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Environmental Protection Procedures and the Biological Control Programme Against Gorse in New Zealand

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Abstract

Gorse is arguably the most economically damaging weed in New Zealand but sometimes has value as: a source of pollen for bees; a nurse crop for native forest regeneration; fodder for goats; protection against erosion; and containment and shelter for grazing animals. Conflicts have therefore arisen between those who utilise gorse and those who wish to control it. Analysis suggests that the direct economic benefits which could arise from successful biological control of gorse exceed the direct costs by at least 12:1. Non-economic costs are also outweighed by the benefits. Current introduction procedures are described including methods for resolving conflicts-of-interest. These currently stress mediation and consensus rather than legislation and litigation. Conflicts in the gorse biological control programme have been resolved using these methods, and gorse spider mite, *Tetranychus lintearius*, should be imported shortly.

Introduction

In New Zealand, as in many other countries, there are continuous demands for increased public participation in decisions which could adversely affect the environment. Decisions concerning the biological control of weeds are not exempt from such scrutiny, and there are two major issues of concern to the public. Firstly, do the costs imposed by a plant sufficiently outweigh its benefits to justify an attempt to biologically control it? Secondly, are the proposed control agents safe to release into the new environment?

To resolve these issues effectively, procedures are required which not only ensure that the correct decisions are made, but also that they are made with the minimum of public dissent. Mechanisms must be included for consulting the affected parties, whether they be a small number of organisations, each with a strong interest in the issue, or individual members of the public. There is a danger that such a process could become expensive, highly bureaucratic and could hinder the implementation of appropriate and desirable biological control programmes. While they must be sufficiently fair and wide-ranging to assess all major conflicts-of-interest in any proposed programme, procedures must also be flexible enough to enable a decision to be made economically and quickly.

Authorities in different countries have developed different responses to deal with this problem (Cullen and Delfosse 1985, Field and Bruzzese 1985, Turner 1985, van Zon 1985). In Australia, controversy surrounding the *Echium plantagineum* L. (Boraginaceae) biological control project led to prolonged court action and then to the implementation of the *Biological Control Act 1984* to provide a legal framework for the universal approval of target plants and their control agents.

A similar controversy has arisen in New Zealand over gorse, *Ulex europaeus* L. (Fabaceae) (Syrett *et al.* 1985). Gorse is the most economically damaging weed in New Zealand but some claim that it has significant economic and environmental value. This has led to conflicts-of-interest between those who wish to have the weed controlled and some members of the community who wish to exploit its positive qualities.

Entomology Division, DSIR resumed its biological control programme against gorse in 1976 and a paper was published which discussed the suitability of gorse as a subject for biological control (MacCarter and Gaynor 1980). Public awareness of the programme and of the

conflicts-of-interest involved has increased greatly since then. In response, Entomology Division has revised and restated its policies and procedures employed when importing new insects and diseases as biological control agents to take account of public opinion in a more formal manner (Longworth 1987*a*,*b*). The gorse programme has been used as a case study to develop and test these revised procedures (Longworth 1987*b*).

This paper describes briefly the procedures currently followed when importing new species into New Zealand. Our methods for resolving conflicts-of-interest within the community are illustrated by the programme to control gorse biologically and are discussed in relation to those practised in other countries, especially Australia. Finally, the implications of the gorse example for future administration of biological control of weeds projects are discussed briefly.

Introduction Procedures in New Zealand

Entomology Division, DSIR is the only organisation in New Zealand which presently imports biological control agents for use in agricultural and horticultural environments. Permits to import control agents, including insects, mites and pathogens, are granted under provisions of the *Plants Act 1970*. This *Act* is administered solely by MAFQual, a branch of the Ministry of Agriculture and Fisheries.

In issuing permits, MAFQual are now bound by the *Environment Act 1986*, the aim of which is

> ... to ensure that, in the management of New Zealand's natural and physical resources, full and balanced account is taken of all values... which are placed by individuals and groups in the community on the quality of the environment, and in so doing to have regard to the needs of future generations.

The policy for achieving this aim is set out in the Environmental Protection and Enhancement Procedures 1987 which oblige Government departments to carry out an Environmental Impact Assessment (EIA) whenever a decision is made which may affect the environment. At its simplest, such an assessment "need be no more than a mental check of the likely environmental consequences of a particular decision...", but decisions of greater complexity justify "... a more rigorous examination backed by appropriate documentation."

The scope of the assessment, including the degree to which the public should participate in the decision, must be determined in consultation with MAFQual early in the proposed biological control programme while "... there is a clear choice between various courses of action including the alternative of doing nothing".

Harris (1985) has pointed out that biological control is only worthwhile if it provides a positive return on investment, and that full evaluation of the likely monetary and ecological costs and benefits must be carried out before a programme commences.

Proposals for new biological control programmes against weeds in New Zealand arise within Entomology Division, in response to community needs. Proposals are then evaluated fully, with the Division calling on outside expertise as required. This involves:

(a) Documentation and assessment of all known economic and environmental conflicts-of-interest and estimation of the likely cost to benefit ratio of the proposal;

(b) An assessment of the risks involved in not proceeding with the proposal, including environmental damage caused by the weed and its economic costs to the community;

(c) An assessment of the quarantine risks such as associated parasites and diseases; and

(d) An estimate of the cost of the programme. This evaluation is a cost/benefit analysis in its broadest sense.

If the evaluation concludes that the proposed programme is desirable, MAFQual is consulted to determine the scope of any further environmental impact assessment. MAFQual then take appropriate advice, depending on the complexity and contentiousness of the issues. They may reject the proposal, find the evidence presented to be adequate, or request that further steps be taken to assess the impact of the proposal. This could involve further discussions with experts, with affected parties, or full public participation through written submissions.

An EIA which incorporates all of the required information is then prepared and submitted to MAFQual with an import permit application. If permission both to import and release the agent is sought, the accompanying information must be comprehensive and include host-plant testing information. If permission is sought only to import the agent for further study in secure surroundings, the EIA would be primarily concerned with questions of quarantine risk. A subsequent request for permission to release would require the EIA to be upgraded.

MAFQual may undertake any review of the evidence which it sees fit and has final control over whether a control agent is to be imported or released.

The Biological Control Programme against Gorse in New Zealand

The History of the Programme

Gorse is a spiny shrub which can form impenetrable thickets over 2 m tall. Despite intensive control efforts, gorse continues to occupy potential grazing land, and its competitive ability inhibits the establishment and maintenance of exotic forests (Zabkiewicz and Balneaves 1984). Plants can be found on 900,000 ha, of which 166,000 ha has greater than 40% gorse cover (Sandrey 1985). It occupies 3.6% of the farmable land in the South Island of New Zealand and farmers there perceive it as their second worst weed (Bascand and Jowett 1982). Gorse remains a threat even on cleared land because the seeds remain viable in the soil for at least 30 years (Hill 1987).

Early studies carried out in England by Chater (1931) and Davies (1928) identified several potential control agents for gorse in New Zealand. Even then, conflicts arose concerning the proposed control programme because gorse was valued as a hedge plant. It was decided only to import species which could restrict the spread of the weed out of hedgerows. As a result, the only species introduced was the gorse seed weevil, *Apion ulicis* Forst. (Coleoptera: Apionidae), which was released in large numbers 1931 to 1946 (Miller 1947, 1970). This species established widely and destroys a large proportion of the seed produced each spring, but appears to be of limited value as a control agent in New Zealand because a significant amount of seed is produced at times of the year when the weevil is reproductively inactive (Cowley 1983).

The importance of gorse as a hedge plant has declined since 1930 and there has been renewed interest in the possibility of biological control of gorse. In 1962, CIBC surveyed the insects which attacked gorse in France on behalf of Entomology Division, DSIR (Zwölfer 1962, 1963, 1965). Similar surveys have since been carried in Spain and Portugal (Markin & Yoshioka, this volume, O'Donnell 1986) and southern England (Hill 1982). A number of potential control agents have been identified (Hill 1983, 1986) and since 1980, biological studies and host-range testing have been carried out on four of these. These are: *Agonopterix ulicetella* Haw. (Lepidoptera: Oecophoridae) (Hill *et al.*, unpublished data, Markin and Yoshioka, this volume), *Dictyonota strichnocera* Fieb. (Hemiptera: Tingidae) (Hill *et al.* unpublished data), *Sericothrips staphylinus* Haliday (Thysanoptera: Thripidae) (O'Donnell, unpublished data) and *Tetranychus lintearius* Dufour (Acari: Tetranychidae). Studies to confirm the reproductive isolation of this mite from closely-related species and host-range studies have recently been completed. *T. lintearius* has now been recommended as a control agent for release in New Zealand (Hill 1987, Hill and O'Donnell, unpublished data).

Recent Progress

In the face of some public concern about the advisability of gorse control in New Zealand, Entomology Division began a full evaluation of the consequences of the programme for primary production and the natural environment.

A cost/benefit analysis of the proposal to biologically control gorse was commissioned. Sandrey (1985) estimated that direct savings (such as reduced control costs) of $ NZ 18 M could accrue annually to farmers and foresters if 50% reduction in gorse vigour could be achieved. Additional indirect benefits (such as increased production) could exceed this amount (Sandrey 1985).

Sandrey (1985) also listed the five major beneficial characteristics of gorse:

(1) Beekeepers regard gorse as a valuable source of pollen in early spring, when there are few other pollen sources to feed larval bees. Pollen shortage in spring can reduce the number of worker bees available to undertake pollination and to forage for nectar in summer.

(2) Native forest plants can germinate and grow under mature gorse stands. Some believe that it is an important nurse crop for regenerating native forests.

(3) Goats readily eat gorse and it has been suggested that gorse could be managed as a fodder for the expanding goat industry.

(4) Gorse grows on many slopes which are prone to erosion and may be a stabilising influence there.

(5) Gorse was originally used as a hedge to shelter and contain stock. It is still used for this purpose to a limited extent.

Sandrey (1985) surveyed all commercial and semi-commercial beekeepers in New Zealand to find out how valuable they thought gorse was and what they thought the consequences of successful control would be for them. On the basis of this data, he estimated that a 50% reduction in the number of gorse flowers could potentially result in a maximum cost of $ NZ 1.6 M. Beekeepers remain the only group who could suffer direct economic loss from the programme.

Sandrey (1985) estimated that if gorse was successfully controlled, the direct benefit to direct cost ratio for the control of gorse was approximately 12:1, but that other indirect economic benefits would increase this ratio.

In a later report, Sandrey (1987) also examined the possible impact of successful gorse control on the goat industry. He concluded that the loss of some gorse as a source of goat fodder was not a threat to the industry and so was not a compelling reason for abandoning the proposal to attempt biological control of gorse.

In 1985, opinions regarding the proposal were sought from a wide range of organisations and interest groups throughout New Zealand. The responses were analysed, discussed and summarised (Hill 1986). This report complemented the cost/benefit analysis because it concentrated particularly on non-economic issues such as the possible impact of gorse control on the natural environment. This report concluded that the benefits which would be obtained from successful gorse control outweighed the benefits to be gained from retaining it at current densities.

The evaluation conducted by Sandrey (1985, 1987) and Hill (1986), and summarised by Hill and Sandrey (1986), concluded that the existing biological control project being conducted by Entomology Division DSIR against gorse should continue.

MAFQual was then consulted to determine what further information was required to complete an adequate EIA. Further information was requested regarding the likely impact of biological control on gorse populations in New Zealand (including the impact on landscape

and recreational values), the possible costs to the goat industry, the benefits to traditional agriculture, and the impact on herbicide usage. In addition, MAFQual decided that the proposal was sufficiently important and contentious that the completed EIA should be made available for public comment by way of written submissions.

An application for permission to import and release the mite *T. lintearius* was finally lodged with MAFQual, supported by the environmental impact assessment summarising all available information regarding the proposed project, including an account of completed host-range studies and incorporating the reports prepared by Sandrey (1985, 1987) and Hill (1986). Copies of the assessment were lodged in all major public libraries in New Zealand. The proposed programme was then announced widely through press releases and public notices, and by letter to numerous interested parties and submissions on the issue were invited. In early February, MAFQual assembled a committee of four independent scientists with expertise in entomology, land use, plant ecology and agricultural science to consider all of the evidence and to recommend to MAFQual:

(1) Whether gorse was a suitable target for biological control in New Zealand; and

(2) Whether *T. lintearius* should be released in New Zealand to help control gorse.

The committee concluded that gorse control was a desirable aim and that *T. lintearius* was a suitable control agent for introduction into New Zealand. It is now expected that the mite will be imported and released by August 1988.

Discussion

The history of the *E. plantagineum* biological control project in Australia is now well known. Complainants opposed to the control of *Echium* successfully applied to the courts for a judicial review of the decision to proceed with the programme. Expert legal opinion suggested that CSIRO might lose the case, and so they withdrew. CSIRO subsequently sponsored the *Biological Control Act 1984* which gave legal sanction to approved biological control programmes (Cullen and Delfosse 1985). While establishment of this legally binding mechanism may forestall legal action, it may also increase the costs and delay of carrying out biological control projects (Cullen and Delfosse 1985).

The laws of Australia and New Zealand have a common basis. For this reason many of the legal restraints described by Cullen and Delfosse (1985) which led to the establishment of the Australian *Act* also apply in New Zealand. In particular, the government must be able to justify legally any act which interferes with the person or property of an individual (at least in peace time) and acting in the public good is no justification for such an act. Any person of standing can apply for judicial review of such an act unless it is sanctioned by legislation such as the *Biological Control Act 1984*.

Legal advice suggests that a New Zealand court would be primarily concerned with three issues:

(1) Was the decision in accordance with the law?;

(2) Was the decision fairly arrived at after appropriate consultation?; and

(3) Was the decision a reasonable one in face of the known evidence?

All of these requirements must be met in considering the controversial proposal to control gorse biologically. DSIR and MAFQual have made strenuous efforts to ensure this. We believe that accepted pathways have now been established which allow full and fair public participation in the decision-making process when this is necessary. These include the appointment of an independent advisory committee to help decide whether the evidence presented was fair and reasonable.

While such committees are common elsewhere (Turner 1985, Cullen and Delfosse 1985), this is the first time such independent scrutiny has occurred in New Zealand. This appears to be an important step in assuring independent review of such questions and will be used more frequently in the future.

The impending decision to proceed with the gorse programme and to allow the release of *T. lintearius* in New Zealand had been made with only minor refinements to procedures which have been successfully employed for the introduction of biological control agents for many years (Longworth 1987*a*,*b*). Legal opinion suggests that existing legislation will allow biological control projects to proceed without the enabling legislation recommended by Harris (1985) and enacted in Australia. For the present we intend to follow this path stressing mediation rather than legislation (Turner 1985) but it remains to be seen whether future court action modifies this approach.

So far, the results achieved have been very encouraging. Our attempts to seek out and face conflicts, and our willingness to consult and discuss at every turn has been widely praised. We have found that people are at their most militant when ignored and are generally willing to leave final decisions to others as long as their own point of view is genuinely taken into account. As a result, almost all of the opposition which we faced in 1985 has now been withdrawn.

The legislation regarding the importation of all forms of exotic biota into New Zealand is currently being revised. It remains to be seen what impact this review will have on existing procedures for the importation of biological control agents. It may provide the vehicle for enabling legislation similar to the Australian *Biological Control Act 1984* (Commonwealth of Australia 1984).

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