

Research on invasive pests and diseases in New Zealand and the law

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Two New Zealand statutes have important implications for research with organisms not previously found in New Zealand and either incidentally or illegally introduced. The Biosecurity Act 1993 and the Hazardous Substances and New Organisms Act 1996 define the legal framework and allowable activities for 'unwanted' and 'new' organisms, respectively. Aspects of these Acts that are relevant to research activities possible with plant pest and disease organisms after their discovery, in particular those organisms requiring rapid development of management strategies and tools, are summarised. The need for accurate, detailed and accessible lists of 'unwanted' and 'new' organisms, and the need for the Ministry for Primary Industries and the Environmental Protection Authority to respond rapidly when the status of these organisms needs to be changed is highlighted. Consideration should be given to making the legislation concerning 'new' organisms more applicable to incidentally or illegally introduced organisms.

Introduction

New Zealand productive systems (e.g. pastures, crops, orchards, plantation forests) and natural systems are subject to continued invasion by new pest and disease species from overseas (see Goldson & Suckling 2003; Kriticos *et al.* 2005; Froud *et al.* 2008), and this is likely to increase with increased trade (Liebhold *et al.* 2012) and international travel. In some cases, these new species are known to be sufficiently damaging to these productive and natural ecosystems that new pest management strategies and tools need to be developed rapidly. Recent examples include the clover root weevil *Sitona lepidus* (Eerens *et al.* 2005), the potato tomato psyllid *Bactericera cockerelli* and *Candidatus Liberibacter solanacearum* (Teulon *et al.* 2009), the causal agent of kiwifruit bacterial canker *Pseudomonas syringae* pv. *actinidiae* (Psa) (Everett *et al.* 2011a), the Monterey pine aphid *Essigella californica* (Flynn *et al.* 2003), and *Didymosphenia geminata* (Lyngbye) Schmidt (commonly known as didymo) (Bickel & Closs 2008).

The Ministry for Primary Industries (MPI) was formed on 30 April 2012 as a result of the merger of the New Zealand Food Safety Authority, the Ministry of Fisheries, and the Ministry of Agriculture and Forestry. MPI investigates all suspected new pest or disease species found in New Zealand. Its response includes establishing the identity of the new incursion (i.e. genus/species name), determining its distribution within New Zealand, assessing its likely impact on New Zealand's productive and natural ecosystems, undertaking a cost/benefit analysis of likely impact and management response, and the feasibility of either eradication or long-term management (MAF BNZ 2008a). In many cases, where eradication is not considered feasible, there

is a need for research to support the rapid development of new systems and tools for management of these new species once they are considered permanently established in New Zealand.

Two New Zealand statutes have important implications for conducting research on new pest and disease organisms that have been introduced either incidentally (a new organism that is imported in or on goods, with some specific exceptions) or illegally into New Zealand. These are the Biosecurity Act 1993 and the Hazardous Substances and New Organisms Act 1996 (HSNO), which define the legal framework and allowable activities for 'unwanted' and 'new' organisms, respectively.

This paper highlights some of the important issues that are pertinent to research activities carried out with pest and disease organisms after they have been discovered in New Zealand. The aim is not to interpret the legal intention of these Acts, but to identify some issues that plant protection researchers need to consider when working with new pest and disease incursions within New Zealand, and to suggest ways to make that activity more effective with respect to the law. This paper does not concern itself with the introduction of new biological control agents into New Zealand or the development of new genetically modified organisms, which both have clear status as new organisms.

Biosecurity Act 1993

This Biosecurity Act provides a legal basis for excluding, eradicating and managing pests and diseases and unwanted organisms, and its powers can be variously used by MPI, other government agencies, regional councils, and pest management agencies (Biosecurity Act 1993). The Act provides a range of functions, powers, and options for the management of risk organisms (MAF BNZ 2008b). The Biosecurity Act is administered by MPI, giving it considerable powers to respond to new pest and disease incursions within New Zealand (MAF BNZ 2008a).

The Act defines an 'unwanted organism' as 'any organism that a Chief Technical Officer believes is capable or potentially capable of causing unwanted harm to any natural and physical resources or human health'. These organisms may or may not already be present in New Zealand. This definition also includes any 'new' organism that EPA has declined approval to import (an unlikely scenario for most pests and diseases) and any organism specified in Schedule 2 of the HSNO Act (no invertebrate plant pests or diseases are listed there).

The Biosecurity Act also places a general duty on all persons in New Zealand to inform the MPI (as MAF in the Act) of the presence of an organism not normally seen in New Zealand (Section 44) or a 'notifiable' organism (Section 46), respectively.

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The Biosecurity Act stipulates activities that cannot be carried out with ‘unwanted organisms’ (Section 52) (prohibited activities). “No person shall knowingly communicate [*Oxford English Dictionary* = *transmit*], cause to be communicated, release [*no definition within the Act but in relation to ‘new organisms’ this means to allow the organism to move within New Zealand free of any restrictions other than those imposed in accordance with the Biosecurity Act 1993 or the Conservation Act 1987*], or cause to be released, or otherwise spread, any pest or unwanted organism except” under special circumstances largely governed by MPI. Additionally, the Act stipulates “that the owner or person in charge of an organism which that person knows or suspects constitutes, contains, or harbours a pest or ‘unwanted’ organism” must not “propagate, breed, or multiply the pest or ‘unwanted’ organism or otherwise act in such a manner as is likely to encourage or cause the propagation, breeding, or multiplication of the pest or ‘unwanted’ organism” (Section 53 (1)(c)).

Making an organism ‘unwanted’ triggers actions to be taken to manage the organism at the border or to require any activity (e.g. research) within New Zealand to be approved. In order to conduct research on an ‘unwanted’ organism, permission must be obtained from MPI (see MAF BNZ 2010a) and generally needs to be carried out under containment conditions.

Hazardous Substances and New Organisms Act 1996 (the ‘HSNO’ Act)

The purpose of the HSNO Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and ‘new’ organisms (HSNO 1996). The Act defines what is a ‘new organism’ (Section 2A (1)) and what is not (Section 2A (2)). A pest or disease species regarded as having newly invaded New Zealand is very likely to be a ‘new organism’ because it is ‘an organism belonging to a species that was not present in New Zealand immediately before 29 July 1998’. It may also be a ‘new organism’ if it ‘belongs to a species, subspecies, infrasubspecies, variety, strain, or cultivar that has been eradicated from New Zealand’ such as the white-spotted tussock moth, *Orgyia thyellina* (Morgan 1998). The Act is not clear if this relates to organisms first found before and/or after 29 July 1998 and is clearly problematic where there is disagreement over whether a newly discovered organism is the result of a new introduction or merely a failed eradication as is the case with the Mediterranean fruit fly (*Ceratitidis capitata*) in California (Myers *et al.* 2000). The Act does, however, make it clear that a ‘new organism does not cease to be a new organism because it is an incidentally imported new organism’, as is likely to be the case with many new pest and disease incursions or ‘because it is subject to a conditional release approval’, or ‘because it is a qualifying organism approved for release with controls’. The last two conditions are unlikely to be relevant for pest and disease species.

A range of activities using new organisms are prohibited without HSNO approval (Section 25 (1)(b)). Approval is required to import, develop, field test, or release new organisms. These terms are described below.

- ‘Import’ relates to intentional importation of the organism into New Zealand and generally into containment. This would seem to be a reasonable restriction in most cases.

- ‘Develop’, in relation to incidentally imported organisms, includes ‘the deliberate isolation, aggregation, multiplication, or other use of the organism’. This could be interpreted as prohibiting the rearing of new pest organisms for research purposes and, it is suggested that this requires further policy consideration.
- ‘Field test’ means ‘the carrying on of trials on the effects of the organism under conditions similar to those of the environment into which the organism is likely to be released, but from which the organism, or any heritable material arising from it, could be retrieved or destroyed at the end of the trials’. This definition seems to relate to newly introduced biological control agents or newly developed genetically modified organisms. It does not explicitly rule out ‘incidentally imported organisms’, so its application to research on new pest and disease incursions is not clear and requires further policy consideration.
- ‘Release’, in relation to new organisms, means ‘to allow the organism to move within New Zealand free of any restrictions other than those imposed in accordance with the Biosecurity Act 1993 or the Conservation Act 1987’. This could be interpreted as prohibiting the movement of an established pest new organism between laboratories (i.e. not under containment) or its release onto field sites, despite these pests existing outside containment in fields or orchards. Again, another area worthy of policy consideration.

The HSNO Act also allows for MPI, or its agents, to isolate, aggregate, multiply, or use an incidentally imported new organism for the purpose of identifying, managing, or eradicating that organism (Section 25 (1B)) but this option does not seem to be used very often for research purposes. However, what constitutes an agent is not clear and requires further policy consideration.

Discussion

In the following discussion, some of the issues that need to be considered before undertaking research for the management of new pest and disease incursions in New Zealand are highlighted, and some recommendations on how these might be addressed are provided.

Determination of ‘unwanted’ and ‘new’ organisms

MPI keeps a searchable on-line register of unwanted and notifiable organisms that it has considered (MAF BNZ 2010b), although there are undoubtedly many other species that could be added if additional risk assessments were carried out. Similarly, the EPA maintains a publicly available list of organisms where decisions on the ‘new’ or ‘not new’ status have been considered, and there are working lists of organisms that require further information. Organisms are added to these lists as new information becomes available.

It is usually very clear whether an organism is ‘unwanted’ or not, as it is specifically designated as such by MPI. However, ‘new’ organisms are determined primarily through interpretation of section 2A of the HSNO Act. Many newly discovered invasive organisms would clearly be ‘new’ organisms, for example the gypsy moth, *Lymantria dispar*, and related species, which are the subject of a national surveillance programme (Brockerhoff *et al.* 2010). However, in some cases it is not clear whether or not a new pest or disease species is a ‘new’ organ-

ism. For example, the causal agent of the zebra chip disease in potatoes (*Candidatus Liberibacter solanacearum*) (first detected in 2008) may have been introduced with its insect vector host (*Bactericera cockerelli*) in 2005–06 (Teulon *et al.* 2009) or it may have been in New Zealand before then (and before July 1998). Nevertheless, this species was made ‘not new’ by Order in Council in 2011 under section 140(1)(ba) (SR 2011/299; Hazardous Substances 2011) (see below for further discussion) to make its legal status under the HSNO Act absolutely clear. For similar reasons, a determination on the status of the causal agent of kiwifruit bacterial canker *Pseudomonas syringae* pv. *actinidiae* (Psa) was made under Section 26 of the HSNO Act (EPA 2011). This determined that Psa was not a ‘new’ organism because it belongs to a species, *Pseudomonas syringae*, which had already been determined as being not a ‘new’ organism, even though the specific pathovar was not considered to be in New Zealand before the 2010 outbreak. This process took approximately 2 weeks. Psa remains an ‘unwanted’ organism under the Biosecurity Act and therefore still subject to regulation.

Lack of clarity around new organisms may also occur for a number of reasons that might require a determination under Section 26 of the HSNO Act (Table 1). Although not all examples are important pests and diseases, they illustrate complexities in categorising which organisms are new and which are not.

Options for research on ‘new’ organisms

It is generally considered that the HSNO Act was designed to deal with the possible intentional release following risk assessments of new organisms into New Zealand such as biological control agents or genetically modified organisms, and to distinguish beneficial from detrimental organisms (Upton 1999). However, it does not appear that it was intended to deal efficiently with unintentionally introduced organisms that cannot be eradicated, but must be managed, under the Biosecurity Act. Therefore the options for research on ‘new’ organisms under the HSNO Act can appear somewhat inappropriate.

There are provisions under the HSNO Act (Section 34) to seek approval from the EPA to ‘import for release’ and ‘release from containment’, including a Rapid Assessment (Section 35). The Minimum Standards (Section 36), however, appears to rule out considering any new pest and disease incursion for release since it requires that an application should be declined if the new organism is likely to cause disease, be parasitic, or become a vector for human, animal, or plant disease, as is the case with many pest and disease incursions. EPA can also authorise approval ‘to import or release new organisms with controls’ (Section 38A), including a Rapid Assessment (Section 38BA), but the nature of new biological invasions and the controls imposed upon them would appear to make this option impracticable. For example, the controls may include: limiting the dissemination or persistence of the organism in the environment (Section 38D (e)); or requiring the disposal of any organisms (Section 38D (f)). If these containment controls could be met, the new pest or disease could very likely be eradicated. It is conceivable that an application requiring the research and management that resulted in the reduction or even eradication of the organism could be approved.

The EPA may approve importation or field testing of any new organism in containment including field testing or maintaining new organisms in containment to produce antigens, biopesticides, biopharmaceuticals, enzymes, hormones, or vaccines, for diagnostic purposes, and/or other purposes the Authority thinks fit (Section 39). While this would allow a range of activities in containment useful for the development of pest and disease management strategies and tools, it would not allow for the validation of these strategies and tools in the pasture, orchard, crop, forest or natural system where they are actually needed. In many cases it may lead to the paradoxical situation where the activities are carried out on a organism in a containment facility that is itself surrounded by that same organism in the crops or fields surrounding it. The enforcement of such controls would

Table 1. Examples of organisms where lack of information can lead to uncertainty over their new organism status.

Organism (host plant)	Reason for uncertainty	Likely status	Reference
<i>Fusarium pseudograminearum</i> (Ascomycota) (on cereals)	Recently characterised but likely to have been present in New Zealand before 1998.	Organism found in New Zealand before 1998. Not a new organism.	Monds <i>et al.</i> 2005
<i>Frankliniella</i> nr. <i>occidentalis</i> (Thysanoptera) (on various plants)	A morphologically identical species to <i>Frankliniella occidentalis</i> has been found in New Zealand since the 1930s but is now considered to be a new species. The true <i>Frankliniella occidentalis</i> was first recorded in New Zealand in the 1980s.	Both organisms found in New Zealand before 1998. Both not new organisms.	Rugman-Jones <i>et al.</i> 2010
<i>Megoura stufkensis</i> (Hemiptera) (on <i>Carmichaelia</i>)	Regarded as indigenous but no close known relatives in New Zealand.	Native. Not a new organism.	Eastop 2011
<i>Sphaceloma perseae</i> (Ascomycota) (on <i>Persea americana</i>)	Wrongly identified in New Zealand from one isolate that was subsequently identified as <i>Phaeosphaeria</i> .	Not present in New Zealand. New organism.	Everett <i>et al.</i> 2011b
<i>Neonectria fuckeliana</i> (Ascomycota) (on <i>Pinus radiata</i>)	Herbarium specimens and isolates of the exotic fungus held in Scion collections examined and dated back to 1997.	Organism found in New Zealand before 1998. Not a new organism.	Dick <i>et al.</i> 2011
<i>Neobulgaria alba</i> sp. nov. (Ascomycota) (on <i>Actinidia deliciosa</i>)	New fungal species found on kiwifruit vine wood and fallen wood in native forests.	Native. Not a new organism.	Johnston <i>et al.</i> 2010

be difficult and/or would add an additional burden on research programmes to develop suitable marking techniques.

Section 25 (1B) of the HSNO Act allows for MPI or 'its agents', to isolate, aggregate, multiply, or use an incidentally imported new organism for the purpose of identifying, managing, or eradicating that organism. This option seems to be seldom used to undertake research into the ongoing management of new pests and diseases. If the 'agent' provision section of the HSNO Act is not used, the only meaningful mechanism allowing plant protection workers to respond effectively to a new pest or disease incursion of a 'new' organism is to have these organisms made 'not new' under Section 140 (1) (ba) of the Act (EPA no date). Under this section, regulations can be made to prescribe organisms as 'not new' organisms. This change requires the making of new regulations and obtaining Cabinet approval. In 2010, the Ministry for the Environment (MfE) instigated an annual process to allow this to happen. However, there is no statutory timeframe associated with this process.

In May 2011, Plant & Food Research applied to MfE to make 'not new' a range of plant pests and diseases. These species were all significant pests or diseases of horticultural crops (i.e. tomato potato psyllid (TPP) (*B. cockerelli*), *Candidatus Liberibacter solanacearum*, Australian citrus whitefly (*Orchamoplatus citri*), lettuce aphid (*Nasonovia ribisnigri*), intonsa flower thrips (*Frankliniella intonsa*), and the honey bee parasite (i.e. varroa mite (*Varroa destructor*)). Each species required urgent and on-going research into their management, as they had formed breeding populations within New Zealand and were widely dispersed throughout the country. MPI no longer had any intention of trying to eradicate them. The amendment was passed on 29 August 2011 (SR 2011/299; Hazardous Substances 2011). These organisms are now considered 'not new' organisms and therefore do not fall under the authority of the HSNO Act. The process, which included consultation with MfE, EPA, MPI, researchers, horticultural industry groups, local government, iwi organisations and other affected parties, took from March until August 2011.

While the annual process for making organisms 'not new' is a step in the right direction, it may still lead to challenges in the rapid management of new pest and disease incursions. If a new incursion occurs soon after the annual call, the chance to make a new organism 'not new' may not occur for another year. In the meantime, research on that new organism is restricted by the HSNO Act to containment (after obtaining appropriate authority). Based on the statement 'from time to time', presumably new organisms can be made 'not new' outside this cycle, but this has not happened to date. This would be influenced by the importance of the pest or disease and the Cabinet and Parliamentary orders of business. A more pragmatic approach would be to have an organism made 'not new' as soon as MPI had determined that eradication was not feasible. MPI could then retain (or invoke) the 'unwanted' status of that organism as required. The major difficulty in making an organism 'not new' is the requirement for an Order in Council, which requires Cabinet time to be available. Another pragmatic solution would be to delegate the decision-making power to the EPA, so that cost-effective and time-bound decisions could be made. However, such a delegation would require further policy consideration.

Summary

Plant protection researchers need to be aware of the legal restrictions placed upon them by the Biosecurity and HSNO Acts when undertaking research on 'unwanted' and 'new organisms'. In many cases these limitations may seem counterproductive for the improved management of pest and disease organisms. MPI, MfE and EPA need to ensure that information on the status of these pests is clear and easily accessible, and that they expedite appropriate changes in 'unwanted' and 'new' status as rapidly as possible. Consideration needs to be given to changing the legislation with respect to 'new' organisms, so that appropriate research can be initiated and conducted much more rapidly.

Acknowledgements

We thank Max Suckling for useful comments on an earlier draft of the manuscript. Warrick Nelson, Stuart Ritchie, and Philippa Stevens provided valuable discussion in relation to this subject, which was taken into account in the development of this manuscript. An earlier draft of this manuscript was provided to MPI (George Gill) for comment. The research was carried out under the Better Border Biosecurity (B3) collaboration.

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