

## **The Silwood International Project on the Biological Control of Weeds**

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### *Abstract*

A summary is given of objectives, methods and progress in a collaborative venture based at Silwood Park in England. The project was founded on the information provided by Julien (1982) in his catalogue *Biological Control of Weeds: A World Catalogue of Agents and Their Target Weeds* and this information has been substantially extended and elaborated through questionnaires completed by biocontrol practitioners in many parts of the world. Currently, the accumulated computer database comprises over 75 000 pieces of information from 627 attempted introductions. This provides a source of material for project participants in their analyses of factors relevant to the theory, practice and success of biological control of terrestrial weeds.

### **Projet International de Lutte Biologique Contre les Plantes Nuisibles à Silwood**

Le présent rapport résume les objectifs et les méthodes d'un projet coopératif de lutte biologique contre les plantes nuisibles mis en oeuvre au parc Silwood en Angleterre, ainsi que les progrès réalisés. Ce projet repose sur les renseignements fournis par Julien (1982) dans l'ouvrage intitulé: *Biological Control of Weeds: A World Catalogue of Agents and Their Target Weeds*, ainsi que sur les données rassemblées au moyen de questionnaires distribués à des praticiens de la lutte biologique dans de nombreuses régions du monde. À l'heure actuelle, la base de données informatisées comprend plus de 75 000 éléments d'information tirés de 627 tentatives d'introduction. Il s'agit d'une source utile pour les participants au projet qui procèdent à l'analyse des facteurs relatifs à la théorie, aux techniques et au succès de la lutte biologique contre les plantes nuisibles.

### **Introduction**

This is a brief report on a collaborative programme that has been titled 'The Silwood International Project on the Biological Control of Weeds'. The main participants in the project are listed in the acknowledgements. The objective of the programme is to elaborate and extend Julien's (1982) database through reference to the relevant literature and, principally, through consultation with acknowledged weed biocontrol practitioners and experts, and to use the new, expanded database for analyses that will improve our understanding of biological control of weeds.

### **Methods**

Julien (1982) lists nearly 600 individual programmes on the biological control of weeds and provides: (i) names and origins of the target weeds; (ii) the names, order, family and origin of each of the agents; (iii) the dates, countries and routes of

introduction of the agents; (iv) a brief descriptive evaluation of the success achieved in each case.

These data were used as the starting point in the development of questionnaires designed to gain additional information on the biological characteristics of the introduced insects and mites used for the biological control of terrestrial weeds (Table 1), on the characteristics of the target weeds (Table 2), and on the successes achieved for each attempt at the biological control of weeds (Table 3). The questionnaires, which were circulated to biocontrol practitioners and accepted experts in each field, called for answers to 163 separate questions (some of which were formulated to allow for multiple answers, hence the total of 177 questions on various aspects that are listed in Tables 1-3). Separate questionnaires were completed for each of 627 biological control attempts (questions in Table 1; Table 2, E only; Table 3) and for each of 85 separate terrestrial weed species that have been the target of biological control (questions in Table 2, A-D). All the questions were numerically coded in the questionnaires allowing for input and storage on the University of London Computer and retrieval via a programme package entitled SIR (Scientific Information Retrieval).

**Table 1.** Number of questions (in brackets) formulated for questionnaires on characteristics of introduced insects and mites used as biological control agents against weeds, world-wide. Separate questionnaires were completed for each attempt with an individual agent species on a specific target weed species, in each country of introduction.

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<b>A. Identifying the agents</b>	
agent order, family, species, origin, target weed species, country of introduction:	(8)
<b>B. Characteristics of the agents in their native lands</b>	
distribution, abundance, competitors, natural enemies:	(5)
<b>C. Biology of the agents</b>	
size, feeding habits and guild, reproduction, sex ratio, fecundity, generation time, longevity, diapause, dispersal, host specificity:	(37)

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## Progress

About 95% of the answers on the questionnaires (in excess of 75 000 pieces of information) have been stored in the computer. The questions that remain to be processed are those listed in Table 2 (A-D) for some weed species. This phase of the project will be complete by the end of 1984 and it will then be necessary to modify and up-date the accumulated information on a regular basis.

Some preliminary analyses have been made using the data and the results are reported elsewhere in these Proceedings (Lawton 1985; Moran and Zimmermann 1985). They indicate the scope and potential for analyses that will improve our understanding of the theory, practice, and success of biological control of weeds.

The data on ratings are to be detailed in a proposed book (edited by V.C. Moran and J.K. Waage) entitled *The Biological Control of Weeds by Introduced Insects: A Practical and Ecological Appraisal*, which will provide accounts on: (i) the data base; (ii) methods for evaluating success; (iii) the population biology of weeds and insect herbivores; (iv) insect-weed interactions; (v) herbivore communities in biological control; (vi) biological control case histories; (vii) analyses of successes and failures; (viii) costs and benefits; and (ix) future prospects for biological control of weeds.

**Table 2. Number of questions (in brackets) formulated for questionnaires on weeds that have been targets for biological control using insects and mites. Separate questionnaires were completed for each target weed species.**

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<b>A. Identifying the weeds</b>	
family, species, origin, country of introduction, native or introduced, terrestrial or aquatic:	(6)
<b>B. Morphology</b>	
growth habit, size:	(5)
<b>C. Characteristics of the weeds in their native lands</b>	
habitat, climate, soil type, water type, distribution, abundance, dominance, taxonomic isolation:	(24)
<b>D. Biology of the weeds</b>	
generation time, flowering, seed characteristics, asexual reproduction, dispersal, physical and chemical defences, adaptations to fire, allelopathy:	(17)
<b>E. Characteristics of the weeds in their countries of introduction</b>	
pest status, undesirable and beneficial qualities:	(10)

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**Table 3. Number of questions (in brackets) formulated for questionnaires on evaluation of success of insects and mites introduced for biological control of weeds, world-wide. Separate questionnaires were completed for each attempt with an individual agent species on a specific target weed species, in each country of introduction.**

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<b>A. Measures of effort (cost)</b>	
collection, rearing, screening; 'scientist years':	(9)
<b>B. Release data</b>	
dates, stages and numbers released, tactics:	(14)
<b>C. Success of the agents</b>	
impact of agent, area of impact, population growth, time until maximum impact, damage:	(9)
<b>D. Effects on target weeds</b>	
pest status of weed, distribution, density, and habitats occupied, before and after biological control:	(24)
<b>E. Factors limiting success</b>	
biotic, abiotic; competition, predators, parasitoids, incompatibility with host plant, taxonomic confusion:	(9)

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