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The effects of legislation and policy in New Zealand and Australia on biosecurity and arthropod biological control research and development

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ABSTRACT

The widespread and intensive application of biological control can create serious gaps between what may be naïve expectation versus reality. An extreme view is that there is a biological control solution for every problem. Similarly, there is the expectation that there are readily available and cheap biosecurity measures that, while having no effect on trade, work flawlessly. Such expectations can lead to two areas of difficulty. The first is that science is seen to have failed when biological control does not work as well as hoped for (and/or there are impacts on non-target species). The second is that people expect a huge amount from their biosecurity.

Alongside this there has been the emergence of legislated—for precautionary principle—based expectation of technical certainty. This is particularly problematic when applied to complex ecological questions. Such circumstances have led to something of a disjunct between the expectations of legislators and what is required of the implementing agencies. This in turn has elicited difficulties in terms of what science is able to deliver for a reasonable/acceptable cost. Such cost is often borne by applicant groups, etc. It is aspects of the above situation that have contributed to the politicisation of biological control and biosecurity issues in New Zealand in the last 15 years.

This contribution highlights some of the differences between legislation, policy and what science can deliver relating to biological control and biosecurity in New Zealand and Australia, and discusses some of the inconsistencies and impracticalities in their implementation with a focus on arthropod biological control examples.

1. Introduction

Endeavours to achieve biological control are not new; indeed growers in ancient Asia and the Middle East were enthusiastic about the use of predaceous ants to control phytophagous plant pests. However, it was not until the early 19th century that coherent interest in biological control arose (e.g. Kirby and Spence, 1815). Thereafter, interest in biological control continued to grow and reached its high-point between 1930 and 1940; much of this was in the USA. However, this focus declined sharply during World War 2 and stayed in abeyance thereafter largely because of the appearance of synthetic pesticides (DDT, etc.). The publication of Rachel Carson's (1962) book the 'Silent Spring' helped to reignite interest in biological control as well as hasten the arrival of modern ideas such as integrated pest management and other non-insecticidal approaches to pest suppression. These latter techniques included sterile male releases and pheromonal confusion techniques, etc.

The background to 'biosecurity' is very different and the term has only been adopted relatively recently. The term 'biosecurity' was not used anywhere until the late 1980s. Its use was first formally adopted in New Zealand with the development of the *Biosecurity Act 1993* which brought together the *Animals Act 1967*, the *Plants Act 1970* and the *Apiaries Act 1969* into one piece of legislation. Even so, 'biosecurity' was not formally defined. Eventually the *Biosecurity Strategy for New Zealand* (2003) provided the following definition:

> Biosecurity is the exclusion, eradication or effective management of risks posed by pests and diseases to the economy, environment and human health.

Interestingly, the FAO (2007) has more recently defined 'biosecurity' as "a strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) for analysing and managing relevant risks to human, animal and plant life and health, and associated risks to the environment." As such, biosecurity covers food safety, zoonoses, the introduction of animal and plant diseases and pests, the introduction and release

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of living modified organisms (LMOs) (e.g. genetically modified organisms (GMOs)) and their products, and the introduction and management of alien species.

Since the 1960s, but particularly in the last two decades, in New Zealand biosecurity and biological control have both become a source of significant public and political interest. Biosecurity became more widely known in the 1990s with the discovery of Asian tiger mosquito (*Aedes albopictus*) in association with the importation of used tyres. In 1996 the Mediterranean fruit fly (*Ceratitis capitata*) incursion occurred; this was efficiently eradicated in the same year (Holder et al., 1997). However, in the same year the white spotted tussock moth (*Orgyia thyellina*) was discovered in Auckland's eastern suburbs (Ridley et al., 2000). This moth was eventually eradicated in 1998 through the repeated aerial spraying of *Bacillus thuringiensis kurstaki* (formulated as Foray 48B). This aerial activity greatly increased biosecurity awareness and coincided with other biosecurity jolts including the discovery of the clover root weevil (*Sitona lepidus*) in 1996 (Barratt et al., 1996) which has not been eradicated. Thereafter, the varroa mite (*Varroa destructor*) was found in 2000 (not eradicable) (Belton, 2000) and the foot and mouth disease outbreak in the UK occurred in 2001. Public concern/interest probably reached a crescendo after the Auckland discovery of painted apple moth (*Teia anartoides*) in Glendene in 1999; this resulted in up to 20 aerial applications of *B. thuringiensis kurstaki* (again, formulated as Foray 48B). This treatment was required for the moth's eradication over an area of 10,500 ha in Auckland. Since then, public concern has been sustained by the discovery of gum-leaf skeletoniser (*Uraba lugens*) in Auckland as well as aquatic pests such as the alga, *Didymosphenia geminata*, an invasive kelp, *Undaria pinnatifida*, a sea squirt, *Styela clava* and very recently, the Mediterranean fanworm (*Sabella spallanzanii*).

During this time, biological control and biosecurity became very important to maintaining New Zealand's '100% Pure' reputation (Tourism New Zealand 1999–2008). Notably, successful examples of non-pesticidal pest suppression have been the integrated fruit production system developed by HortResearch (now Plant & Food Research) (e.g. Suckling et al., 2003), the use of biological control in vineyards (Fiedler et al., 2008) and AgResearch's biological control programmes against various broadacre weevil species (e.g. Goldson and Gerard, 2008; Barker and Addison, 2006). This is appropriate as New Zealanders' nervousness about pesticide contamination and non-target effects has never subsided (e.g. Watts, 1994); this too has contributed to ongoing interest in biological control and constraints to the methodologies used to maintain New Zealand's biosecurity.

2. The status quo

There is no real argument against the extensive application of biosecurity methodologies and the conscientious pursuit of cost-effective biosecurity measures. However, a serious gap has probably opened up between what may be naïve political/social expectation of these scientific areas and reality. At one extreme, there is the simplistic and almost euphoric view that there is a biological control solution for every problem; similarly, there is unrealistic expectation that it is possible to develop iron-clad biosecurity with no adverse effects on trade. Both of these extreme positions are attractive politically; indeed, it is very compelling to argue the merits of biological control rather than the use of the products of multinational pesticide manufacturers. As a result, in the eyes of some, the users of pesticides (e.g. City Councils) can be unfairly construed to be negligent because they are not resorting to biologically based control methods.

To some extent the science community itself may be implicated in such unrealistic expectation. In a highly competitive (results-based) funding environment such as that found in New Zealand, applicants (understandably) have been incentivised to be zealous about the prospects for biological control. The reality is that the biological control success in New Zealand over the last 100 years is very modest; Cameron et al. (1993) found that only about 24% of introductions over the preceding 116 years had any discernable impact although with the advent of more information obtained from DNA-based investigation, this figure may well be improving.

3. Misalignments between the law-makers, the implementing agencies and the science community

Further to the above, something of a disjunct has developed between the expectations of biological control and biosecurity legislators and what is required of the implementing agencies and what science is able to deliver for a reasonable/acceptable cost.

Legislators and some government strategists have been highly specific in what they expect to see from implementing agencies in terms of precautionary principle-driven risk requirements. To be fair, this very much reflects public concern about such matters. Such circumstances have in turn, required regulatory/implementing authorities to adopt nil/minimal risk requirements, or at least, require some adverse and beneficial effect information on proposed biological control/biosecurity interventions. As a direct result of such expectation, it is then incumbent on the science community to produce data that show evidence of safety, or at least an informed understanding of likely outcomes. Given that science deals with probabilities (and that there is more-or-less the prospect of diminishing returns on effort to define risk at increasing levels of precision) outside groups understandably become frustrated with the scientists who (often working to a restricted budget) cannot unequivocally guarantee the required precision. In effect, such well-intended process often leads to an impasse that can result in significant lost opportunity and frustration with the scientists.

In some ways, this demand for certainty has led to politicisation of biological control and biosecurity that is exemplified by the public concern during Auckland's aerial spraying programmes several years ago. This still has not completely run its course.

4. The legislative environment

The legislative environment for biological control and biosecurity is complex with numerous overlapping responsibilities and intentions; in addition, there are international standards that do not necessarily align with domestic intent. For example, in both Australia and New Zealand biological control requirements are set out in multiple pieces of legislation and/or standards. These include:

International standard

- International Standard for Phytosanitary Measures No. 3 (ISPM 3) entitled: *Code of conduct for the import and release of exotic biological control agents* (2005).

Australian legislation

- Biological Control Act 1984.
- Quarantine Act 1908.
- Environment Protection and Biodiversity Conservation Act 1999.

New Zealand legislation (Parliamentary Counsel Office, 2009)

- Hazardous Substances and New Organisms Act 1996.
- Biosecurity Act 1993.