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Alien seed beetles (Coleoptera: Chrysomelidae: Bruchinae) in Europe

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Abstract

Under the framework of the DAISIE consortium, whose main mission is to make an inventory of the alien invasive species of Europe and its islands, we review the current state of knowledge and provide an up-to-date catalogue and distributional status for alien seed beetles (Coleoptera: Chrysomelidae: Bruchinae) in Europe. This work is based on studies of the species detected from the last century to the present, but with greater emphasis on the beginning of the 21st century, during which new biological studies have been carried out and findings made in European countries. The main objective of this paper is to focus on this last fact, which has promoted new views on the existing and potential threat of exotic bruchids in relation to climate change. This must now be regarded as a matter of concern for European agricultural and environmental policies. Only species of exotic origin introduced in European regions outside their native range were considered. Therefore, species of European origin spreading to new countries within Europe are not treated. Also, we provide a new approach to classifying alien seed beetle species according to their ability to become established, distinguishing between the well-established and those that may appear in seed stores but are not capable of invading natural and agricultural ecosystems. We present a taxonomic characterization of the alien bruchids found in Europe, providing an illustrated key based on external morphological characters of adults. The key facilitates the identification of the sixteen most frequently recorded genera, which represent 37 of the 42 species of exotic species recorded in Europe up to the present, whether established, not established or occasional. Finally, we provide a summary of the state of knowledge of the taxonomy and biology of the 20 most worrying species as pests, both established and non-established. This includes, where appropriate, an illustrated key for the identification of species. The study reveals that the majority of exotic bruchid species in Europe originate in Asia and Africa, from host plant species imported for ornamental or forestry purposes, and that a greater effort in European customs control is advisable.

Key words: invasive species, DAISIE, catalogue, identification keys, taxonomy, biology, Chrysomelidae: Bruchinae

Introduction

The impact of biological invasions by exotic species (non-native) on the conservation of biodiversity and the functioning of native ecosystems is becoming increasingly evident (Wittenberg & Cock 2001, Sax *et al.* 2005, Melbourne *et al.* 2007, Sax *et al.* 2007, Roques *et al.* 2010, Pimentel 2011). In the last 200 years, a significant number of exotic species have become established successfully in large areas of Europe (Hulme 2007), a phenomenon which, according to all forecasts, is set to increase in the coming decades (Sala *et al.* 2000) and could accelerate the degradation of local ecosystems (Vilà *et al.* 2007).

interest. It is also one of the most commonly used laboratory animals, especially for physiological and ecological studies. A summary of the state of knowledge until the mid-twentieth century is in Hoffmann *et al.* (1963) and later in Delobel & Tran (1993). Work continues to the present, e.g. Qi & Burkholder (1982) on endocrine regulation; Giga & Smith (1983), Moreno *et al.* (2000) and Zannou *et al.* (2003) on its life cycle. A comprehensive manual on the biology of this insect was published recently by Beck & Blumer (2011).

20. *Callosobruchus phaseoli* (Gyllenhal, 1833)

This is a less well-known and widespread species than other *Callosobruchus*. It is of uncertain origin but is possibly from the Oriental region. Hoffmann *et al.* (1963) attributed an American origin to it that is unlikely, as this genus does not exist in the New World. In any case, this species has also become cosmopolitan due to commercial trade of legume seeds. It is known from a smaller range of host plants than the other species of the genus, but with additional plants such as beans (*Phaseolus vulgaris*) (from where it took its scientific name), the genus *Vigna* (*V. mungo*, *V. radiata*, *V. umbellata* and *V. unguiculata*) and other legumes such as *Cajanus cajan*, *Cicer arietinum*, *Lablab purpureus* and *Pisum sativum*. The species was first detected in Europe in 1945, in France (Beenen & Roques 2010). It has now been detected in the Czech Republic, the UK, Greece, Italy, Poland and Spain (Anton 2010), as well as Albania (Beenen & Roques 2010). As with other *Callosobruchus* species, *C. phaseoli* is not established in Europe, since it has never been found outdoors. It is only able to reproduce in storehouses as it requires temperatures ranging between 30–32.5°C and a humidity level of 70%, environmental conditions more typical of tropical and subtropical countries. Its status in Southern Europe will depend on how climate change progresses. The pre-imaginal stages have not been described yet. Its biology has barely been studied; Utida (1971) provides some of the only data on the environmental conditions required by the species.

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