

## Occurrence of *Calamagrostis villosa* in the Bieszczady Mts., the Eastern Carpathians

Výskyt třtiny chloupkaté v Bieszczadech (Východní Karpaty)

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Observations of stands dominated by *Calamagrostis villosa* (CHAIX) J. F. GMEL., in three separate ranges of the Bieszczady Mts., reduce the assumed gap in the Carpathian area of distribution of this ecologically remarkable species.

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The following treatise refers to the Bieszczady (named according to KLIMASZEWSKI and STARKEL 1972), a mountain district also called the Western Bieszczady, situated in the extreme south-eastern corner of Poland, and representing the westernmost part of the Eastern Carpathians. Botanists and geographers have been attracted by several outstanding features of this district, particularly by (1) a comparatively low altitude of the timberline formed by *Fagus sylvatica*, (2) absence of the upper forest belt dominated by *Picea excelsa*, (3) absence of the krummholz belt dominated by *Pinus mugo*, and (4) occurrence of extensive species-rich "polonina" grasslands on the summits. These biogeographical problems have been thoroughly studied by Polish monographers in the two last decades, particularly by PALCZYŃSKI (1962), ZARZYCKI (1963), JASIEWICZ (1965) and RALSKA-JASIEWICZOWA (1980).

One of the questions left unanswered was the absence of *Calamagrostis villosa* (CHAIX) J. F. GMEL., a common grass species in the montane and sub-alpine belt of the neighbouring ranges of the Carpathians. MEUSEL and BUHL (1962) left a gap in the general area of distribution of this species, and later, MEUSEL, JÄGER and WEINERT (1965) put a questionmark into the same gap situated approximately in the position of the Bieszczady Mts. Neither PALCZYŃSKI (op. c.) nor ZARZYCKI (op. c.) reported a plant community containing this competitive grass, and in the remarkable and detailed monograph by JASIEWICZ (op. c.) the same species was recorded merely in two localities situated at 600 and 580 m a.s.l., in the vicinity of a peat-bog near Smerek and Kalnica.

### FINDINGS IN 1980

A short-term study conducted by the present author in the polonina grasslands of the Bieszczady Mts. in August 1980 (see JENÍK 1983) revealed striking changes in the pattern of plant communities as compared with that

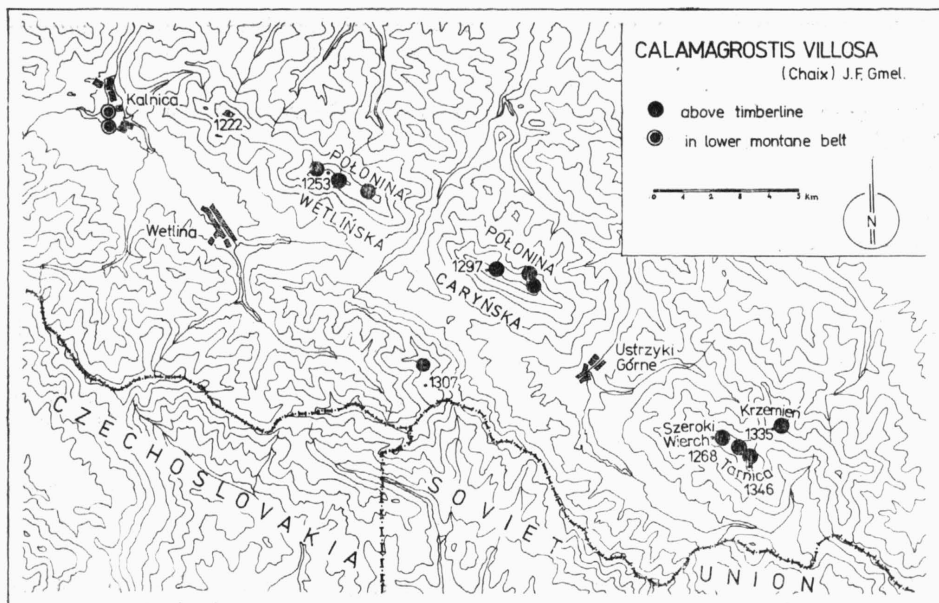


Fig. 1. — Localities of *Calamagrostis villosa* (CHAIX) J. F. GMEL in the lower montane belt (after JASIEWICZ 1965) and above timberline (according to observations in 1980) in the Bieszczady Mts., Eastern Carpathians.

described in the earlier monographs. Expansion of *Calamagrostis arundinacea* (L.) ROTH. and *Deschampsia cespitosa* (L.) BEAUV., replacing the communities dominated by *Nardus stricta* L. and *Vaccinium myrtillus* L., was a major experience in these observations. Tufted *Calamagrostis arundinacea* seems to expand over the greater part of the polonina grasslands. However, in the phytosociological relevés a rhizomatous grass identified as *Calamagrostis villosa* occurred repeatedly. So far unrecorded above the timberline, this species raised our interest and following is the summary of our findings.

*Calamagrostis villosa* has been found above 1200 m altitude in three major polonina regions of the Bieszczady Mts. (Fig. 1), in a variety of species-poor communities (Table 1). Brief description of the localities follows:

(1) The Tarnica-Krzemień Massif. — Stands of *Calamagrostis villosa* grow on the northern slopes adjoining the summit area of three peaks visited during the study. On Szeroki Wierch (1268 m) small patches of this species occur near the crestline, mostly in a balanced community with *Vaccinium myrtillus* and, obviously, delayed in phenology by longlasting snow drift. An extensive stand is situated on the steep northern slope descending from the Tarnica peak (1346 m) towards a saddle connecting Tarnica with the above mentioned summit. In this locality, *C. villosa* is a component of a luxuriant community, in which *Vaccinium myrtillus* and *Homogyne alpina* (L.) CASS. take part. Finally, our grass grows on the top of Krzemień (1335 m), again in smaller patches facing north, often in association with ericaceous shrubs, incl. *Empetrum hermaphroditum* (LANGE) HAGERUP and *Melampyrum herbichii* WOL. (Plate XII, photo 2).

(2) Polonina Caryńska. — Two different habitats of *Calamagrostis villosa* have been encountered. On the northern slope of the 1234 m elevation point amidst a continuous stand of *Vaccinium myrtillus* and *Calamagrostis arundinacea*, our grass forms circular patches about 2 to 3 m in diameter — a likely result of vegetative reproduction. High on the crest, *C. villosa* occurs in small patches close to the crestline, always on slopes inclined to north and north-east and probably covered with late snow until the beginning of summer. Loose tufts, short leaves and absent culms suggest that the grass survives at the margin of its ecological amplitude.

(3) Polonina Wetlińska. — Near the 1228 m elevation point *Calamagrostis villosa* occurs in narrow strips situated on the north-eastern slopes, closely to the crestline (Plate XI, photo 1); a short-grass community with *Festuca supina* SCHUR. seems to replace stands of *C. villosa* on the wind-exposed and sunny slopes of the summits. The latter species is associated with *Vaccinium myrtillus*, *Homogyne alpina* and a few other sub-alpine species. Similar north facing stands occur along the crest towards the 1253 m elevation point and, also, westward of Hnatowe Berdo saddle. An outstanding plant community dominated by *C. villosa* has been found on the south-facing scree below the 1253 m elevation point. Here, our species is accompanied by a species-rich community consisting of *Laserpitium alpinum* WALDST. et KIT., *Angelica silvestris* L., *Stellaria holostea* L. and *Rosa pendulina* L. (for a full record see Table 1, rel. 8). Polonina Wetlińska does not belong to the Bieszczady National Park and cattle grazing remains an efficient ecological factor.<sup>1)</sup>

#### Ecological and biogeographical discussion

The above given enumeration of localities of *Calamagrostis villosa* recorded above the timberline in the Bieszczady Mts. opens a number of new questions, out of which four can be briefly discussed:

(a) Has it been a native species growing in the polonina region above the timberline continuously in the Holocene Era? With regard to its absence in phytosociological relevés and floristic lists of the Polish monographers, and taking into account the present-day dynamics of the polonina grasslands, serious doubts can be expressed about the indigenous character of this species. But we are inclined to conclude that the majority of localities represents old refuges that have been persisting above the timberline for many centuries; only one locality, on Polonina Caryńska, suggested vegetative spreading of polycormic bodies derived from newly established seedlings within abandoned grazing land. Another locality, on Polonina Wetlińska, shows a teeming population within an area affected by grazing.

(b) What kind of habitats are to be considered as the likely refuges of *Calamagrostis villosa*? Two kinds of biotopes might have offered this grass a safe refuge for many centuries or even thousands years: (1) Narrow strips facing north and north-east near the crestline, receiving the heavy burden

<sup>1)</sup> In the final stage of preparation of this paper, Dr. D. Blažková, Institute of Botany, Czechosl. Acad. Sci., Průhonice, showed the author her notebook from June 1973, containing a record of a large patch of sterile *Calamagrostis villosa* at about 1250 m on the northern slope near the summit of Mała Rawka; making the distribution of this species above the timberline of the Bieszczady Mts. still more complete, this locality has been marked in Fig. 1.

Table 1. — Relevés of plant communities dominated by *Calamagrostis villosa* above the timberline in the Bieszczady Mts. in August 1980; sample plots approx. 20 m<sup>2</sup>; abundance + dominance and sociability estimated according to Braun-Blanquet's scale; 1 — Szeroki Wierch (altitude 1260 m a.s.l., exposure N, inclination 35°, cover 80 %), 2 — Szeroki Wierch (1270, N, 30°, 70 %), 3 — Tarnica (1300, N, 40°, 85 %), 4 — Tarnica (1260, N, 40°, 100 %, in addition *Festuca supina* SCHUR. and *Hypochoeris uniflora* VILL.), 5 — Krzemień (1320, NE, 10°, 100 %), 6 — Krzemień (1330, NE, 35°, 90 %), 7 — Polonina Wetlińska (1250, NE, 35°, 80 %, in addition *Rubus idaeus* L.), 8 — Polonina Wetlińska (1235, S, 30°, 80 %)

Relevé No.	1	2	3	4	5	6	7	8
<i>Calamagrostis villosa</i> (CHAIX.) J. F. GMEL.	3.3	4.3	3.4	2.2	4.2	2.2	3.1	3.3
<i>Vaccinium myrtillus</i> L.	3.3	2.2	2.2	3.3	4.4	4.4	4.4	2.2
<i>Homogyne alpina</i> (L.) CASS.	+	+	+	2.2	1.1	2.2	2.2	.
<i>Potentilla erecta</i> (L.) RAEUSCH	1.1	+	+	+	.	.	.	.
<i>Phegopteris polypodioides</i> FÉE	+	1.1	+	.	.	.	.	.
<i>Gentiana asclepiadea</i> L.	+	1.2	.	.	.	.	.	+
<i>Luzula nemorosa</i> (POLL.) E. MEY.	.	+	.	+	+	+	1.1	+.2
<i>Calamagrostis arundinacea</i> (L.) ROTH	.	.	+	+.2	.	+.2	+	+
<i>Solidago virga-aurea</i> L.	.	.	.	+	+	+	+	+
<i>Sorbus aucuparia</i> L.	.	.	.	+	.	+	+	.
<i>Melampyrum herbichii</i> WOL.	.	.	.	.	+	+	.	.
<i>Empetrum hermaphroditum</i> (LANGE) HAGERUP	.	.	.	.	.	+	.	.
<i>Polytrichum formosum</i> HEDW.	.	.	.	2.2	.	.	.	.
<i>Lycopodium selago</i> L.	.	.	.	+	.	.	.	.
<i>Polygonatum verticillatum</i> (L.) ALL.	.	.	.	.	+	.	.	.
<i>Allium victorialis</i> L.	.	.	.	.	+	.	.	.
<i>Angelica sylvestris</i> L.	.	.	.	.	.	.	+	+
<i>Rumex arifolius</i> ALL.	.	.	+	.	.	.	.	+
<i>Vaccinium vitis-idaea</i> L.	.	.	.	+	.	.	.	+
<i>Laserpitium alpinum</i> WALDST. et KIT.	.	.	.	.	.	.	.	+
<i>Astrantia major</i> L.	.	.	.	.	.	.	.	+
<i>Silene cucubalus</i> WIBEL	.	.	.	.	.	.	.	+
<i>Stellaria holostea</i> L.	.	.	.	.	.	.	.	+
<i>Sedum fabaria</i> KOCH	.	.	.	.	.	.	.	+
<i>Salix silesiaca</i> WILLD.	.	.	.	.	.	.	.	+.2
<i>Rosa pendulina</i> L.	.	.	.	.	.	.	.	+.2
<i>Picea excelsa</i> (LAM.) LINK.	.	.	.	.	.	.	.	+.2

of snow drifts and preventing the expansion of woody plants and less tolerant grasses. (2) Both sunny and shaded scree where the absence of fine earth has prevented *Alnus viridis* (CHAIX) LAM. et DC. and ericaceous dwarf shrubs from dominating the habitat. — *C. villosa* survives by vigorous vegetative spreading of its far-creeping rhizomes, leaving the uncertain maturity of culms and panicles as a less important factor in the reproduction. DEYL (1940) described numerous plant communities containing *C. villosa*, both from the alpine and sub-alpine zone of the East Carpathian Pop Ivan Massif (1940 m); northern and eastern aspects prevailed in the relevés recorded above the timberline. According to the latest monograph by MALINOVSKI (1980), covering all ranges of the Ukrainian (= Eastern) Carpathians,

the *Calamagrostetum villosae* and *Calamagrostetum villosae herbosum* develop in a variety of soils and aspects between 1500 to 1900 m altitude. — With regard to the phytosociological classification, stands of *C. villosa* in the Bieszczady Mts. (Table 1) obviously belong to several syntaxa, partly to the *Vaccinio-Piceetea* BR.-BL. in BR.-BL., SISS. et VLIEG. 1939, and partly to the *Nardo-Calamagrostieta* JENÍK, BUREŠ et BUREŠOVÁ 1980.

(c) What are the reasons for the comparative rareness of *Calamagrostis villosa* in the Bieszczady Mts.? *C. villosa* is a common companion of Norway spruce forests forming the upper montane belt in the high ranges of the Carpathians. Absence of *C. villosa* in the Bieszczady Mts. seems to be related to the absence of *Picea excelsa* (LAM.) LINK. in the same area. Though RALSKA-JASIEWICZOWA (1980) confirms the longlasting presence of Norway spruce in the pollen spectrum of the lower montane belt, ZARZYCKI (1963) and ZARZYCKI and GŁOWACIŃSKI (1973) deny larger stands of spruce forest in the upper montane belt, and suspect the dry and warm winds blowing from the Pannonian Lowland as the decisive factor preventing the dispersal of Norway spruce in the summit area. The same factor could have diminished the competitive ability of *C. villosa* against the more thermophilous *C. arundinacea*. The monograph by GOLUBEC (1978) also suggests the natural absence of spruce forests at the western edge of the Eastern (Ukrainian) Carpathians.

(d) Having been recorded in the Bieszczady Mts., is there any more gap in the Carpathian area of distribution of *Calamagrostis villosa*? The detailed monograph of mountain vegetation of the Eastern Carpathians by MALINOVSKI (1980) obviously does not confirm the presence of any kind of "*Calamagrostietum villosae*" in the Gorgany and Boržava Mts., the two mountain ranges east of the Bieszczady Mts. The occurrence of this species has been recorded in the Svidovec, Černogora, Marmaroš and Čivčoin Mts. Although our findings in the Bieszczady Mts. have reduced the gap, MEUSEL, JÄGER and WEINERT (1965) are still justified in leaving a questionmark in the Eastern Carpathian area of distribution of *C. villosa*.

## SOUHRN

Při studiu sukcese na poloninských loukách v Bieszczadech v roce 1980 se ve fytoocenologických snímcích jako dominantna nebo subdominantna vyskytovala vícekrát třtina chloupkatá, *Calamagrostis villosa* (CHAIX) J. F. GMEL. Tato významná tráva nebyla dosud z vyšších poloh Bieszczadů známa, ačkoliv tvoří větší porosty na různých biotopech ve třech oddělených horských masivech. Přebíhá na severních a severovýchodních svazích, které se přimykají ke hřbetnici a vreholům nejvyšších poloh; málo vitální a neplodné porosty ve společenstvu s řídkými porosty keřů z čeledi vřesovcovitých tu obsazují místa s dlouho ležícím sněhem a krátkou vegetační sezónou. Reliktní charakter třtiny chloupkaté v Bieszczadech naznačují i výskyty na sutích, kde tento druh roste ve společenstvu většího počtu subalpinských a alpinských druhů. Vyskytl se i případ kruhovitých polykormonů třtiny chloupkaté uprostřed souvislých porostů s dominantním *Vaccinium myrtillus* a *Calamagrostis arundinacea*; to je pravděpodobný výsledek sukcesních pochodů v poloninských porostech po skončení pastvy dobytka na konci druhé světové války. Zjištěný výskyt třtiny chloupkaté v Bieszczadech sice zmenšuje předpokládanou přervu v karpatském areálu tohoto druhu, avšak vzhledem k chybějícím údajům z Gorgan a Boržavské Poloniny nepopírá oprávněnost mezery v areálu, kterou zaznamenali MEUSEL, JÄGER a WEINERT (1965) ve své srovnávací chorologii středoevropské květeny.

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Plate XI. — Photo 1. Pattern of medium-grass community of *Calamagrostis villosa* and tall-grass community of *Cal. arundinacea* on the top of Polonina Wetlińska in 1980.

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Plate XII. — Photo 2. Northern slopes of Krzemień (1335 m) in the Bieszczady Mts. with hummocks of *Sphagnum*, ericaceous dwarf-shrubs and relict occurrence of *Calamagrostis villosa* (August 1980).

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