

Rapid Communication

Distribution of *Iris pseudacorus* (Linnaeus, 1753) in South Africa

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Abstract

The yellow flag iris, *Iris pseudacorus* L., was recorded for the first time outside of cultivation in South Africa along the Vaal River in Gauteng Province in 2004. The yellow flag iris is native to Eurasia and North Africa and was probably introduced to South Africa as an ornamental plant. We recorded *I. pseudacorus* in four of the nine provinces of South Africa, with naturalised populations at 24 localities covering an estimated area of about 0.4 ha around rivers, streams, dams and wetlands. While we found it at multiple sites (suggesting the species should be classified as category E in South Africa under the Blackburn scheme), the current planted and naturalised distribution throughout South Africa and neighboring countries is likely to be substantially higher than reported here. Infestations are likely to cause substantial negative impacts as seen elsewhere in the world. The species is currently listed as an eradication target under South African regulations, but the feasibility of control still needs to be determined and given its popularity, eradication from the region looks unlikely.

Key words: alien species, escape cultivation, Iridaceae, ornamental, yellow flag iris

Introduction

There are about 1036 species of the family Iridaceae native to the southern African region (van Kleunen et al. 2007). *Iris* is the largest genus with more than 250 species, with no representative species in southern Africa. The genus is distributed across the north temperate zones to North America, and is most diverse in Asia (Goldblatt 2000; Goldblatt et al. 2003; Wilson 2003).

Iris pseudacorus (Linnaeus, 1753); yellow flag iris, pale yellow iris) is a popular plant used in water gardens and in other ornamental plantings. It has a wide native distribution from North Africa to Siberia (Morgan 2011) and has escaped cultivation in many regions of the United States of America, Canada and New Zealand (Cody 1961; Sutherland 1990; Katharine 2009; USDA 2010). The species was probably introduced to South Africa as an ornamental plant (Jaca 2012).

Iris pseudacorus is a nitrophile in that it can live in oxygen-poor soils. It frequently invades the banks of streams and wetlands and can form dense clumps (Sutherland 1990; Figure 1). *I. pseud-*

acorus is easily spread by water where broken rhizomes may be transported downstream and establish new populations (Kratschmer 2009; Jaca 2013). In its native region, this species is reported to be poisonous to grazing animals as it contains glycosides (Ramey 2001). Sutherland (1990), mentioned that *I. pseudacorus* has been shown to decrease soluble organics by 25% in a year. The aim of this study was to examine the distribution of *I. pseudacorus* in South Africa.

Description

Although South African *Moraea* species (Goldblatt et al. 2003) were treated in the same genus, the native range of *Iris* L. is now restricted to the northern hemisphere, with no native representatives in South Africa. *I. pseudacorus* is a herbaceous perennial, semi-aquatic plant (Jacobs et al. 2010), that may superficially resemble some indigenous species in South Africa, for example *Moraea huttonii* (Baker) Oberm. and *Typha capensis* (Rohrb.) N.E.Br. (when not in flower). However, *I. pseudacorus* differs from *M. huttonii* in that its root stock is

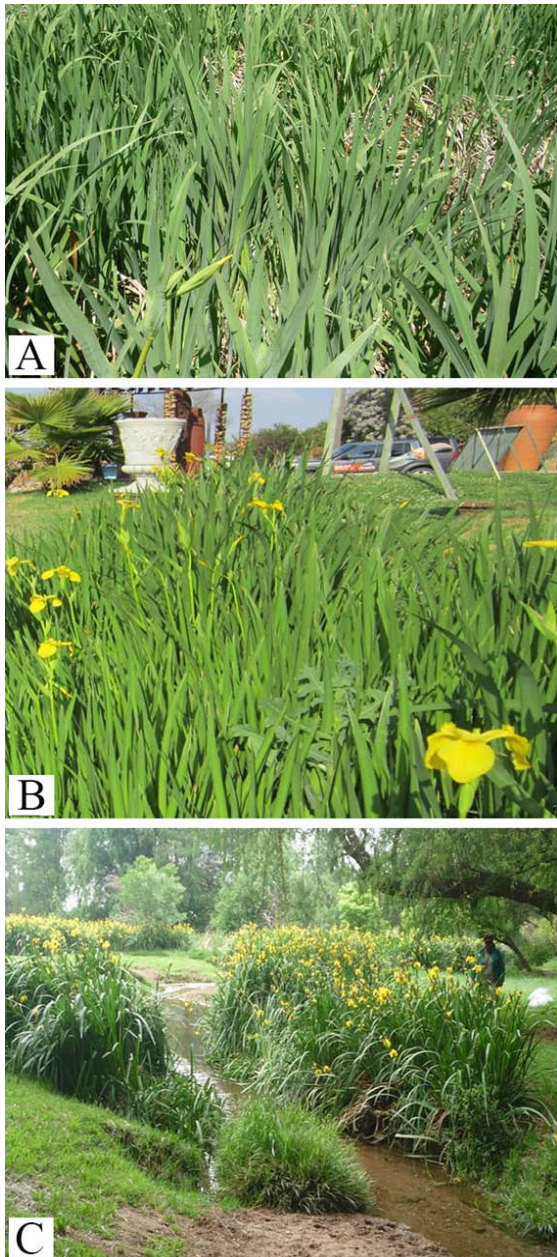


Figure 1. *Iris pseudacorus* infestation along a stream in Pretoria, Equistria (a), Witkoppen Road in Johannesburg (b) and along a river bank at the Johannesburg Botanical Garden (c). Photographs by Thulisile P. Jaca.

a pink creeping rhizome (Figure 2), whereas *M. huttonii* has a corm. At a distance these species look similar as they both have yellow flowers and the flower structure is similar. *I. pseudacorus* differs from *T. capensis* in that the leaves have a raised midrib while in *T. capensis* the midrib is not raised.



Figure 2. *Iris pseudacorus* rhizomes forming mats. Photograph by Thulisile P. Jaca.

Materials and methods

The distribution of *I. pseudacorus* in South Africa, during the period 2004–2014 was determined using data from the Southern African Plant Invaders Atlas (SAPIA) supplemented by records from field observations made between 2010 and 2014 by field biologists and the authors (Supplementary material Table S1). To estimate the extent of *I. pseudacorus* infestations, 100 m × 20 m transects, along dams and river banks where *I. pseudacorus* was present, were surveyed at seven localities. The seven localities were in Limpopo Province (Klein Kariba Resort, wetland adjacent to camping site), Gauteng Province (Pretoria, Equestria, where Furrow Road crosses the spruit; Johannesburg area on Witkoppen road on stream joining Jukskei River; Roodepoort, along Christiaan De Wet road; and Paulshof area along stream), and KwaZulu-Natal Province (Pietermaritzburg, Balgowan, junction off Balgowan road and Curry’s Post road; Merrivale, Celtiskloof, outside the garden fence).

To determine invasive potential, the post-border Australian Weed Risk assessment scheme (Pheloung et al. 1999) was used. This scheme has been applied in a variety of geographies and is reported to be almost accurate (Gordon et al. 2008, 2010; Hulme 2012).

To estimate seed production, we counted the number of capsules per stem and number of seeds per capsule at ten sites. To confirm identification we examined material from virtual herbaria in the countries of origin and voucher specimens from Germany housed at the Compton herbarium (NBG, abbreviation according to Holmgren et al. 1990).

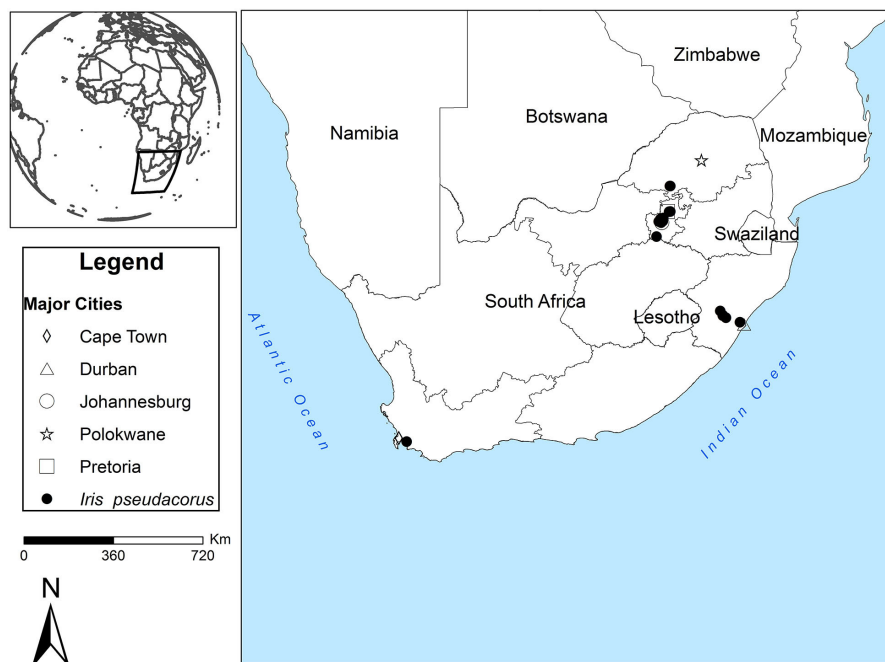


Figure 3. Known distribution of *Iris pseudacorus* in South Africa (for details see Supplementary material Table S1).

Results and discussion

The first record of *I. pseudacorus* outside cultivation in South Africa was made in 2004 along the Vaal River (between Vereeniging and Vanderbijlpark), Gauteng Province (SAPIA 2013). *I. pseudacorus* was recorded in Klein Kariba Resort, Limpopo Province in 2005 and from 2006 to 2014 the species was recorded in the Western Cape and KwaZulu-Natal Provinces and more records discovered in Gauteng Province (Figure 3; Table S1). The population in Johannesburg at Witkoppen Road (Gauteng Province) is suspected to have escaped from Potplace Nursery as the plants were growing alongside a water drainage, just outside the nursery. Potplace Nursery was inspected and plants were found in a pond; the owners were not aware of its potential invasiveness. To verify the source of the infestation the authors searched 20 m up the drainage from the nursery and no other plants were discovered.

We suspect that plants at all of the surveyed sites initially established from rhizomes of discarded plants from nearby gardens and nurseries (Denslow and Katz 2011). This is evident from the population discovered along Witkoppen Road where subsequent spread may have resulted from the breaking up of rhizomes.

For the invasive risk assessment, 44 of the 49 questions in the post-border Australian Weed Risk assessment scheme were answered, leading to a score of 23 which would have resulted in the species being rejected in a pre-border evaluation (Supplementary Table S2). According to the assessment environmental sector is at risk from invasion by this species.

To date 24 naturalised populations have been reported (14 from Gauteng Province; seven from KwaZulu-Natal Province; two from Limpopo Province; and one from the Western Cape Province, Table S1). Most populations were discovered in 2011 (15) following a countrywide survey, but more populations are still being found (Figure 4).

One stem produces an average of 11–20 (to maximum of 27) seed capsules and each capsule produces, on average, about 60 viable seeds (Jaca pers. obs.). Further studies need to be conducted on seed germination as the viability of seeds does not assure successful germination. Low temperatures may be required to break seed dormancy, as is the case for other invasive species in South Africa such as *Cotoneaster pannosus* Franch., *C. franchetii* Bois, *Pyracantha angustifolia* (Franch.) C.K. Schneid, *P. coccinea* M.Roem. and *P. crenulata* (Roxb. ex D.Don) M.Roem. that are restricted to areas where freezing winter

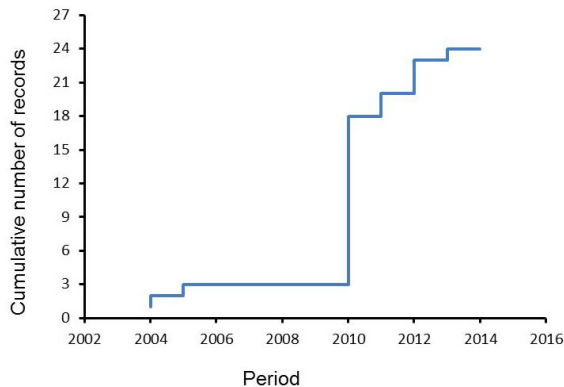


Figure 4. Cumulative number of localities recorded from 2004 to 2014.

temperatures are a requirement to trigger seed germination (Henderson 2007). In some areas surveyed this species has started to spread up to 250 m from where it was planted. Plants were recorded in all of the seven transects surveyed in the Limpopo, Gauteng and KwaZulu-Natal Provinces. This could indicate that *I. pseudacorus* has the potential to spread in South Africa. Though still contained in manageable populations, if the species is left unattended, the invasion may result in severe adverse impacts for native wetland species.

In Connecticut (eastern North America) and Hawaii, *I. pseudacorus* was able to exclude the native *Peltandra virginica* (L.) Schott, a species whose fruits are an important food of wood ducks (*Aix sponsa* L.) during the nesting season (Cox 1999). Crawford (2000), also reported that along the lower Potomac River near Washington D.C., *I. pseudacorus* has contributed to the conversion of riparian marshes, favoured by indigenous *Salix* species, into mesic forest dominated by exotic *Fraxinus* species. Thomas (1980) further elaborated that *I. pseudacorus* speeds up the destruction of swamps on Theodore Roosevelt Island, reducing suitable habitat and available forage of the wood duck.

I. pseudacorus was recorded mainly along river banks, stream banks, edge of dams and wetlands. These habitats are similar to those in the native region where herbarium samples were collected. We observed that in urban and suburban settings this species is clogging drainage pipes, flood control ditches and reducing stream width. This is concurrent with studies in Montana where it is reported to cause reduction in stream width by up to 25 cm creating new banks and contributing to sediment retention (Tyron 2006).

Conclusion

Iris pseudacorus was first recorded as naturalized at one locality in 2004 and by 2014 at an additional 23 sites. The distribution map and habitat records indicate that the species has managed to establish itself in natural areas. *I. pseudacorus* can potentially become a major problem in South Africa by modifying stream ecosystems, out-competing native plants and forming dense stands if not controlled. Like many invasive semi-aquatic plants, *I. pseudacorus* is disturbance-adapted; natural disturbances and human induced factors are associated with its spread. It is crucial to understand the distribution, ecology and spread of this species for management. *I. pseudacorus* is spreading in South Africa, but still occurs in low densities. It has consequently been identified as a species of concern that requires urgent attention (NEM:BA 2014). Some horticulturist are unaware of the potential invasiveness of this species hence the plant still continues to be sold in local nurseries. Therefore there is a need for awareness directed to horticulturists who are still growing and selling this plant. We plan to expand our search for the species throughout South Africa and neighboring countries and to assess the feasibility of eradication or control.

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Supplementary material

The following supplementary material is available for this article:

Table S1. Records of naturalised populations of *Iris pseudacorus* in South Africa from 2004–2014.

Table S2. Evaluation of invasive risk of *Iris pseudacorus* using the Australian Weed Risk Assessment scheme (Pheloung et al. 1999).

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