i>Artemisia vulgaris</i>	<i>Armoracia rusticana</i>	<i>Conyza canadensis</i>	
<i>Barbarea vulgaris</i>	<i>Capsella bursa-pastoris</i>	<i>Galinsoga parviflora</i>	
<i>Berteroa incana</i>	<i>Centaurea cyanus</i>	<i>Impatiens parviflora</i>	
<i>Bromus hordeaceus</i>	<i>Chamomilla recutita</i>	<i>Oxalis stricta</i> ( <i>Xanthoxalis stricta</i> )	
<i>Cardaminopsis arenosa</i> ( <i>Arabidopsis arenosa</i> )	<i>Chenopodium murale</i>	<i>Solidago canadensis</i>	
<i>Carex hirta</i>	<i>Cichorium intybus</i>	<i>Xanthium albinum</i>	
<i>Centaurea stoebe</i>	<i>Consolida regalis</i>		
<i>Chenopodium album</i>	<i>Descurainia sophia</i>		
<i>Convolvulus arvensis</i>	<i>Digitaria sanguinalis</i>		
<i>Corynephorus canescens</i>	<i>Echinochloa crus-galli</i>		
<i>Dactylis glomerata</i>	<i>Euphorbia helioscopia</i>		
<i>Polygonum lapathifolium</i> subsp. <i>lapathifolium</i>	<i>Euphorbia peplus</i>		
<i>Daucus carota</i>	<i>Galeopsis ladanum</i>		
<i>Echium vulgare</i>	<i>Lactuca serriola</i>		
<i>Elymus repens</i> ( <i>Elytrigia repens</i> )	<i>Lithospermum arvense</i> ( <i>Buglossoides arvensis</i> )		
<i>Equisetum arvense</i>	<i>Matricaria maritima</i> subsp. <i>inodora</i>		
<i>Equisetum pratense</i>	<i>Myosotis arvensis</i>		
<i>Equisetum sylvaticum</i>	<i>Papaver argemone</i>		
<i>Erodium cicutarium</i>	<i>Papaver dubium</i>		
<i>Erophila verna</i> ( <i>Draba verna</i> )	<i>Papaver rhoeas</i>		
<i>Euphorbia cyparissias</i>	<i>Papaver strigosum</i>		
<i>Euphorbia esula</i>	<i>Raphanus raphanistrum</i>		
<i>Fallopia dumetorum</i>	<i>Scleranthus annuus</i>		
<i>Heracleum sibiricum</i>	<i>Setaria pumila</i>		

Apophytes	Archaeophytes	Epocophytes	Ergasiophyophytes
<i>Knautia arvensis</i>	<i>Setaria viridis</i>		
<i>Leontodon autumnalis</i>	<i>Sinapis arvensis</i>		
<i>Lychnis flos-cuculi</i>	<i>Sisymbrium officinale</i>		
<i>Lysimachia nummularia</i>	<i>Spergula arvensis</i>		
<i>Lysimachia vulgaris</i>	<i>Thlaspi arvense</i>		
<i>Melandrium album</i>	<i>Urtica urens</i>		
<i>Mentha arvensis</i>	<i>Veronica arvensis</i>		
<i>Myosotis ramosissima</i>	<i>Veronica triphyllos</i>		
<i>Myosotis stricta</i>	<i>Vicia angustifolia</i>		
<i>Myosoton aquaticum</i>	<i>Vicia hirsuta</i>		
<i>Phleum pratense</i>	<i>Vicia tetrasperma</i>		
<i>Plantago lanceolata</i>	<i>Vicia villosa</i>		
<i>Polygonum aviculare</i>	<i>Viola arvensis</i>		
<i>Polygonum persicaria</i> ( <i>Persicaria maculosa</i> )			
<i>Pulicaria vulgaris</i>			
<i>Rhinanthus serotinus</i>			
<i>Rubus plicatus</i>			
<i>Rumex acetosella</i>			
<i>Scleranthus polycarpus</i>			
<i>Stachys palustris</i>			
<i>Veronica verna</i>			
<i>Vicia lathyroides</i>			
<i>Viola tricolor</i>			

The above-cited data showed that the flora of the *field margins* was more similar to the typical segetal flora rather than the segetal or ruderal flora of KPN.

In this study I found a group of 34 rare segetal species (Table 2), 25 of which are threatened on synanthropic sites in KNP (Kirpluk, Bomanowska, 2008), and 12 of which were given the status of endangered species according to Bomanowska (2008). Moreover, two species, *Camelina microcarpa* Andr. and *Filago arvensis* L., have the highest conservation EX/CR status (locally extinct in segetal habitats). Both of them were registered in one site only.

*Camelina microcarpa* was found on a rubble heap in one of the villages in the 1990s. It was not observed in the following years, but now the site probably does not exist any more. The village is now completely abandoned, the houses have been pulled down and the surrounding fields are ploughed and reforested. The close vicinity of forest communities favors the succession at this site, and the human penetration is in-

Table 2. Rare segetal plants species in ruderal sites of the Kampinos national Park

	Species	Number of observed sites	Found in the field margins	KPN 2008 AB	Syntaxonomic unit
1	<i>Agrostemma githago</i> L.	6	Y	LC	<i>Centauretalia cyani</i> *
2	<i>Anchusa arvensis</i> (L.) M. Bieb.	9	Y	LC	<i>Stellarietea mediae</i> *
3	<i>Anthemis ruthenica</i> M. Bieb.	1	Y		<i>Eragrostion</i> **
4	<i>Anthemis tinctoria</i> L.	2	N		<i>Festucetalia valesiaceae</i> **
5	<i>Arnoseris minima</i> (L.) Schweigg. & Korte	5	Y		<i>Arnoseridenion minima</i> *
6	<i>Camelina microcarpa</i> Andr.	1	N	EX/CR	<i>Centauretalia cyani</i> **
7	<i>Centaurea cyanus</i> L.	13	Y		<i>Centauretalia cyani</i> *
8	<i>Centunculus minimus</i> L.	1	N	CR	<i>Centunculo-Anthoceretum</i> *
9	<i>Cerastium semidecandrum</i> L.	5	N		<i>Koelerio-Corynepheretea</i> *
10	<i>Chenopodium polyspermum</i> L.	5	N	NT	<i>Oxalido-Chenopodietum</i> *
11	<i>Chondrilla juncea</i> L.	1	N		<i>Koelerion glaucae</i> *
12	<i>Consolida regalis</i> Gray	7	Y	NT	<i>Centauretalia cyani</i> *
13	<i>Cynoglossum officinale</i> L.	5	N		<i>Onopordenion</i> *
14	<i>Digitaria sanguinalis</i> (L.) Scop.	7	Y	LC	<i>Eragrostion</i> *
15	<i>Eryngium planum</i> L.	5	N		<i>Festuco-Brometea</i> **
16	<i>Euphorbia peplus</i> L.	1	Y		<i>Polygono-Chenopodietalia</i> **
17	<i>Filago arvensis</i> L.	1	N	EX/CR	<i>Vicio lathyroidis-Potentillion</i> *
18	<i>Galeopsis ladanum</i> L.	2	Y		<i>Centauretalia cyani</i> ***
19	<i>Helichrysum arenarium</i> (L.) Moench	10	N		<i>Koelerio-Corynepheretea</i> *
20	<i>Herniaria glabra</i> L.	2	N	NT	<i>Vicio lathyroidis-Potentillion</i> *
21	<i>Hypericum humifusum</i> L.	1	N	NT	<i>Radiolion linoidis</i> *
22	<i>Malva pusilla</i> Sm.	14	N		<i>Urtico-Malvetum</i> *
23	<i>Myosotis ramosissima</i> Rochel	1	Y		<i>Koelerio-Corynepheretea</i> *
24	<i>Papaver argemone</i> L.	8	Y	VU	<i>Papaveretum argemones</i> *
25	<i>Papaver dubium</i> L.	9	Y	LC	<i>Aphanenion arvensis</i> **
26	<i>Papaver rhoeas</i> L.	13	Y		<i>Centauretalia cyani</i> *
27	<i>Papaver strigosum</i> (Boenn.) Schur	1	Y		<i>Centauretalia cyani</i>
28	<i>Scabiosa ochroleuca</i> L.	2	N		<i>Festucetalia valesiaceae</i> *

	Species	Number of observed sites	Found in the field margins	KPN 2008 AB	Syntaxonomic unit
29	<i>Scleranthus polycarpus</i> L.	1	Y		<i>Vicio lathyroidis</i> - <i>Potentillion</i> *
30	<i>Sedum maximum</i> (L.) Hoffm.	7	N		<i>Festuco-Brometea</i> **
31	<i>Sinapis arvensis</i> L.	13	Y		<i>Stellarietea mediae</i> *
32	<i>Thlaspi arvense</i> L.	4	Y		<i>Stellarietea mediae</i> *
33	<i>Veronica verna</i> L.	4	Y		<i>Vicio lathyroidis</i> - <i>Potentillion</i> *
34	<i>Vicia lathyroides</i> L.	1	Y		<i>Vicio lathyroidis</i> - <i>Potentillion</i> *

Explanations: KNP 2008 AB – threatened segetal species occurring in the Kampinos National Park (Bomanowska 2008): EX/CR – locally extinct on segetal habitats, CR – critically endangered, VU – vulnerable, NT – near threatened, LC – least concern; Y – Yes = found in the *field margin*; N – No = not found in the *field margin*. Grey background marks taksons found only in ruderal sites in the villages studied. Syntaxonomic unit according to: \*Matuszkiewicz (2001), \*\*Zarzycki *et al.* (2002), \*\*\* Kropac, Mochnacky (2009)

significant. All these circumstances limit the possibility of protection of segetal species, especially those with a high conservation status.

*Filago arvensis* was found in 2004 in one of the villages on a sandy road and on the roadside. The site was quite large and contained a few dozen specimens. In 2006 it doubled its area. The village has also been completely abandoned and pulled down, but the surrounding fields sites remain and the road is still used, although not frequently. These conditions are favorable for the growth of *Filago arvensis*, but it is not known whether these conditions will change.

During her research of segetal habitats Bomanowska (2008) did not find either *Camelina microcarpa* or *Filago arvensis*.

*Centunculus minimus* L., a critically endangered (CR) species, was found in the first period of the studies, in one site, on rubble. The village had only one farm, which was also abandoned in the following years. The site was not found during later studies. Bomanowska noted another site where *C. minimus* was present. The existence of this species in KNP is unstable.

*Papaver argemone* L., the only species with the VU status (vulnerable), was found in eight villages. Bomanowska (2008) noted eight other localities of this plant. One can assume that this species has a chance to survive within the KNP area.

I found four species with a lower conservation NT status (near threatened): *Chenopodium polyspermum* L., *Consolida regalis* Gray, *Herniaria glabra* L., and *Hypericum humifusum* L.

*Chenopodium polyspermum* was found in five villages, but the sites were not numerous. It occurred on roadsides, in the vicinity of houses and on rubble heaps. It was not

observed in *field margins*. Bomanowska (2008) also lists 14 other sites. *Consolida regalis* was observed as single specimens in 8 villages: on roadsides, along the fences, near houses, on rubble heaps, and in *field margins*. Bomanowska (2008) observed 12 other sites. *Herniaria glabra* was found in 2 villages. The sites, which were not numerous, were located on roadsides and in close proximity to houses. Bomanowska (2008) noted 10 other sites where the species occurred. *Hypericum humifusum* was found at one site only, on a roadside. Bomanowska (2008) listed 24 other sites in segetal habitats.

In the second stage of the studies, only *Consolida regalis* was found among the species listed above. It occurred only in three localities of those identified earlier. Interestingly, the preserved sites were typical ruderal habitats, not even *field margins*. Bomanowska (2008) did not observe *Consolida regalis* in these places. This may suggest that the sites suitable for this species no longer exist in segetal habitats in the villages studied.

Four species with the LC (least concern) status have been found: *Agrostemma githago* L., *Anchusa arvensis* (L.) M. Bieb., *Digitaria sanguinalis* (L.) Scop., and *Papaver dubium* L.

*Agrostemma githago* was found in 6 villages on the roadsides, in the vicinity of houses, and in the *field margins*. The sites were not numerous. In the second stage of our research, the species was found only in two places (one specimen in the *field margin*!). According to Bomanowska (2008), the species is still frequent in KNP. In some villages it occurs only in ruderal habitats.

*Anchusa arvensis* was found in most of the villages studied in the vicinity of households, on rubble heaps, and in *field margins*. *Papaver dubium* exhibited a similar pattern of occurrence, although it was also noted on roadsides. Localities of *Digitaria sanguinalis* were less frequent, although sometimes locally quite abundant. Bomanowska (2008) noted several localities of these species in segetal habitats of KNP. *Anchusa arvensis* and *Digitaria sanguinalis* were found only in ruderal habitats in four villages, whereas *Papaver dubium* was recorded in six villages (Kirpluk, Bomanowska, 2008).

The remaining 22 taxa (Table 2) are not assigned to any conservation category. Nevertheless, some of them are noteworthy since in the area studied they had only one or two sites of occurrence and were found only in ruderal habitats (Kirpluk, Bomanowska, 2008). *Anthemis tinctoria* L. was recorded in two villages, in the vicinity of houses and roads. *Chondrilla juncea* L. occurred at one site, also near houses and roads. *Papaver strigosum* (Boenn.) Schur (a taxon not always distinguished from *Papaver rhoeas* L.; Mirek et al. 2002) was found on the roadside and in the *field margin* of one of the villages. *Scabiosa ochroleuca* L. was recorded at two sites, in the vicinity of houses and roads.

In this work the species found at the margins of the abandoned fields of KPN were added to the list of rare segetal taxa when their syntaxonomical affinity allowed doing so (Table 2). *Arnosaris minima* (L.) Schweigg. & Korte, *Thlaspi arvense* L. and *Veronica verna* L. have been registered before in segetal habitats (Kirpluk, Bomanowska, 2008). In this study they were found in four to five villages each. *Anthemis ruthenica* M. Bieb., *Euphorbia peplus* L., *Galeopsis ladanum* L., *Myosotis ramosissima* Rochel, *Scleranthus polycarpus* L., *Vicia lathyroides* L. were not recorded in these habitats (Bomanowska 2001, Kirpluk, Bomanowska, 2008) and in the abandoned villages of KPN they had one or two sites of occurrence.

## Final remarks

The list of rare species of the segetal flora presented in this work comprises only 15 sites in KNP and thus is local in its scope. Representatives of a large group of 17 rare taxa were found only on ruderal sites in the abandoned villages in KNP, and they have not been noted in segetal habitats (indicated with a grey background in Table 2). Some of the segetal species have not been found outside the ruderal habitats of KNP (*Anthemis ruthenica* M. Bieb., *Camelina microcarpa* Andrz., *Cynoglossum officinale* L., *Euphorbia peplus* L., *Filago arvensis* L., *Galeopsis ladanum* L., *Malva pusilla* Sm., *Myosotis ramosissima* Rochel, *Scleranthus polycarpus* L., *Vicia lathyroides* L.).

The distribution pattern of the discussed taxa in the abandoned villages in KNP reveals that ruderal habitats may function as a potential source of diaspores of segetal species and as sites that preserve segetal flora together with its rare and endangered elements. Unfortunately, segetal species tend to disappear gradually from KNP due to the reduction or abandonment of cultivated fields. Many of the rare species were found only in ruderal habitats at the sites investigated. The decrease of land cultivation can have an effect similar to the intensification of agriculture in other areas. Progressive secondary succession, together with the Park Management's policy, has a negative effect on the status of the local segetal flora. Preserving some of the scarcely populated villages and the practice of extensive agriculture seem to be the only good solution to this problem.

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**РІДКІСНІ ЕЛЕМЕНТИ СЕГЕТАЛЬНОЇ ФЛОРИ,  
ЩО ЗБЕРЕГЛИСЯ В ЗАЛИШЕНИХ СЕЛАХ КАМПІНОСЬКОГО  
НАЦІОНАЛЬНОГО ПАРКУ (ЦЕНТРАЛЬНА ПОЛЬЩА)**

Флористичні дослідження були проведені в 15 залишених селах Кампіноського національного парку впродовж 1992—1995 та 2004—2007 років. Стаття містить цікаву інформацію щодо сегетальних видів, знайдених на досліджуваній території (34 рідкісних таксони, які об'єднують 25 вразливих і загрозливих видів). На маргінальних місцезростаннях виявлено 110 видів. Апофізи становлять основну групу (близько 47 %), археофіти є менш чисельними (близько 38 %). Метою цього дослідження було обстеження ділянок, які можуть функціонувати як потенційні джерела діаспор рідкісних сегетальних видів, що є важливим для збереження біорізноманіття.

*К л ю ч о в і с л о в а:* рідкісні види, сегетальна флора, рудеральні місцезростання, залишені села, Кампіноський національний парк, Центральна Польща.

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**РЕДКИЕ ЭЛЕМЕНТЫ СЕГЕТАЛЬНОЙ ФЛОРЫ,  
СОХРАНИВШИЕСЯ В ЗАБРОШЕННЫХ СЕЛАХ КАМПИНОСКОГО  
НАЦИОНАЛЬНОГО ПАРКА (ЦЕНТРАЛЬНАЯ ПОЛЬША)**

Флористические исследования были проведены в 15 заброшенных селах Кампиносского национального парка в 1992—1995 и 2004—2007 годах. Статья содержит интересную информацию о сегетальных видах, выявленных на исследованной территории (34 редких таксона, включающих 25 видов, которые находятся под угрозой исчезновения). На маргинальных местообитаниях найдено 110 видов. Апофизы составляют основную группу (около 47 %), археофиты — немногочисленные (около 38 %). Цель исследования — изучение участков, которые могут функционировать как потенциальные источники диаспор редких сегетальных видов, что важно для сохранения биоразнообразия.

*К л ю ч е в ы е с л о в а:* редкие виды, сегетальная флора, рудеральные местообитания, заброшенные села, Кампиносский национальный парк, Центральная Польша.