4.1 The New Zealand System to Assess the Environmental Benefits and Risks of Releasing New Biocontrol Agents of Arthropods

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The Environmental Protection Authority (EPA) in New Zealand regulates the importation, development and release of new organisms in New Zealand under the Hazardous Substances and New Organisms Act 1996 (HSNO Act). Under this regulatory regime, a new organism is, in part, defined as an organism belonging to a species that was not present in New Zealand before 29 July 1998, the date when the Act was promulgated. Any organism not recorded to be present in the New Zealand environment before this date is considered to be new. An EPA approval is required to import, develop, field test or release a new organism (including an exotic biocontrol agent (BCA)) in New Zealand.

Legislative criteria to obtain an approval to release a new BCA and application process: Applicants must submit a dossier of information as part of their application that provides evidence for why they consider a proposal to release a new BCA meets the regulatory requirements. This information informs the EPA and its decision makers about the risks and benefits of the prospective BCA, allows a comparative analysis of adverse and positive effects, and informs qualitative risk assessments. Furthermore, the regulator must determine whether the BCA meets a set of minimum standards in the HSNO Act.

Applicants consult with EPA staff in the preparation of an application whilst they develop a dossier. Formal processing of an application has strict statutory timeframes; a decision to release a new BCA must be made public within 100 working days of receiving a final application. Within this time the EPA invites comments from the New Zealand public and other government departments, performs a risk and cultural assessment of the application, and holds a public hearing and consideration meeting where an independent committee makes a decision whether to approve or decline the application.

Qualitative risk assessment: The HSNO Act requires a risk assessment of the effects on the environment, market economy, human health, society and communities, and Māori culture and traditions as part of our obligations under the Treaty of Waitangi. As part of a dossier, applicants must provide information about the biology of the new BCA and its taxonomic relationship with species in New Zealand, as well as information to demonstrate the likely effects on native New Zealand species and the potential economic impacts from using the new BCA. The magnitude and likelihood of each of the elements occurring is determined qualitatively, followed by an assessment of the combination of the magnitude and likelihood to assign a level to and result of the effect, i.e. negligible, low, medium or high. We weigh combined benefits against combined risks to determine whether the

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benefits outweigh the risks, or vice versa. In some instances, qualitative risk descriptors over-simplify the trade-offs between environmental risks and economic benefits, and the EPA avoids using a risk matrix.

Here we discuss two previous applications for invertebrate BCAs to demonstrate the EPA's approach to risk assessment. Both agents, *Tamarixia triozae* Burks (Hymenoptera: Eulophidae) and *Macrolophus pygmaeus* Rambur (Heteroptera: Miridae), could establish self-sustaining populations in the environment and were being considered for classical biological control use, although *M. pygmaeus* was intended for release in greenhouses.

Risk assessment assumptions: The EPA risk assessments assume that a BCA will successfully establish in the New Zealand environment and develop self-sustaining populations. If a BCA establishes a large population, the frequency of potential risks occurring increases and, at the same time, the benefits will also increase. Therefore, an assessment made on full establishment of a BCA in its introduced range makes it easier to weight benefits against risks.

Risks and benefits: The EPA took into consideration results from host range testing that demonstrated *T. triozae* as a BCA for tomato potato psyllid, *Bactericera cockerelli* Sulc (Hemiptera: Triozidae), a pest of crop plants in the solanaceous family, would not form self-sustaining populations on any species that were tested other than *B. cockerelli*. However, native species, *Trioza panacis* Maskell (Hemiptera: Triozidae), is within its physiological host range and *Trioza curta* Ferris & Klyver may die if *T. triozae* encounters and attacks this psyllid. They are also rare and threatened psyllids in New Zealand for which limited information is available. The EPA risk assessment included contemporary scientific knowledge regarding parasitoid foraging behaviour, the occurrence of environmental refuges and sequential steps that would have to occur for *T. triozae* to reach and parasitize rare psyllids. The EPA assessed whether *T. triozae* would operate in cropping environments where high densities of *B. cockerelli*'s host plants are found, and considered that it is unlikely to be attracted into native habitats due to its olfactory responses to host plants based on research that was undertaken on another *Tamarixia*-host system; whether *T. triozae* would employ chemical cues to forage for *B. cockerelli* in the immediate environment where its food plants are present; whether native psyllids are found in crop systems; and potential overlap between the pest's non-crop food plants and host plants for native psyllids in crop-border areas, creating refuges for native psyllids. The magnitude of adverse effects and likelihood of any effects occurring was considered separately for native psyllids in crop and border systems, native psyllids in native habitats, and rare or threatened psyllids.

In our second example, the weighing of potential positive and adverse effects from the release of *M. pygmaeus* in greenhouses was measured across individual, local and regional scales. The EPA assessment found that the risks to the environment in the immediate vicinity of glasshouses are negligible, while human health benefits to be gained through reduced organophosphate applications are likely. The benefits therefore outweighed risk at this scale. The risks to the modified environment surrounding glasshouses and benefits to the economy were assessed to be non-negligible, and the benefits were found to likely outweigh risks at the local scale. Finally, the risks to the environment at a regional to national scale were assessed to be non-negligible, and the decision makers considered that the benefits at this scale were unquantifiable.

The benefits of *T. triozae* to control tomato potato psyllid rested on independent economic analysis of the predicted reductions in costs to control *B. cockerelli* that might be generated from this BCA (Fig. 4.1.1). Further, the release of *T. triozae* would have beneficial effects on the environment by reducing broad-spectrum insecticide use and re-establishing integrated pest management in *B. cockerelli* affected crops. The EPA assessed that the BCA will help growers of traditional Māori solanaceous crops to control *B. cockerelli*, allowing Māori and other amenity gardeners to return to traditional and organic control methods.

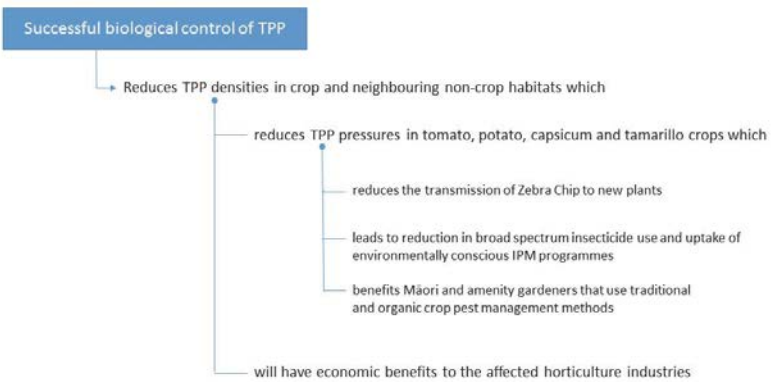

Fig. 4.1.1. EPA assessment pathway to demonstrate positive effects that may follow release of *T. triozae* for control of *B. cockerelli* or TPP (the tomato potato psyllid). Zebra chip is a disease transmitted by *B. cockerelli* – the causal agent is the bacterium *Candidatus Liberibacter solanacearum*.

Concluding remarks: The New Zealand system to assess new BCAs for arthropods is based on scientific data, economic analysis, contemporary evidence and cultural and broader societal impacts. It is a time-bound and transparent process. The EPA increasingly includes post-release validation of predictions from quarantine testing or field evaluations in its assessments. In addition, new qualitative and belief modelling approaches that rely on scientific information and expert elicitation may be used to improve risk predictions and reduce uncertainty in decision making in the future, enhancing the EPA's challenging task of weighing complex benefits against complex risks.