Studies in Italian Cyperaceae 1. Eleocharis pellucida, new to Europe, naturalised in Piemonte (Italy)

FILIP VERLOOVE

National Botanic Garden of Belgium
Domein van Bouchout, B-1860 Meise
(filip.verloove@br.fgov.be)

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Ricerche sulle Cyperaceae Italiane. 1. Eleocharis pellucida, nuova per l’Europa, naturalizzata in Piemonte (Italia) - Si segnala per la prima volta il ritrovamento in Europa di Eleocharis pellucida J. Presl & C. Presl (Cyperaceae), una specie esotica originaria dell’Asia orientale e sudorientale, ben naturalizzata e localmente abbondante in diverse brughiere (baragge) delle province di Biella, Torino e Vercelli (Piemonte, Italia), probabilmente presente anche altrove ma sinora sfuggita all’osservazione. I caratteri diagnostici vengono illustrati e comparati con quelli delle specie simili, sia autoctone sia alloctone e viene elaborata una chiave aggiornata del genere Eleocharis in Piemonte. Infine si forniscono una fotografia e un disegno al tratto originale e si ipotizzano le modalità di introduzione.

Key words: Italy, Cyperaceae, Eleocharis pellucida, naturalisation, xenophyte.

Eleocharis R. Br. (Cyperaceae) is a nearly cosmopolitan genus of ca. 200 species (Mabberley, 2008). According to Conti et al. (2005) ten taxa are native in Italy: Eleocharis acicularis (L.) Roem. & Schult., E. carniolica W. D. J. Koch, E. mamillata (H. Lindb.) H. Lindb. subsp. austriaca (Hayek) Strandh. and subsp. mamillata, E. multicaulis (Sm.) Desv., E. ovata (Roth) Roem. & Schult., E. palustris (L.) Roem. & Schult., E. parvula (Roem. & Schult.) Palla, E. quinqueflora (Hartm.) O. Schwarz, and E. uniglumis Schult. Four additional species are locally naturalised (Conti et al., 2005; Celesti-Grapow et al., 2009): Eleocharis atropurpurea (Retz.) Kunth, E. flavescens (Poir.) Urb., E. geniculata (L.) Roem. & Schult., and E. obtusa (Willd.) Schult., mostly as weeds of rice. In the course of an excursion in a heath land (baraggia) near Benna (prov. Biella, Piemonte, Italy) in September 2008 I came across a tiny species of Eleocharis that did not match any of the species mentioned above. Diagnostic features proved to be its annual life form, acute spikelets, 3-fid styles and bluntly trigonous, yellowish-greenish achenes. The species obviously belonged to subgenus Eleocharis and more precisely to section Eleocharis and series Multicaules Svens. ex Kern (González-Elizondo & Peterson, 1997). It then easily keys out to Eleocharis pellucida J. Presl & C. Presl (Svenson, 1939), a species from eastern and south-eastern Asia, apparently never recorded before in Europe. Additional field work in September 2009 yielded supplementary records.

\[1\] Genuine Eleocharis geniculata probably has never been reliably recorded in Italy. The collections seen by Greuter & al. (2002) in fact belong to the related Eleocharis cadorica.
again in Piemonte (provinces of Biella and Torino). Moreover, a herbarium specimen of Eleocharis carniolica from Villarboit (province of Vercelli), dating back to 1989, also turned out to be ascribable to E. pellucida.

So, this species is locally naturalised in abundance in several different heath lands and possibly overlooked elsewhere in north-western Italy. In the present paper Eleocharis pellucida is described and illustrated. Its diagnostic features are discussed and a key to the genus Eleocharis in Piemonte is presented. Finally, the species’ potential introduction history in Piemonte is reconstructed.

Nomenclature

[Synonymy especially after Ohwi (1944), T. Koyama (1961), and partly after Govaerts & Simpson, (2007)].


Eleocharis sp.: Moritzi, Syst. Verz.: 97. 1845.
Scirpus affluens (Steud.) Benth., Fl. Hongkong.: 394 (1854).


Taxonomy

Densely caespitose annual with filiform to capillary culms up to 20 (-40) cm long and 0.3-0.5 mm wide, striae to slightly sulcate. Uppermost leaf sheath oblique at apex, tight and firm (not translucent). Spikelets ovoid to ovoid-cylindrical, acute at apex, many-flowered, 5-7 mm long. Glumes ovate-oblong, obtuse to subacute at apex, the upper reddish-brown with green midrib and membranous margins, the lowest larger and often paler (entirely green or suffused with reddish-brown), ca. 1-1.4 mm long. Stamens 2(-3), anthers ca. 0.5 mm long, style green or suffused with reddish-brown), ca. 1-1.4 mm long. Stamens 2(-3), anthers ca. 0.5 mm long, style 3-fid. Perianth bristles usually 6, as long as or slightly longer than achene. Achenes ca. 1 mm long, bluntly trigonous, narrowly obovate, olive to yellowish-green, tubercle (stylopodium) darker, narrowly triangular, acuminate at apex, much narrower than the achene and clearly constricted at base (Figs. 1, 2).

Specimina visa

ITALY: Piemonte - Prov. Biella, Benna (SE-Biella), baraggia, heath land (in shallow water), locally abundant, along with E. obtusa, 15.09.2008, Filippo Verloove 7426 (priv. herb. author, dupl. priv. herb. E.J. Clement, BR, K, LG, M BK, TO); Benna, baraggia, heath land (military training area), 08.09.2009, Filippo Verloove 7842 (priv. herb. author); Candello, baraggia, heath land (military training area), locally abundant, along with E. obtusa and E. flavescens,
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Fig. 1 - Eleocharis pellucida: general habit and floral details (original drawing Sven Bellanger).
Soldano & Sella (2000) cite five species of Eleocharis from the province of Biella: Eleocharis acicularis, E. carniolica, E. multicaulis, E. obtusa and E. palustris. Eleocharis pellucida obviously is most closely similar to the perennial E. carniolica and E. multicaulis. All belong to series Multicaules, are densely caespitose (tufted) and also share similar ecological preferences. The unique combination of 3-fid styles and bluntly trigonous achenes (best seen when immature) by far provides the best distinguishing feature of Eleocharis pellucida. Life form is often indicative but surely not decisive: Eleocharis pellucida usually is an annual but coarser, perennial forms do exist (these are mostly considered to be a distinct species, E. congesta – see below). On the other hand, Eleocharis carniolica is said to be perennial but often flowers in the first year and slender forms are much reminiscent of E. pellucida. In addition to the characters mentioned above and in the key below both are also readily distinguished by the colour of their spikelets: these are distinctly tinged with red in Eleocharis pellucida (giving it a typical wine-coloured appearance; see Fig. 2) and merely greenish in E. carniolica. Confusion with Eleocharis multicaulis is

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2 The taxonomic position of Eleocharis carniolica is somewhat critical. Species of series Multicaules are usually told to have trigonous achenes (Kern, 1974; González-Elizondo & Peterson, 1997) but those of E. carniolica are definitely biconvex.
less likely although both share a 3-fid style and trigono-nous achenes. However, the latter is a much coarser plant with a lignescent rootstock and is much larger in all its floral parts (spikelets, glumes, achenes). Finally, Eleocharis pellucida could be mistaken for E. flavescens [especially var. olivacea (Torr.) Gleason; syn.: E. olivacea Torr.], a native of the south-eastern United States but locally naturalised in northern Italy (in Lombardia and Piemonte, according to Conti et al., 2005). The latter two belong to section Eleogynus (Nees) Benth. & Hook. f. series M aculoseae Svenson subseries O createae (C.B. Clarke) Svenson (GonzálezElizondo & Peterson, 1997) and shares the small olive-green achenes with a highly constricted tubercle and acute spikelets with Eleocharis pellucida. However, Eleocharis flavescens has membranous upper leaf sheaths, biconvex achenes and 2-fid styles. Moreover, it is a rhizomatous perennial but rhizomes are often short and the plant may appear more or less tufted. The main diacritic features for the separation of Eleocharis carniolica, E. flavescens and E. pellucida are summarised in table 1.

The circumscription of Eleocharis pellucida is rather controversial. It is here accepted as a species of its own following Govaerts & Simpson (2007) and Svenson (1939). Other authors tend to simply include it in a broadly circumscribed Eleocharis congesta (Kern, 1974; González-Elizado & Peterson, 1997) or subsume it under the latter at varietal or subspecific rank (Simpson & Koyama, 1998). Eleocharis congesta is a taller, perennial plant with thicker culms and larger spikelets and achenes. According to Kern l.c. there is no obvious dividing line between both species. However, the plants thus far seen in Piemonte are delicate annuals with filiform stems and perfectly agree with Eleocharis pellucida.

### Key to the species of Eleocharis in Piemonte

1. Spikelets with 2-7 (or 8) flowers. Tubercle (stylopodium) not swollen, not or scarcely constricted at base and thus not clearly demarcated from achene. Eleocharis quinqueflora (native)  
   - Spikelets with (much) more than 7 flowers. Tubercle clearly demarcated from achene, usually swollen and constricted at base. E. acicularis (native)

2. Achenes terete, distinctly cross-ribbed (trabeculate) E. acicularis (native)
   - Achenes triquetrous or trigonous, smooth or finely punctate, never cross-ribbed. E. acicularis (native)

3. Achenes triquetrous or trigonous (sometimes bluntly so), not biconvex. Style branches usually 3 (rarely 2) E. mamillata (native)  
   - Achenes compressed, biconvex. Style branches usually 2 (rarely 3). E. multicaulis (native)

4. Coarse, caespitose perennial, culm 1-1.5 mm across. Achene 1.5-2 mm E. multicaulis (native)
   - Slender, caespitose annual, culm 0.3-0.5 mm across. Achene ca. 1 mm E. pellucida (introduced)

5. Long-rhizomatous perennial, ultimately mat-forming. Culm up to 100 cm tall E. pellucida (introduced)
   - Caespitose annual or perennial, more rarely short-rhizomatous perennial (never mat-forming). Culm rarely exceeding 40 cm E. mamillata subsp. austriaca (native)

6. Culm exceeding 40 cm E. mamillata subsp. austriaca (native)
   - Culm less than twice as long as wide. Perianth bristles usually 5 (sometimes 4 or 6) \_
   - E. mamillata subsp. austriaca (native)

7. Upper leaf sheath membranous, hyaline, often wrinkled and inflated at the apex. Shorty-rhizomatous perennial E. acicularis (native)
   - Upper leaf sheath firm at the apex. Annual or caespitose perennial E. acicularis (introduced)

8. Caespitose perennial. Lowest glume of spikelet empty, encircling base of spikelet E. carniolica (native)
   - Annual. Two lowest glumes of spikelet empty, subequal and half encircling base of spikelet E. mamillata subsp. austriaca (introduced)

9. Achene shiny, black, very small (0.3-0.5 mm long). Tubercle minute E. atropurpurea (introduced)
   - Achene dull, brownish or greenish, 0.75-1.3 mm long. Tubercle at least half as wide as the achene, compressed and lamelliform E. mamillata subsp. austriaca (introduced)

10. Tubercle 0.5-0.8 mm wide, nearly as wide as achene. Style branches usually 3. Culm up to 1.5 mm across E. obtusa (introduced)
   - Tubercle 0.3-0.5 mm wide, ca. 2/3 as wide as achene. Style branches usually 2. Culm ca. 1 mm across E. ovata (native)
Eleocharis pellucida is a rather inconspicuous species and, at a glance, closely resembles native E. carniolica (and to some extent E. obtusa). All also seem to have similar ecological preferences and share the same habitats. Therefore, it is not unlikely that Eleocharis pellucida has been overlooked so far in north-western Italy (or elsewhere). Further fieldwork will probably yield additional records. It should be looked for in heaths in the rice-growing areas in Benna and Vercelli to the Vauda nature reserve in Lombardore.

**Table 1** - Comparison of main distinguishing features of Eleocharis pellucida, E. carniolica, and E. flavescens in Piemonte (Italy).

<table>
<thead>
<tr>
<th></th>
<th><strong>Eleocharis pellucida</strong></th>
<th><strong>E. carniolica</strong></th>
<th><strong>E. flavescens</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of style branches</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Form of achene</td>
<td>Bluntly trigonous</td>
<td>Biconvex</td>
<td>Biconvex</td>
</tr>
<tr>
<td>Length of achene (incl. stylopodium)</td>
<td>&lt;1 mm</td>
<td>Ca. 1.5 mm</td>
<td>0.6-1.8 mm</td>
</tr>
<tr>
<td>Life form</td>
<td>Usually tufted annual</td>
<td>Usually tufted perennial</td>
<td>Usually rhizomatous perennial</td>
</tr>
<tr>
<td>Upper leaf sheath apex</td>
<td>Firm and tight, not at all translucent (herbaceous)</td>
<td>Firm and tight, not at all translucent (herbaceous)</td>
<td>Slightly inflated and wrinkled, translucent (membranous)</td>
</tr>
</tbody>
</table>
Acknowledgements

The author is thankful to Tetsuo Koyama (Makino Botanical Garden, Kochi, Japan) for confirming our determination. Sven Bellanger (National Botanic Garden of Belgium) prepared an original line drawing. Daniela Bouvin (Torino) provided a photograph (Fig. 2). Gabriele Galasso (Milano) is acknowledged for preparing the Italian summary and Adriano Soldano (Vercelli) and Alberto Selvaggi (Torino) for providing general information about the genus Eleocharis in Piemonte.

REFERENCES

Summary: Eleocharis pellucida J. Presl & C. Presl (Cyperaceae), native in south-eastern and eastern Asia, is reported for the first time as a xenophyte in Europe. It is locally abundant and well-naturalised in several heaths (baraggias) in the provinces of Biella, Torino and Vercelli (Piemonte, Italy) and possibly overlooked elsewhere. Diagnostic features are discussed and compared with those of related native and non-native species. An updated identification key for the genus Eleocharis in Piemonte as well as a photograph and an original line drawing are presented. Finally, the species' potential introduction history in Piemonte is discussed.