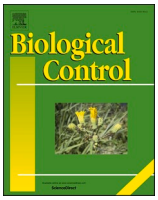
Biological Control 169 (2022) 104886

Contents lists available at ScienceDirect

Biological Control

journal homepage: www.elsevier.com/locate/ybcon



Climatic suitability and compatibility of the invasive *Iris pseudacorus* L. (Iridaceae) in the Southern Hemisphere: Considerations for biocontrol

Gianmarco Minuti [a,b,*], Iris Stiers [a,c], Julie A. Coetzee [d]

[a] Department of Biology, Ecology & Biodiversity Research Unit, Vrije Universiteit Brussel, Brussels, Belgium
[b] Centre for Biological Control, Department of Zoology & Entomology, Rhodes University, Makhanda, South Africa
[c] Multidisciplinary Institute for Teacher Education, Science & Technology (MILO), Vrije Universiteit Brussel, Brussels, Belgium
[d] Centre for Biological Control, Department of Botany, Rhodes University, Makhanda, South Africa

HIGHLIGHTS

- *Iris pseudacorus* is the target of a biocontrol programme in the Southern Hemisphere.
- *Aphthona nonstriata* was prioritized as a candidate biocontrol agent.
- The climatic suitability of both organisms is analyzed with the software MaxEnt.
- The climatic niche of the agent is predicted to be a subset of that of its host.
- High-priority areas to search for climatically compatible enemies are identified.

ARTICLE INFO

Keywords:
Yellow flag iris
Iris flea beetle
Aphthona nonstriata
Ecological niche modelling
MaxEnt

ABSTRACT

Iris pseudacorus L. (Iridaceae) is an emergent macrophyte native to Europe, North Africa and western Asia. Considered invasive in wetland habitats around the world, this species is now the target of a biocontrol programme in the Southern Hemisphere. Native range surveys of the weed led to the selection of the flea beetle, *Aphthona nonstriata* Goeze (Coleoptera: Chrysomelidae), as a candidate biocontrol agent. An important aspect to consider in weed biocontrol is the ability of an agent to establish and thrive in the environment where it is released. Climatic incompatibility between source and intended release sites can in fact limit the success of a biocontrol programme. In the current study, the potential climatic niche of *I. pseudacorus* and *A. nonstriata* in the Southern Hemisphere was analysed. The ecological niche modelling software MaxEnt was used to map the climatic suitability of both organisms across invaded regions in South America, southern Africa and Australasia. Furthermore, occurrence records from each invaded range were used independently to model the climatic compatibility of *I. pseudacorus* in Europe, in order to prioritize areas of the native range to explore during future surveys for potential biocontrol agents. The models identified areas at high risk of invasion by *I. pseudacorus* in northern Argentina, Uruguay, southern Brazil and central Chile, as well as numerous provinces of eastern South Africa, Lesotho, southern Australia and New Zealand. Accordingly, the highest climatic suitability for *A. nonstriata* was predicted across the humid temperate climates of north-east Argentina, Uruguay, southern Brazil, southern South Africa, south-east Australia and New Zealand. These results can eventually be used in future release plans to prioritize areas where establishment and survival of the agent is expected to be highest. At the same time, it may be useful to search the native range of the weed for biological control agents showing high climatic adaptation towards the intended release sites of each invaded range. In this regards, our climatic compatibility models identified high-priority areas across the Mediterranean regions of Italy and southern France, as well as the temperate regions of central and western Europe. Altogether, the current study provides useful new information to tackle the invasion and advance the biocontrol programme of *I. pseudacorus* in the Southern Hemisphere.

* Corresponding author at: Department of Biology, Ecology & Biodiversity Research Unit, Vrije Universiteit Brussel, Brussels, Belgium.
E-mail address: Gianmarco.Minuti@vub.be (G. Minuti).

https://doi.org/10.1016/j.biocontrol.2022.104886
Received 16 November 2021; Received in revised form 25 February 2022; Accepted 1 March 2022
Available online 10 March 2022