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Short communication

Muhlenbergia schreberi J. F. Gmel (Poaceae), a new naturalized species in Croatia

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Abstract – *Muhlenbergia schreberi*, nimblewill, is a widespread North American perennial grass species, slowly spreading in European countries, where it has been recorded in Spain, Switzerland, Italy, and Slovenia. In addition, a well naturalized population was discovered in Opatija (Northwestern Croatia, Croatian Littoral) in 2011 as described herein. It has been recognized as a persistent weed in some North American states, and in the last few decades its secondary European distribution range has been slowly increasing. Thus most probably it will also spread in Croatia and become classified as invasive.

Keywords: Croatia, *Muhlenbergia schreberi*, neophyte, nimblewill, potentially invasive species

Introduction

In the last decades, neophytes have been at the forefront of not only floristic research but also of nature conservation, which is becoming more and more aware of their potential importance as threats to indigenous biodiversity. So countries mostly have drawn up their lists of aliens or invaders (Boršić et al. 2008, Celesti-Grapow et al. 2010, Jogan et al. 2012). Unfortunately, further from the mere act of listing, »the path becomes rough« and so alien species are spreading steadily and more and more new taxa are entering our nature. Not all neophytes are easily recognizable in the field and sometimes their secondary spread remain unnoticed for decades. This is certainly the case with some umbellifers, such as *Ammi visnaga* (Ruščić and Nikolić 2011) and even more with some of the grasses. Such is the case of *Sporobolus neglectus,* recorded for the first time in Croatia soon after World War II (Marković 1973), but without any further records until recently, when it has been observed to be already widespread along several main roads in lowland Croatia. Most probably the case of *Muhlenbergia schreberi*, recently recorded for the first time in Croatia in Opatija, will be similar.

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***Muhlenbergia schreberi* J. F. Gmel** [*M. diffusa* Willd.]

The genus *Muhlenbergia* Schreb. belongs to the subfamily *Chloridoideae* with majority of taxa in dry and warmer parts of the world. Of the approximately 160 species, the majority are confined to America and only about a dozen are also native in the warmer parts of Asia (Clayton and Renvoize 1986, Mabberley 1990, Watson and Dallwitz 1992). The genus was named after the Lutheran pastor Heinrich Ludwig Mühlenberg (1756–1817), a famous researcher into North American flora, especially grasses (Ascherson and Graebner 1898–1902).

In Europe, the genus *Muhlenbergia* is represented by only some ephemerophytes (Ascherson and Graebner 1898–1902, Ryves et al. 1996, Conert 1998) and by *M. schreberi,* which is locally naturalized. In addition, some authors include *Sporobolus vaginiflorus* (A. Gray) A. W. Wood, a naturalized North American annual, in the genus *Muhlenbergia* as *M. vaginiflora* (A. Gray) Jogan (Jogan 1999, Poldini et al. 2002).

Muhlenbergia schreberi, nimblewill*,* is a perennial grass 0.1–0.3 m tall with a much-branched geniculate culm rooting at the lower nodes, somehow cespitose. Leaf sheaths are shorter than internodes, with ligule < 0.5 mm long, and leaf blades narrowly lanceolate, flat, 2–3 mm wide and 3–7 cm long, more or less perpendicular to the culm. Inflorescence is a distinctly contracted interrupted panicle, up to 20 cm long, with short branches, nodding, spikelets are numerous, on short pedicels, one-flowered, < 2.5 mm long (awn not included). Glumes are very reduced, < 0.5 mm long, lemma appressedly hairy, 2–2.5 mm long, tapering into a straight weak 2–5 mm long awn, distinctly 3-nerved, and a palea slightly shorter than lemma, visible. Stamens are only slightly protruding at the top of the spikelet during anthesis, with yellow anthers 0.2–0.4 mm long. After anthesis, ripe spikelets disarticulate above the persistent glumes, caryopsis 1.3 × 0.3 mm. 2n = 40. Flowering time is late, September and October.

The primary distribution of *M. schreberi* is in the eastern part of North America, from central Mexico to south-east Canada, and South America southwards to North Argentina. The centre of its distribution range seems to be in the eastern half of the USA. In South America it is reported for the warm temperate belt, i.e. for North Argentina (Nicora and Rugolo de Agrasar 1987), and is much rarer in Colombia, South Uruguay and South Brazil.

In its secondary distribution range, in Switzerland nimblewill is restricted to the Ticino/Tessin canton in the south first recorded by Becherer in 1963 (Conert 1998) where it is still locally naturalized (Aeschimann and Burdet 1994, Lauber and Wagner 2001). In neighboring north Italy it is reported for Piedmont, Lombardy, Trentino-Alto Adige (Aeschimann et al. 2005), and Bolzano/Südtirol (Fischer et al. 2008). In Slovenia it has been naturalized at least since the 1980s in the sub-Mediterranean part on the junction between Kras plateau and Vipava valley (Jogan 1990) and has been recently recorded naturalized in Litija (central Slovenia, unpublished). There was a neglected occurrence in north-eastern Spain (Catalunya, Bordils 10 km north-east of Girona) where the species was collected in 1932 in alluvial forest plantations of *Platanus* and *Populus* but it was discovered again in 2007 (Pyke 2008). On the one hand this shows the persistence of the population and on the other hand the general floristic neglect of grasses. Because of its occurrence in Spain and Italy, it could be expected to be found in France. It has also been recorded as a casual in United Kingdom (Ryves et al. 1996).

In the former USSR (Cvelev 1976) *M. schreberi* is reported from the Caucasian region (North Ossetia, West Transcaucasia, today Georgia) and Armenia, but its occurrence there is definitely not native as it is wrongly reported to be in Euro+Med PlantBase (http://ww2.bgbm.org/euroPlusMed). In Japan it is listed among invasive alien species as established (http://www.nies.go.jp/biodiversity/invasive/).

Its occurrence seems secondary also in the western USA, where nimblewill is treated as a noxious weed in California (Peterson 2003). In South America the ecological conditions of *M. schreneri* are reported as hygrophilous subtropical forests and gallery forests (Nicora and Rugolo de Agrasar 1987). In North America its ecology seems very diverse (Peterson 2003, 2007). Judging from the 89 herbarium labels from Smithsonian (http://collections.si.edu/) of which about half mention the habitat type, it has mostly been collected in ruderal places (17/43), various types of wetlands (12/43), grasslands (8/43) and woods or shaded places (6/43), which is certainly only a rough estimation of the author, but clearly shows the habitat type preferences. Hitchcock and Chase 1971 simplify its ecology to »damp shady places«.

In the Caucasus region the grass was reported as a weed in plantations of subtropical plants (Cvelev 1976). In Switzerland *M. schreberi* is reported as a new-comer to an abandoned landfill site together with several other neophytes (Bellosi et al. 2011) and in general it is scattered on road banks, lawns and among shrubs (Lauber and Wagner 2001) and several other ruderal places and forests (Conert 1998). It prefers weakly acid substrates with enough humus, slightly sandy. In Northeast Spain, where *M. schreberi* populations have persisted for more than 70 years, it is reported to grow in river banks, wet and ruderal places (Pyke 2008). In Slovenia, the habitat types of *M. schreberi* are ruderal, forest fringes on shady slopes and meadows (Jogan 1990). In the whole wider area of the Alps *M. schreberi* is recognized as a species of Geo-Alliarion type of vegetation (Aeschimann et al. 2005).

Methods

The newly discovered locality of *M. schreberi* is the outcome of the author's systematic floristic field work focused on grasses. Mapping is conducted in the frame of the informal international project »Flora of Istria« (Starmühler 1998) comprising the wider territory of Istria south of the line Trieste-Rijeka including the northern part of the Kvarner archipelago, coordinated by W. Starmühler (Graz, Austria). The floristic activities of several dozen collaborators have been carried out for roughly 15 years and preliminary results such as checklists and herbarium revisions have been published in a series of articles starting with Starmühler 1998. Herbarium vouchers are deposited in public herbaria and duplicates are offered to collaborating institutions. The first collection of *M. schreberi* is deposited in herbarium LJU (University of Ljubljana, Biotechnical faculty).

Results and discussion

The first known population of *M. schreberi* in Croatia (Fig. 1) was recorded in the Kvarner Littoral, in Opatija, on lawns, forest fringes and ruderal places near the Hotel Ambasador, 45°20'26"N, 14°18'41"E, 0651/4 (leg. N. Jogan 11. 12. 2011, herbarium LJU).

The population is hard to analyze because it is scattered over a frequently mown lawn on the south oriented slope in front of the hotel. The lawn is about 100 × 30 m in size and a few

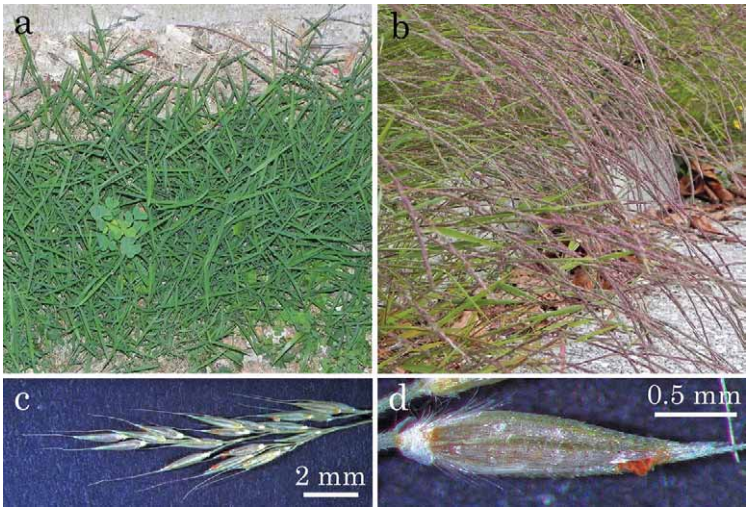

Fig. 1. *Muhlenbergia schreberi*. a) typical summer aspect with densely growing shoots bearing almost perpendicular linear leaf blades; b) autumn aspect, when long narrow nodding panicles are developed; c) detail of panicle from herbarium specimen; d) spikelet, awned lemma and palea visible. Pictures a) and b) were taken at a locality in Litija, Slovenia, as it was not possible to get such well developed plants in the Opatija locality, while pictures c) and d) were taken from a herbarium specimen collected at the Opatija locality. All photos were taken by N. Jogan.

dozen stands of *M. schreberi* of different sizes up to a few square meters are scattered all over the lawn. Due to very frequent mowing, only some culms can be found flowering, but with its stolons this perennial plant is slowly spreading and it can be recognized quite easily during the winter by its dry whitish leaf blades or during the vegetation period by the quite dense leaves distinctly in two rows on vegetative shoots. Propagation and further spread at the locality might be enhanced by frequent mowing that results in small parts of the stolons being dispersed and rooting at the nodes; propagation by seed is not to be excluded, however.

In the autumn, the flowering period of *M. schreberi,* only a couple of accompanying plant species are flowering, e.g. *Cynodon dactylon, Bothriochloa ischaemum*, on more ruderal margins *Digitaria sanguinalis, Setaria viridis* and also an interesting American ephemerophyte *Cyclospermum leptophyllum* (Pers.) Sprague ex Britton and P. Wilson which had not been recorded in Croatia previously.

In its native range *M. schreberi* is treated as a troublesome weed (BROWN 1979) especially in lawns, as it slowly spreads by stolons and patches on lawns gradually increase, but in autumn does not remain green, like other lawn grasses. It will at first turn brown, and then, until the late spring the withered pale brown leaves are easily noticed as »dry« patches in the lawn. Green leaves develop later in spring. Because of the vegetative spread of the many-branched stolons, *M. schreberi* stands are almost without other plant species. Also in several other weed lists *M. schreberi* has a status ranging from »casual alien« to »noxious weed« (compilation in Global Compendium of Weeds, http://www.hear.org/gcw/species/muhlenbergia_schreberi/), e.g. in California, Kentucky, Nebraska and Great Plains it is listed as invasive weed.

Some authors recognize *M. schreberi* in Europe as invasive or at least naturalized, but judging from the situation in its homeland, America, where the species is described as »noxious weed« or »environmental weed« (see above), in its secondary distribution range too it can slowly become at least a local weed of the ruderal places, if not an invasive grassland species. In Europe it is listed as neophytic threat in Italy (as »invasive« in Lombardy and Veneto, »naturalized« in Piedmont, »casual« in Alto Adige; Celesti-Grapow et al. 2010), Switzerland (status »unknown« by Wittenberg ed. 2006 and later corrected to »naturalized« on web version of the same document, see http://www.sib.admin.ch/uploads/media/UW-0629-E.pdf) and Slovenia (»potentially invasive«, Jogan et al. 2012).

We can conclude that for several decades nimblewill has obviously been a well naturalized species in several European countries with some Mediterranean climatic impact. It is slowly spreading by seeds and vegetatively, and as a late-flowering grass its occurrence is often overlooked. Most probably also in the newly recorded locality in Opatija the species has been present for several years already and thorough field work in autumn will certainly reveal more populations scattered in the Kvarner Littoral. At the moment, its occurrence seems confined to ruderal places, but diversity of microhabitats and conditions similar to those in natural habitat types (e.g. forest fringes, wet grasslands, even rocks) suggests its possible spreading in the vicinity.

In Croatia *M. schreberi* can be listed as a naturalized neophyte, most probably not (yet) as an invasive species, but the wider geographical area adjacent to the discovered locality needs to be explored.

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