Carex cespitosa: reappraisal of its distribution in Europe

Abstract


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Carex cespitosa L. (Cyperaceae) has been traditionally regarded as widespread in Europe, being reported from most countries. However, its distribution is currently overestimated due to the ambiguous use of the name C. cespitosa, together with frequent taxonomic confusion, mainly with the closely related C. elata All. and C. nigra (L.) Reichard. We present a critical revision of the distribution of C. cespitosa in Europe W of the former USSR, based on herbarium material and literature. We confirm the presence of the species in 19 European countries, while its occurrence is considered as doubtful in another five countries. Data pertinent to the ecology and conservation status of the species in the different countries are also provided. It is considered threatened or nearly so in at least eight countries. Hybrids with C. acuta L., C. elata and C. nigra are morphologically characterized and discussed. Although chorological revisions of the European flora are commonly considered of relatively minor scientific relevance, the situation detected by our survey of C. cespitosa reveals the importance of, and need for, these basic works for the accurate knowledge of many species, especially for subsequent works on conservation biology and biogeography.

Additional key words: “Carex caespitosa”, chorology, conservation, endangered flora, hybrids

Introduction

Carex cespitosa L. (misspelled as “caespitosa” in many works) is the type species of C. sect. Phacocystis Du-mort. (Egorova 1999), one of the largest sections of the genus Carex L. (Cyperaceae) with approximately 90 species distributed worldwide (Dragon & Barrington 2008). Taxa belonging to C. sect. Phacocystis are characterized morphologically by oblong to cylindrical female spikes, two stigmas and lenticular, frequently papillose, short-beaked utricles (Chater 1980; Egorova 1999; Luceño & Jiménez-Mejías 2008). The taxonomy of C. sect. Phacocystis is complex mainly due to hybridization processes and the faint morphological boundaries among many taxa (see Stoeva & al. 2005; Nakamatte & Lye 2007; Jiménez-Mejías & al. 2014). Many studies based on morphological and/or molecular data have contributed to elucidate the intricate relationships among its members in Europe.
The distribution of *Carex cespitosa* in Europe W of the former USSR, based on herbarium records and reliable bibliographic data, is shown in Fig. 2 and Table 1. No vouchers or literature evidence were found for the occurrence of *C. cespitosa* in Belgium, Greece, Iceland, Ireland, Luxembourg, Macedonia, Malta, Portugal and European Turkey. Specimens studied are listed by country in Appendix 1.

1. Distribution

**Albania**

*Carex cespitosa* has recently been found in a single location during fieldwork in the NE part of the country, near the Kosovian border (Barina & al. 2011).

**Austria**

Citations in Austria before the late 19th century are not reliable, since the species was frequently misidentified as either *Carex nigra* or *C. elata* (cf. Ortmann 1854). The species is relatively frequent close to the Austrian-Czech border in Lower Austria, at the E limit of the Bohemian Massif (Waldviertel district; Janchen 1977; Grulich & Chytrý 1993). In the rest of Austria, *C. cespitosa* is restricted to very few localities, mainly in the E regions of the country. It is absent from the two westernmost provinces, Tyrol and Vorarlberg (Fischer & al. 2008). For the Salzburg region only a single population, bordering the Alps, is currently known (Flachgau district; Eichberger & al. 2004; Eichberger & Arming 2004). An additional population reported from nearby (Reiter 1947) might be extinct (Wittmann & al. 1996). In Upper Austria it has lately been...
confirmed for the Bohemian Massif but it is considered as extinct in the lowland areas (Hohla & al. 2009). Further citations can be found for W Styria (next to Neumarkt in Steiermark; Melzer 1961, 1968), SE Styria and the nearby area of S Burgenland (Melzer 1968; Wallnöfer & al. 1991), and the nearby areas of Carinthia (Melzer 1966, 1969) – here, exceptionally, within the Alps.

The Red List of ferns and flowering plants of Austria (Niklfeld & Schratt-Ehrendorfer 1999) considers *Carex cespitosa* within category 2 (equivalent to Endangered – EN).

**Bosnia and Herzegovina**

We are not aware of any literature records concerning

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Fig. 1. *Carex cespitosa* representative photographs – A: basal sheaths; B: general habit; C: inflorescence with ripe utricles; D: river shore population. – A & B: Niederösterreich, Austria, photographed by C. Paschschoell; C & D: Bidasoa River, Navarra, Spain, photographed by M. Luceño.
the occurrence of Carex cespitosa in Bosnia and Herzegovina. The identity of a herbarium voucher housed at SARA “In fossis subsexiccatis vallis Stabrova ča prope Jelaš c. 1400 m, 8 Jul 1931, Maly (SARA)” could not be confirmed with certainty. We therefore consider its occurrence in Bosnia and Herzegovina as doubtful.

**Bulgaria**

There are only three confirmed records of Carex cespitosa in Bulgaria, two of them very close together in the Yambol region (Yornanov & al. 1974; Stoeva & al. 2005), and a third near Sofia (Hájek & al. 2007). These Bulgarian populations are the southernmost in Europe.

Despite its rarity in the country, Carex cespitosa is not listed on the Red List of Bulgarian vascular plants (Petrova & Vladimirov 2009).

**Croatia**

The only published records of Carex cespitosa from the current territory of Croatia are from the surroundings of Rijeka (Rossi 1930; see also Ilijanić & Topić 2000). The record published in Flora croatica (Schlosser de Klekovski & Farkaš-Vukotinović 1896) is from Zemun (“Semlin”), near Beograd, nowadays part of Serbia. Moreover, the record from Srem (“Sirmien”; Schulzer von Müggenburg & al. 1866) is likely to be from current Vojvodina in Serbia. There is no herbarium material of this species available in the main Croatian herbaria (A. Alegro, pers. comm.). However, C. cespitosa has recently been observed from Drežničko polje, near Drežnica village in Velika Kapela (N Dinarides), and registered in the Flora Croatica Database (Topić 2011). This observation (confirmed by us from photographic material; Topić pers. comm.) constitutes the first reliable record for the country.

**Czech Republic**

Carex cespitosa is rather scattered in the Czech Republic. The first reliable records in the country are from the late 19th and early 20th centuries (Čelakovský 1867; Oborny
Localities are known almost all over the country, but the abundance of the species appears to be widely variable in different regions. Approximately 600 records are databased for the forthcoming Flora of Czech Republic (Grulich & Řepka, unpubl. ms.). This species prefers middle altitudes in relatively continental climatic conditions, like those in S Bohemia and SSW Moravia (Grulich 1990), where it can ascend to 1000 m a.s.l. in the Šumava Mountains. Some localities are situated in lower, warmer parts of C Bohemia and Moravia. The species is quite rare in W and E parts of Bohemia, in the Bohemian-Moravian Highlands, and in the E part of Moravia.

Table 1. Summary of the distribution of *Carex cespitosa* in Europe W of the former USSR, based on herbarium records and reliable bibliographic data (see text for details). Countries where the occurrence is questionable are indicated by a question mark (?). When the number of confirmed extant populations is given as “undetermined” it most probably implies more than 20 populations. Bosnia and Herzegovina is excluded (doubtful occurrence based on a single herbarium voucher of unconfirmed identity).

<table>
<thead>
<tr>
<th>Country</th>
<th>Regions</th>
<th>First published record</th>
<th>Number of confirmed extant populations</th>
<th>Conservation status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>NE Albania</td>
<td>2011</td>
<td>1</td>
<td>not assessed</td>
</tr>
<tr>
<td>Austria</td>
<td>mainly E Austria, rare in Salzburg, upper Austria, Styria and Carinthia</td>
<td>late 19th century</td>
<td>undetermined</td>
<td>EN</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Yambol and Sofia</td>
<td>1974</td>
<td>3</td>
<td>not included</td>
</tr>
<tr>
<td>Croatia</td>
<td>NW Croatia</td>
<td>1930</td>
<td>1</td>
<td>not assessed</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>scattered</td>
<td>1867</td>
<td>undetermined</td>
<td>NT</td>
</tr>
<tr>
<td>Denmark</td>
<td>scattered in Jutland and Zealand</td>
<td>19th century or before</td>
<td>24</td>
<td>LC</td>
</tr>
<tr>
<td>Finland</td>
<td>widespread</td>
<td>19th century or before</td>
<td>undetermined</td>
<td>not included</td>
</tr>
<tr>
<td>France</td>
<td>scattered in Massif Central and Jura, rare in E Pyrenees</td>
<td>19th century or before</td>
<td>undetermined</td>
<td>LC</td>
</tr>
<tr>
<td>Germany</td>
<td>widespread, but only common in the north and southwest</td>
<td>19th century or before</td>
<td>undetermined</td>
<td>VU</td>
</tr>
<tr>
<td>Hungary</td>
<td>scattered</td>
<td>1891</td>
<td>undetermined</td>
<td>EN</td>
</tr>
<tr>
<td>Italy?</td>
<td>Friuli-Venezia Giulia</td>
<td>second half of 20th century</td>
<td>–</td>
<td>not included</td>
</tr>
<tr>
<td>Montenegro?</td>
<td>Durmitor Massif</td>
<td>1933</td>
<td>–</td>
<td>not included</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Drenthe and Overijssel</td>
<td>1974</td>
<td>2</td>
<td>“sensitive”</td>
</tr>
<tr>
<td>Norway</td>
<td>widespread in S Norway and Troms, rare in Sør-Trøndelag</td>
<td>19th century or before</td>
<td>undetermined</td>
<td>NT</td>
</tr>
<tr>
<td>Poland</td>
<td>widespread</td>
<td>19th century or before</td>
<td>undetermined</td>
<td>not included</td>
</tr>
<tr>
<td>Romania</td>
<td>Carpathians</td>
<td>1866</td>
<td>undetermined</td>
<td>not included</td>
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<tr>
<td>Serbia?</td>
<td>scattered</td>
<td>1976, probably before</td>
<td>–</td>
<td>not included</td>
</tr>
<tr>
<td>Slovakia</td>
<td>scattered</td>
<td>probably 19th century</td>
<td>undetermined</td>
<td>VU</td>
</tr>
<tr>
<td>Slovenia?</td>
<td>SE Alps</td>
<td>early 20th century</td>
<td>–</td>
<td>not assessed</td>
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<tr>
<td>Spain</td>
<td>W Pyrenees</td>
<td>2007</td>
<td>2</td>
<td>CR</td>
</tr>
<tr>
<td>Sweden</td>
<td>widespread</td>
<td>18th century1</td>
<td>undetermined</td>
<td>not included</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Jura</td>
<td>1999 (18532)</td>
<td>undetermined</td>
<td>VU</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>East of England</td>
<td>2012</td>
<td>1</td>
<td>not assessed</td>
</tr>
</tbody>
</table>

1 Described by Linnaeus (1753), implicitly including Sweden in the list of polynomials.
2 Cited by Godet (1853) but excluded by Welten & Sutter (1982); rediscovered by Cosson & Morcrette (1999).

1883–1886; Podpěra 1930). Localities are known almost all over the country, but the abundance of the species appears to be widely variable in different regions. Approximately 600 records are databased for the forthcoming Flora of Czech Republic (Grulich & Řepka, unpubl. ms.). This species prefers middle altitudes in relatively continental climatic conditions, like those in S Bohemia and SSW Moravia (Grulich 1990), where it can ascend to 1000 m a.s.l. in the Šumava Mountains. Some localities are situated in lower, warmer parts of C Bohemia and Moravia. The species is quite rare in W and E parts of Bohemia, in the Bohemian-Moravian Highlands, and in the E part of Moravia.

Although many sites for *Carex cespitosa* have been destroyed, the species is not particularly threatened in the Czech Republic. It is able to tolerate mowing (Hájková & Hájek 2007), and also a certain degree of reforestation (e.g. semi-shaded conditions below *Alnus*; Chytrý & Vicherek 1995). Therefore *C. cespitosa* is listed on the Red List of Czech vascular plants (Grulich 2012; see also Danihelka & al. 2012) as a taxon of lower risk under the category Near Threatened (NT).

**Denmark**

*Carex cespitosa* was formerly known from numerous localities throughout most of the Danish mainland (including North Jutlandic Island) and Baltic territories (Funen, Zealand and Bornholm) (Winstedt 1943; Hultén 1950), but due to agricultural expansion it has become rare (Løjtnant & Worsøe 1993). At present only eight localities are known in Zealand and 16 in Jutland (Naturbasen 2013).

Despite the apparently clear decline in the populations of the species, *Carex cespitosa* is listed as Least Concern (LC) on the Danish Red List (DMU 2007).

**Finland**

*Carex cespitosa* is widespread and locally common in
the N part of Finland, while less frequent in the south (Hultén 1950). It is therefore not included on the Red List of Finnish species (Rassi & al. 2010).

France

Carex cespitosa has attracted the attention of French botanists due to its scarcity and, therefore, its distribution and conservation status have been very well studied, documented and brought up to date. It is distributed through the mountain systems of the Jura, Massif Central and Pyrenees, in C and S France, in the regions of Alsace, Franche-Comté, Auvergne and in the E Pyrenees (reviewed in Olivier & al. 1995 and Duhamel 2004). It appears to be relatively frequent at least in the Massif Central (Tort & al. 1988; Olivier & al. 1995: CHLORIS 2010) and rather common in Franche-Comté (Gillet & al. 1980; Prost 1992; Cosson & Morcrette 1999; Ferrez & Guyonneau 2005). However, it is only known from a single location in both the E Pyrenees (Villeneuve; cf. Terrisse 1994) and Alsace (étang d’Hirsingue; cf. Issler & al. 1965; Schultz-Motel 1968).

It is listed as Least Concern (LC) for the French territory (FCBN and MNHN 2012).

Germany

Carex cespitosa is widely distributed throughout Germany. However, Schultz-Motel (1968) noted that it is only relatively common in the N and the SW (Baden-Württemberg). In the N half of the country, C. cespitosa appears in Schleswig-Holstein and Mecklenburg-Vorpommern. It is quite rare in Sachsen and Thüringen, almost absent in the NW lowlands (BfN 2005), and reported as extinct in Nordrhein-Westfalen (Wolff-Straub & al. 1999). From C Germany southwards, it can be found mainly in the Swabian Jura and upper Neckar and Danube basins (Hölter 1964; Sebald 1998; Schönfelder & Bresinsky 1990).

The national Red List considers Carex cespitosa as Vulnerable (VU) (Korneck & al. 1996).

Hungary

The first record of Carex cespitosa in Hungary was made by A. Waisbecker in 1891, from the foot of the Kőszeg Mountains (W Hungary). This classic locality still exists and the species is dominant there (A. Mesterházy, pers. obs.). Later, the species was recorded by Szodfridt-Tállos (1965) from the Órség region (W Hungary), where it has recently been collected (A. Mesterházy, pers. obs.). Only one small population was known from the Dunántúli-Mountain Range (Szodfridt-Tállos 1962; confirmed by Lájer 2003). Scattered occurrences are known from Nyírség (Lájer 2003) and the Északi mountain range in NE Hungary (Bükk Hills, Úpponyi Hills, Aggtelek Karst; Sulyok-Schmotzer 1999; Penksza-Salamon 1997a, b).

Due to its rarity, the latest national Red List of Hungary considers the species to be Endangered (EN) (Király 2007).

Italy

Carex cespitosa was recorded for Italy in Flora europaea (Chater 1980) and Flora d’Italia (Pignatti 1982). In the most updated checklist of Italian plants (Conti & al. 2005), it was reported from the N regions of Piemonte, Lombardia, Friuli-Venezia Giulia and Liguria. Despite this alleged distribution, no Italian C. cespitosa specimen could be found during intensive searches in the collections of the main Italian herbaria (BERG, BOLO, FI, PA, RO and TO). Personal communication with the curators and staff from BOZ, GDOR, GE, MSNM, ROV and UVV was also without any positive result. The erroneous early use of the binomial C. cespitosa and the frequent confusion with similar species could help to explain this situation (Pignatti 1982). In fact, all the material labelled as C. cespitosa in these herbaria belongs to closely related species from C. sect. Phacocystis. Accordingly, the species has already been excluded from the Piemonte flora (Jiménez-Mejías & Selvaggi 2011).

To our knowledge, the only reliable reference to the presence of Carex cespitosa in Italy seems to be an old sheet from South Tyrol (Friuli-Venezia Giulia; NE Italy) in W (“Bolzano, com. P. Gredler”; Wallnöfer 2004). Nonetheless, the possibility of label misplacement cannot be excluded. In addition, Schultz-Motel (1968) also recorded C. cespitosa for the Italian Tyrol (“Cadore, Ampezzo, Unter-Friaul”). More fieldwork is necessary in these NE regions where the occurrence of this species could be likely.

The species is not included on the Red and Blue List of the Italian flora (Pignatti & al. 2001).

Montenegro

The only reported occurrence of Carex cespitosa in Montenegro is in the lake Ribljein of Mount Durmitor (“In uligin. ad lac. Riblje jezero sub. m. Durmitor; Pantček”, see Rohlena 1942). Hayek (1933) indicated this species for Montenegro probably based on the same record. However, this locality has never been confirmed, and indeed C. cespitosa is not in the plant checklist from this locality (Birks & Walters 1972). Additionally, the material studied from this locality was unequivocally classified as C. acuta (8 Jul 1989, Stevanović & Jovanović, BEOU; 15 Jul 1991, Jovanović & al., BEOU). We therefore consider the occurrence of C. cespitosa in Montenegro as doubtful.

Netherlands

At least three reliable locations have been reported for Carex cespitosa in the Netherlands, two of them in the province of Drenthe and the other one in Overijssel (De Boer 1974; Mennema & al. 1980). Older records are considered to be incorrect (Kern & Reichgelt 1954). The species is currently still known from the two northernmost sites in Drenthe (J. Koopman, pers. obs.).

On the Red List of the vascular plants of the Netherlands (Ministry of Agriculture, Nature and Food Qual-
ity 2004) Carex cespitosa is listed under the category “sensitive”, without a clear equivalence with the IUCN criteria.

Norway
Carex cespitosa is a rare and scattered plant across most parts of Norway, although it can be locally common and sometimes dominant in the vegetation near the inner parts of the Oslofjord (S Norway), and in the Norwegian far north (Troms, Finnmark). South of the Arctic Circle, it is found mainly E of the Scandinavian Mountains, with the exception of the apparently disjunct populations from Sør-Trøndelag (CW Norway; Hultén 1950). Our revision revealed an old voucher from the county of Møre og Romsdal, close to the Sør-Trøndelag border (see Appendix 1).

On the Norwegian Red List of plants Carex cespitosa is included as Near Threatened (NT) (Solstad & al. 2010).

Poland
Carex cespitosa is apparently common in Poland when compared with more W and S European countries. Therefore only 14 vouchers from Poland were studied. It is scattered throughout the country and is often common in bogs and peat-meadows (Zając & Zając 2001). It is therefore not listed on the Red List of Polish plants (Kaźmierczakowa & Zarzycki 2001).

Romania
The first reference to Carex cespitosa in Romania dates back to the 19th century (Schur 1866, as Vignantha “Dreyeri”) and is included as Near Threatened (NT) (Solstad & al. 2010).

Slovakia
Carex cespitosa is scattered but not common in Slovakia. It seems to be absent in the warmest parts in S Slovakia. Most populations are known from the Záhorská nížina lowland in the westernmost part of the country and from the Carpathian valleys in C and N Slovakia (Hájková 2007).

In the last edition of the Red List of Slovakian flora Carex cespitosa was evaluated as Vulnerable (VU) (Feráková & al. 2001).

Slovenia
Although Schultze-Motel (1968) listed Carex cespitosa for several regions of Slovenia (Koroška – Carinthia, Gorenjska – Upper Carniola, and Primorska – Slovenian Littoral), most of them correspond to territories currently in Austria and Italy, respectively (see ethnic regions considered by Mayer 1952). More recently, Martinčič (2007) only listed the Karavanke Mountains, although the identity of this record is unclear (A. Martinčič, pers. comm.). It is likely to be based on a note by A. Paulin in his edition of the Austrian flora (Krieže near Tržič [Gorenjska]; Hayek & Paulin 1907). There is an additional record from Obrov in Primorska (Poldini 1980). However, none of the records is supported by herbarium material at LJU or other herbaria. Therefore, the occurrence of this species in Slovenia remains questionable, although fairly probable given the proximity of some Hungarian populations (Szentgyörgyvölgy; see Appendix 1).

Spain
On the Iberian Peninsula, the presence of Carex cespitosa has been reported recently by Jiménez-Mejías & al. (2007) and subsequently recorded in Flora iberica (Luceno & Jiménez Mejías 2008). It is based on a single location in the Pyrenees along the N-facing Bidasoa river, in the Navarra region close to the French border. This population was previously misidentified as C. elata s.s. (cf. Luceno & Aedo 1994). Herbarium revision has revealed a second population in Sarries, in the Navarra region as well (see Appendix 1). This population is located in a S-facing valley in the River Ebro basin, 65 km S from the other known population. The Spanish populations constitute the westernmost limit of the global distribution of the species.

Carex cespitosa is listed on the Red List of Spanish vascular flora (Moreno & al. 2008) as Critically Endangered (CR).

Sweden
Carex cespitosa is widespread and locally common in C Sweden (Almquist 1929; Malmgren 1982; Genberg 1992; Rydberg & Wennorp 2001; Bertilsson & al. 2002), while rarer in the north (Danielsson 1994) and south (Sterner 1986; Edqvist & Karlsson 2007; Tyler & al. 2010). In this latter region, it is extinct in the Dal (Andersson 1981) and Blekinge districts (Fröberg 2006).
Carex cespitosa is not listed on the Red List of Sweden (Aronsson & al. 2010).

Switzerland

Carex cespitosa has recently been rediscovered in Switzerland (Jura mountains, Vaud and Neuchâtel cantons; Cosson & Morcrette 1999; Morcrette & al. 2002; Druart 2004). It was first recorded from Neuchâtel in the 19th century (Godet 1853), but subsequently excluded from the Swiss flora (Welten & Sutter 1982; Moser & al. 2002). Populations from the Swiss Jura are located in the Upper Doubs basin and environs, like those from the French Franche-Comté (see under France above; Cosson & Morcrette 1999). We have detected additional herbarium vouchers from Bern and Schaffhausen cantons (see Appendix 1), not far from the populations in the Swiss and German Jura mountains. Due to the rarity of the species, the persistence of these populations should be checked.

The national conservation status for Carex cespitosa in Switzerland is Vulnerable (VU) (Druart 2004).

United Kingdom

Carex cespitosa was excluded from the account of Cyperaceae for the British Isles by Jermy & al. (2007), who attributed all previous records to misidentifications. However, we found a reliable herbarium voucher of this species from E England (Hertfordshire: near West Mill, near Buntingford, 26 May 1960, Dony 3815, BM). The persistence of this population was recently confirmed; it is composed of about 300 tussocks approximately 2.5 km S of the original record in a spring-fed mire (James & al. 2012).

Due to its recent discovery in the United Kingdom, Carex cespitosa has not yet been included on any official list of endangered plants. The existence of a single known population could lead to its being considered as Critically Endangered (CR) (James & al. 2012).

2. Hybrids

Koopman (2011) reported seven hybrids of Carex cespitosa for the whole of Europe. In our study area, the following three hybrids of C. cespitosa with species of C. sect. Phacocyctis have been found. Specimens studied are listed in Appendix 2.

1. Carex cespitosa × C. acuta


This hybrid has been doubtfully recorded by Schultz-Motel (1968) from N Germany, and later confirmed by Kiffe (2001a) from the SW of the country. It has also been recorded recently from Finland, France, Norway, Russia, and Sweden by Koopman (2011). We have studied a single specimen from Austria (see below).

It can be distinguished from Carex cespitosa by the longer spikes and the lowest bract, which is as long as or slightly longer than the inflorescence, while shorter in C. cespitosa. Regarding C. acuta, the hybrid is smaller in all its parts and has well-preserved, apparent, orangey, entire basal sheaths, instead of the brown, leaf-like, frequently inconspicuous and disintegrating basal sheaths typical of C. acuta. This hybrid plant strongly resembles the relatively frequent hybrid between C. acuta and C. nigra (C. xelytroides Fries.; see Jermy & al. 2007 for a detailed description), although the two can easily be separated because this latter has amphistomatic leaves, whereas C. xallolepis is entirely hypostomatic.

2. Carex cespitosa × C. elata


This hybrid has previously been recorded from Germany (Schultz-Motel 1968; Kiffe 2001a, b) and Austria (Melzer 1988), and more recently from the Czech Republic, France, Italy and Sweden (Koopman 2011). It is easily identified due to its clearly intermediate morphological characters, both quantitative and qualitative, between the two parental species: leaves hypostomatic; basal sheaths enlarged, reddish, brown-reddish or yellowish-brown, sometimes with a ladder-fibrosilile structure; male and female spikes show an intermediate length, generally longer than those in Carex cespitosa (20–30 mm); utricles are faintly nervet or nerveless, with the inner side reddish.

3. Carex cespitosa × C. nigra


This hybrid has been recorded from the Czech Republic, Finland, France, Germany, Italy, Norway, Poland, Slovakia and Sweden (Schultz-Motel 1968; Kiffe 2001b; Koopman 2011). It is more variable than the previous ones, probably due to the highly variable morphology of Carex nigra.

The main diagnostic character is the amphistomatic leaves, therefore combining the feature from the hypostomatic Carex cespitosa and the epistomatic C. nigra. Rhizomes vary from densely caespitose to rhizomes with more or less enlarged internodes. Basal sheaths are mainly reddish, more lanceolate than in C. cespitosa, and sometimes breaking up as in C. nigra. Utricles are subbipicellar, faintly nervet or nerveless.

The name Carex sororia Meinsh. has been applied to hybrids between C. cespitosa and C. nigra. However, careful examination of the type collection (at BM and K) revealed no evidence of hybrid origin. Indeed, the specimens at BM is rather typical C. cespitosa. Thus, we lectotypify C. sororia on the BM specimen, and the name is to be considered a mere synonym of C. cespitosa.

3. Ecology

Even omitting the fact that the ecology of Carex cespitosa has been somewhat blurred mainly by its confusion with other plants (e.g. reported as a species of Molino-Juncetea by Soó 1973 in C Europe, due to a misidentification with C. elata), its ecological preferences seem to be indeed wide when viewed in a European context. The habitats reported by the extant reliable records and herbarium vouchers (see Appendix 1) indicate in all cases a dependence on water, ranging from flooded ground to damp soil or underground water, probably in most (or all) cases with a high peat content and mesotrophic conditions, and in both open grasslands or more or less canopy-closed river forests. Thus, C. cespitosa can be found in swampy peat bogs (Tort & al. 1988; Ferrez & Guyonneau 2005), mires (Lájer 2003), and river beds (Jiménez-Mejías & al. 2007), but also commonly in not strictly aquatic habitats such as wet meadows and megaphorhic communities (Höller 1964; Morcrette 2000; Ferrez & Guyonneau 2005; Stoeva & al. 2005), and in some cases, areas subject to flooding by rivers (see Höller 1964; De Boer 1974). A preference for calcareous soils has been mentioned (e.g. James & al. 2012), but it seems to be rather inconstant.

Due to this ecological plasticity, Carex cespitosa is able to survive fluctuations and some degree of disturbance, such as grazing (James & al. 2012), or forest colonization as a result of ecological succession (e.g. by Alnus; Chytrý &Vicherek 1995).

4. Conservation status

The wide global distribution of Carex cespitosa across the Palearctic makes it difficult to apply the IUCN Red List conservation categories and criteria at the global level (IUCN 2012). Nonetheless, it appears highly unlikely that the species would fulfill some of them (i.e. very large extent of occurrence and area of of occupancy for criterion B, unknown but surely above threshold total number of individuals for criteria C and D). For criterion A, the degree of reduction in population size is also unknown and difficult to estimate given the distribution of the species, although the presence of the species appears to have been considerably diminished in many European countries due to anthropogenic influences. Therefore, although the global conservation status of C. cespitosa is probably Least Concern (LC), conservation studies at country level and below appear advisable (IUCN 2012). Indeed, the species has been included under one of the threatened – or near threatened – categories in eight out of the 19 countries for which we have confirmed its presence: Near threatened (NT) in the Czech Republic and Norway; Vulnerable (VU) in Germany, Slovakia and Switzerland; Endangered (EN) in Austria and Hungary; and Critically endangered (CR) in Spain. In the Netherlands the plant is considered as “sensitive”, indicating a certain degree of threat, and reports of decline have been given for Sweden. In only two cases – Denmark and France – is it explicitly considered as not threatened (Least Concern – LC). For Albania, Bulgaria, Croatia, Finland, Poland, Romania, Sweden and the United Kingdom it is not included in the national Red Lists. In the cases of Albania, Croatia and the United Kingdom its absence from the lists is due unequivocally to its recent discovery. The Bulgarian and Danish cases need revision, especially the latter, given the clear decline of the species in Denmark (see above).

5. Conclusions

Carex cespitosa occurs mostly scattered and is typically a rare plant in many European countries, especially in W and S Europe. The presence of the species is confirmed in 19 European countries. In each of Albania, Croatia and the United Kingdom only one extant population is known; in both the Netherlands and Spain only two; in Bulgaria only three. In Switzerland it is mostly restricted to the Jura Mountains. It is more widely distributed in France, where it inhabits three mountain systems: the Jura, the Massif Central, and the E Pyrenees, although it is very scarce in the last mentioned, with a single station. In Scandinavia and C Europe, its distribution seems to be more continuous, although in Denmark it appears to have disappeared from many places. The presence of C. cespitosa in Bosnia and Herzegovina, Italy, Montenegro, Serbia and Slovenia is in need of confirmation and further field work is necessary.

Although chorological revisions in Europe are commonly neglected as minor works of little relevance, the divergence between the situation depicted by the literature for Carex cespitosa and the actual one detected by our study highlights the importance of, and the need for, these basic works for the accurate knowledge of many species, especially for those threatened, rare or declining.

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References


DMU (Danmarks Miljøundersøgelser) 2007: The Danish Red Data Book. – Danmarks Miljøundersøgelser. – Published at [http://www2.dmu.dk/1_Om_DMU/2_ Lyae-funk/3_lfdc_bio/projekter/redlist/artgrupper_en.asp](http://www2.dmu.dk/1_Om_DMU/2_Lyae-funk/3_lfdc_bio/projekter/redlist/artgrupper_en.asp) (accessed 19 Aug 2011).


Egorova T. V. 1999: The sedges (Carex L.) of Russia and adjacent states (within the limits of the former URSS). – St. Louis: Missouri Botanical Garden Press.


Feráková V., Maglovčík Š. & Marhold K. 2001: Červený zoznam paprštnorastov a semenných rastlín Slovenska


Linnaeus C. 1753: Species plantarum. – Stockholm: Carl Michael Fretz.


Morcrette P., Duurt P. & Heger T. 2002: La redécouverte de la laïche en touffe (*Carex cespitosa* L.) dans le canton de Neuchâtel, fruit d’une collaboration franco-suisse. – Les Nouvelles Archives de la Flora jurassienne 1: 11–12.


Appendix 1: List of Carex cespitosa specimens studied by country

ALBANIA: in village Pac, near to brook “Lumi i Pacit”, in meadow, c. 560 m, 3 Jun 2009, Barina & al. 15375 (BP).


CZECH REPUBLIC: NORTH BOHEMIA: Spříčce u Chomutova, no date, KnAF (PRC); Velemin, 1999, Ducháček (PR); Mimoň, 1871, Polák et al. (P); Praha-Motol, 1888, Velenovský (PRC); Rečkov, reserve Klokočka, 1994, Hlaváček (HOMP); Malý Kounín, 1928, Šmarda (ROZ); Příbram-Háje, 1999, Hlaváček et al. (BRNU). — SOUTH BOHEMIA: Strunkovice nad Volýňkou, 30 May 2005, Vydrová (BRNU); Smrkovice, 1877, Velenovský (PRC); Soběslav, 1943, Votrávil (PRC); Jílové u Prahy, 30 Apr 2001, GruLiCh (BRNU); Nový Špícák, near destroyed village in military area, 21 Jun 2004, GruLiCh &Vydrová (BRNU); Volary, Soumarský Most, 31 May 2010, GruLiCh (BRNU); Želnava, 21 May 1995, Žíla (LI); Podvoří u Bečvářova, 8 May 1995, Žíla (LI). — SOUTH MORAVIA: Vratěnín, 26 Jun 1991, GruLiCh (BRNU); Kuřín, 1928, Šmarda (BRNU); Pernice, wet forest Valachy, 1987, Plušár (BRNU); Hodonín, 1946, Holzknecht (BRNU). — CENTRAL MORAVIA: Pavlov, wetlands Pavlovske mokřady, 1996, Řehořek (BRNU); Olomouc, 1907, Podpěra (BRNU); Olomouc, in pratis paludosis prope aquaeductum, 21 May 1927, Otruba (BASBG, K, P, WU); Kozlov, wet meadows Smolenská luka in military area, 2 May 2006, GruLiCh (BRNU). — SILESIA: Neplachovice, 1952, Kousal (PRC); Děhylov, 1956, Vicherek (BRNU).


FINLAND: ÅLAND: Jomala 1 km from the main highway along the road from Ingby village to Jomala village, 8 Jun 1962, Alava 2836 (UPS). — LAPLAND: Ylikyla, 12 Jul 1943, Montell (UPS); Tervola, near Lapin lääni, 40 m, 2 Sep 2004, Lye 28693 (O); Posio, Kaski-Posio, near Nurmuivaara, 7 Jul 1949, Marklund (UPS); Alakarta, Virtaniemi, 1 Jul 1936, Lindberg 1845 (UPS); Muonio, 8 km Sirkka, 300 m, 29 Jul 1969, Höller (M). — NORTHERN KARELIA: Tohmajärvi, Akkala, wet spruce forest at Väärämäki, 1 Jul 1966, Alho (BRNU). — NORTHERN OSTROBOITHIA: Kuusamo, Alakarta, Virtaniemi, 1 Jul 1936, Lindberg 1845 (WU). — SOUTHERN FINLAND: Pusula (church village), Kalkki mäki, below the old limestone quarries, 3 Jun 1964, Alava 4100 (BRNU, UPS). — WESTERN FINLAND: Sääksmäki, Ikkala, Uotila, in fruticeto juxta ripam lacus, 27 Jun 1935, Linkola 1844 (P, UPS, WU).

FRANCE: AUVERGNE: Besse, megaphorbie, bords du chemin carrossable conduisant au lac de Montcineyre, 11 Jul 1971, Bosc (BBF); Besse en Chandesse, lac de Montcineyre, tourbière de Champezade, 1250 m, 7 Aug 1984, Leconte Lorain (RNG); Puy-de-Dôme, lac de Montcineyre, 3 Jul 1962, Gauelle (MA); Puy-de-Dôme, Narse d’Espinasse, près Randanne, 999 m, 10 Jul 1934, d’Alliezette 7340 (B, BRNU, G, MA, P, RING); Uriage-Le-Glaize, près Randanne, 10 Jul 1934, Rotereau (P); Narse d’Espinasse, Jun 1932, Chassagne (P); juxta ripam lacus, 27 Jun 1935, Linkola 1844 (P, UPS, WU).

GERMANY: BADEN-WÜRTTEMBERG: Alpenvorland, Um- Schache und am Perkabach, 13 Jun 1941, Hertel 4965
lich Kloster Moosen bei Dorfen/Isen, 22 May 1965
1964,
ler
Höller (M); Isental, Dorfen E Flachmoor, 22 May 1965, Höller (M); Kleine Laber Tal, Mallersdorf Bfh, 23 May 1963, Höller (M); Sünding südöstlich von Regens- burg, 5 Jun 1898, Vollman (M). — BERLIN: Forst- haus Fahlenberg am Gosener Kanal, 8 Jun 1975, Ben- kert (B); Jungfernheide, 25 May 1901, Lackowitz (B); Jungfernheide, 19 Jun 1901, Woller (MA); Karlishorst, im Walde, 8 Jun 1910, Gross (B); Möchneritz süd- lich vom Spandauer Schifffahrtskanal, 28 Apr 1895, Schultz (B); Spandauer Stadttheide, 15 Jun1901, Schultz (B); Karlishorst in schattigen Waldstelen, Jun 1906, Gross (P). — BRANDENBURG: Fürstenberg, Boberow- See, 1960, Freitag (JE); Lange-Damm-Wiesen nahe Hennickendorf, Sumpfwiese zwischen Hügel 1 und 4, 10 May 1974, Stohr (B); Lychen, in allen Wiesen, 25 May 1889, Heiland (B); Maxsee bei Müncheberg, in feuchter Wiese, 6 Jun 1936, Krummbholz 1936/19 (B); Rheinsberg, auf einer Sumpfwiese nördlich von Möckern, 19 May 1902, Schultz (B). — HAMBURG: Bram- fend, Jun 1891, Fritsche (L); Farmsten, 10 Jun 1891, Schmidt (JE); Wandsbeck, Jun 1892, Pram (JE). — NIEDERSACHSEN: Braunschweig, 1 Jun 1891, Kuehn (CHE); Hannover, auf der Dörhener Masch, John (JE); Verden, Westen, 18 May 1933, König (BREM).


becker (BRNU; P); Köszeg, patakan, 28 May 1897, Waissbecker 340 (SAMU). — ZALA COUNTY: Szentgyörgyvölgy, A falutól délre a jugoszláv határ közéleben, 5 Jun 1963, Szőfrid (BP).

NETHERLANDS: DRENTHE: Spijkerboor, 8 Jun 1973, Bakker & van der Ploeg (L).

NORWAY: AKERSHUS: Ås, S of Pollevatn, 1 m, 4 Sep 2003, Jiménez-Mejías & al. (L).

Poland: Dolnośląskie Voivodeship: Wrocław-342 Jiménez-Mejías & al. (L).


NETHERLANDS: DRENTHE: Spijkerboor, 8 Jun 1973, Bakker & van der Ploeg (L).

NORWAY: AKERSHUS: Ås, S of Pollevatn, 1 m, 4 Sep 2003, Lye 27961 (NLH); Bærum, Kalvøya, 0.5 m, 6 Jun 2004, Lye 28348 (NLH, THR); Brønnøya, 1 Jul 1904, Fridtz (C). — HEDMARK: Ringsaker, between Kolstad and Skog, 215 m, 12 Aug 2005, Lye 29129 (O). — MÖRE O Romsdal: Insula Næsø, 5 Jun 1963, Szodfridt (BP).


SPAIN: NAVARRA: Lesaka, Zalain, orilla del Bidasoa, 20 m, 20 Jun 1981, Aizpuru & Catalán (MA); Lesaka, Zalain, orilla del Bidasoa, 30 m, 18 May 1983, Aizpuru & Catalán (ARAN, MA); Lesaka, Zalain, orilla del Bidasoa, 30 m, 16 Jul 2006, Jiménez-Mejías & al. (UPoS); Sarries, saucedala-aliseda, 1 Jun 1986, Aizpuru & Catalán (SALA).


— SÖNDERMANLAND: Stockholm, Brännkyrka par., Högdalen, 5 Jun 1949, Danielsson (UPS); Vingåker kom., near Vingåker railway station, Jun 1877, Elgenstierna (UPS); Nyköping kom., 300 m south of Hånö, 8 m, 16 Aug 2011, Lye 33391 (O); Près marécageux près de Stockholm, May 1858, Andersson 2565 (P).

— UPPLAND: Uppsala kom., Västra Eriksberg at Hågånn, 23 Jun 1960, Lundqvist 2475 (UPS); Uppsala kom., Fjällnora, shores of Ramsen, 17 m, 16 Aug 2011, Lye 33392 (O); Norrtälje kom., Eastern par., Möry, 2 Jun 1931, Plengier (ZT); Åtundana par. 1 km NW of Storvreta on E bank of Pyris River, 9 Jun 1968, Lundqvist 5977 (UPS). — VÄSTERGÖTLAND: Skara kom, Skaraberg, 5 Sep 1915, Alm (UPS); Götene kom, Kinnekulle, Martorp, 15 Jun 1928, Skårmen (UPS); Norrköpings kom., Fjällnora, shores of Ramsen, 17 m, 16 Aug 2011, Lye 33391 (O); Près marécageux près de Stockholm, May 1858, Andersson 2565 (P).

— Schweden: Stockholm, Brännkyrka par., Högdalen, 5 Jun 1949, Danielsson (UPS); Vingåker kom., near Vingåker railway station, Jun 1877, Elgenstierna (UPS); Nyköping kom., 300 m south of Hånö, 8 m, 16 Aug 2011, Lye 33391 (O); Près marécageux près de Stockholm, May 1858, Andersson 2565 (P).

— United Kingdom: Hertfordshire: near West Mill, 22 Jun 1960, Dony 3815 (BM); Braughing (Hamel’s) Meads, spring-fed mire beneath a steep, wooded hill overlooking the flood plain of the river Rib, 10 May 2011, James (UPOS).

Appen 2: List of Carex cespitosa hybrid specimens studied

