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ACHNATHERUM CALAMAGROSTIS (L.) P. BEAUV. IN THE ROMANIAN CARPATHIANS: CRITICAL OVERVIEW, PHYTOCOENOTIC CONTEXT AND CONSERVATION STATUS

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Abstract: This study proposes a critical analysis of the occurrence in the Romanian Carpathians of the rare plant species *Achnatherum calamagrostis* (L.) P. Beauv. (Poaceae, silver spike grass). This species has been reported from several of the mountains in the Romanian Carpathians, but reviewing the herbarium collections from Romania we were unable to find any validated specimens of *A. calamagrostis* collected outside the range of the Mehedinţi, Cernei and Vâlcan Mountains.

Furthermore, we processed the available botanical literature, which brought us to the same conclusion: the presence of this grass in all previously reported localities outside the western range of the Southern Carpathians cannot be supported by any reliable data and is, therefore, considered doubtful.

The authors propose the inclusion of *A. calamagrostis* in the next edition of the Romanian Red Book of Vascular Plants as Vulnerable (VU), on the basis of its distribution within a restricted area of the Romanian Carpathians.

Keywords: Chorology; *Achnatherum calamagrostis*, silver spike grass, Red Data Book, phytosociology, Mehedinți Mountains.

Introduction

Nearly 25% of an estimated 250.000 species of vascular plants in the world may become extinct within the next 50 years [87].

Unfortunately, sometimes the sozological status of particular vascular plant species in the Romanian Carpathians has not been evaluated properly, so that several threatened plant species were not included in the Red Book of Vascular Plants of Romania [39]. A noteworthy case is *Gentiana clusii* E. M. Perrier & Songeon, which was previously considered to occur sporadically in the Romanian Carpathians. In fact, the species seems to be present only in the Apuseni Mountains [4].

Another species not included in the Romanian Red Book is *Achnatherum calamagrostis* (L.) P. Beauv. (silver spike grass), the distribution of which in the Romanian Carpathians has not been clearly assessed.

A. calamagrostis is a robust, caespitose perennial grass. The stem is 60–120 cm long. The leaves are 2–3 mm wide, usually convolute when dry, gradually attenuate into a long, slender apex; the sheaths are smooth, glabrous or ciliate on the margin. The panicle is up to 30 cm long. The spikelets are (6–)8–9 mm long, shining, often purplish. The glumes are lanceolate, acute, glabrous or shortly hairy. The lemma is 3–4 mm long, with patent hairs, the awn *c*.10 mm long

(straight or curved) [104].

A. calamagrostis naturally occurs in Morocco, Central and Southern Europe, Central Asia to Siberia, and in Northern and Central China [110], mainly in the mountains, on calcareous rocky or stony ground [104]. It is conspicuously successful as a pioneer in screes and rocky places in sub-Mediterranean areas. The flowering period is June to October.

In the Romanian botanical literature [8, 24, 72, 85, 93] silver spike grass has been reported from several massifs: Rodna Mts., Ceahlău Mts., Piatra Mare Massif, Postăvaru Massif, Bucegi Mts., Parâng Mts., Vâlcan Mts., Cernei Mts., Mehedinţi Mts., Almăj Mts., Locva Mts., Metaliferi Mts., Gilău-Muntele Mare Mts. and Bihor Mts. However, most of these localities were recorded in 19th century, without recently confirmed populations.

The species is not included in the Romanian Red Lists [13, 38, 71] or in the Red Book of Vascular Plants of Romania [39].

The main aim of this study was to clarify the distribution of *Achnatherum calamagrostis* in the Romanian Carpathians, based on a detailed review of the available herbarium and literature data. Furthermore, the phytocoenotic context in which *A. calamagrostis* grows in the Mehedinţi Moutains is characterised by original field data.

Material and Methods

Our investigations are based on recent field studies and the investigation of herbarium material lodged at CL, BUC, BUCA, BVS, SIB, I, IAGB, IASI, CRAI, EGR, P, W, WU (acronyms according to Thiers 2016 [103]), as well as literature surveys.

All existing Romanian herbarium material was revised and all available information from botanical literature was critically compiled in order to clarify the distribution of *Achnatherum calamagrostis* in the Romanian Carpathians. Several field surveys were carried out between 2003 and 2015 in the Rodna Mts., Ceahlău Mts., Piatra Mare Massif, Postăvaru Massif, Perşani Mts. (Eastern Carpathians); Bucegi Mts., Vâlcan Mts., Mehedinţi Mts., Almăj Mts., Locva Mts., (Southern Carpathians); and Metaliferi Mts., Gilău Mts., Bihor Mts. (Apuseni Mountains), from where the species had been reported.

The plant communities in which *A. calamagrostis* occurs were studed according to the methodology of the Central-European phytosociological school [14, 30]. In order to identify and describe the plant associations, we have taken into consideration some recent phytosociological papers [21, 22, 28, 92].

Results and Discussion

1. Distribution of *Achnatherum calamagrostis* in the Romanian Carpathians

1.1. **Munţii Rodnei** (Rodna Mountains, Eastern Carpathians)

This important hotspot for alpine flora in the Carpathians has attracted botanists since the end of the 18th century.

Achnatherum calamagrostis was first mentioned in the flora of this mountain range by Schur (1866) under the name *Lasiagrostis calamagrostis* Link *a. transsilvanica* Schur, but without any exact locality. Later, the species was not mentioned from this mountain group in other botanical monographs by famous botanists such as Porcius (1878), Simonkai (1886), Soó (1944) or Coldea (1990).

Nyárády (1967) remarked that the species mentioned by Schur corresponds to a variety of

Calamagrostis varia (Schrad.) Host.

Recent botanical literature [93] erroneously indicates the presence of silver spike grass in this mountain range.

We could not find any certain proof of the existence of this species in the massif, neither in the herbarium collections, nor during our field surveys (A. Bartók, pers. obs. 2003-2005, 2009, 2010, 2012-2015).

Thus, it can be concluded that the presence of *A. calamagrostis* in the Rodna Mountains is based on erroneous identification and it is very unlikely that this grass occurs here.

1.2. **Munţii Ţibleşului** (Ţibleş Mountains, Eastern Carpathians)

The Ţibleş Mts. are a volcanic mountain range located in northern Romania, with a maximum altitude of 1839 m a.s.l. on Ţibleş Peak.

Achnatherum calamagrostis was first listed from this mountain group by Baumgarten (1816), as *Calamagrostis speciosa* (Schrad.) Host, for Mt. Arszul (Vf. Arcer). Fuss (1866) also enumerated the species in his floristic list, as *Lasiagrostis* c*alamagrostis* (L.) Link., from the same location. Porcius (1878) only mentioned silver spike grass for Mt. Arszul.

Neither Morariu (1943, 1978) nor Übelhart (1993) reported silver spike grass for the Ţibleşului Mountains, but later Sârbu et al. (2013) mentioned this species in that mountain range.

Nor could we find any herbarium voucher of this species from the Ţibleş Mts. and moreover this thermophilic plant requires a specific limestone habitat (e.g. calcareous screes), which is not present in that mountain range. It can be concluded that the mention of *A. calamagrostis* in the Ţibleş Mountains is very likely to be a mistake.

1.3. **Munţii Ceahlău** (Ceahlău Mountains, Eastern Carpathians)

The first mentions of *A. calamagrostis* from this massif date back to the 19th century, when J. Szabó cited the species from the Ceahlău Mountains as *Calamagrostis speciosa*, but without exact locality [101]. In his floristic synthesis, Brândză (1883) reported silver spike grass in the Ceahlău Mountains, quoting Szabó, but without exact locality.

Later studies of this massif [46, 69, 20, 59] did not report *A. calamagrostis* from this mountain range. In some botanical literature [108, 57, 72, 23, 93] silver spike grass is enumerated with a question mark.

In this mountain range the presence of silver spike grass was never confirmed by either herbarium material or by our fieldwork (fide A. Bartók, pers. obs. 2003–2007, 2009, 2015). Probably *A. calamagrostis* was confused with *Calamagrostis arundinacea* (L.) Roth, since this species is frequently encountered in this region.

1.4. **Masivul Piatra Mare** (Piatra Mare Massif, Eastern Carpathians)

Baumgarten (1816) was the first author to report *A. calamagrostis* from this mountain range but without exact locality. In his floristic synthesis, Fuss (1866) mentioned silver spike grass in the Piatra Mare Mountains, quoting Baumgarten.

Buiculescu (1987) in the floristic synthesis of the Piatra Mare Mts. mentioned *A. calamagrostis*, only quoting Baumgarten; she was unable to confirm the presence of silver spike grass in this area.

The flora of the Piatra Mare Mts is relatively well explored, and other floristic or phytosociological publications [17, 18] did not mention the occurrence of *A. calamagrostis* here. Later, only Oprea (2005) and Sârbu et al. (2013) mentioned the species in this mountain group.

Silver spike grass could not be observed in the Piatra Mare Mountains (A. Bartók, pers. obs. 2003–2015) and also we were unable to trace herbarium specimens of *A. calamagrostis* from this mountain range in all herbaria we checked. It can be concluded that reports of silver spike grass in the Piatra Mare Mountains are very likely to be a mistake.

1.5. **Masivul Postăvaru** (Postăvaru Massif, Eastern Carpathians)

A. calamagrostis was reported in the flora of this mountain unit by Fink (1975), from Stejărişul Mic (Kleine Hangenstein), quoting Morariu (1972). Morariu reported silver spike grass from the Straja Mts. (Braşov county) but not from Stejărişul Mic. It is possible that the locality "Straja Mts." mentioned by Morariu relates to Worthe hill, not far from Stejărişul Mic.

The flora of the Postăvaru Mts. is relatively well explored and other floristic or phytosociological publications [91, 42, 32, 73, 33, 34] have failed to mention the occurrence of *A. calamagrostis* in this mountain range.

We could not trace any herbarium specimen from the Postăvaru Mts. in all the herbaria investigated. Moreover, we could not find this grass in Stejărişul Mic or in other area of the mountain range during our field surveys (A. Bartók, pers. obs. 2014–2015). Thus we assume that silver spike grass was reported erroneously from these mountains.

1.6. **Munţii Perşani** (Perşani Mountains, Eastern Carpathians)

Undoubtedly, the Vârghişului (Vargyas) gorge is one of the most botanically interesting areas of the the Perşani Mts.

Kovács (1983) recorded for the first time *A. calamagrostis* from the Vârghişului gorge but without exact locality. Afterwards, Vojtkó et al. (2012) mentioned the silver spike grass in the Vârghişului gorge floristic list, but they referred only to Kovács's data.

Later, Vojtkó et al. (2013) confirmed in a short note the certain presence of *A. calamagrostis* in the flora of the Vârghişului gorge. The analysis of the specimen from the author's private herbarium (its picture provided to us by the author) demonstrated that the plant collected does not represent silver spike grass but *Trisetum flavescens* (L.) P. Beauv. Soó (1940, 1943), Morariu et al. (1967) and Munteanu et al. (1987) did not report *A. calamagrostis* from the Perşani Mountains.

During our field surveys, the species was not found near the Vârghişului gorge (A. Bartók, pers. obs. 2015). Furthermore, we were unable to identify herbarium specimens of this taxon from the mountain range in any public herbaria. The species remains doubtful for the flora of this mountain range.

1.7. **Munţii Bucegi** (Bucegi Mountains, Southern Carpathians)

Within the whole range of the Southern Carpathians, the Bucegi Mts. probably represent the region most intensively investigated by botanists.

A. calamagrostis was first listed from this mountain range by Baumgarten (1816). Fuss (1866) cited this taxon following Baumgarten; Prodan (1939) mentioned the presence of silver spike grass in the Bucegi Mts. but without clear indication of its locality. Paucă & Roman (1959) reported the species from this mountain group in the "Ialomiţei" valley system, more precisely in sandy places.

Beldie (1967, 1972) in his floristic monographs did not report *A. calamagrostis* from any area of this mountain range.

We could find no proof of the existence of this species in the massif, either in the herbarium collections or during our field surveys (A. Bartók, pers. obs. 2003–2015). As with

other areas of the Eastern or Southern Carpathians, it is very unlikely that the plant occurs in the Bucegi Mts.

1.8. **Munţii Vâlcanului** (Vâlcan Mountains, Southern Carpathians)

Baumgarten (1816) recorded *A. calamagrostis* for the first time from this mountain group, more precisely from Mt. Straja. Simonkai (1886) only mentioned silver spike grass in this mountain range (Mt. Straja), citing Baumgarten, but he emphasised that the plant's presence was doubtful.

More recently, silver spike grass was reported by Muică (1989, 1995) in the south-western part of the Vâlcan Mountains, on limestone cliffs and screes in the Izbucul Călugărului, Steiul Roşu and Motru basin.

We could not find any herbarium specimen of *A. calamagrostis* from the Mt. Straja area. This thermophilic plant requires a specific limestone habitat (e.g. calcareous screes), which is not present in this part of the Vâlcan Mountains. Therefore, the occurrence of silver spike grass in the area (where schists are dominant) remains unproven by clear data.

The occurrence of *A. calamagrostis* in the south-western part of the Vâlcan Mountains is well documented in the herbarium collections of BUCA, CL and IAGB (G. Negrean, Steiul Roşu, 1983; G. Negrean, Izbucul Călugărului, 2004; I. Sârbu, Roşu Mt., 1983) and thus we can clearly state that this is one of the few definite occurrences of silver spike grass in the South-Eastern Carpathians.

1.9. **Munţii Mehedinţi** (Mehedinţi Mountains, Southern Carpathians)

Certainly, the Mehedinţi Mts. is one of the most botanically interesting parts of the South-Eastern Carpathians. The flora and vegetation of this area have been studied by many botanists: Rochel (1828), Heuffel (1858), Borbás (1874), Simonkai (1886), Degen (1901), Boşcaiu (1971), Resmeriţă (1971,1972), etc. The limestone cliffs of Domogled and Şuşcu peak, Ţesnei valley, Vârful lui Stan and Piatra Cloşanilor peak harbour a great variety of floristic elements, and preserve numerous Carpathian endemics, thermophilous sub-Mediterranean or threatened plant species, e.g. *Aethionema saxatile* (L.) R. Br., *Sorbus borbasii* Jáv., *Dryopteris submontana* (Fraser-Jenk. & Jermy) Fraser-Jenk., *Campanula crassipes* Heuff., *Orchis pallens* L., *Saponaria bellidifolia* Sm., *Primula auricula* L. subsp. *serratifolia* (Rochel) Jáv., *Hypericum rochelii* Griseb. & Schenk, *Lactuca aurea* (Sch. Bip. ex Pančić) Stebbins, *Arabis collina* Ten., *Noccaea banatica* (R. Uechtr.) F. K. Mey. and *Astragalus depressus* L. (A. Bartók, pers. obs. 2006–2016).

Rochel (1828) this species recorded for the first time in the Mehedinţi Mts., under the name *Arundo speciosa* Schrad., near Băile Herculane, without exact locality. Silver spike grass has been mentioned several times in the botanical literature from this mountain range: Heuffel (1858), Borbás (1874); Pax (1898, 1908); Degen (1901); Jávorka (1925); Fekete (1959); Popescu (1960); Popescu & Samoilă (1962); Nyárády (1967); Resmeriţă (1971, 1972); and Ciortan & Negrean (2012, 2014). Floristic or phytosociological studies have reported the presence of this thermophilous plant species in the following locations: Domogled peak [40]; Şuşcu peak [82]; Topolniţei gorges [70]; Ogaşul lui Beniuc, Ponoarele, Ciolanul Mare peak, Ciolanul Mic peak, Pietrele Vinete peak, Giurgiani, Iştani, and Rudina [25, 26].

In addition, our own botanical researches have revealed this interesting plant species in several other locations: Prolaz gorges, Pietrele Albe peak, Crovul Medved, Poienile Porcului, Crovul Mare, Broscan peak, Poiana Beletina, and Stan peak (A. Bartók, pers. obs. 2006–2016).

The distribution of *A. calamagrostis* in this mountain range is also well documented in the herbarium collections of CL, BUCA, I, SIB, BVS, IAGB, IASI, W and WU.

1.10. **Munţii Cernei** (Cernei Mountains, Southern Carpathians)

The Cernei Mts. shelter a very interesting flora, especially in particular localities: Arjana, Biliana and Poiana Cicilovete peaks, Vânturătoarea waterfall, and Prisăcinei and Drăstănicului gorges, with rare, threatened and endemic species: *Minuartia graminifolia* (Ard.) Jáv. subsp. *hungarica* Jáv., *Scutellaria alpina* L., *Astragalus depressus* L., *Genista radiata* (L.) Scop., *Silene flavescens* Waldst. & Kit., *Alyssoides utriculata* (L.) Medik. and *Micromeria pulegium* (Rochel) Benth. (A. Bartók, pers. obs. 2006–2016).

A. calamagrostis was first listed from this mountain group by Neilreich (1866), near Mehadia. Silver spike grass was mentioned several times in the botanical literature from this mountain range in different locations: Coronini plateau [68]; Mt. Ciorici [36]; Mt. Schirbiţa [70]; Prisăcinei, Drăstănicului and Bedinei gorges, and Irişov cliffs [11].

1.11. **Munţii Almăjului** (Almăj Mountains, Southern Carpathians)

Silver spike grass was reported from the Cazanele Mici and Fețele Dunării areas (in the Management Plan of Porțile de Fier Nature Park - Annex 6) [112], in the *Achnatheretum calamagrostis* vegetal association.

The flora of the Almăj Mts. is relatively well explored, and other floristic or phytosociological publications [10, 95, 109, 31, 80, 37, 12, 58] did not mention the occurrence of silver spike grass in this mountain range.

We could not find any herbarium specimen of silver spike grass from this area. *A. calamagrostis* could not be found near Cazanele Mari gorge nor in other parts of this mountain range during our field surveys (A. Bartók, pers. obs. 2009–2015).

Therefore, the occurrence of *A. calamagrostis* in the Almăj Mountains remains unsupported by currently known data.

1.11. **Munţii Locvei** (Locva Mountains, Southern Carpathians)

Silver spike grass was first mentioned in the flora of this mountain unit by Rochel (1828) under *Arundo speciosa* Schrad., from near Baziaş monastery. The monograph of Banat's flora by Heuffel (1858) failed to mention *A. calamagrostis* in this mountain range.

Later, the species was cited by Raclaru & Alexan (1972) but they only referred to Rochel's old data. Oprea (2005) mentioned silver spike grass in the Locva Mts. (between Tri Kule and Svinița), quoting Popescu & Ştefureac (1976). But in their article Popescu & Ştefureac did not cite the occurrence of *A. calamagrostis* in this mountain range – only the species *Stipa aristella* L. is listed.

The flora of the Locva Mts. is relatively well studied [102, 29, 81, 19] but the species was not found by any botanist in the last century.

Since neither could we find *A. calamagrostis* in Locva Mts. (A. Bartók, pers. obs. 2013–2014), nor are there reliable herbarium specimens from this mountain group, the occurrence of silver spike grass in the Locva Mts. cannot be proved without firm data.

1.12. **Munţii Metaliferi** (Metaliferi Mountains, Apuseni Mountains)

Beldie (1979), Ciocârlan (2009) and Sârbu et al. (2013) recorded silver spike grass in this mountain group but without exact locality; only Morariu (1972) mentioned specific locations, the Almaşul Mic and Crăciuneşti gorges. This mountain range is well studied from a botanical point of view, but no botanist has cited this species from the Metaliferi Mountains [45, 2, 3, 1].

In the Iaşi herbarium (I) we have found specimens from two locations: I 51935, I 51948, *Lasiagrostis calamagrostis*, Almaşul Mic: Pleşa Moşului, on limestone, 6 Jun 1961, leg. ? and I 51947, *Lasiagrostis calamagrostis*, N Ardeul, Pleaşa Ardeului, on limestone, 10 Oct 1955, leg. ?. The material labelled as such does not represent *A. calamagrostis*, but *Helictotrichon decorum*. All these specimens were revised by Irina Irimia (29 Feb. 2016).

During our field surveys, we could not find silver spike grass in this mountain range (A. Bartók, pers. obs. 2013-2014). Furthermore, we were unable to identify any herbarium specimens belonging to this taxon from the mountain range in any public herbaria.

It can be concluded that the presence of *A. calamagrostis* in the Metaliferi Mts. is based on erroneous identification and it is very unlikely that the grass occurs here.

1.13. **Munţii Gilău-Muntele Mare** (Munţii Gilău-Muntele Mare Mountains, Apuseni Mountains)

Baumgarten (1816) recorded *A. calamagrostis* for the first time from this mountain group, as *Calamagrostis speciosa*, from Mt. Szirbi.

Simonkai (1886) cited this taxon in Gilău-Muntele Mare after Baumgarten, but he questioned its presence in Transylvania.

In Herbarium Baumgartenianum (included in the CL collections) are three herbarium sheets, which are labelled as follows:

CL 942: "2873, *Calamagrostis speciosa*, In aridis montis versus M. Szirbi, aug. 1819";

CL 1649: "2871, *Calamagrostis speciosa*"

CL 1649: "2872, *Calamagrostis speciosa*, ? Jul. 1826" [this label also contained two illegible words].

Simonkai (1886) assumes in his critical work that Baumgarten's "Szirbi" toponym corresponds to Mt. Silha, a peak south of Giurcuţa de Sus (Felső-Gyurkucza). Simonkai erroneously considered that Silha peak is situated near to the head of the Someşul Cald valley. Indeed, Silha peak (1491 m a.s.l.) is situated in the Gilău Mts. but not the Bihor Mts. [9]. The peak is forested and does not provide ecological conditions for this thermophilic species.

Morariu (1972) listed in the Romanian flora (vol. XII) the occurrence of silver spike grass in the Runcului gorge, but without any comments on this important biogeographical and floristic find. In the same work, Morariu (1972) reported *A. calamagrostis* from the head of Someşul Cald valley; the locality is identical to the Szirbi Mts. (Silha peak) mentioned by Simonkai (1886) and, as noted above, the head of the Someşul Cald valley is situated in the Bihor Mts. not in the Gilău Mts. [9].

The Gilău Mts. (particularly Runcului gorge and Scăriţa-Belioara) represent one of the regions most intensively investigated by botanists within the whole Apuseni Mountains range, but *A. calamagrostis* was not mentioned in any subsequent monographs on the flora and vegetation of this area [77, 50, 51, 49].

We could not find any herbarium specimen (apart from those problematic specimens from Baumgarten's herbarium) of silver spike grass from this area. Nor could we find it in the field, in any of the areas surveyed in this mountain range (A. Bartók, pers. obs. 2004-2006, 2012, 2013). Therefore, the occurrence of *A. calamagrostis* in the Gilău Mountains remains unsupported by currently known data.

1.14. **Munţii Bihor** (Munţii Bihor, Apuseni Mountains)

Beldie (1979), Ciocârlan (2009), Oprea (2005) and Sârbu et al. (2013), who mentioned *A. calamagrostis* from this mountain range, considered the occurrence of silver spike grass at the head of Someşul Cald; in the earlier botanical literature [53, 97, 47, 78, 54, 55, 96, 79] there is no reference related to *A. calamagrostis* from this mountain range.

We could not trace any herbarium specimen from the Bihor Mts. in all the herbaria we checked. Moreover, we could neither find *A. calamagrostis* in this mountain range (A. Bartók, pers. obs. 2009, 2011, 2013). It can be concluded that the mention of silver spike grass here is very likely a mistake.

Based on our field research, analysis of accumulated herbarium material and data from literature, we present the distribution map of *A. calamagrostis* in the Romanian Carpathians (Figure 1).

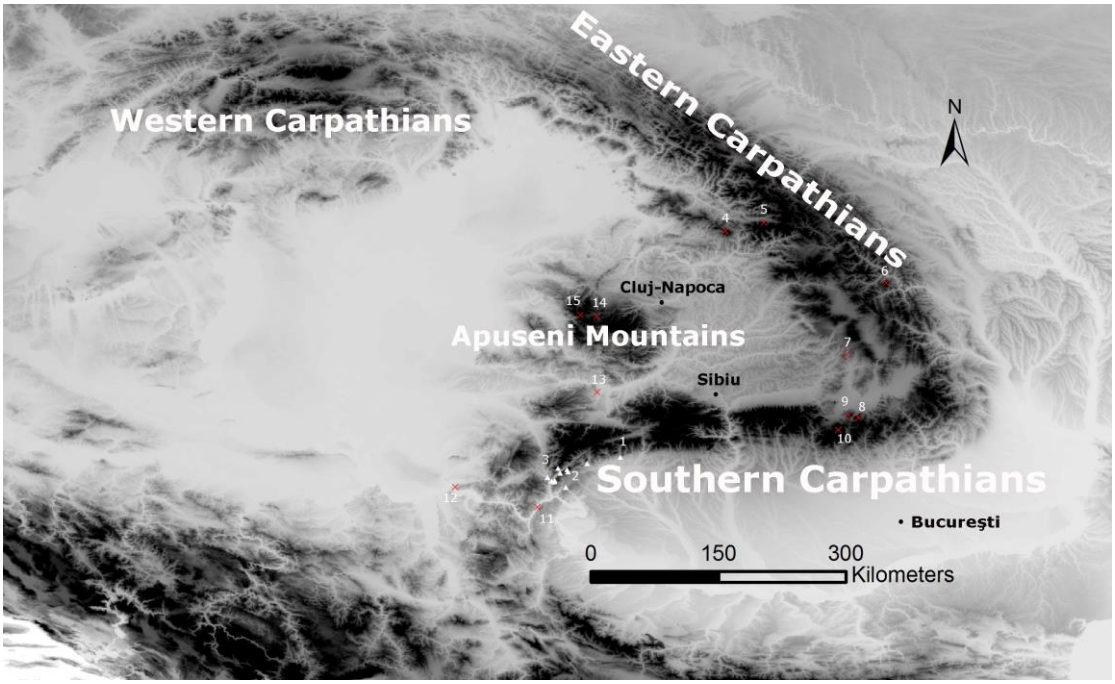

Fig. 1: Chorological map of *Achnatherum calamagrostis* in Romanian Carpathians (white triangles represent the confirmed locations and red cross stars represent the uncertain locations). Legend: 1-Vâlcan Mts.; 2-Mehedinţi Mts; 3-Cernei Mts.; 4-Ţibleş Mts.; 5-Rodna Mts.; 6-Ceahlău Mts.; 7-Perşani Mts.; 8-Piatra Mare Massif; 9-Postăvaru Massif; 10-Bucegi Mts.; 11-Almăj Mts.; 12-Locva Mts.; 13-Metaliferi Mts.; 14-Gilău-Muntele Mare Mts.; 15-Bihor Mts.

The validated *Achnatherum calamagrostis* specimens included in this study are listed in Appendix 1.

2. Habitat description by recent field observations

In the Romanian botanical literature, *A. calamagrostis* is ascribed to the *Achnatherion calamagrostis* or *Micromerion pulegii* syntaxa [11, 93].

During our field surveys in the Domogled-Valea Cernei National Park in the Prolaz Gorge and Ţesnei Valley calcareous screes, we identified *A. calamagrostis* in two plant

associations: *Achnatheretum calamagrostis* Br.-Bl. 1918 and *Asplenio-Syringetum vulgaris* Jakucs et Vida 1958 (syn. *Syringo-Fraxinetum orni* (Borza 1958) emend. Resmeriţă 1972).

1. Ass. *Achnatheretum calamagrostis* was identified in the Prolaz gorges (Table 1). It grows on limestone screes, on steep, south-facing rocks at an altitude of 300 m. The characteristic and dominant species of the association is *Achnatherum calamagrostis* (L.) P. Beauv., accompanied by *Aurinia petraea* (Ard.) Schur, *Arabis procurrens* Waldst. & Kit. and *Saxifraga paniculata* Mill.

This plant association belong to type Natura 2000 habitat: 8160* Medio-European calcareous screes of hills and montane levels [44].

Table 1: *Achnatheretum calamagrostis* Br.-Bl. 1918

Relevé no.	1
Altitude (m, a.s.l.)	300
Aspect	SE
Slope (°)	40
Area (m^2)	100
Cover of the vegetation (%)	55
Number of species	15
Char. ass.	
Achnatherum calamagrostis	3
Stipion calamagrostis	
Galium album	+
Melica ciliata	+
Parietarion officinalis, Galio-Parietarietalia officinalis et Thlaspietea rotundifolii	
Arabis procurrens	1
Asplenietea trichomanis s.l.	
Asplenium ceterach	+
Aurinia petraea	+
Dianthus petraeus	+
Genista januensis	+
Poa nemoralis	1
Saxifraga paniculata	1
Sedum album	+
Elyno-Seslerietea s.l.	
Festuca xanthina	+
Quercetea pubescentis s.l.	
Genista radiata	+
Festuco-Brometea s.l.	
Asperula purpurea	+
Variae syntaxa	
Noccaea banatica	+

Place and date of relevé: 1. Prolaz gorges, 19.V.2012

Table 2: *Asplenio-Syringetum vulgaris* Jakucs et Vida 1959

Relevé no.	1
Altitude (m, a.s.l.)	550
Aspect	S
Slope (°)	50
Area (m^2)	100
Cover of the shrub layer (%)	55
Cover of the herbaceous layer (%)	25
Number of species	18
Char. ass.	
Syringa vulgaris	2
Syringo-Carpinion orientalis	
Hypericum rochelii	+
Scabiosa banatica	+
Fraxino orni-Cotinion et Fraxino orni-Cotinetalia	
Arabis collina	+
Fraxinus ornus	3
Quercion pedunculiflorae, Quercetalia cerris et Quercetea pubescentis	
Veratrum nigrum	+
Querco-Fagetea s.l.	
Campanula trachelium	+
Vaccinio-Piceetea s.l.	
Pinus banatica	+
Festuco-Brometea s.l.	
Primula auricula ssp. *serratifolia*	+
Veronica crassifolia	+
Asplenietea trichomanis s.l.	
Campanula kladniana	+
Saxifraga paniculata	1
Thlaspietea rotundifolii s.l.	
Achnatherum calamagrostis	2
Aethionema saxatile	+
Athamanta turbith ssp. *hungarica*	+
Campanula crassipes	+
Elyno-Seslerietea s.l.	
Festuca xanthina	1
Seseli libanotis	+

Place and date of relevé: 1. Ţesna valley, 20.V.2012

2. Ass. *Asplenio-Syringetum vulgaris* was found in the Ţesna valley (Table 2). It grows on steep, south-facing rocks, at an altitude of 550 m. The shrub layer is identified by *Syringa vulgaris* L. and *Fraxinus ornus* L., sometimes penetrated by *Pinus banatica* (Georgescu & Ionescu) Georgescu & Ionescu. The herbaceous layer is dominated by *Achnatherum calamagrostis* (L.) P. Beauv., accompanied by *Seseli libanotis* (L.) W.D.J. Koch, *Festuca xanthina* Roem. & Schult. and *Sesleria rigida* Heuff. ex Rchb.

This plant association belongs to type Natura 2000 habitat: 40A0* Subcontinental peri-Pannonic scrub [44].

In the investigated phytocoenoses we found several rare plant species: *Arabis collina* Ten., *Sorbus borbasii* Jáv., *Primula auricula* L. subsp. *serratifolia* (Rochel) Jáv., *Genista radiata* (L.) Scop., *Genista januensis* Viv., *Noccaea banatica* (R. Uechtr.) F. K. Mey., *Campanula crassipes* Heuff., *Aethionema saxatile* (L.) R. Br., *Veronica crassifolia* Wierzb. ex Heuff. and *Hypericum rochelii* Griseb. & Schenk, that are included in the Romanian Red Book of Vascular Plants [39].

3. Recommended IUCN threat category

Only a few populations of *A. calamagrostis* are known with certainly from the South-Eastern Carpathians, in limited areas of the Mehedinţi, Cernei and Vâlcan Mountains. The locations where the species occurs are included in the Domogled-Valea Cernei National Park.

On the basis of new chorological data and assessment of population condition, we can define silver spike grass as IUCN VU D2 [111] in the Romanian Carpathians.

We therefore recommend the inclusion of *Achnatherum calamagrostis* in the next edition of the Romanian Red Book of Vascular Plants as Vulnerable (VU).

Conclusion

Based on the critical analysis of the distribution of *Achnatherum calamagrostis* in the Romanian Carpathians it appears that the species is relatively rare and deserves more attention from botanists and nature conservation authorities.

Based on the present study, which includes our own field research, analysis of regional herbarium collections and data from literature, we can state that silver spike grass occurs in the Romanian Carpathians only in limited areas of the Mehedinţi, Cernei and Vâlcan Mountains.

Appendix 1: List of validated *Achnatherum calamagrostis* specimens (from the Romanian Carpathians and included in the present study)

Mountains	Locality	Collected by/ year	Herbarium
Cernei Mts.	Mt. Ciorici	Thaisz, 1900	BUCA, CL, SIB, W
	Near Topleţ	?, 1815	W
		Grinţescu, 1926	BUCA
	Mt. Schirbiţa	Nyárády & Váczy, 1967	SIB
	Near Mehadia	Reuss, 1868	W
Vâlcan Mts.	Steiul Roşu	Negrean, 1983	BUCA
	Mt. Roşu	Sârbu, 1983	IAGB
	Izbucul Călugărului	Negrean, 2004	CL
Mehedinţi Mts.	Mt. Domogled	Rochel, 1815	W
		Haynald, 1872	BVS
		Borbás, 1873	CL
		Borza & Nyárády, 1931	BUCA, BVS, CL, I, IASI, SIB, W
		Grinţescu, 1931	BUCA
		Kárpáti, 1935	Herbarium "Székely Nemzeti Múzeum", Sf. Gheorghe
		Bujorean, Arvat & Popescu, 1948	BUCA
		Beldie, 1951	BUCA
		Pop, 1962	SIB
		Boşcaiu, 1963	CL
		Goga, 1965	IAGB
		Sârbu, 1972	I
		Frink, 2004	CL
		Grulich, 2010	BRNU
		Heuffel, ?	W
		Pávai, ?	CL
	Near Rudina	Negrean & Ciortan, 2011	CL
	Topolniţa gorge	Ţopa, 1949	IAGB
		Nyárády & Nyárády, 1949	SIB
	Ţesna valley	Resmeriţa, 1968	IAGB
	Jelărău valley	Nyárády, 1931	CL, SIB
	Prolaz gorge	Nyárády, 1907,1928,1950	BUCA, CL, SIB

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ACHNATHERUM CALAMAGROSTIS (L.) P. BEAUV. ÎN CARPAȚII ROMÂNEŞTI: STUDIU CRITIC, CONTEXT FITOCENOTIC ŞI STAREA DE CONSERVARE A SPECIEI

(Rezumat)

Studiul nostru propune o analiză critică a distribuţiei speciei rare *Achnatherum calamagrostis* (L.) P.Beauv. în Carpații Românești.

În literatura botanică românească *A. calamagrostis* este menţionată ca fiind spontană in mai multe masive din Carpații de Sud-Est (Rodnei, Ceahlău, Piatra Mare, Postăvaru, Bucegi, Parâng, Vâlcan, Cernei, Mehedinţi, Almăj, Locvei, Metaliferi, Gilău-Muntele Mare şi Bihorului), însă nu au fost găsite exemplare de herbar colectate din afara Munţilor Mehedinți, Cernei și Vâlcan în vederea susţinerii acestui argument.

O analiză critică a literaturii botanice disponibile ne conduce la aceeaşi concluzie: toate localităţile menţionate în Carpaţii Românești (în afară de Munţii Mehedinți, Cernei și Vâlcan) nu sunt susţinute prin date concrete şi prin urmare prezenţa speciei *A. calamagrostis* în aceste localităţi se consideră îndoielnică.

Autorii propun includerea speciei *A. calamagrostis* în viitoarea ediție a Cărții Roșii a Plantelor Vasculare din România, în categoria sozologică ”Vulnerabilă” (VU).

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