Distribution of *Carex vaginata* Tausch in Poland

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Abstract

The distribution of *Carex vaginata* Tausch in Poland is analysed on the basis of data from literature, herbarium and the author's field investigations. The paper also presents the general distribution of this species in the world and describes ecological and phytocoenological data.

Key words: *Carex vaginata* Tausch, distribution maps, habitats, phytocoenoses, nomenclature, variability

INTRODUCTION

Carex vaginata is among the most rarely occurring endangered species of the vascular flora of Poland (Jasiewicz 1981, Zarzycki 1984, Zarzycki and Wojewoda 1986). Its few localities can be found in three regions: the Sudety Mountains, the north-east and central parts of the country.

The first records of its occurrence come from the north-east region of Poland (Abromeit et al. 1898-1940) and from the Sudety Mountains (Wimmer 1844, Schube 1903, 1904, Pax 1915). In the period between the two World Wars, data concerning the localities of this species in the environs of Warsaw were published (Klejstówna 1929, Kobendza 1934). Recently the species has been found in the Białowieża National Park (Sokołowski 1981) and in the Mazury Landscape Park (Kruszelnicki in prep.).

The fact that three new localities of this species were found in the Bolimów Primaeval Forest has prompted the idea of elaborating the distribution of *C. vaginata* in Poland.

MATERIALS AND METHOD

The aim of the paper is to present the distribution of *Carex vaginata* in Poland on the basis of data from literature and herbarium materials.

Information about a few localities of *C. vaginata* is to be found in the papers by: Abromeit et al. (1898-1940), Schube (1903), Klejstówna (1929), Kobendza (1934), Mądalski (1948), Sokołowski (1981), Kruszelnicki (in prep.). Besides, general mentions of its occurrence in the Karkonosze Mountains and East Prussia are contained in papers by: Wimmer (1844), Fiek (1881), Ascherson and Graebner (1902-1904), Schube (1904), Steffen (1940), Raciborski and Szafer (1919), Dostal (1958), Pałowski (1972).

Herbarium materials belonging to the following institutions and private collectors were another source of information:

- Institute of Botany, Jagiellonian University, Kraków (KRA);
- Institute of Botany, Polish Academy of Sciences, Kraków (KRAM);
- Institute of Botany, Warsaw University (WA);
- Museum of Natural History, Wrocław University (WSRL);
- Museum of Natural Science, Bytom (MB);
- Department of Plant Taxonomy, Botanical Institute, A. Mickiewicz University, Poznań (POZ);
- Department of Biology, Warsaw University, Białystok Branch (WAB);
- Private herbarium of Prof. Józef Mądalski (JM);
- Private herbarium of Mgr Jerzy Kruszelnicki (JK);
- Institute of Environmental Biology, Łódź University (LOD).

Incomplete or too general bits of information on the localities of *C. vaginata* contained in some earlier works and herbarium materials could not be taken as the basis of strictly determining the actual position of the species. As an example we may take the papers by Fiek (1881), Wimmer (1844) and Steffen (1840), in which *C. vaginata* is mentioned as one of the flora elements of East Prussia and the Sudetes, as well as some descriptions of herbarium specimens, such as "Za Rybnikami", coll. D. Wąsowicz 1871 (KRAM) and "Karkonosze", coll. K. Domin 1901 (WSRL).

The position of the localities described in earlier publications has been determined with the use of Rospond's Dictionary (1951). In the list of localities the administrative division of the country introduced in 1975 has been adopted. Numbers of localities in the list correspond to numbers used on the distribution map of *Carex vaginata* in Poland (Fig. 2).

DISTRIBUTION

Carex vaginata is a circumpolar species whose wide range covers the northern regions of Europe, Asia and the North America (Hulten 1962). The central areas of its occurrence are the Scandinavian Peninsula and the northern

Fig. 1. Distribution of *Carex vaginata* Tausch (after Hulten 1962)

part of the Soviet Union (Fig. 1). The most northern locality is in Greenland, 78° latitude (Rabotnov 1980). Pax (1915) includes *Carex vaginata* among species of the boreal-arctic element.

In Europe the main area of *C. vaginata* is Scandinavia and the northern regions of the European part of the Soviet Union. Besides, separate localities of this plant exist in the mountains of Central Europe (the Sudetes and Carpathians, Alps, the Harz Mountains) and of central France as well as in the East Pyrenees (Kükenthal 1909). This species occurs in many European countries, yet outside of the central area of its occurrence, it is a rare species (Tutin et al. 1980).

Within the present Polish territorial limits, 16 localities of *Carex vaginata* in all have been recorded: 2 of them in the Sudetes, 9 in the northeast part of the country, and 5 in central Poland. At present, the occurrence of 10 localities is unquestionable, whereas the existence of the remaining 6 has not been confirmed in post-war studies; namely these are 4 localities from East Prussia and the Sudetes, given at the turn of the 19th century, and 2 localities to the east of Warsaw, recorded in the period between the two World Wars (Fig. 2).

Fig. 2. Distribution of *Carex vaginata* Tausch in Poland: a — localities known before 1939; b — localities confirmed or rediscovered after 1945; c — new localities, hitherto unpublished

HABITATS AND PHYTOCOENOSSES

According to Pawłowski (1931), the general distribution of *C. vaginata* indicates that this species is a boreal, forest-peaty plant rather than a mountain one. Kulczyński (1927) assigns it to the species of the historical boreal element, and within this group, to mountain and peaty plants of an ecological type.

Carex vaginata occurs up to the height of about 2 000 metres above sea-level (South Norway) (Hulten 1962) and is connected with a cool climate. It is a species growing in places with full sunlight or partly protected from the sun, most often on damp soils which are temperately poor, peaty and considerably rich in mineral components (Zarzycki 1984). Rabotnov (1980) states that the species does not require fertile soils and that it occurs in damp and moderately damp habitats.

C. vaginata shows a rather large phytocoenotic amplitude. It grows in many various plant communities. In mountain regions it occurs on damp, grassy slopes and in grasslands (Thome 1886, Schube 1904, Kükenthal 1909, Pawłowski 1931, Mądalski 1948). In lowlands it can be found in damp mixed forests (Abromeit et al. 1898-1940, Kobendza 1934, Krechetovich 1935, Steffen 1940, Sokołowski 1981) and more seldom on peat-bogs (Klejstówna 1929, Kruszelnicki in prep.). Within forest communities it occurs in spruce, birch, pine, alder, oak and mixed forests. It also grows in wet scrubs, clearings and meadows as well as near forest roads and paths (Fedorov 1976, Rabotnov 1980).

Beyond the forest range it can be found in swampy scrubs, on peat-bogs and in meadows, and within the arctic regions in moss-chamaephyte and moss-sedge tundra (Rabotnov 1980).

Out of the three new localities found in the Bolimów Primaeval Forest, two exist in the *Tilio-Carpinetum* association with a thin multispecies tree-stand, and one in the poor birch-oak forest formed most likely in a habitat of a damp mixed forest (Table 1).

The most abundant locality (4) is in the Puszcza Mariańska forest range. There, *Carex vaginata* grows in an area of about 250 m² in Sections 231g and 232d. The locality spreads along both sides of the forest road separating these sections. In its western vicinity there is a small peat-bog dominated by *Carex hudsonii*. In the Mariańska Primaeval Forest, *C. vaginata* forms five rather dense stands of a surface area ranging from 6 to 20 m². There are numerous young stems growing at a certain distance around separate centres. This locality contains about 700 specimens, among which infertile stems prevail. The number of stems with flowers is variable; in 1985/86 it varied from 20 to 40 stems.

In the locality (3) situated in the Sokule forest range, *C. vaginata* occupies an area of 40 m² (Section 37i). There about 80 specimens grow forming a loose stand among *Tilio-Carpinetum typicum*. *Quercus robur*, with an inconsiderable

Table 1

The occurrence of *Carex vaginata* Tausch in forest communities of the Bolimow Primaeval Forest

Successive number		1	2	3
Number of record		130	119	131
Number of a locality on the map — Fig. 1		4	3	5
		17	14	17
Date		06	06	06
		86	84	86
Density of tree layer	a ₁ in %	30	70	30
	a ₂	50	30	40
Density of shrub layer	b	10	50	10
Cover of herb layer	c	60	70	30
Cover of moss layer	d	10	5	40
Area of record	in m ²	300	400	200
Number of species in record		28	34	20
Trees and shrubs				
<i>Quercus robur</i>	a ₁	.	4	.
	a ₂	1	2	.
	b	.	+	+
	c	.	2	+
<i>Betula verrucosa</i>	a ₁	2	.	2
	c	+	.	.
<i>Betula pubescens</i>	a ₂	.	2	2
	b	.	1	.
	c	.	+	+
<i>Carpinus betulus</i>	a ₂	3	.	.
	b	1	.	.
	c	1	.	.
<i>Pinus silvestris</i>	a ₁	2	.	.
<i>Alnus glutinosa</i>	a ₂	1	.	.
<i>Quercus rubra</i>	a ₁	.	.	2
	a ₂	.	.	3
<i>Frangula alnus</i>	b	1	3	2
	c	+	+	1
<i>Picea excelsa</i>	b	.	1	.
	c	.	+	+
<i>Viburnum opulus</i>	c	.	+	.
<i>Sorbus aucuparia</i>	c	.	.	+
Herbs and mosses				
<i>Carex vaginata</i>		3	1	2
Ch. <i>Querco-Fagetea</i>				
<i>Anemone nemorosa</i>		1	2	.
<i>Scrophularia nodosa</i>		+	+	.
<i>Poa nemoralis</i>		+	+	.
<i>Viola silvestris</i>		1	.	.
<i>Festuca gigantea</i>		1	.	.
<i>Stellaria holostea</i>		.	1	.
<i>Ranunculus auricomus</i>		.	+	.
Ch. <i>Molinio-Arrhenatheretea</i>				

<i>Lysimachia vulgaris</i>	1	1	1
<i>Deschampsia caespitosa</i>	1	+	+
<i>Molinia coerulea</i>	.	2	1
Accompanying			
<i>Vaccinium myrtillus</i>	+	2	1
<i>Polytrichum formosum</i>	2	1	3
<i>Luzula pilosa</i>	+	.	+
<i>Carex ericetorum</i>	+	.	+
<i>Majanthemum bifolium</i>	1	2	.
<i>Ajuga reptans</i>	+	+	.
<i>Convallaria maialis</i>	.	2	+
<i>Melampyrum pratense</i>	.	1	+
<i>Oxalis acetosella</i>	2	.	.
<i>Ranunculus repens</i>	1	.	.
<i>Catharinea undulata</i>	1	.	.
<i>Calamagrostis arundinacea</i>	.	1	.

Sporadic species: in record 1 — *Pirola minor* (+), *Mycelis muralis* (+), *Athyrium filix-femina* (+), *Carex pallescens* (+), *Scutellaria galericulata* (+), *Lycopus europaeus* (+); in record 2 — *Veronica chamaedrys* (+), *Carex leporina* (+), *Veronica officinalis* (+), *Viola riviniana* (+), *Hieracium sabaudum* (+), *Dryopteris spinulosa* (+), *Potentilla erecta* (+), *Selinum carvifolia* (+), *Moehringia trinervia* (+), *Carex fusca* (+), *Rubus* sp. (+); in record 3 — *Sphagnum* sp. (+), *Leucobryum glaucum* (+).

birch-asp admixture, constitutes the tree-stand. In 1984, 10 or more specimens with stems with flowers were found in this locality, whereas in 1986 none was recorded.

In the Miedniewice-Ulaski forest range (locality 5, Section 114-f) near a forest road, *C. vaginata* constitutes five stands of a surface area ranging from 1 to 4 m². This locality covers an area of about 100 m² altogether. About 250 specimens have been recorded there. In 1985/1986 the number of stems with flowers equalled 10-20. In this locality *C. vaginata* grows in a damp birch-oak forest with a very poor mosaic herb layer. The tree-stand includes *Betula verrucosa*, *B. pubescens* and *Quercus rubra*. The herb layer is mostly of *C. vaginata*, *Molinia coerulea*, *Lysimachia vulgaris* and *Vaccinium myrtillus*. A well developed moss layer is built mainly of *Polytrichum formosum*.

NOMENCLATURE AND GEOGRAPHICAL-ECOLOGICAL VARIABILITY

Carex vaginata shows a climatic-ecological variability. *C. vaginata* coming from distant areas of its general range was considered a species or taxon of lower dignity and given various names. Among synonyms of this species Kükenthal (1909) mentions: *C. sparsiflora* (Wahlenb.) Stend., *C. panicea* var. *sparsiflora* Wahlenb., *C. smithii* Tausch, *C. sudetica* Presl., *C. phaeostachya* Smith., *C. Melichhoferi* Smith., *C. scotica* Spreng., *C. tetanica* Reichb., *C. curvirosta* Hartm., and *C. sparsiflora* var. *borealis* Anderss.

In North America it was qualified as *C. altocaulis* Dew. or *C. vaginata* subsp. *altocaulis* (Dew.) Britton a. Brown (1896) = *C. vaginata* var. *altocaulis*

Dew. (1866). Kükenthal (1909) treats it as an individual geographical race. Besides, he considers *C. tetanica* Schkuhr a species distinct from *C. vaginata*, occurring in the Atlantic part of the country.

Var. *distracta* Norman and var. *pauciflora* (Wahlenb.) Anderss were distinguished in the Scandinavian Peninsula, whereas var. *Petersii* (C. A. Mey) Kükenth. in Manchuria and Kamchatka (Kükenthal 1909).

In the territory of the Soviet Union, three species were distinguished (Hulten 1962), namely: *C. vaginata* — in the European part of the country and further to the east, *C. falcata* Turch. (1938) — from the Jenisej River up to Kamchatka and Manchuria, and *C. algida* Turch. ex Krech. (1935) — in the north regions of the USSR up to the Kolyma River and the Sajon Mountains.

Carex falcata occurs mainly in forests, scrubs and meadows, and is characterized by its size of 30-60 cm, a yellow-green utricle 5-6 mm in length and a curved beak with a length of up to 1.5 mm. *C. algida* grows mostly in the tundra and its characteristics are a narrow utricle and short beak (Krechetovich 1935).

The *C. vaginata* occurring in the Arctic regions as well as in the Alpine layer of the Sajon and Ural Mountains and of the Verkhojanskij Ridge differs from the plants of a forest zone only by its smaller size and slightly higher colouring of female glumes and beaks of utricles (Tolmachev 1966).

A variety of *C. vaginata* — var. *Gruetterii* exists in the lowlands of central Europe (Ascherson and Graebner 1902-1904, Hegi 1939). Its distinctive features are relatively large size (up to 50 cm), rough stem under bracts and very rough leaf-blades. It was found in East Prussia, Lithuania and Latvia (Kükenthal 1909, Abromeit et al. 1898-1940, Steffen 1940) and in the Lipki forest district, near Warsaw (Małdalski 1948). Małdalski (1948) regards var. *Gruetterii* as a climatic-ecological form of *C. vaginata*.

On the basis of the material from Charnohora, collected at an altitude of 1920-1940 metres above sea-level, Małdalski distinguished a new form — *C. vaginata* Tausch. for. *spicata* (Małdalski 1948). It is characterized by the presence on the stem of 1-3 reduced bracts, whose groins produce single male flowers. Its stem ends with a monoecious single spike. This form is the only one distinguished in the mountain regions of Central Europe, though it does not seem to be the only one among the forms of this territory. It may be exemplified by the remark of Pawłowski (1931): "My specimens from Smotrecie also differ a bit from the Sudetic ones, their female glumes are slightly paler and only the bract edge of the spikes is rough a little".

In its three new localities in Central Poland, *Carex vaginata* exhibits the features of the variety var. *Gruetterii* Asch. et Graeb.

On the basis of herbarium materials from various regions within the wide range of *C. vaginata*, found in the herbaria of KRA, KRAM, WA, WRSL, POZ, and MB, it is possible to formulate general remarks, on the morphological features of this species.

The most changeable features are the height of stems (15-50 cm) as well as the length and width of leaves (10-30 cm and 2-7 mm, respectively). As regards size, the examined herbarium materials can be divided into two groups: 1) 30-50 cm in height; materials collected in forests and scrubs (Sweden, Canada, USSR), 2) 15-30 cm in height; materials collected in mountain regions (the Sudetes, Charnohora, the Gorgany and Harz Mountains, Mont Dore-Puy Ferrand).

Other variable features are: colouring of female glumes (light-ginger, brown, dark-brown), colouring of utricles (yellow-green, grey-green), transition of utricles in to beaks (rapid or gradual), shape of beaks (more or less curved), and their length (0.5-1.5 mm). The size of utricles seems to be an unchanging feature (about 4 mm).

No correlation between the plant size and other mentioned features has been observed. The only one that has been observed is that the dark colouring of female glumes appears most often in specimens occurring in regions with a severe and cool climate. It seems that the morphological variability of *C. vaginata* results from the influence of all the ecological factors, among which climate is the most significant one.

LIST OF LOCALITIES

1. Jelenia Góra voivodeship, Riesengebirge-Schneeegruben (Karkonosze-Śnieżne Kotły), Schube 1903, Mały Śnieżny Kocioł, coll. J. Mądalski 1951, JM, Mądalski 1974.
2. Jelenia Góra voivodeship, Agnetendorf (Jagniątków), Schube 1903.
3. Skierniewice voivodeship, Sokule forest range, Sect. 37i, *Tilio-Carpinetum*, coll. J. Jakubowska-Gabara 1984, unpubl., LOD.
4. Skierniewice voivodeship, Puszcza Mariańska forest range, Sect. 231g and 232d, *Tilio-Carpinetum*, coll. J. Jakubowska-Gabara 1984, unpubl., LOD.
5. Skierniewice voivodeship, Miedniewice-Ulaski forest range, Sect. 114f, birch-oak forest with poor herb layer, coll. J. Jakubowska-Gabara 1985, unpubl., LOD.
6. Warszawa voivodeship, Struga and Zagórze, near Radzymin, peat-bog, *Sphagnetum*, Klejstówna 1929.
7. Ostrołęka voivodeship, Klembów, Lipki forest district, mixed forest, coll. Kobendza 1933, WA, JM, Kobendza 1934.
8. Białystok voivodeship, Białowieża National Park, Sect. 224b, *Quercus-Piceetum*, Sokołowski 1981.
9. Białystok voivodeship, Białowieża National Park, Sect. 287c, *Quercus-Piceetum*, Sokołowski 1981.
10. Suwałki voivodeship, Mazury Landscape Park, 3 km NE Uka, pine-spruce-birch forest with oak admixture, coll. Kruszelnicki 1985, JK.

11. Suwałki voivodeship, Mazury Landscape Park, 4 km NNE Ukta, peat-bog with *Salix cinerea*, coll. Kruszelnicki 1985, JK.
12. Olsztyn voivodeship, Lipnick (Lipnik), near Szczytno, Abromeit, Neuhoﬀ, Steffen 1898-1940.
13. Ostrołęka voivodeship, Kokosken (Kokoszki), near Rozogi, Abromeit, Neuhoﬀ, Steffen 1898-1940.
14. Ostrołęka voivodeship, Rehhof (Sarna), near Rozogi, Abromeit, Neuhoﬀ, Steffen 1898-1940.
15. Suwałki voivodeship, Augustów Primaeval Forest, Płaska, Mały Borek Reserve, damp pine forest with *Carex globularis*, coll. A. Czerwiński 1972, unpubl., det. F. Celiński, coll. R. Plackowski 1974, unpubl., LOD.
16. Białystok voivodeship, Knyszyn Primaeval Forest, Straż peat-bog, Złota Wieś range, Sect. 25, pine forest with mosses and *Carex dioica*, coll. A. Czerwiński 1986, unpubl., det. E. Pietruszka, WAB.

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Rozmieszczenie *Carex vaginata* Tausch w Polsce

Streszczenie

Carex vaginata jest rośliną cyrkumpolarną, której zasięg obejmuje północne rejony Europy, Azji i Ameryki Północnej (Hulten 1962). Głównym obszarem jej występowania jest Skandynawia oraz północne rejony europejskiej części Związku Radzieckiego (rys. 1). Jest składnikiem flor 13 państw europejskich, lecz wszędzie poza centrum zasięgowym jest gatunkiem rzadkim (Tutin et al. 1980). Ma charakter rośliny w mniejszym stopniu wysokogórskiej, co raczej borealnej leśno-torfowiskowej (Pawłowski 1931).

We florze krajowej *C. vaginata* należy do najrzadziej występujących i zagrożonych gatunków (Jasiewicz 1981, Zarzycki 1984, Zarzycki i Wojewoda 1986). Odkrycie trzech nowych stanowisk w lasach Puszczy Bolimowskiej stało się impulsem do podjęcia opracowania rozmieszczenia tego gatunku. Na podstawie literatury, materiałów zielnikowych, informacji Doc. A. Czerwińskiego i Mgr J. Kruszelnickiego oraz badań własnych zebrano dane o szesnastu

stanowiskach tej rośliny w Polsce (rys. 2). Wydaje się, że jako pewne można traktować 10 stanowisk. Bardzo wątpliwe jest istnienie 3 stanowisk podanych przez badaczy niemieckich z północno-wschodniej Polski (Abromeit et al. 1898-1940). Nie ma również pewności co do istnienia stanowisk w okolicach Radzimina (Klejsówna 1929) oraz w leśnictwie Lipki k. Klembowa (Kobendza 1934). Populacje *C. vaginata* z terenów niżowych Polski, w tym również z nowych stanowisk, należą do odmiany var. *Gruetteri* (Ascherson i Graebner 1902-1904).

Na podstawie zbadanego materiału zielnikowego przedstawiono ogólne wnioski dotyczące zróżnicowania morfologicznego gatunku, będącego wyrazem jego geograficzno-ekologicznej zmienności. Praca zawiera również charakterystykę warunków siedliskowych *C. vaginata* oraz przynależności fitocenotycznej gatunku.