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**THE IMPORTANCE OF ARCHIVAL DATA IN THE PRESENT-DAY  
BOTANICAL RESEARCH – ABOUT THE MONOGRAPH  
BY ROMAN KOBENDZA “PHYTOSOCIOLOGICAL RELATIONS OF  
KAMPINOSKA PRIMEVAL FOREST” (1930)**

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### **Introduction**

Kampinoski National Park (Central Poland; 52°19'0" N, 20°34'0" E) was established in 1959 to protect the remnant of Kampinoska Primeval Forest, with its complex of glacial valley inland dunes and swamps unique in Europe, with their biological and landscape diversity. In 2000, due to their natural and cultural significance, Kampinoski National Park and its buffer zone were designated the “Puszcza Kampinoska” Biosphere Reserve by UNESCO.

Detailed studies on the flora and vegetation of Kampinoska Forest were initiated in the 1920s by Professor Roman Kobendza, who created a full list of cryptogamous and vascular plants, and described plant communities in his monograph “*Phytosociological relations of Kampinoska Primeval Forest*” (Kobendza, 1930; fig. 1).

From the time of Kobendza, botanical research of Kampinoska Forest region gained new momentum and achievements. Among the many publications on the flora and vegetation (e.g. Bibliografia, 2006; Ferchmin, 2009), the monograph by Roman Kobendza is still the most detailed and complete source of reliable floristic data. The treatise is particularly important for botanists studying non-forest flora and vegetation related to areas of traditional agriculture and settlement in Kampinos National Park, because until nearly the end of the 20<sup>th</sup> century, it was actually the only report containing information on the flora and vegetation of these areas (e.g. Kirpluk, Bomanowska, 2008; Michalska-Hejduk, Bomanowska, 2009).

The objective of the study was to demonstrate, using selected examples, the usefulness of the monograph by Kobendza (1930) by the comparative analysis and assessment of contemporary changes in the non-forest vascular flora of Kampinoski National Park.

## Professor Kobendza and his monograph

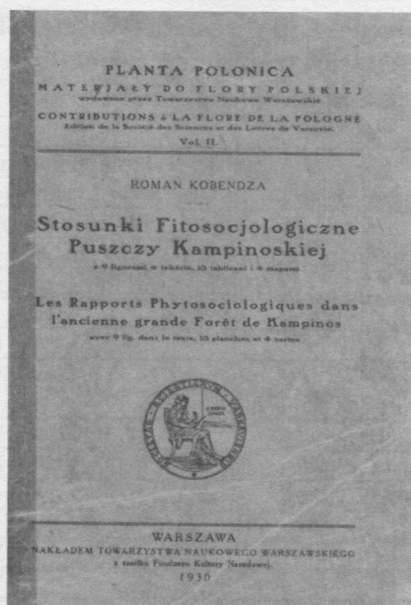
Roman Kobendza (1886-1955) is still regarded as the most outstanding researcher of the flora of Kampinoska Forest and one of the most prominent Polish botanists active in the first half of the 20<sup>th</sup> century. Kobendza began botanical studies in Kampinoska Forest in 1922, and his efforts produced the monograph *Phytosociological relations of Kampinoska Primeval Forest* (Kobendza, 1930). This work inspired further research by Kobendza in this area, and the results scientifically substantiated the establishment of Kampinoski National Park.

The monograph by Kobendza is an important source of botanical data. It provides abundant floristic information and contains original phytogeographic analyses, including the relationships between vegetation and other geographical elements of the environment. The analysis of flora and vegetation of Kampinoska Forest carried out by Roman Kobendza deserves special attention for several reasons:

1. It is the first detailed floristic report on whole Kampinoska Forest territory. Kobendza listed in total 1144 plant species, including 944 vascular and 140 cryptogamous plants (liverworts, mosses and ferns). Many species were reported for the first time from the Warsaw region. For most species, there is information about their prevalence and types of plant communities wherein they grow.
2. The analysis of diversity of plant communities presented in the monograph based on theoretical principles of the central-European phytosociological school (Braun-Blanquet, Tüxen) represented a pioneering approach to Kampinoska Forest, and was one of the first ever prepared in Poland.
3. The analytical approach of Kobendza to the origins of the described community types was innovative at the time, and added value to the descriptions of communities, showing the vegetation of Kampinoska Forest not as merely an inventory of communities, but also as a specific spatial vegetation system formed in a original environmental conditions, and preserving the features of habitats.
4. A phytosociological map included in the dissertation, prepared based on Kobendza's personal field research, was the first attempt mapping the vegetation Kampinoska Forest.
5. The monograph provides a reliable and comprehensive botanical description of entire Kampinoska Forest in the early 20<sup>th</sup> century, so from the period of intensive agricultural use of this area before being under protection.

These facts prove that the scientific monograph by Kobendza, despite its botanical nomenclature being out of date in many cases, and obsolete phytosociological interpretations, is still an invaluable and useful source of botanical information, mainly floristic. The findings of the author on the distribution and spread of many species are useful for tracking their future changes in Kampinoska Primeval Forest over the next several decades. This refers both to

continuously needed data on extinct or endangered species, and to information on the spread of alien species, including invasive ones.



**Fig 1. Title page of the monograph by Professor Roman Kobendza from the year 1930**

### **The contemporary use of Kobendza's historical data**

Kobendza's historical data were compared with contemporary floristic data gathered by the authors of this paper, resulting from their own botanical studies carried out on non-forest agricultural and settlement areas within KNP, i.e. arable fields, meadows, pastures and rural areas (e.g. Kirpluk, Bomanowska, 2008; Michalska-Hejduk, Bomanowska, 2009; Otręba, Michalska-Hejduk, 2014). The comparative analysis of floristic data from both periods had to consider the existing differences in the scope and methodology between historical and contemporary studies, e.g. differences between the borders of historical research areas (the whole area of Kampinoska Primeval Forest limited by the borders established in the early 20<sup>th</sup> century, including the left bank of the Vistula river and a part of the Łowicko-Błońska Plain) and contemporary ones (the area only within national park borders) and not always precise descriptions of site location and information on the abundance of species provided by Kobendza (1930). Due to the somewhat discrepant extent of floristic studies carried out at various times, we only chose species listed in the monograph that had undisputedly been found in the area of the contemporary national park, and for comparison we used data on species

occurrence encoded in a binary fashion (0-1, absent-present) without taking into account any degrees of quantitative occurrence.

**Table 1. Legally protected and threatened species of non-forest plant communities connected with traditional agriculture and settlement in Kampinoski National Park**

No.	Name of species	Species protection <sup>1</sup>	Category of treatment			Occurrence in KNP	
			PL	SEG	AR	Koben dza (1930)	Present data
1	2	3	4	5	6	7	8
1.	<i>Adonis aestivalis</i> L.		V	V	En	+	-
2.	<i>Aethusa cynapium</i> L. subsp. <i>agrestis</i> (Wallr.) Dostál			I	Vu	+	+
3.	<i>Agrostemma githago</i> L.			V	Vu	+	+
4.	<i>Anagallis arvensis</i> L.			V	Ld	+	+
5.	<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	SP				+	+
6.	<i>Asperugo procumbens</i> L.		E	V	Vu	+	+
7.	<i>Atriplex rosea</i> L.		E		Vu	-	+
8.	<i>Botrychium lunaria</i> (L.) Sw.	SP	V			+	-
9.	<i>Bromus arvensis</i> L.		E	Ex	En	+	-
10.	<i>Bromus secalinus</i> L.		V	V	s	+	-
11.	<i>Camelina microcarpa</i> Andr.			V	Ld	-	+
12.	<i>Carex davalliana</i> Sm.	SP	V			+	+
13.	<i>Carex dioica</i> L.	PP	V			+	+
14.	<i>Centaurea cyanus</i> L.			I	Ld	+	+
15.	<i>Centaurium pulchellum</i> (Sw.) Druce	PP		R		+	-
16.	<i>Centunculus minimus</i> L.			R		+	+
17.	<i>Consolida regalis</i> Gray			I	Ld	+	+
18.	<i>Cuscuta europaea</i> L.			V		+	-
19.	<i>Cyperus flavescens</i> L.	SP	V			+	+
20.	<i>Dactylorhiza majalis</i> (Rchb.) P. F. Hunt & Summerh.	Ch				+	+
21.	<i>Dianthus arenarius</i> L.	PP				+	+
22.	<i>Dianthus superbus</i> L. s.s.	SP	V			+	+
23.	<i>Digitaria sanguinalis</i> (L.) Scop.			I	s	+	+
24.	<i>Epipactis palustris</i> (L.) Cranz	SP	V			+	+
25.	<i>Filago arvensis</i> L.			I		+	+
26.	<i>Fumaria officinalis</i> L.			I	Ld	+	+
27.	<i>Gagea pratensis</i> (Pers.) Dumort.		V	I		+	+
28.	<i>Gentiana pneumonanthe</i> L.	SP	V			+	+
29.	<i>Gladiolus imbricatus</i> L.	SP				+	-
30.	<i>Gnaphalium luteo-album</i> L.			V		+	+
31.	<i>Gratiola officinalis</i> L.	PP				+	-
32.	<i>Herniaria gabra</i> L.			I		+	+

1	2	3	4	5	6	7	8
33.	<i>Holosteum umbellatum</i> L.			I		+	+
34.	<i>Hypericum humifusum</i> L.			V		+	+
35.	<i>Illecebrum verticillatum</i> L.		V	V		+	-
36.	<i>Iris sibirica</i> L.	SP	V			+	+
37.	<i>Jovibarba sobolifera</i> (Sims) Opiz	SP				+	+
38.	<i>Juncus capitatus</i> Weigel			R		+	+
39.	<i>Lathyrus palustris</i> L.	PP	V			+	+
40.	<i>Lathyrus tuberosus</i> L.			I		+	+
41.	<i>Liparis loeseli</i> (L.) Rich.	SP	E			+	-
42.	<i>Lolium remotum</i> Schrank		E	E	Crw	+	-
43.	<i>Lycopodium clavatum</i> L.	PP				+	+
44.	<i>Lycopodiella inundata</i> (L.) Holub	SP	V			+	+
45.	<i>Lythrum hyssopifolia</i> L.	SP	V	V		+	+
46.	<i>Malva pusilla</i> Sm.			I	s	+	+
47.	<i>Melandrium noctiflorum</i> (L.) Fr.			I	Vu	+	+
48.	<i>Menyanthes trifoliata</i> L.	PP				+	+
49.	<i>Myosurus minimus</i> L.		V	V		+	+
50.	<i>Ophioglossum vulgatum</i> L.	SP	V			+	+
51.	<i>Ostericum palustre</i> Besser	SP	V			-	+
52.	<i>Papaver dubium</i> L.			I	s	+	+
53.	<i>Pedicularis palustris</i> L.	PP	V			+	-
54.	<i>Pedicularis silvatica</i> L.	PP				+	+
55.	<i>Polycnemum arvense</i> L.		V	V		+	-
56.	<i>Portulaca oleracea</i> L.			R		+	-
57.	<i>Pulicaria vulgaris</i> Gaertn.		V			+	+
58.	<i>Radiola linoides</i> Roth		V	V		+	+
59.	<i>Ranunculus lingua</i> L.	PP	V			+	+
60.	<i>Ranunculus sardous</i> Cranz			I		+	+
61.	<i>Trollius europaeus</i> L. s.s.	SP				+	+
62.	<i>Veronica opaca</i> Fr.			V	En	+	-

Explanations: <sup>1</sup>according to Regulation of the Minister of Environment of 09 October 2014 with reference to the species of natural plants covered by protection (Polish Journal of Laws, item 1409 of 16 October 2014), PL – vascular plant species threatened in Poland (Zarzycki, Szelaĝ, 2006), SEG – segetal plant species threatened in Poland (Warcholińska, 1994), AR – list of archaeophytes in Poland (Zajęc, Zajęc, 2014). Species protection: SP – strictly protected, PP – partially protected. Categories of threat: Ex – extinct species, E – endangered, V – vulnerable, I – indeterminate threat, R – rare, Crw – critically endangered in whole range in Poland, En – endangered (above 80% of localities lost), Vu – vulnerable (near 50% of localities lost), Ld – with number of localities decreasing, s – with stable dynamics.

Quantitative changes in the vascular flora were analysed for two groups of species found in areas under traditional agricultural use, and whose spread has a strong impact on the dynamics of the flora of Kampinoski National Park, i.e. endangered and protected species (Warcholińska, 1994; Zarzycki, Szelaĝ, 2006; Zajęc, Zajęc, 2014; Regulation of the Minister of Environment, 2014) and invasive species in Poland (Tokarska-Guzik, et al., 2012).

The comparative analysis demonstrated a decrease in the number of endangered and protected species – 61 identified by Kobendza (1930) versus only 47 identified currently (Table 1). Only three species, i.e. *Atriplex rosea*, *Camelina microcarpa* and *Ostericum palustre*, not reported by Kobendza (1930) were found during the later research. Contemporary research did not identify sites of species characteristic of wet meadows: *Gladiolus imbricatus*, *Gratiola officinalis*, *Pedicularis palustris* and archaeophytes associated with cereals: *Adonis aestivalis*, *Bromus arvensis*, *B. secalinus* and *Lolium remotum*. A decrease in the number of sites and abundance was observed for other valuable meadow species such as *Gentiana pneumonanthe*, *Dianthus superbus* and *Trollius europaeus*. We also found a dramatic decline in the number and abundance of species characteristic for wet and waterlogged mineral soils: *Centunculus minimus*, *Hypericum humifusum*, *Juncus capitatus*, *Myosurus minimus* and *Radiola linoides*. The number of sites increased, however, for some valuable species, e.g. *Ophioglossum vulgatum*, *Lathyrus paluster*, *Iris sibirica* and *Epipactis palustris*.

Changes were also found in the number of invasive species. In the communities of agricultural and settlement areas of KNP current research revealed 38 taxa of invasive plants, which is almost two-fold more than reported by Kobendza (1930) in his dissertation (20 species; Table 2). These species create a serious problem for natural ecosystems in Kampinoski National Park though the relative isolation of KNP from strongly anthropogenically transformed non-forest areas. The comparative analysis of historical and current data indicate their spontaneous spread across the majority plant communities in KNP. Nearly all plants reported by Kobendza (1930) significantly increased their distribution range from the early 20<sup>th</sup> century, and encroached into new habitats (compare Otreba, Michalska-Hejduk, 2014). The analysis of historical data provided in the Kobendza monograph indicated that a large group of invasive plants spontaneously spreading in the KNP includes alien shrubs and plants cultivated in household gardens located in forest villages at the beginning of the last century (Kobendza, 1930). These include *Acer negundo*, *Cornus sericea*, *Helianthus tuberosus*, *Robinia pseudoacacia* and other species.

## Conclusions

The comparison demonstrated that the scientific monograph by Kobendza is still a useful source of botanical information necessary for the assessment of contemporary transformations in the vascular flora of Kampinoska Primeval Forest. Although it cannot be used for qualitative floristic analyses due to the considerable differences in methodological approach when compared to modern studies, the monograph is still useful for the assessment of quantitative changes. It can be used for tracking the spread of many species and changes in their status in the national park, which is particularly important for protected areas. The analysis of species' fate helps in undertaking protective measures (with respect to valuable,

**Table 2. Invasive alien plant species of non-forest plant communities connected with traditional agriculture and settlement in Kampinoski National Park**

No.	Name of species	Occurrence in KNP	
		Kobendza (1930)	Present data
1.	<i>Acer negundo</i> L.	+	+
2.	<i>Amaranthus retroflexus</i> L.	+	+
3.	<i>Anthoxanthum aristatum</i> Boiss.		+
4.	<i>Aster novi-belgii</i> L.	+	+
5.	<i>Avena fatua</i> L. s.l.		+
6.	<i>Bidens frondosa</i> L.		+
7.	<i>Bromus carinatus</i> Hook. & Arn.		+
8.	<i>Conyza canadensis</i> (L.) Cronquist	+	+
9.	<i>Cornus sericea</i> L.	+	+
10.	<i>Echinochloa crus-galli</i> (L.) P. Beauv.		+
11.	<i>Echinocystis lobata</i> (F. Michx.) Torr. & A. Gray		+
12.	<i>Epilobium ciliatum</i> Raf.		+
13.	<i>Erigeron annuus</i> (L.) Pers.	+	+
14.	<i>Fraxinus pennsylvanica</i> Marshall		+
15.	<i>Galinsoga ciliata</i> (Raf.) S.F.Blake	+	+
16.	<i>Galinsoga parviflora</i> Cav.	+	+
17.	<i>Helianthus tuberosus</i> L.	+	+
18.	<i>Heracleum</i> spp.*		+
19.	<i>Impatiens glandulifera</i> Royle		+
20.	<i>Impatiens parviflora</i> DC.		+
21.	<i>Juncus tenuis</i> Willd.	+	+
22.	<i>Lupinus polyphyllus</i> Lindl.	+	+
23.	<i>Lycium barbarum</i> L.	+	+
24.	<i>Oxalis fontana</i> Bunge	+	+
25.	<i>Padus serotina</i> (Ehrh.) Borkh.		+
26.	<i>Parthenocissus inserta</i> (A. Kern.) Fritsch		+
27.	<i>Quercus rubra</i> L.	+	+
28.	<i>Reynoutria japonica</i> (Houtt.) Ronse Decraene		+
29.	<i>Reynoutria sachalinensis</i> (F. Schmidt) Nakai		+
30.	<i>Rhus typhina</i> L.		+
31.	<i>Robinia pseudoacacia</i> L.	+	+
32.	<i>Rudbeckia laciniata</i> L.		+
33.	<i>Setaria pumila</i> (Poir.) Roem.&Schult.	+	+
34.	<i>Setaria viridis</i> (L.) P. Beauv.	+	+
35.	<i>Solidago canadensis</i> L.	+	+
36.	<i>Solidago gigantea</i> Aiton	+	+
37.	<i>Veronica persica</i> Poir.		+
38.	<i>Xanthium albinum</i> (Widder) H. Scholz	+	+

Explanations: \* one of two species: Sosnowsky's hogweed (*Heracleum sosnowskyi* Manden) or giant hogweed (*Heracleum mantegazzianum* Sommier & Levier). The taxonomical status of these plants in KNP has not yet been clearly worked out.



declining and endangered species) or preventive measures with respect to invasive plants.

Obviously, this dissertation does not reduce the need for new research, for example because of some imprecise data on site locations, outdated nomenclature or obsolete syntaxonomic classification, but it is still a useful reference for contemporary analyses.

Despite the passage of time, the treatise by Professor Roman Kobendza is an important source of botanical knowledge, and continues to be a key publication stimulating research into the flora and vegetation of Kampinoska Primeval Forest and its environmental conditions.

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