

Abstract

Misidentifications are an important but neglected problem in studies on plant invasions. This review shows how taxonomic education of staff and stakeholders is of great importance for correctly assessing threats provoked by alien plant species in field and literature based studies.

Four randomly chosen recent examples (*Digitaria violascens*, *Eleocharis pellucida*, *Juncus dichotomus* and *Vicia dalmatica*) from Europe demonstrate that, as a result of an initial erroneous identification and/or confusion with similar harmless species, potentially noxious environmental weeds have been able to become fully naturalised. They act as "invaders in disguise" and therefore constitute a real problem for conservation management.

Keywords

Taxonomy, alien species, *Digitaria violascens*, *Eleocharis pellucida*, *Juncus dichotomus*, *Vicia dalmatica*

Bio-sketch

The author has been studying non-native plants (ephemerals as well as invasives) for some 20 years by now. His work chiefly emphasizes on recognition (identification) and taxonomy. F. Verloove has produced lots of publications on naturalized vascular plants in Europe. Since several years, he is working on online "Manual of alien plants of Belgium".

Invaders in disguise. Conservation risks derived from misidentifications of invasive plants

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Introduction, Hypotheses and Problems for Management

Biological invasions have become a major concern in the past decades since they are believed to be responsible for declining biodiversity worldwide. Especially in North America, Australia and Europe numerous scientists are now involved in the study of non-native organisms. Their scope is exceedingly diverse and includes, among others, the elaboration of checklists and catalogues, pest risk management, traits assessment, etc.

In many parts of Europe studies on non-native vascular plants have yielded an extraordinary amount of valuable data. Most countries by now have published catalogues or checklists that provide information on such items like the degree of naturalisation, time and mode of introduction, origin, habitat preferences, chorology, biology (for instance life form), etc. Logically, these data are usually taken from literature since databases with literature references are very manageable and easy to access. However, several studies have proved that data from literature are

not only unverifiable; they are often also unreliable. Pyšek (2003) demonstrated that Czech data extracted from the monumental Flora Europaea where surprisingly unreliable: numerous taxa were omitted and others were erroneously included. A catalogue of neophytes in Belgium (Verloove 2006) was therefore based on a thorough revision of the main public Belgian herbaria. About 20% of the taxa was not previously recorded (unidentified or erroneously identified before, confused with similar or related taxa, etc.). On the other hand not less than 30 taxa from the Belgian flora needed to be omitted because they were incorrectly included (Verloove & Lambinon 2008).

It is generally accepted that an early detection of new xenophytes is essential. However, this firstly requires an accurate determination. It is obvious that a correct identification is an essential and primary tool in studies on non-native vascular plants. Not before a correct name has been established for a given alien taxon, its pest risk can be assessed. Alas, the above proves that misidentifications still

obviously of non-European origin (for instance *Eichhornia crassipes* (C.F.P. Mart.) Solms-Laub., *Ludwigia grandiflora* (Michaux) Greuter & Burdet, *Opuntia div. spec.*, etc.). However, in the past years it has become clear that an increasing number of non-native vascular plants managed to become naturalised or even invasive in parts of Europe without ever being noticed! Such species can be either very inconspicuous (for instance several Lemnaceae) or (and more frequently) very reminiscent of related native or harmless non-native species. They are here designated as “invaders in disguise” and surely act as a new challenge to plant taxonomists and ecologists.

Some recent examples of misidentified plant taxa

Digitaria violascens Link (Poaceae)

This crabgrass is probably of South American origin but now occurs as a weed of arable land, irrigated lawns etc., in tropical and subtropical areas of both the New and Old World. It is exceedingly reminiscent of the native European *Digitaria ischaemum* (Schreb. & Schweigg.) Muhl. Verloove (2008) recently demonstrated that *Digitaria violascens* is known since at least the 1990's from southern France and parts of Italy and Spain where it has been confused with *D. ischaemum*. The latter is a rare

native species in these areas and recent records were considered to be valuable. Eventually they most likely are erroneous due to confusion with *Digitaria violascens*. *Digitaria violascens* now proves to be a typical example of an invader in disguise. Since Verloove (2008) it was furthermore reported by Pyke (2008) and Verloove & Sánchez Gullón (2008) but it was estimated to be merely locally naturalised and mainly confined to irrigated lawns. However, fieldwork in September 2009 in northwestern Italy showed that *Digitaria violascens* has become exceedingly common in parts of Piemonte (and doubtlessly elsewhere). It now commonly occurs by road verges and wasteland. However, it also penetrates in natural habitats: it is a typical element of riparian associations in a fairly large number of river valleys (Fig. 1). Even more regrettable is its presence in the many heaths of Piemonte, most of which are vulnerable and protected areas (for instance the Riserva Naturale della Vauda north of Torino and all Parco Baragge areas in the surroundings of Novara and Vercelli). In these heaths *Digitaria violascens* obviously benefits from the practices commonly used to maintain a semi-natural, open vegetation (see also Lonati & al. 2009 for an identical case with the American grass *Panicum acuminatum* Swartz in Italian heaths). Since it has been confused with native *Digitaria*

Resumen

Los errores en la identificación de especies son un problema común en los estudios sobre plantas invasoras. En esta revisión se muestra cómo la educación taxonómica de los trabajadores y gestores es de enorme importancia para evaluar correctamente las amenazas provocadas por especies vegetales alóctonas en estudios de campo o basados en literatura.

Escogidos al azar cuatro ejemplos recientes de Europa (*Digitaria violascens*, *Eleocharis pellucida*, *Juncus dichotomus* and *Vicia dalmatica*) se demuestra que, como resultado de determinaciones iniciales erróneas o por confusión con especies semejantes que no suponen peligro, las verdaderas especies invasoras que pasaron desapercibidas han sido capaces de llegar a naturalizarse por completo. De esta forma actúan como ‘invasoras disfrazadas’ y constituyen un problema real en el manejo de la biodiversidad.

Palabras clave

Taxonomía, especies alóctonas, *Digitaria violascens*, *Eleocharis pellucida*, *Juncus dichotomus*, *Vicia dalmatica*

ischaemum its occurrence and spread logically have never been of any concern. In a heath near Cossato (E of Biella) *Digitaria violascens* now is the dominant species, along with *Euthamia graminifolia* (L.) Nutt. (syn.: *Solidago graminifolia* L.), another American xenophyte.

Digitaria violascens by now is so common in northwestern Italy that it must have been introduced quite some time ago. By the time it was finally recognised it has been able to spread in a fast way and now has occupied valuable natural habitats (including nature reserves and other protected areas).

Eleocharis pellucida Presl (Cyperaceae)

This is a noxious Asian weed of rice fields and other temporarily damp habitats (Figs 2-3). It was discovered in abundance in 2008 in shallow depressions and tracks in a heath near Benna in Piemonte (northwestern Italy). Additional field work in September 2009 yielded several supplementary records from other heaths in the same area (Verloove 2010). It is clearly well established in natural and vulnerable habitats and its initial introduction probably dates back to several decades ago. It was most likely formerly introduced as a weed in the vast rice-growing area around Benna and eventually managed to

spread to suitable habitats in the surrounding heaths.

Eleocharis pellucida is exceedingly similar to the native Italian *E. carniolica*. The latter is a very rare and vulnerable species and by now extinct in many of its classical localities (Lastrucci & Becattini 2007). It is one of the target species for nature conservation management and hence of high concern in several nature reserves (including the Riserva Naturale della Vauda north of Torino). Both species surely have been confused and increasing or new populations of presumed *Eleocharis carniolica* might as well refer to *E. pellucida*. Both species often grow sympatrically and practices of conservation management that should favour native *Eleocharis carniolica* are probably also of benefit to the non-native but hitherto unrecognised weed *E. pellucida*.

Juncus dichotomus Elliott (Juncaceae)

This is a New World species of the *J. tenuis* Willd. complex. Some years ago it was discovered near Novara in northwestern Italy. In September 2009 more profound fieldwork yielded several new localities in Piemonte (personal observations author). This species is obviously well established locally and must have been confused so far

with *Juncus tenuis* which is one of the most widespread xenophytes in Europe (DAISIE 2008). It occurs in natural habitats (including heaths, clearings and tracks in woodland, etc.) and man-made habitats (railway yards, cracks in pavements in urban areas, etc.).

Even in the first case it is seldom regarded as a noxious environmental weed even though it often occurs in abundance. *Juncus dichotomus*, on the contrary, is a more specialised species and more confined to at least temporarily wet habitats (see for instance Correll & Correll 1975): riverbanks, pond margins, depressions in heaths, sometimes also near rice fields. It behaves in the same way in Italy and future invasive behaviour cannot be ruled out (see also Randall 2002 or www.hear.org/gcw/). It seems that *Juncus dichotomus* is a relatively recent xenophyte in Europe (although herbarium revisions of *J. tenuis* might bring to light new records). It seems appropriate to closely watch its future expansion.

Vicia dalmatica A. Kern. (Fabaceae)

This is a member of the *Vicia cracca* L. complex and is most closely related to *V. tenuifolia* Roth. Its natural distribution range is in southeastern Europe.

The Montagne Saint-Pierre in Belgium – a nature reserve with sun-

exposed calcareous slopes and lots of Orchidaceae – harbours one of the last Belgian populations of presumed native *Vicia tenuifolia*. Species-specific conservation management proved to be successful and has ensured its survival since at least the 1940's. However, a critical revision of these populations recently demonstrated that not the native and vulnerable *Vicia tenuifolia* was concerned but the non-native *V. dalmatica*. This means that, as a result of an initial erroneous identification, a xenophyte has been able to become perfectly established and its survival

has been enhanced by conservation practices.

Analogously, *Vicia dalmatica* managed to become naturalised in numerous calcareous and thermophilous grasslands in Central-Europe. Like in Belgium it was only relatively recently detected but must have been present since quite some time.

Conclusions

These four recent examples show that an early detection and accurate identification are essential tools in plant invasion research. In a worst

case scenario an invasive exotic weed can proliferate as a result of conservation management practices that were in fact meant to favour vulnerable, native species, simply because it was initially misidentified. It is obvious that field workers should be aware for such invaders in disguise. Determinations should be critically assessed, in case of doubt preferably by experts. A sudden and unexpected expansion of rare, presumably native species might as well hide an incipient invasion of a noxious non-native look-alike.



Fig. 1. Typical habitats of *Digitaria violascens*. 1a) River Elvo near Salussola; 1b) Parco Baragge in Benna, heath; 1c) Track in remote riparian woodland along river Elvo near Arro, invaded by *Digitaria violascens*.



Fig. 2. Vauda Nature Reserve near Lombardore, typical habitat of *Eleocharis pellucida* and *E. carniolica*.



Fig. 3. *Eleocharis pellucida* (inflorescences and stems)

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