Weed biological control regulation in Europe: boring but important

R.H. Shaw

Summary

If the Europe Union (EU) is to deliver on its Convention on Biological Diversity (CBD) commitments and its Member States are to have any chance of achieving a good status classification for their water bodies, classical biological control will be needed. A lack of history and considerable inertia impede the development of biological control programmes but an inappropriate and ineffective regulatory environment could prove more of a barrier to weed biological control implementation. This paper reviews the current situation in Europe and considers the codes and regulations for the release of arthropods and fungi before considering the suitability of pest risk assessments.

Keywords: legislation, EU, pest risk assessment.

Introduction

As signatories to the Convention on Biological Diversity, European Union Member States (MS) have an obligation to ‘prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats and species’ (Decision VI/23 in 1992). They are also encouraged to invest in research and assessment of biological control as a control option. The European Strategy on Invasive Alien Species (ESIAS) came into being in 2003, and calls for a regional approach to the problem highlighting the need for cost-benefit analyses of long-term control measures. Exotic weeds are amongst the most problematic of invasive species but are amenable to biological control (Cruttwell McFadyen, 1998). In parallel many herbicides have been lost as a result of changes in registration requirements and there is no shortage of invasive plant species in Europe and more potential invasive alien weeds arrive daily. A recent review by EPPO recorded the shipments of aquatic plants into one French airport and revealed an average of more than one shipment per day of exotic plants. In the month of May 2006 alone, almost 100,000 plants arrived through this port (EPPO, 2007) including ten species that are known problematic invaders in Europe and another nine that are not yet present in Europe but known to be invasive elsewhere. As exotic species with a lack of specialist natural enemies, many of the invasive weeds in Europe would be amenable to classical biological control (Sheppard et al., 2006) and some have ‘off-the-shelf’ agents that have been thoroughly tested elsewhere and are likely to be safe for release. It would seem that the stage is set for the expansion of classical biocontrol of weeds into Europe.

In much the same way as the weed invades, biological control activity could be expected to increase rapidly from a slow start, and the current lack of precedent could be a reason in itself for a lack of take-up. In reality, a major factor is public and political perception. Plants are perceived by the public and their representatives as less threatening than insect pests since the latter more obviously threaten our food supply. Thus, a proposal to engage in an irreversible introduction of yet another alien species can seem counterintuitive. Fear of what might go wrong is certainly a consideration when a new concept is proposed, but other factors may prove to be more important. Though public perceptions and governmental needs are changing, in part thanks to ongoing programmes against Japanese knotweed, Fallopia japonica (Djeddour et al., these proceedings), the crucial regulatory environment is far from ideal.

The regulations

The regulatory framework in Europe is characterised by a lack of clarity and accompanied by varied interpretation. The lack of history of weed biological control in Europe is almost certainly the cause of the legislative gaps and similar situations existed in more experienced
countries prior to their development of tailored legislation such as the Australian Biocontrol Act 1986, and the New Zealand Hazardous Substances and new Organism Act 1996. Thus, many countries find themselves using regulations that were not designed for the purpose of dealing with the introduction and release of exotic biological control agents such as those provided for plant quarantine, genetically modified organisms and wildlife conservation. The responsible Government department is often unclear about how to proceed, and this was a significant factor in the failure to make positive decisions to release agents in the bracken, Pteridium aquilinum (L.) Kuhn, programme in the 1980s (S.V. Fowler, personal communication, 1998).

To assess the situation in Europe, a letter was sent out to the Plant Protection Department of each European country in June 2005 requesting information on their regulation of classical weed biological control agents in general and more specifically those relating to plant pathogenic fungi. Of the 25 recipients of the request, 11 responded. What became clear was that classical agents, both insect and fungal, cause considerable problems not only in practical regulatory terms but also in understanding. Some countries clearly had no understanding of the meaning and implications of classical biological control, let alone the regulatory paths for the two taxa. In some cases the responsible authority for initial import and actual release differed, as did the departments dealing with fungi and insects.

The confusion comes about because, even though the ultimate goal and strategy of classical biological control is the same whether insect or fungal agents are considered, they are regulated very differently by the EU, and each country has to fit the requirements of its own legislation. For example, one of the early milestones in a biological control programme is agreeing to the test plant list to be used during host range testing. This is carried out by the Technical Advisory Group (TAG) in North America, but in the UK, for example, there appears to be no mechanism for agreeing to such lists prior to the application for release.

**Arthropods**

European directive 2000/29/EU protects Europe against the introduction and spread of ‘blacklisted’ known pests and harmful macroorganisms by their prohibition. However, any species not on the list (including all potential classical biological control agents and many potentially invasive plants) can therefore be introduced without any formal risk assessment. This suggests that there is no EU level provision for assessing releases of beneficial exotics.

However, each EU member state transposes and interprets the ED 2000/29/EU into their national legislation and as a result can, and should, develop regulatory procedures for the releases of non-indigenous macroorganisms such as arthropod classical biological control agents (Genovesi and Shine, 2004). Currently there remains a wide divergence in such regulatory requirements from virtually none in many EU countries, to an incipient risk assessment process being developed with appropriate regulatory bodies in, for example, the UK and Portugal—the two countries most advanced in developing classical weed biological control programmes. In the commercial world a lack of clear legislation is often exploited. However, that is generally not the case in the public-interest, public-investment research sector, and consequently, weed biological control releases are conspicuous by their absence.

There have been over a thousand releases of biological control agents for weeds worldwide (Julien and Griffiths, 1998) yet no full classical weed biological control programme has been carried out in any EU Member State. This contrasts strongly with the repeated use of exotic insects to control insect pests in Europe. The BIOCAT database (Greathead and Greathead, 1992 – updated to end-2004) lists a staggering 137 species that have been included in a total of 276 releases since 1901. This extensive use of exotic natural enemies in Europe has been poorly regulated in some countries and, as a result, has not been without problems. This is not surprising since, for example, of the 65 species to have been introduced since 1908 into Spain alone, only four are considered monophagous (Jacas et al., 2006). Thus, it is highly likely that extensive non-target effects are occurring without being noticed. The recent problem with the predatory ladybird Harmonia axyridis (Pallas) (Majerus et al., 2006) highlights the dangers and may be another factor to hinder the acceptance of classical weed biological control in Europe.

There is an inherently greater general precaution over releases of herbivorous vs entomophagous arthropods because, as in the United States, the release agency is likely to be legally responsible should any biological control agent cause economic loss or significant environmental damage (Delfosse, 2005; Miller and Aplet, 1993).

EU countries would be expected to use the EPPO standards on the safe use of biological control (EPPO, 2000) as well as and the newly revised international advisory ‘Guidelines for the Export, Shipment, Import and Release of Biological Control Agents and Organisms Claimed to be Beneficial’ otherwise called the International Standards for Phytosanitary Measures, publication No. 3 or ISPM 3 (IPPC, 2005) [reviewed by Genovesi and Shine (2004); Kairo et al., (2003)]. These documents also highlight the need for consultation between relevant neighbouring countries. Interestingly, ISPM 3 recommends that the National Plant Protection Organization should conduct a pest risk assessment (PRA) either before import or before release of biological control agents and other beneficial organisms. It is also inclusive of fungal agents, i.e. non-formulated micro-organisms that are released with the expectation of establishment. It follows, therefore,
that any national regulatory procedures developed by EU member states for the release of classical biological control agents, as a result of EU directive 2000/29/EU, and based on ISPM 3, should be technically capable of including both macro- and microorganism agents.

Another organisation that became involved in the regulation of arthropod biological control agents was the Organisation for Economic Cooperation and Development who produced a set of guidelines (OECD, 2004). These guidelines are very thorough and deal with the likelihood of establishment and efficacy as well as direct non-target effects. Seeing the threat posed to the commercial biological control industry if these guidelines became the template for national regulation, the International Biocontrol Manufacturers’ Association (IBMA) proposed that the International Organisation for Biological Control (IOBC) should oversee the harmonization of all these documents into one. This harmonization document was published in 2005 (Bigler et al., 2005) with the stated aim of providing advice to the competent national authorities on the information required to perform risk assessments with respect to the import and release of an insect biological control agent (IBCA). Most of the guidelines remain applicable to weed biological control agents but these have been specifically excluded from consideration. The sections are divided as follows:

- Information requirements for the importation of non-native IBCAs for research
- Information requirements for the deliberate release of non-native IBCAs
  - not previously released
  - previously authorized for release
- Information requirements for the release of native IBCAs

Despite this mass of non-binding documentation it is yet to be shown how any nation will actually implement the guidelines in their national legislation when it comes to the release of an invertebrate classical weed biological control agent. Amazingly, the situation is even more bizarre when one considers plant pathogens.

**Plant pathogens**

The regulatory framework that exists in the EU for the use of plant pathogens in classical biological control is officially driven by one central EU directive which effectively hinders and may actually prevent their use. Although aimed at minimizing the use of chemicals by regulating ‘the placing of plant protection products on the market’, the EU directive for chemical pesticide regulation 91/414/EU, as updated by Council Directive 2005/25/EU, has been written in such a way as to include, by default, microorganisms as classical biological control agents. For example, the definitions section of the directive begins with a reference to the form in which the products are supplied to the user and the whole process revolves around label claims. This is contrary to classical biological control as there is no supply to users and there are no labels. That no specific consideration was given to micro-organisms as classical biological control agents is perhaps not unexpected, since it is a technique with no history in Europe. The situation, however, has been described as totally inadequate as it hinders progress (Seier, 2005).

A highly-specific obligate plant pathogen, released once in order to provide permanent control of the target weed, generates no subsequent sales, but must still go through a regulatory assessment application designed for non-specific herbicides. Such applications require large amounts of scientific data inappropriate for the use of pathogens as classical biological control agents (e.g. mammalian toxicity and efficacy versus current chemical alternatives). In addition, the application costs are high, although some EU countries appear willing to reduce the costs of application. The UK currently has a Biopesticide Scheme with dossier assessment costs of about £23,000 (33,400 Euro) and allows a reduced data package. Nonetheless, these costs and requirements are even considered prohibitive to the commercial biological control manufacturers who are producing products with labels and generating subsequent income.

Classical biological control agents are normally used in line with the EU goal of reducing chemical inputs to the environment. Yet such agents are blocked by inadequacies in the legislation aimed at stricter assessment of new pesticides. The consequences of 91/414/EU are wide reaching and could prevent the use of plant pathogens in classical biological control in Europe, despite an impeccable worldwide safety record (Barton, 2004) and high levels of effectiveness (Charudattan, 2005).

Recent reviews of the 91/414/EU directive have separated consideration of chemicals from microorganisms but there remains a need for a new directive or for revisions to cover classical biological control agents. As this will take considerable time, an interim measure might be to indicate that Member States apply the directive only to ‘formulated products’, thereby distinguishing between those microorganisms considered for commercialization (i.e. those requiring labels with storage, application and safety information) and those considered as classical fungal agents to be released once, or a few times, in the public interest.

One glimmer of hope is the current EU-funded project looking at the regulation of biological control agents in Europe (REBECA). The groups involved come from all fields of biological control from scientists, through producers to regulators, and are expected to make recommendations to the Commission. At a recent REBECA subgroup meeting it was accepted that classical weed biocatalysts agents that are fungi should be excluded from 91/414 (B. Ritchie, 2006, personal communication). It will be a step forward if such a recommendation is accepted by the EU.
The Japanese knotweed programme (see Djeddour et al., these Proceedings) may be the first to test the regulatory framework, since both an insect and a leafspot fungus are primary candidate agents. Communications with various government departments since the late 1990s have attempted to clarify the pathway for each type of agent with little progress until 2005. Then initial meetings were held with the Pesticide Safety Directorate through whom the UK Government’s Department of Environment Food and Rural Affairs (Defra) implements 91/414. Negotiations continue with an interdepartmental committee which was established just to deal with this particular issue. All parties are taking a pragmatic approach to the issues and mutually agreeable and practical solutions are expected.

**Pest Risk Assessment (PRA)**

As intimated above, it would seem that some version of a PRA will be favoured by EU Member States. Historically the treatment of potential crop pests has differed from that of uncultivated plants but these are now coming together in the key area of risk analysis (Baker et al., 2005). The International Plant Protection Convention (IPPC) was signed in 1951 as a response to increasing pest invasions, in particular that of the Colorado potato beetle, *Leptinotarsa decemlineata* Say. The IPPC has since produced 21 International Standards for Phytosanitary Measures (ISPMs) which are recognized by the World Trade Organisation (WTO). If a pest is of potential economic importance then it is considered a quarantine pest and joins the lists of such organisms posted by nations and trading blocks. To avoid unnecessary barriers to trade, both the IPPC and WTO stipulate that quarantine status and controls can only be put in place once a real threat is identified through a pest risk analysis. The tools for this are ISPM2 (FAO, 1996) and ISPM 11 (FAO, 2001).

According to the ISPM 2 revision document, which is currently out for member country consultation, biological control agents ‘are intended to be beneficial to plants or plant products without causing harm’. This is true from an ecosystem perspective but quite the opposite of the intention when one considers the target plant to which harm is most definitely intended. It goes on to say that, ‘when performing a PRA or monitoring their release, the main concern is unanticipated harm to non-target organisms in the PRA area’. The most appropriate current tool for assessing the risks associated with a biological control release is probably ISPM 11, which was established in 2001 and was updated in 2004 to include analysis of environmental risk and living modified organisms (FAO, 2004). Unhelpfully, it refers to pests throughout which from a biological control perspective is confusing since biological control agents must then be called ‘beneficial pests’. Nonetheless, the IPPC defines a pest as ‘any species strain or biotype of plant, animal or pathogenic agent, injurious to plants or plant products’ (FAO, 2004). As such, classical biological control agents rest firmly in ISPM 11. Furthermore, in section 1.1.2 of the latest version of ISPM 11, it is stated that a PRA may be initiated if a request is made to import an organism.

The general requirements of a PRA are fairly similar country to country but since they are written for pests, much of the information required is not necessarily appropriate for weed biological control. An analysis of the questions posed found that half are inappropriate, mainly because they deal with the risk of the pest’s arrival and the prospects for its control. It seems increasingly likely that this form of PRA will be applied to biological control agents, at least in the UK, and it will probably be under Plant Health regulations, as suggested above. This is much the same as the situation in South Africa where the Directorate of Plant Health and Quality regulates any biological control agent release.

**Discussion**

Biological control of weeds in Europe is just beginning and has all the teething troubles associated with such a period. The unclear funding and regulatory situation coupled with a general inertia has hindered the development of classical biological control and in some areas Europe reflects the situation in countries such as Australia and New Zealand as it was decades ago. Europe has an advantage in that it can learn from history and avoid the painful mistakes made by our pioneering ancestors, especially since a lot of biological control expertise is already present in European countries.

It is clear that at least those regulations governing fungal biological control agents are in need of revision. My proposal to precede description of Plant Protection Product with the word ‘formulated’ in the 91/414 Directive could solve most of the problems surrounding the presumably mistaken inclusion of classical fungal weed agents. As is often the case with authorities, simply trying to avoid regulations by requesting an exemption is not the best course, and the inclusion into Plant Health legislation would seem to be the best solution. However, it is likely that the early applications will need to be considered by all interested parties in the absence of tailored regulations.

As Europe comes to terms with its CBD commitments and the growing scale of invasions by environmental weeds, classical biological control should become more commonplace. This is particularly so in aquatic and riparian systems, where most of Europe completely bans the use of chemical herbicides and no real alternative exists. The driving force in such delicate habitats may well turn out to be the Water Framework Directive (Dec. 2000) which requires parties to ensure that all their waterways reach ‘good status’ by 2015. The presence of invasive alien species in or on
these waterways logically would prevent this goal being achieved and should focus attention on alternative approaches to their management, ones that are commonplace in countries in other continents—that is, classical biological control.

**Acknowledgements**

I would like to thank the Defra Japanese knotweed Project Board for their advice and counsel as well as the project funders for supporting the research.

**References**


Barton, J. (2004) How good are we at predicting the field host-range of fungal pathogens used for classical biological control of weeds? _Biological Control_ 31, 99–122.


