Environmental Protection Authority
Te Mana Rauhī Taiao

APPLICATION FORM

Release

To obtain approval to release new organisms

(Through importing for release or releasing from containment)

Send to Environmental Protection Authority preferably by email (neworganisms@epa.govt.nz) or alternatively by post (Private Bag 63002, Wellington 6140)
Payment must accompany final application; see our fees and charges schedule for details.

Figure 1. Clockwise from top left: moth plant fruit; moth plant smothering a tree; moth plant beetle larvae on roots; moth plant beetle adult.

Application Number

APP203667

Date

20 December 2018

Completing this application form

1. This form has been approved under section 34 of the Hazardous Substances and New Organisms (HSNO) Act 1996. It covers the release without controls of any new organism (including genetically modified organisms (GMOs)) that is to be imported for release or released from containment. It also covers the release with or without controls of low risk new organisms (qualifying organisms) in human and veterinary medicines. If you wish to make an application for another type of approval or for another use (such as an emergency, special emergency, conditional release or containment), a different form will have to be used. All forms are available on our website.
2. It is recommended that you contact an Advisor at the Environmental Protection Authority (EPA) as early in the application process as possible. An Advisor can assist you with any questions you have during the preparation of your application including providing advice on any consultation requirements.
3. Unless otherwise indicated, all sections of this form must be completed for the application to be formally received and assessed. If a section is not relevant to your application, please provide a comprehensive explanation why this does not apply. If you choose not to provide the specific information, you will need to apply for a waiver under section 59(3)(a)(ii) of the HSNO Act. This can be done by completing the section on the last page of this form.
4. Any extra material that does not fit in the application form must be clearly labelled, cross-referenced, and included with the application form when it is submitted.
5. Please add extra rows/tables where needed.
6. You must sign the final form (the EPA will accept electronically signed forms) and pay the application fee (including GST) unless you are already an approved EPA customer. To be recognised by the EPA as an “approved customer”, you must have submitted more than one application per month over the preceding six months, and have no history of delay in making payments, at the time of presenting an application.
7. Information about application fees is available on the EPA website.
8. All application communications from the EPA will be provided electronically, unless you specifically request otherwise.

Commercially sensitive information

9. Commercially sensitive information must be included in an appendix to this form and be identified as confidential. If you consider any information to be commercially sensitive, please show this in the relevant section of this form and cross reference to where that information is located in the confidential appendix.
10. Any information you supply to the EPA prior to formal lodgement of your application will not be publicly released. Following formal lodgement of your application any information in the body of this application form and any non-confidential appendices will become publicly available.

11. Once you have formally lodged your application with the EPA, any information you have supplied to the EPA about your application is subject to the Official Information Act 1982 (OIA). If a request is made for the release of information that you consider to be confidential, your view will be considered in a manner consistent with the OIA and with section 57 of the HSNO Act. You may be required to provide further justification for your claim of confidentiality.

Definitions

Containment	Restricting an organism or substance to a secure location or facility to prevent escape. In respect to genetically modified organisms, this includes field testing and large scale fermentation
Controls	Any obligation or restrictions imposed on any new organism, or any person in relation to any new organism, by the HSNO Act or any other Act or any regulations, rules, codes, or other documents made in accordance with the provisions of the HSNO Act or any other Act for the purposes of controlling the adverse effects of that organism on people or the environment
Genetically Modified Organism (GMO)	Any organism in which any of the genes or other genetic material: • Have been modified by *in vitro* techniques, or • Are inherited or otherwise derived, through any number of replications, from any genes or other genetic material which has been modified by *in vitro* techniques
Medicine	As defined in section 3 of the Medicines Act 1981 http://www.legislation.govt.nz/act/public/1981/0118/latest/DLM53790.html?src=qs
New Organism	A new organism is an organism that is any of the following: • An organism belonging to a species that was not present in New Zealand immediately before 29 July 1998; • An organism belonging to a species, subspecies, infrasubspecies, variety, strain, or cultivar prescribed as a risk species, where that organism was not present in New Zealand at the time of promulgation of the relevant regulation; • An organism for which a containment approval has been given under the HSNO Act; • An organism for which a conditional release approval has been given under the HSNO Act; • A qualifying organism approved for release with controls under the HSNO Act; • A genetically modified organism; • An organism belonging to a species, subspecies, infrasubspecies, variety, strain, or cultivar that has been eradicated from New Zealand; • An organism present in New Zealand before 29 July 1998 in contravention of the Animals Act 1967 or the Plants Act 1970. This does not apply to the organism known as rabbit haemorrhagic disease virus, or rabbit calicivirus A new organism does not cease to be a new organism because: • It is subject to a conditional release approval; or • It is a qualifying organism approved for release with controls; or

	• It is an incidentally imported new organism
Qualifying Organism	As defined in sections 2 and 38I of the HSNO Act
Release	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
Unwanted Organism	As defined in section 2 of the Biosecurity Act 1993 http://www.legislation.govt.nz/act/public/1993/0095/latest/DLM314623.html?src=qs
Veterinary Medicine	As defined in section 2(1) of the Agricultural Compounds and Veterinary Medicines Act 1997 http://www.legislation.govt.nz/act/public/1997/0087/latest/DLM414577.html?search=ts_act%40bill%40regulation%40deemedreg_Agricultural+Compounds+and+Veterinary+Medicines+Act+_resel_25_a&p=1

1. Applicant details

1.1. Applicant

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2. Information about the application

2.1. Brief application description

Approximately 30 words about what you are applying to do

An application to introduce the beetle *Freudeita* cf *cupripennis* as a biological control agent for the weed moth plant (*Araujia hortorum*)

2.2. Summary of application

Provide a plain English, non-technical description of what you are applying to do and why you want to do it

This is an application to introduce the root-feeding moth plant beetle *Freudeita* cf *cupripennis* (Chrysomelidae) as a control agent for the weed moth plant (*Araujia hortorum*).

Moth plant is widely naturalised in New Zealand from Nelson and Marlborough northwards, and is abundant north of Tauranga. It is considered a significant threat to conservation values and urban environments, and is already considered one of the most dangerous weeds in Auckland and Northland. Moth plant is a tough, perennial climber from South America and is an emerging weed in several regions of the world. It can grow up trees to reach over 5 metres tall, and forms a heavy mass of foliage that can break down underlying trees. The mass shades and kills underlying foliage. Moth plant grows equally well creeping over the ground, shading out low-stature vegetation such as regenerating seedlings.

This weed adversely affects the health of forest margins, as well as many vulnerable habitats with smaller shrubs and herbs. It is a significant threat to the integrity of reserved land managed by the Department of Conservation (DOC) and local authorities. Moth plant is also a hated weed in the urban environment in northern New Zealand. It straggles over backyard fences, walls and power poles and has to be controlled. The latex sap from broken stems can cause skin burns, and it has caused poisoning of humans in New Zealand. It is also an issue in orchard shelterbelts.

Spraying this vine can result in unacceptable damage to underlying vegetation on land reserved for conservation. The options available to weed managers are therefore limited. Treatment by hand and collection of seed pods is viable where volunteers protect land of high local importance, but these methods quickly become impractical for the protection of biodiversity values nationwide. Biological control is the only sustainable option if the damage caused by this weed is to be contained.

A collective comprising 14 regional and unitary councils and DOC has determined that biological control is the only means of achieving widespread environmentally acceptable and cost-effective control in New Zealand. Manaaki Whenua – Landcare Research (MWLR) staff have provided the research described in the application. Richard Hill & Associates prepared the application and managed the application process.

A rust fungus that infects the leaves of moth plant, *Puccinia araujiae*, was approved for release in 2015 (APP202529) but has not yet been distributed. EPA approved the introduction of moth plant beetle in 2011 (APP201039) under the name *Colaspis argentinensis*. This approval was not exercised, due to challenges in gaining export permits in Argentina, and lapsed in 2016. A new approval is now sought. The rust fungus and the beetle are expected to work together to suppress moth plant. Biological control has not yet been developed elsewhere.

Hill (2018) has summarised the risks, costs and benefits of the proposal. The application explains the expected positive effects of biological control of moth plant, including:

- long-term mitigation of damage to New Zealand's native ecosystems (section 5.1.1)
- reduced invasion of un-infested sites and within existing sites (section 5.1.1)
- reduced control costs to managers of reserved land and to the general public (section 5.3.1)
- improved allocation of resources to maintain biodiversity values (section 5.4.1).

Introduced natural enemies must be safe to import if this weed management tactic is to be environmentally acceptable. Significant adverse environmental or economic effects would occur if feeding in the roots by beetle larvae caused significant damage to valued non-target plants, whether native or introduced. The beetle has only been recorded from South America.

Tests conducted in the laboratory to determine the host range of the beetle confirmed that it can only develop on plants belonging to the same sub-tribe as moth plant. If the beetle was released in New Zealand, these tests suggest that damage to the ornamental plant tweedia (*Oxypetalum caeruleum*), which is occasionally grown in New Zealand gardens, cannot be ruled out (section 5.4.2). Three *Parsonsia* spp. are the only New Zealand native plants in the same family as moth plant, but they belong to a different sub-family and so are not closely related. Two of these was chosen for testing to represent the genus, and was not attacked by moth plant beetle (McGrath et al. 2018). No other valued plants are at risk. The application considers other environmental risks of introduction, but none are considered to be significant (section 5).

2.3. Background and aims of application

This section is intended to put the new organism(s) in perspective of the wider activitie(s) that they will be used in. You may use more technical language but all technical words must be included in a glossary.

2.3.1 Purpose

The purpose of this application is to establish biological control of the weed *Araujia hortorum,* or moth plant. The agent chosen to effect control is a root-feeding chrysomelid beetle, *Freudeita* cf. *cupripennis.*

Approval is sought to import this new organism from South America and release it in New Zealand. Successful establishment of the moth plant beetle would:

- reduce the biomass of infected plants
- reduce the ability of moth plant to compete with more valued plants
- reduce the proportion of plants surviving to produce seeds
- reduce seed production.

Successful and safe biological control would:

- affect a high proportion of moth plants wherever they occur
- decrease the dominance of moth plant in native habitats, helping to restore ecosystems and reducing management costs
- reduce the rate of spread by reducing the number of seeds available for dispersal.

2.3.2 Biology and pest status of moth plant

Araujia hortorum E. Fourn. (family: Apocynaceae) is native to south-east Brazil, Argentina, Paraguay and Uruguay. *Araujia hortorum* was originally introduced as an ornamental, and was first recorded in New Zealand in 1888. It has become naturalised in Europe, Turkey, Africa, North America, and elsewhere in South America. It is regarded as a weed in most regions it has colonised. In Australia it is present in all temperate states. It is common in coastal New South Wales and south-east Queensland, and is regarded as a minor weed (Winks & Fowler, 2000; Hill & Gourlay, 2011). In the past, moth plant in New Zealand has been referred to as *A. sericifera.*

Araujia hortorum has been recorded as far south as Christchurch but is thought to be fully naturalised only north of Nelson/Blenheim. Only 37 sites are known in the Greater Wellington Region, but moth plant is abundant north of Tauranga (Hill & Gourlay, 2011). It is generally acknowledged that this plant is spreading and becoming more abundant in the North Island, but there are no quantitative studies to support this view.

Moth plant does not thrive in dry soils. Southward expansion of its range in New Zealand appears to be restricted by intolerance to cold, but persistence at some sites indicates that moth plant has some frost and drought tolerance, and that it has not yet reached its full distribution in New Zealand (DOC, in

Hill, 2018). However, the risk of moth plant as a serious weed may be restricted to lowland areas in the North Island and northern South Island because it requires a moist, warm climate to thrive (Winks & Fowler, 2000).

Moth plant is a perennial, broad-leaved, herbaceous climber or liane, with twining stems. On a supporting structure vines can grow to over 5 metres, with almost oblong leaves measuring 3–11 cm. It flowers in profusion, with clusters of small, creamy-coloured tubular flowers (sometimes marked with pinkish mauve), which form between December and May. However, only 1% of flowers bear fruit, and this may be because of a lack of suitable pollinators in New Zealand. The establishment of an efficient pollinator in New Zealand could further increase the weediness of moth plant (A. E. Esler, pers. comm., in Winks & Fowler, 2000).

The choko-like fruits, as big as a fist, contain about 400 parachute-like seeds. Mature fruits normally remain on the vines, giving the advantage of elevation for wind dispersal of the seeds as the fruit dries and splits. It is suspected that seeds may have blown over 22 kilometres from the mainland to offshore islands in the Hauraki Gulf (Esler, 1988, in Hill, 2018). Plants are also known to have been spread as seed in bagged plants (DOC, in Hill, 2018). Seeds can germinate freely more than 5 years after being shed (Winks & Fowler, 2000).

Figure 2. Moth plant foliage and fruit

Moth plant vines smother shrubs and small trees, breaking them down. It also spreads over the ground, shading small native plants and regenerating seedlings. Moth plant therefore poses a high risk to urban reserves and forests, overtopping and smothering trees, and replacing native vegetation. In time it will become more common outside of urban areas and will become an increasing threat to healthy native forests in northern New Zealand. Moth plant is known from intact and disturbed forest and margins, tracks, coastline, cliffs, riparian margins, shrublands, mangroves, inshore and offshore islands – almost any frost-free habitat. The wider threat to the natural estate is acknowledged by weed management authorities, and their opinions on moth plant are presented in Hill, 2018. Moth plant is also sometimes called cruel plant because it occasionally attracts and traps insects. This is unlikely to have a significant impact on biodiversity values.

There are no quantitative studies of the adverse effects of moth plant on values in the natural estate in New Zealand, but it is accorded a weed score of 27 out 36 (https://www.doc.govt.nz/globalassets/documents/science-and-technical/scienceposter21.pdf). This high pest status is reinforced by commentary provided by weed managers and volunteers (Hill, 2018).

Moth plant is a common weed in the urban environment in northern New Zealand, straggling over fences, walls, power poles and through vegetation. It establishes most freely in semi-shade, but will tolerate exposure to full light once it reaches the canopy of shrubs, hedges or trees. Householders in the north of New Zealand detest moth plant: it was the second most frequent reason for weed-related enquiries to Waikato Regional Council in 2011. In Northland, moth plant is a problem in urban areas, forest reserves, orchard shelter belts and offshore islands, such as in the Bay of Islands. Its control is a cost to local authorities, householders and businesses (see section 5.3.1). Both fruits and stems exude a caustic milky sap when broken in the course of manual control, and they have caused adverse human health effects (see section 5.2.1).

Moth plant is listed under the National Pest Plant Accord and cannot be sold, propagated or distributed in New Zealand (http://www.biosecurity.govt.nz/nppa). Additional regulation varies from region to region, but most Regional Pest Management Plans require all or some landowners and/or occupiers to remove moth plant from their property whenever it is found. This is a significant drain on the resources of the general public, private enterprises and infrastructure companies (see section 5.3.1).

Moth plant is mainly an urban pest in the Waikato Region with large infestations also found in the Coromandel and northern parts of the region and is beginning to spread to more remote and natural areas. Of the regulated plants in the region, moth plant is one of the most difficult to enforce control of because large amount of seeds are produced and spread by wind. Once established it is difficult to eradicate. Over the past 6 years there have been around 700 recorded sites where Waikato Regional Council has controlled or instructed landowners to control moth plant. Despite this action it continues to persist at a large percentage of these sites. Based on an average of 2 hours work for a Biosecurity Officer per site, there has been approximately 1400 hours spent on moth plant, which is 35 weeks or 5.8 weeks per year for the last 6 years. In Hamilton City, Waikato Regional Council also receives about 80 calls a year asking for advice on moth plant control. In addition, control measures are taken by district councils, Hamilton City Council and private landowners.

3. Information about the new organism(s)

3.1. Name of organism

Identify the organism as fully as possible

Non-GMOs - Provide a taxonomic description of the new organism(s).

GMOs – Provide a taxonomic description of the host organism(s) and describe the genetic modification.

Both -

- Describe the biology and main features of the organism including if it has inseparable organisms.
- Describe if the organism has affinities (e.g. close taxonomic relationships) with other organisms in New Zealand.
- Could the organism form an undesirable self-sustaining population? If not, why not?
- How easily could the new organism be recovered or eradicated if it established an undesirable self-sustaining population?

3.1.1 Taxonomy and source

Order	Coleoptera
Superfamily	Chrysomeloidea
Family	Chrysomelidae
Subfamily	Eumolpinae
Genus	*Freudeita*
Species	cf. *cupripennis* (Lefèvre, 1877)

The term cf. (an abbreviation of ‘confer’) is commonly placed between the generic name and the specific name to describe specimens for which identification is yet to be confirmed because of practical difficulties, such as lack of taxonomic revision and specialists, the condition of the specimens, too few available specimens, or lack of access to type specimens. In this case, *F.* cf. *cupripennis* indicates that the population of beetles belongs to the genus *Freudeita,* and is believed to be *F. cupripennis,* but definitive identification requires additional confirmation.

The genus *Freudeita* is distributed from Costa Rica south to northern Argentina and contains 21 species, three of which are divided into subspecies, with several species and forms sympatric with moth plant in Brazil, Paraguay, Uruguay and Argentina. Morphological differences between the similar species *F. cupripennis* and *F. cuprinula* have been documented, and several characteristics are variable between the species. Between these two species there are three subspecies and one aberration (in Leschen, 2018).

Dr R. Leschen (MWLR, pers. comm.) has examined specimens from the Melilla (Uruguay) population of moth plant beetle and considers that these specimens are drawn from a single population of generally similar size, morphology, and colour range. He has referred these specimens to *F.* cf. *cupripennis* (Leschen, 2018). This is the population imported into containment in New Zealand and used in the host-range tests reported in section 3.1.4. If this application is approved, these will be the parents of any moth plant beetles released.

In 2010/11 moth plant beetles were collected from sites near Buenos Aires and La Plata and were identified in Argentina incorrectly (in Leschen 2018) as *Colaspis argentinensis*. The host range of this population was determined, and release of this agent for the biocontrol of moth plant was approved by EPA in 2011 (https://epa.govt.nz/database-search/hsno-application-register/view/APP201039). This approval was not exercised and lapsed in 2016. Dr Leschen has subsequently examined a limited number of specimens from this population and states that these are *F.* cf. *cupripennis* and not *C. argentinensis.* Like the Melilla population, he considers the specimens examined to belong to a single population.

Dr Leschen states that there is variation between specimens sourced from the populations in Argentina and Uruguay, and in specimens held in other collections (Leschen, 2018). He suggests that without a full taxonomic revision or genetic study it is difficult to determine if the *cupripennis* complex represents a group of related species or a widespread, panmictic and highly variable species. The nominal species (and subspecies) form a grade, and each taxonomic name (and series of consistently identified specimens) may represent morphological extremes among the phenotypic range of the entire *cupripennis* complex.

As a result, Dr Leschen is not yet in a position to categorically state that the two populations of moth plant beetles are the same species, or to settle on *F. cupripennis* as the name of the Melilla population. **The applicant intends to introduce beetles from the Melilla population only.**

The 2011 and 2018 collection sites are approximately 250 kilometres apart and separated by the Rio de la Platte. However, moth plant is common on the river bank in both countries (H. Gourlay, MWLR, pers. comm.), and it is unlikely that the two beetle populations are geographically isolated. Beetles from both populations have a similar host range (see section 3.1.4).

Moth plant beetle is not known to host any inseparable organisms. The population will be reared in containment to isolate and remove any parasitoids present in imported material. Specimens will be examined for the presence of any likely disease-forming organisms, and a report will be provided to the Ministry for Primary Industries before permission is sought to remove the population from containment.

3.1.2 Biology and native range

Adults feed on moth plant foliage but this damage is not usually significant. Eggs are laid on or in the ground around the base of the stem, and hatching larvae burrow down to feed in the root zone. It is not clear whether eggs are dropped from the leaves above, or whether adults descend to the ground to lay. Observations during feeding tests suggest that where adults choose to feed may also determine where eggs are laid. In the laboratory, adults can lay several hundred eggs over 2–4 months. Development from egg to adult takes 30–40 days. Two full generations might be expected each year in New Zealand.

Little is known about the effect of root feeding by moth plant beetle on the fitness of moth plant in South America, but other eumolpine beetles with root-feeding larvae are known to have significant adverse effects on their hosts. For example, *Colaspis brunnea* (grape colaspis) is a significant polyphagous pest of maize and soybeans in the USA (http://bulletin.ipm.illinois.edu/pastpest/articles/200311b.html), and *Colaspis pini* Barber is a pest of plantation forests.

3.1.3 Affinities with the New Zealand fauna

The chrysomelid sub-family Eumolpinae is very large. There are 500 genera known worldwide and 7,000 species. Adults of the Eumolpinae feed on leaves while the larvae feed in the roots. Only four native genera have been recognised in mainland New Zealand, with 19 species (Nadein & Leschen, 2017). There are no egg, larval or adult parasitoids known to attack native eumolpine chrysomelids in New Zealand.

3.1.4 Potential for safe biological control

Why biological control?

Biological control seeks to establish a complex of natural enemies in New Zealand that prey on or adversely affect the target weed. Biological control aims to restore the natural balance between the weed and its environment by restricting the ability of the weed to grow and spread. It is an appropriate tactic to apply against moth plant because, once established, introduced natural enemies would colonise and damage the plant wherever it occurs, and would be widespread and persistent from year to year. Any benefits of biological control would accrue even in areas where it is not feasible to deploy other treatments.

Defining the impact of an agent on a target weed in its home range is difficult. Control agents are often hard to find and it is unusual to encounter evidence of heavy damage during short-term surveys. This is because:

1. the host plants are not common and are often unhealthy, or
2. control agent populations are often regulated by their own natural enemies and outbreaks are rarely encountered, or
3. heavy infestations vary across time and space and will not necessarily coincide with rare visits by researchers.

The impact of a single biological control agent on its target weed varies from place to place and from time to time. Successful control is more likely if a complex of non-competing control agents with different modes of attack can be deployed. So far, two organisms are considered suitable biological control agents for moth plant.

An application to release the moth plant beetle was approved by EPA in December 2011 (https://epa.govt.nz/database-search/hsno-application-register/view/APP201039). The larvae of this beetle feed on the roots of moth plant. This new application seeks to restore that approval. Release of the moth plant rust, *Puccinia araujiae*, was approved by EPA in 2015 (https://epa.govt.nz/database-search/hsno-application-register/view/APP202529). The impact of the beetle is expected to complement the leaf and stem damage by the moth plant rust. Accounts of the development of the biological control programme can be found here: http://www.landcareresearch.co.nz/science/plants-animals-fungi/plants/weeds/biocontrol/research/projects/moth-plant. A seed-feeding fly, *Toxotrypana australis* Blanchard, is also being considered.

Predicting the host range of moth plant beetle in New Zealand

Source of moth plant beetles

Due to on-going difficulties in gaining permission to collect and remove the beetles from Argentina, beetles were instead collected in 2018 from the Melilla area, northwest of Montevideo, Uruguay, Populations were shipped to New Zealand. Experiments were conducted in containment at the MWLR containment facility at Tamaki, Auckland. If the release of moth plant beetle is approved, the Melilla area will be the sole source of founding beetles.

Test plant selection

Protocols for defining host range are based on the premise that the plants most likely to be attacked by a biocontrol agent following release are those most closely related to the target weed (Wapshere et al., 1974; Briese, 2002, Briese & Walker, 2002; Sheppard et al., 2005). Moth plant is a member of the dogbane family, Apocynaceae, and the sub-family Asclepiadoideae. The Apocynaceae are represented in the New Zealand flora only by the genus *Parsonsia*, which belongs to a different sub-family, the Apocynoideae (http://www.mobot.org/MOBOT/research/APweb/welcome.html).

There are at least three species of *Parsonsia* in New Zealand: *Parsonsia capsularis* (not threatened), *Parsonsia heterophylla* (not threatened), and *Parsonsia praeruptis* (nationally endangered) (http://www.nzflora.info/factsheet/Taxon/Parsonsia.html). *P. heterophylla* and *P. capsularis* were selected to represent this genus in host range tests.

There are 12 exotic species in the family Apocynaceae recorded in the New Zealand flora, five of which are only encountered casually and are not naturalised (http://www.nzflora.info/factsheet/Taxon/Apocynaceae.html). Other species (such as hoya) are grown only as indoor ornamentals and are not at significant risk from biological control agents. Ten species were selected for testing, representing six tribes (three sub-families) of this plant family (Figure 4). The taxonomic relationship between these species is depicted in Figure 3. This was considered adequate coverage to delimit the host range of the insect in New Zealand (e.g. Briese, 2002). Other plants related to moth plant included on the test plant list were swan plants (*Gomphocarpus* species), and notable ornamental species including tweedia (*Oxypetalum caeruleum*), scarlet milkweed (*Asclepias curassavica*), oleander (*Nerium oleander*), and hoya (represented by *Hoya carnosa*). The rationale for test plant selection is discussed further by McGrath et al. (2018).

Test methods

The capacity of moth plant beetles originating from Melilla to colonise plants other than the primary host was determined using tests which assessed three attributes; the ability of adult beetles to colonise and feed on non-target plants, the ability of newly-hatched larvae to detect and feed on non-target roots, and the ability of larvae to complete development on those roots.

Adult feeding - Freshly emerged, unmated, adult beetles were collected from rearing cages and confined on a shoot of control or test plant foliage that had been placed in a plastic specimen tube containing water and then placed in a plastic container (one adult/shoot per container). Beetles were left for 7-8 days after which the presence of feeding damage on the leaves was assessed and it was noted if the beetles were alive or dead.

The following test plants were included in testing, with replicates set up between 16 October and 21 October 2018: *Araujia hortorum* (8 replicates)*; Oxypetalum caeruleum* (7)*; Asclepias curassavica* (8)*; Gomphocarpus fruticosus* (8)*; Hoya carnosa* (8)*; Mandevilla laxa* (8)*; Nerium oleander* (6)*; Parsonsia capsularis* (8)*; Parsonsia heterophylla* (8)*; Vinca major* (5)*; Vinca minor* (5)*.*

Larval survival and development - Freshly hatched first instar larvae of *Freudeita cf. cupripennis* were placed onto the soil near the stems of potted test plants. Generally, each plant was inoculated with 10 larvae, which previous rearing had shown should result in high survival on *Araujia hortorum* plants of the size used in the test. However, replicates 2-5 of *Oxypetalum caeruleum* were smaller plants, so only 5 larvae were used to prevent possible starvation due to a lack of food. Replicate 4 of *Parsonsia heterophylla* was inoculated with only 7 larvae, due to a shortage of larvae.

The following test plants were included in testing, with replicates set up between 20 September and 26 October 2018: *Araujia hortorum* (5 replicates)*; Oxypetalum caeruleum* (5)*; Asclepias curassavica* (5)*; Gomphocarpus fruticosus* (5)*; Hoya carnosa* (5)*; Mandevilla laxa* (5)*; Nerium oleander* (4)*; Parsonsia capsularis* (5)*; Parsonsia heterophylla* (5)*; Vinca major* (5)*; Vinca minor* (5)*.*

Results

The details of these tests are described in McGrath et al.(2018);
https://www.landcareresearch.co.nz/__data/assets/pdf_file/0008/167696/host-range-of-Freudeita-cf-cupripennis.pdf).

Adults fed extensively on multiple leaves of *Araujia hortorum* and *Oxypetalum caeruleum* in all replicates. Minor, barely discernible, nibbling was recorded on *Asclepias curassavica* (1 replicate only)*; Nerium oleander* (1 replicate only)*; Parsonsia capsularis* (1 replicate only)*;* and *Parsonsia heterophylla* (1 replicate only). No feeding damage at all was recorded on other test plant species.

There was a highly significant effect of test plant on the proportion of beetles that fed (x^2 = 6.37 d.f. = 10, $P < 0.001$).

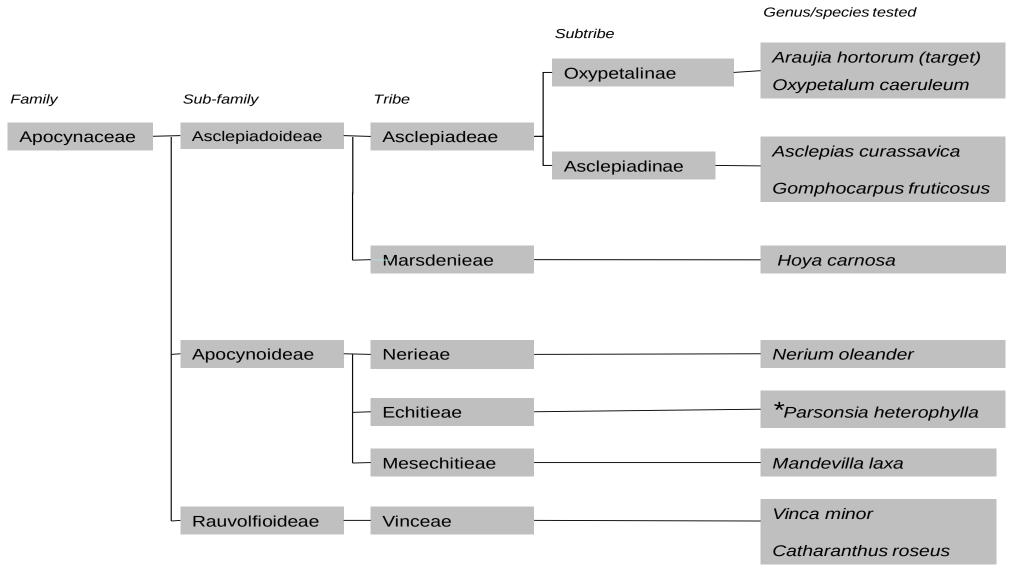


Figure 3. Taxonomic relatedness of selected plants in the family Apocynaceae in New Zealand. * indicates the one native genus in the family in New Zealand.

Based on these results, it is likely that foliage of *Araujia hortorum* and the closely-related *Oxypetalum caeruleum* will be attractive to adult *F.* cf. *cupripennis* beetles in the field in New Zealand. It is unlikely that the other plant species detected will be sufficiently attractive to arrest the movement of food-seeking beetles.

Final instar larvae and/or pupae were present in all replicates on *Araujia hortorum* and *Oxypetalum caeruleum* and mean survival was >45% on both species (Figure 4).

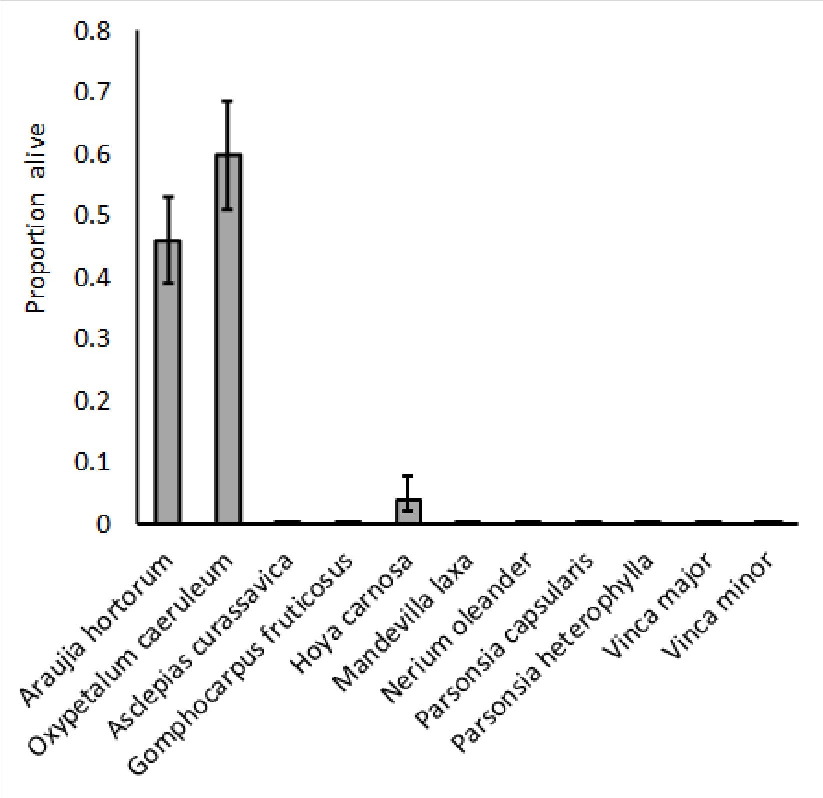
Two larvae were found on one *Hoya carnosa* plant (mean survival 4%). These appeared healthy, although slightly different in colour to those on *Araujia hortorum* and *Oxypetalum caeruleum*. The slightly different appearance could be a result of feeding in a different food plant, although it is also possible that the soil was contaminated with larvae of other beetle species such as bronze beetle, *Eucolaspis* sp.

No larvae or pupae were found on any other test plant.

There was a highly significant effect of test plant on the proportion of larvae that were still alive (x^2 = 16.28 d.f. = 10, $P < 0.001$).

Based on these results, it is likely that only *Araujia hortorum* and the closely-related *Oxypetalum caeruleum* (both subtribe Oxypetalinae) could support extensive development of *F. cupripennis* larvae in New Zealand.

Figure 4. The proportion of first instar larvae that were still alive (as mature larvae or pupae) at the end of the test.



Female beetles typically walk down the plant on which they feed to lay eggs in the soil around the crown of the plant and then return to feed in the foliage. This behaviour occurs repeatedly (H. Gourlay, Z. McGrath, Landcare Research, unpubl. obs.). With one exception, damage to the leaves of the non-target plants tested was trivial. However, adult beetles fed heavily on *O. caeruleum* foliage in laboratory tests. If this behaviour occurred in the field, then eggs could well be laid on *O. caeruleum* roots. If a plant cannot attract adult beetles and elicit feeding then it is unlikely to be exposed to *F. cf. cupripennis* eggs or larvae, unless it is growing intermingled with infested *A. hortorum* or *O. caeruleum* plants. There was no significant feeding on other test plants so it is unlikely that *F. cf. cupripennis* could colonise any plants outside the sub-tribe Oxypetalinae, the sub-tribe of moth plant and tweedia.

Freudeita cf. cupripennis poses negligible risk to the three native *Parsonsia* species. Adults did not feed consistently on the foliage of *P. heterophylla* or *P. capsularis* and would have no reason to dwell on this plant. Larvae placed on the roots did not survive. The pattern of host plant use revealed in tests provides no reason to suggest that the third *Parsonsia* species in New Zealand would be any more susceptible. As there are no other native species in this family, the risk to other native non-target plants is negligible.

Swan plant, *Gomphocarpus* spp., are important amenity plants in gardens, and are the main hosts of the monarch butterfly. Adults did not feed on swan plant foliage and larvae placed on the roots did not survive. As with *P. heterophylla*, these results gave no indication that swan plant is a potential host for *Freudeita cf. cupripennis*, and the risk of this insect causing even minor damage to swan plant in the field is insignificant. *Asclepias curassavica* is a relatively rare ornamental but its foliage can also support the development of larvae of the monarch butterfly. There was no significant damage to foliage by adults and no larvae were detected at the conclusion of tests.

Apart from incidental oviposition, there was no evidence that *Freudeita cf. cupripennis* could colonise *Mandevilla laxa*, *Hoya carnosa*, or *Nerium oleander*, or cause significant damage to these ornamental species. Two larvae were found in the soil/roots of one *H. carnosa* plant at the conclusion of the larval survival test. The larvae may yet prove to be extraneous to the experiment, but even if these prove to be *F. cf cupripennis* beetles, the risk to the health of hoya plants is nevertheless very low because adult beetles could not feed on the foliage. It is unlikely that this plant would be exposed to significant numbers of eggs or hatching larvae, especially as it is largely restricted to indoor ornamental use in New Zealand.

Discussion

From the test results we conclude that the host range of *Freudeita cf. cupripennis* is narrow within the family Apocynaceae. However, beetles fed on, and laid eggs on *Oxypetalum caeruleum* (tweedia), and larvae successfully developed in the roots of this host. It is an adequate laboratory host for *Freudeita cf. cupripennis*. **This application assumes that *O. caeruleum* is a potential field host of moth plant beetle in New Zealand and could be at risk of significant attack** (see Section 5.3.2)**.** Further, the results suggest that any other species within this sub-tribe that are resident in New Zealand would be equally susceptible to attack. At this point, no such species are known to be present in New Zealand.

Both the Melilla and the Buenos Aires / La Plata populations of moth plant beetle are currently referred to the taxon *Freudeita* cf *cupripennis* (see section 3.1.1). Approval to introduce *F.* cf. *cupripennis* from La Plata, Argentina, was granted by EPA in December 2011 under the name *Colaspis argentinensis* *https://epa.govt.nz/assets/Uploads/Documents/New-Organisms/Reports/APP201039-decision.pdf)*. The application for approval to release included an assessment of the potential risk to non-target plants in New Zealand, based on the results of host-range tests using beetles sourced from La Plata, Argentina. The application stated that the host range appeared to be restricted to the sub-tribe Oxypetalinae which, in New Zealand, might well include the garden ornamental tweedia (*O. caeruleum*). No other non-target plants were considered at significant risk. The same conclusion can be drawn from the current tests which used beetles from a *F. cf. cupripennis* population found at Melilla, Uruguay.

Centrifugal testing based on the phylogenetic relatedness of test plants remains the best method to predict the host range of potential biological control agents for weeds (Wapshere, 1974; Briese & Walker, 2002; Sheppard et al., 2005). In this case, the plants initially selected for testing all belonged to the family Apocynaceae. No significant attack was observed on plants outside the tribe

Asclepiadeae. This is sufficient evidence to predict that plants outside the family would not be hosts for the Melilla population of moth plant beetle in New Zealand.

3.1.5 Establishment and eradication of unwanted populations

The object of introducing this control agent is to establish desirable, self-sustaining and self-dispersing populations wherever moth plant occurs, contributing to the suppression and reduced dispersal rate of this weed.

The establishment of *Freudeita cf. cupripennis* would be an irreversible change. It would not be feasible to eradicate an unwanted population by the time it was detected. The agent must therefore be safe to introduce, and in particular must not:

- significantly affect populations of valued plants, whether native or non-native
- significantly displace native species in their natural habitat
- cause significant deterioration of natural ecosystems (see sections 3.1 and 5.1.2).

Experiments indicate that the host range of moth plant beetle is restricted to moth plant and possibly other species in the sub-tribe Oxypetalinae. The prospect of reducing the serious impacts of moth plant outweighs potential damage to tweedia (see section 5.4.2). The introduction of the beetle is not expected to have any other significant adverse ecological, economic, cultural or social effects (see section 5). On balance, no populations established in New Zealand are expected to be undesirable. (see also section 6.4). Any population that develops on specimen plants of tweedia could be protected by pesticides (see section 5.4.2).

3.2. Regulatory status of the organism

Is the organism that is the subject of this application also the subject of:

An innovative medicine application as defined in section 23A of the Medicines Act 1981?

☐ Yes ☒ No

An innovative agricultural compound application as defined in Part 6 of the Agricultural Compounds and Veterinary Medicines Act 1997?

☐ Yes ☒ No

4. Māori engagement

Discuss any engagement or consultation with Māori undertaken and summarise the outcomes. Please refer to the EPA policy 'Engaging with Māori for applications to the EPA' on our website (www.epa.govt.nz) or contact the EPA for advice.

Consultation with Māori was undertaken in the course of developing the application to introduce moth plant beetle that was approved in 2011 (https://epa.govt.nz/database-search/hsno-application-register/view/APP201039) and the application to introduce the moth plant rust (https://epa.govt.nz/database-search/hsno-application-register/view/APP202529) that was approved in 2015. The members of Te Herenga and the Ngāi Tahu and Ngāpuhi HSNO komiti were contacted in 2018 to inform them of the new proposal.

4.1 Consultation undertaken in 2011

Email or written responses were received from seven sources (Hill, 2018). The issues abstracted from those submissions are provided below, and are addressed in the application:

> On a personal level I don't mind that biological controls are used to combat such as these. My reservations will be what potential impacts they will have on our native fauna/flora. Are there such already in our indigenous arsenal and if so can we bolster their numbers? (see section 5.1)
>
> ... does not oppose these applications…but urges caution when introducing foreign organisms; blackberry/gorse, weasels/rabbits etc come to mind. We are aware these organisms are put through rigorous tests but sometimes many years pass before these things break out of their natural cycle and become further pests and equally as bad as their host plant.
>
> I do not have a problem with your proposal, there are much worse things happening that I am dealing with.
>
> If the beetle is successful at eradicating the moth plant, what other food sources would it eat? Could it impact another native species? (see section 5.1.2)
>
> Does it have the potential to degrade the land when it lays eggs and hatchlings emerge? If infestation occurs how will they be controlled?
>
> If Maori resources are affected so are the people – loss of flora and fauna, loss of cultural identity, loss of clothing for Papatuanuku, loss of native vegetation, and increase of runoff if not filtered.
>
> Te Taiao ki au, ki au te Taiao.
>
> Ongoing management by Maori of our cultural and natural resources relies on Kaitiakitanga. We must be certain of the potential impacts on our resources. (see sections 5.1.2 & 5.3.2)
>
> We see that both of these plant pests pose a threat to our native ecosystems and are happy for the release to go ahead. Containment or eradication in the north is preferable to actions later in the south.
>
> We appreciate your communication on this matter however, due to capacity issues we are unable to engage further with you on this issue.
>
> Will the introduced species eradicate their hosts? If so, does this mean the introduced species will eventually die out once their hosts have been eradicated? If not, what will the introduced species achieve? (see sections 5.1.2 & 5.3.2)

4.2 Consultation with Te Herenga (2018)

Te Herenga, the EPA's national network, comprises approximately 80 iwi, hapū or Māori organisation representatives with national geographical and subject-matter coverage. Information about the proposed biological control of moth plant was distributed to members of Te Herenga in July 2018. No feedback has yet been received via this route. Any issues brought to the attention of the applicant before formal consideration of this application will be made available to the EPA

4.3 Issues raised in previous consultations

This application is similar to other applications submitted over the last 9 years to introduce new biological control agents for weeds. Communications with Māori over previous applications are relevant here and have been summarised on the MWLR website (Hill, 2018). The key areas identified in consultations over this period are:

- possible direct effects on native plant species (see section 5.1.2)
- possible indirect effects on native flora and fauna, and other valued species (see sections 5.1.2, 5.3.2)
- the need to monitor future effects (see section 7)
- predictability of effects (see section 5.1.2)
- specific benefits to Māori (see below)
- effects on cultural and spiritual values (see below)
- integration of control methods and indigenous solutions (see below)
- herbicides and biological control (see section 5.1.1)
- aversion to the introduction of new organisms
- lack of capacity precludes comment.
- is the weed present in our rohe?

Benefits accruing to Aotearoa from the introduction of the beetle or the more effective control of moth plant are explained in section 5. No benefits (or costs) have been identified that are exclusive to Māori.

Any indirect impact of the beetle through changes of relationships with other flora and fauna will be insignificant because no such interactions are expected, and because any interactions would be restricted to the immediate vicinity of moth plant (see section 5.1). Effects of the introduction of moth plant beetle on cultural and spiritual values are therefore limited. Moth plant itself adversely affects the integrity of native habitats, and successful biological control would partially restore that integrity.

Surveys indicate there are no native natural enemies that could be utilised or enhanced as indigenous solutions to the moth plant problem (Winks et al., 2004).

4.4 Māori reference group

The EPA convened a Māori reference group (MRG) to discuss the potential issues of significance to Māori surrounding the proposed applications. The MRG was made up of four members with expertise and/or experience relevant to biocontrol proposals. After undertaking a review of the information available on the proposals, the MRG identified a number of initial draft principles or themes that apply to biological control proposals generally (Landcare Research, 2018). The following key principles were identified:

- kaitiakitanga – the responsibility of Māori to manage natural resources within and beyond hapū and iwi boundaries
- manaakitanga – the ability of Māori to protect cultural rights and ownership within hapū and iwi boundaries
- whakapapa as the foundation for kaitiakitanga, and the need to consider the potential impacts of biocontrol agents across the breadth of trophic and ecosystem levels (see section 5.1.2)
- the requirement for applicants to provide comment and/or data to evaluate potential impacts (see section 5)
- the need to define the regional scope of effects, and effectively consider effects on iwi and hapū at a local level (see below)
- the desirability of making vegetation restoration an integral component of biocontrol
- the need to specifically address benefits to Māori – with reference to the initial draft principles, the MRG noted that the proposed introduction of these control agents might have significant direct beneficial effects on culturally valued species, and indirect benefits for the wider native ecosystem.

The reference group specifically commented that the presence of weeds of significant stature within the margins of the ngahere (forest), such as moth plant, adversely affects our appreciation of the forest environment.

The focus of this application is to establish biological control of moth plant to reduce large-scale environmental damage and control costs. Successful biological control would reduce the amount of herbicide currently applied to moth plant (see section 5.1).

Moth plant is largely an environmental weed, so the benefits of successful control for Māori values, such as tiaki (conservation) of flora and fauna, broadly align with priorities for wider Aotearoa (see section 5.1.1). There were no benefits or costs identified that were exclusive to Māori. Benefits and costs would accrue generally to the market economy and to the environment (see sections 5.1 & 5.3).

The addition of this agent would change the fauna within hapū and iwi boundaries. However, the beetle is functionally host-specific, with a low footprint in the native environment. It is not expected to have an adverse impact on the function of ecosystems (see section 5.1.2). On the other hand, moth plant is encroaching on Māori values, and successful biological control of the weed would stem the intensity of those effects.

4.5 Regional consultation

The Ngāi Tahu and Ngāpuhi HSNO komiti were informed in 2018 that an application to introduce moth plant beetle was to be re-submitted.

5. Risks, costs and benefits

Provide information of the risks, costs and benefits of the new organism(s).

These are the positive and adverse effects referred to in the HSNO Act. It is easier to regard risks and costs as being adverse (or negative) and benefits as being positive. In considering risks, cost and benefits, it is important to look at both the likelihood of occurrence (probability) and the potential magnitude of the consequences, and to look at distribution effects (who bears the costs, benefits and risks).

Consider the adverse or positive effects in the context of this application on the environment (e.g. could the organism cause any significant displacement of any native species within its natural habitat, cause any significant deterioration of natural habitats or cause significant adverse effect to New Zealand's inherent genetic diversity, or is the organism likely to cause disease, be parasitic, or become a vector for animal or plant disease?), human health and safety, the relationship of Māori to the environment, the principles of the Treaty of Waitangi, society and the community, the market economy and New Zealand's international obligations.

You must fully complete this section referencing supporting material. You will need to provide a description of where the information in the application has been sourced from, e.g. from in-house research, independent research, technical literature, community or other consultation, and provide that information with this application.

The potential risks, costs and benefits of the proposed introduction to New Zealand of moth plant beetle have been identified by literature review, by review of issues raised in previous applications to ERMA/EPA to introduce biocontrol agents for weeds, and by consultation with stakeholders. All effects identified during this process are listed on the MWLR website (Hill & Gourlay, 2011). Those effects considered to be potentially significant are highlighted on that list, and only those effects are addressed in detail here (section 5). Potential effects are associated with

- permanent establishment in New Zealand of the moth plant beetle
- reduction in the abundance and vigour of existing moth plant infestations
- reduction in the spread of moth plant.

Stakeholders were consulted in 2011 and 2015 in the preparation of previous applications for approval to introduce moth plant control agents (APP201039 and APP202529). Section 5 contains quotes and citations obtained during the 2011 and 2015 processes. There was no additional consultation in 2018.

5.1 Potential effects of control on the environment

5.1.1 Potential beneficial effects on the environment

The introduction of moth plant beetle would benefit the environment if larvae feeding in the roots caused sufficient suppression of moth plant to:

- increase the survival and fitness of native plants growing beneath moth plant curtains by reducing the adverse effects of shading and competition by moth plant
- reduce the rate of establishment of moth plant at new sites by limiting seed production
- contribute to the restoration of trophic webs by reducing shading by moth plant
- reduce herbicide use.

Reducing the adverse effects of moth plant in native habitats

Moth plant vines directly damage underlying vegetation by shading, and by the weight of the stems and leaves. It can also spread over the ground, smothering regenerating seedlings and small native plants. Moth plant therefore poses a high risk to urban reserves and forests, overtopping and smothering trees, and replacing native vegetation (DOC, in Landcare Research, 2015). Damage to vegetation has a flow-on effect to associated flora and fauna.

In time, moth plant will become more common beyond urban areas and an increasing threat to healthy native forests in northern New Zealand. It is already known from intact and disturbed forest and margins, tracks, coastline, cliffs, riparian margins, shrublands, mangroves, inshore and offshore islands (DOC, in Landcare Research, 2015) in almost any frost-free habitat. The wider threat to the natural estate is acknowledged by weed management authorities such as DOC and regional councils, and their opinions on moth plant are also presented in Hill, 2018. Moth plant flowers are said to attract and trap insects, but the importance of this on biodiversity values is questionable.

Persistent and heavy feeding in the root zone of moth plant is likely to reduce the vigour and growth rate of moth plant vines. Successful biological control would cause defoliation and death of some plants, reduce shading, and enable underlying vegetation to recover. The intensity of larval feeding achieved in New Zealand will only be known post-release, but even modest levels of root damage are expected to reduce the adverse effects of moth plant.

Reduction in moth plant seed production?

DOC (Landcare Research, 2015) manages moth plant surveillance and control programmes on at least five remote offshore islands where endemics and threatened plants such as *Lepidium oleraceum*, *Picris burbidgeae*, *Strebulus banksii*, *Senecio scaberulus*, and *Pisonia brunoniana* are at risk from moth plant. The islands are up to 22 kilometres from the mainland, which illustrates that windborne seed provide moth plant with an effective long-distance dispersal capability. As on the off-shore islands, effective moth plant management on the mainland is hampered by the ongoing re-invasion of moth plant sites after control has been achieved.

> The weed control on the off-shore islands started in 1994 and we have kept a database containing location of sites, and number of plants pulled (adults and juveniles). Over time we have been able to plot these numbers and see how the numbers have shown a steady decline. However, the threat of new incursions is alive as the mainland (coastal areas) is abundant in moth plant; therefore the risk of seeds [being] constantly blown over is high. (DOC, 2011)

Damage to the roots by moth plant beetle is expected to reduce fruit production in infested vines, limiting the amount of windborne seed distributed from infested sites. Successful biological control would eliminate re-invasion risks following treatment. However, the magnitude of the benefit will depend on the proportion of plants infested and the level of damage achieved (see also section 5.4.1). This will only be known once the agent becomes established.

Reduction in the use of herbicide in native habitats

The recommended herbicides include herbicide gel that is applied to the trunk and stems, and metsulfuron, dicamba, picloram and triclopyr sprays. Sprays can be applied aerially or as a basal spray. None of the herbicides are specific to moth plant, and as moth plant is usually found growing over or through other plants, off-target damage from the herbicides occurs, especially in hot conditions. Successful biological control would reduce the need to apply herbicides, reducing incidental damage and pesticide loads in the environment. Although locally significant at infested sites, the overall benefit to the wider environment of reduced herbicide use is probably limited because herbicides are currently applied to only a small proportion of the area currently infested with moth plant.

5.1.2 Potential adverse effects on the environment

The introduction of moth plant beetle would adversely affect the New Zealand environment if:

- native plant populations were reduced through beetle attack
- the presence of the beetle sufficiently altered food web interactions to cause significant displacement of native organisms through ‘apparent competition’ (see below)
- decline in moth plant abundance led to the invasion of sensitive habitats by worse weeds.

Potential for damage to native plant populations

The results of host range testing are summarised in section 3.1.4, and McGrath et al. (2018) provide additional detail. The validity of the testing regime and interpretation of the results has been peer reviewed, and that review has been provided to EPA. The plants chosen for host-specificity testing were selected in accordance with international best practice for weed biocontrol host-range testing (Wapshere, 1974; Sheppard et al., 2005; Briese, 2005; McGrath et al., 2018). As there is only one genus of native plants in the same family as moth plant it was not necessary to test natives outside this genus. *Parsonsia heterophylla* and *P. capsularis* were selected to represent the three native species (Figure 3).

The risk posed by moth plant beetle to the native species *Parsonsia heterophylla* is negligible (see section 3.1.4). Adults did not feed on the foliage, and would have no reason to seek out or dwell on this plant. Larvae placed on the roots did not survive (Figure 4). The pattern of host plant use revealed in tests provides no reason to suggest that the other *Parsonsia* species in New Zealand would be any more susceptible. As there are no other native species in this family, the risk to other native non-target plants is **negligible** (but see section 5.4.2. for discussion of risk to valued species other than natives).

Native ecosystems and trophic webs

The introduction of the moth plant beetle would have adverse effects on New Zealand's ecological values if:

- any native species was significantly displaced from moth plant, or
- ecosystem interactions were significantly altered through apparent competition.

'Apparent competition' between two species occurs when both are preyed upon by the same natural enemy. For example, if species A and species B were both prey for a parasite, an increase in the population of species A could lead to an increase in the population of the parasite, which in turn could exert unnatural pressure on populations of species B.

Hypothetically, resident generalist parasitoids, predators or diseases could colonise and build large populations on moth plant beetle following its release, which in turn could suppress other Coleoptera, increasing the risk to other beetle populations and their role in ecological systems.

The applicant believes the scope for these potential effects would be biologically and geographically limited, for the following reasons.

- There are no known parasitoids that could be shared between native eumolpine beetles and moth plant beetle (see section 3.1.3).
- Moth plant beetle is functionally host specific (see section 3.1.4). Any apparent competition would be restricted to the environs of moth plant infestations.
- New Zealand has a diverse fauna of chrysomelid beetles, which are abundant in the environment. The introduction of one more species with a limited distribution is unlikely to impact heavily on current chrysomelid/natural enemy population dynamics.

The scope for significant effects appears limited (see section 3.1). The applicant considers the magnitude of potential adverse interactions with non-target beetle populations is likely to be **minimal to minor**.

Replacement by worse weeds

Biological control would have an adverse environmental effect if decline in this weed led to invasion by worse weeds. The widespread exotic vines that have similar ecological and economic effects in the range of moth plant are old man's beard, banana passionfruit and Japanese honeysuckle, and any of these could potentially replace moth plant. However, these species do not always occupy the same niche as moth plant and replacement is not certain. Should replacement occur, it seems unlikely that environmental impacts would be worse, although there are no data to support this view. The applicant believes that where replacement occurs, the effects are likely to be neutral.

5.2 Potential effects of control on human health

5.2.1 Potential beneficial effects on human health

Successful biological control would reduce the incidence and abundance of moth plant in New Zealand, and reduce the frequency of adverse health effects.

Both fruits and stems of moth plant exude a caustic milky sap when broken. The sap is under pressure so flows freely out the fruit. This white latex is sticky, and causes skin irritation in susceptible people. The sap can also cause eye irritation. The latex is poisonous to humans (https://www.landcareresearch.co.nz/__data/assets/pdf_file/0010/42013/Poisonous_plants_nz.pdf) and ingestion of the foliage of moth plant can cause gastrointestinal symptoms such as nausea, vomiting and diarrhoea.

From 1 June 2002 to 15 July 2011 there were 16 calls to the National Poisons Centre (NPC) in New Zealand about ingestion (seven), exposure to eyes (two), and skin (five), involving 14 human exposures, one cow and one dog (Jenni Jones, NPC, pers. comm., in Landcare Research, 2015). In New Zealand it would appear that the benefits to human health from reducing moth plant (i.e. less poisoning) would outweigh the costs (i.e. loss of potential to use it to treat warts or induce vomiting).

5.2.2 Potential adverse effects on human health

Winks & Fowler (2000) record the following:

> In its native range of Argentina and Brazil, moth plant is considered to be an ornamental, industrial, and medicinal plant (Esler et al. 1993). The stem yields tough smooth fibre for textiles, and the silky down on the seeds has many uses. When cut, the stems, pods, and leaves of moth plant exude a milky sap, which can cause irritation to the skin. This latex is used as a treatment for warts in South America and South Africa. The plant is also reported to be a purgative and an agent that induces vomiting.

No significant beneficial uses of moth plant are known in New Zealand, and so successful control would have no adverse consequences for human health

5.3 Potential effects of control on the market economy

5.3.1 Potential beneficial effects on the market economy

Control of moth plant is a measurable cost to DOC, regional councils, other territorial authorities, and to other land managers. Successful biological control would yield benefits to the market economy if it could significantly:

- reduce the current cost of control for occupiers, regional councils, DOC, and others, and/or
- reduce the rate at which moth plant management costs are growing.

Information about the adverse effects of moth plant and the costs of mitigating those effects was sought from regional councils and unitary authorities, DOC, forest and land managers, infrastructure managers, professional scientific societies, producer organisations and NGOs in 2011, 2013 and 2014 (Landcare Research, 2015; Hill, 2018). Objective data were scarce, but commentaries were provided by a range of DOC and regional council staff to indicate the economic cost of moth plant management to these organisations (Hill & Gourlay, 2011).

Department of Conservation

At least 12 national priority biodiversity management units and 40 reserves contain moth plant infestations, and at least four community groups run moth plant programmes on public conservation land managed by DOC (see section 5.4). Because of the distribution of moth plant, it is unrealistic to manage moth plant as a weed-led eradication, except for small localised patches such as those in Wairarapa and the South island. Most management occurs as part of site-led weed programmes. Costs are difficult to determine as moth plant is usually managed as part of general weed programmes, but can include a day's hire of a helicopter to carry out surveillance and control, running island weed teams, and annual visits to remove seedlings at eradication sites.

Moth plant is controlled either by physical removal or by herbicides. Manual control is often used in plantings and around sensitive plants. Trained supervisors must be present for the application of some herbicides. DOC has moth plant control programmes and surveillance programmes on at least five remote offshore islands (see section 5.1.1). Some infestations have persisted for 10 to 16 years. Island weed programmes require boat charters, and living and working in challenging conditions.

> Moth plant is a huge concern on the Coromandel with DOC only able to focus on the conservation estate. Places such as Cathedral Cove [have] a huge infestation with no easy solution … [DOC] estimates approximately 10% i.e. $10,000 of [its] weed budget would be spent on controlling moth plant in the Coromandel region (not including Cuvier Island). (DOC, 2011)

Moth plant is too widespread outside Auckland to justify 'weed-led' control operations by DOC, and the costs of moth plant could not generally be isolated within weed management budgets. However, comments (Hill & Gourlay, 2011) indicate that maintaining moth plant populations to low levels requires multiple visits, and this is a major priority in expensive offshore island operations on Poor Knights Islands and the Hen and Chicken Islands. Control is complicated by reinvasion generated by seed drifting from the mainland. Six percent of the sites treated in 2008/09 were moth plant, but this increased to 10% in the last year. Significant operations on Bream Head and Manaia aim to reduce this seed rain (Hill & Gourlay, 2011).

Regional and unitary councils

The protection of reserved land, offshore islands and amenity areas from moth plant requires large investment from regional and territorial councils. Moth plant is seen as a potential environmental and public threat throughout the Waikato region. Moth plant is still limited in distribution in Waikato, but it has the potential to become one of the region's most serious ecological weeds. It is already a problem in Coromandel. Moth plant is a serious weed in the neighbouring Auckland region, and potential spread south along State Highway 1 into this region is a major concern to Waikato Regional Council. All landowners/occupiers are responsible for controlling moth plant on their property and are required to work with Waikato Regional Council in areas where control programmes are in place.

In 2011 Auckland Council estimated that over $1 million was invested in direct control and in supporting community initiatives by the council, volunteers and the general public (H. Cox, pers. comm., in Hill, 2018). On Waiheke Island alone the council spends approximately $33,000 per annum, and expenditure by the public was estimated at over $150,000. Over the region as a whole, known expenditure was $369,000 per annum, with the public contributing an additional $750,000 (in Hill, 2018).

So summing it all up

Enquiries, complaints, education etc (AC Biosecurity)	$300,000 pa
Local Biosecurity Officer projects-	$6120 pa
Gen public (est.)	$600,000 pa
Parks (+parks volunteers)	$12,800 pa
AC Local Parks (Waiheke)	$25,000 pa
Waiheke gen public (est.)	$162,000 pa
Known volunteer effort	$25,740 pa
TOTAL OF ESTIMATE (Auckland Council, in Hill, 2018)	$1,131,660 per year.

Other councils also report significant investment on moth plant management, even (or perhaps especially) in areas where it is not yet common.

> While the amount of resource put towards this species is quite low ($36,798 since 2009) the potential of this plant if allowed to establish and spread uninhibited is well documented. In some areas of the country this plant has well and truly gone past the point where it can be effectively controlled by chemical means or physical (due to costs …) When a plant reaches this point it has become too expensive to control but has **<u>only just started</u>** to spread and the full impacts due to density and coverage will always be a long way off (so after the point of too expensive it will always get a lot worse). (2011 consultation)
>
> We control it simply because of its potential as it is not in our RPMS for Plants. There is potential for significant infestation of riparian areas & other public amenity areas currently vegetated with desirable species, to be invaded and adversely affected by moth plant. (2011 consultation)

> We have completed delimit surveys around each of our known Total Control sites, now completed, during 7 years to June 2011. Average of around $7,000 annually to control 187 sites, currently 104 active this season, 17 monitored and 10 eradicated. (2011 consultation).

Moth plant imposes financial costs on other agencies. For example, in the control area designated by Horizons Regional Council, roading authorities are specifically tasked with moth plant eradication in the road reserve to limit corridor spread. Greater Wellington Regional council estimate the Net Present Value of moth plant to production values and control costs over 75 years at $2.74 million. The council is spending $7,000 annually to monitor 187 sites with a view to eradicating the weed from the region.

Primary producers, QEII National Trust and New Zealand Landcare Trust

Moth plant does not appear to be a significant issue affecting production in farming or forestry, but it is an issue in horticultural shelterbelts.

> Moth plant is widespread in the coastal BOP. It especially infests kiwifruit orchard shelterbelts, estuary margins, road and rail reserves and coastal back-dune areas. It is a significant problem to the kiwifruit industry. It especially slows down the work of shelter trimmers when they run into large entanglements in the shelter hedge. It also causes a dermatitis type reaction in people handling the plant without protective gear. (2011 consultation)

> … after googling Moth plant we also have that on the boundary growing in our shelter belt and having been wanting to control it and as the paddock was a sacrifice paddock this year the seed were really obvious across the paddock. (2011 consultation)

> Moth plant is definitely a problem in our road reserves and a cost to businesses here, many of whom struggle in this economic climate to cope with the additional expense of control. Commercial sites, vineyards and other lifestyle block owners are ones that come to mind. (2011 consultation)

Moth plant is present in 119 QEII National Trust covenants nationwide, 90 of which are in Northland. There are no quantitative data about management costs or pest status.

> I have ongoing battles with moth plant at a number of sites within the Whangarei district. Several sites have been targeted for a number of years, even receiving funding from the Biodiversity Condition Fund. Most recently I collected 7 large rubbish bags of pods from the roadside opposite a QEII area where we had spent hours over a number of years dealing with moth plant and other weeds. So I guess I can provide some detail on how relentless the battle appears to be if you would like some info. (2011 consultation)

> There are of course many other landcare groups who target moth plant, but this is usually tackled as part of an integrated animal and plant pest program. (2011 consultation)

Other moth plant parts (including seeds) have been reported as being toxic to poultry and cattle in Australia, but it is not often eaten and cases of poisoning are not common. In feeding tests with poultry, dark brown, ripe seeds were fatal at rates of 5 ±15 g per head (0.3 ± 0.6% of body weight). Violent symptoms appeared within 4 hours of eating the seeds and death occurred within 24 hours (in Winks & Fowler, 2000).

5.3.2 Potential adverse effects on the market economy

The establishment of moth plant beetle would adversely affect the market economy if feeding in the roots of valued non-native plant species resulted in significant damage, reducing their value to the nursery industry.

New Zealand Plant Producers Incorporated (NZPPI) state that non-native plants grown for ornamental purposes are part of New Zealand's heritage and should be valued along with other biodiversity. Moth plant beetle completed development on *Oxypetalum caeruleum* (commonly called tweedia) in the laboratory (see section 3.1.4). Tests could not rule out the possibility that moth plant beetle would damage tweedia, or any other member of the sub-tribe Oxypetalinae if released in New Zealand.

NZPPI have suggested that gardeners and butterfly enthusiasts are passionate about tweedia and their views need to be addressed. The importance of tweedia to society and communities is discussed further in section 5.4.2. However, they also stated that the trade in tweedia plants is valued only in the tens of thousands, and that all growers protect nurseries during production and sale. A detailed search of current and past nursery catalogues revealed that there are no other plants in the sub-tribe that are (or have been) valued by the nursery industry in New Zealand (M. Dawson, MWLR, pers. comm.). Moth plant itself has no value to the nursery industry.

5.4 Potential effects on society and communities

5.4.1 Potential beneficial effects on society and communities

Successful biological control of moth plant would benefit society and its communities if:

- reduction in the pest status led to less effort expended on moth plant control by the general public
- replacement of moth plant with native vegetation led to significant improvement in the recreational values of natural areas
- reduction in the weediness of moth plant led to better use of community resources and conservation volunteers.

Householders in the north of New Zealand detest moth plant. Moth plant has a significant impact on the well-being and lifestyle of householders throughout northern North Island. The concern of the public is clear. Regional council officers routinely field calls from ratepayers seeking advice on how to manage the plant.

> Our Tauranga office takes about 20 calls per year specifically seeking advice on how to control moth plant. Regionally about 60 calls per year. Regional field officers would receive about 200 enquiries per year on this plant. (2011 consultation)

> Waitakere Biosecurity Officers spend about 520 hours a year following up complaints on moth plant. So this would be equivalent $23,400 (2011 consultation).

It was the second most frequent cause of weed-related enquiries to Waikato Regional Council in 2010, and regional field officers of Environment Bay of Plenty receive about 200 enquiries per year about this plant. Comments from householders are included in Hill, 2018.

Disposal of the weed takes time and effort, and the latex damages clothes and causes skin irritation. Application of herbicide risks damage to valued plants in backyards. Weeds like moth plant reduce aesthetic enjoyment for some of reserves in urban areas. Successful biological control would reduce the visual impact of moth plant on native habitats.

Considerable resources have been invested in moth plant management by DOC, regional and unitary councils, community groups and occupiers. Successful biological control would reduce the need for moth plant control operations, leading to biodiversity gains from re-targeting community resources and use of conservation volunteers (Hill, 2018).

> The Motutapu Restoration Trust was established in 1993 to support the Department of Conservation in restoring the 'natural and cultural' landscapes of the island of Motutapu in the Hauraki Gulf Marine Park. … The major pest plant, tackled by volunteers is moth plant. … The Trust learnt many years ago that moth plant is not easily eradicated. Its seed bank remains viable for many years and unless the root is completely removed the plant continues to regenerate year after year. Volunteers from the Trust spend a great deal of time collecting pods from mature plants as each pod can contain about 500 viable seeds! Over a year several hundred onion sacks of moth pods are collected and destroyed. Just last week 40 sacks of 100 pods each were collected from a new area added to our weed control area. (2011 consultation).
>
> The Guardians of the Bay is a community group working with DOC to restore … One thing they do is control weeds on the islands, the most well-known island being Urupukapuka in the ipipiri group and they are under the umbrella of weedbusters. They target mothplant on several islands where they can reach it. (2011 consultation).
>
> I'm Chair of The Bushland Trust and we mainly do restoration work on Aupouri Pen wetlands closer to Kaitaia. We're undertaking moth plant control at Lake Heather trying to stop its spread north… and [it is] not without its pitfalls! NRC are trying to draw a line in the sand at Houhora or there about.

5.4.2 Potential adverse effects on society and communities

The biological control of moth plant would have adverse effects on society and communities if feeding in the roots by the biological control agent resulted in significant loss of enjoyment by the public of the ornamental values of non-native plants.

Ornamental tweedia

Oxypetalum caeruleum, commonly called tweedia, is an ornamental species grown occasionally in New Zealand gardens. The prospect of possible attack by moth plant beetle on the roots of tweedia was raised in 2011 in a message to the weekly *Get Growing* newsletter associated with the *New Zealand Gardener* magazine. The views concerning the value of tweedia expressed in emailed responses were mixed (Landcare Research, 2015).

> I am torn both ways – I hate moth plant, but I can get rid of it. And I love Tweedia not only for its lovely blue flowers but because the butterflies like it.

> My garden is specifically designed to attract both butterflies and bees. I would not like to lose my Tweedias.
>
> I live in Otaki on the Kapiti Coast. Do we have moth plant in this area? I can't say that I have seen Moth Plant but I have recently purchased a Tweedia plant and hope to grow more from the seeds I have just collected.
>
> Moth vine is a real problem where I live (Waiheke Island) – we have it on a steep cliff with impossible access, so biological control would be fantastic. Waiheke is too dry in summer for the sort of garden that is likely to feature Tweedia, so for me, and I suspect my fellow Waiheke Islanders, the sacrifice of Tweedia in order to get rid of the moth vine is a no-brainer.

The garden ornamental tweedia is valued as a forage plant for butterflies. Tweedia and moth plant are closely related within the sub-tribe Oxypetalinae. Both proved susceptible to the moth plant beetle in the laboratory (see section 3.1.4). In the absence of any other evidence, it must be assumed that tweedia would be susceptible if moth plant beetle was released in New Zealand.

Moth plant beetle is expected to build to damaging proportions and have a severe impact on moth plant, its primary host. If it does not, then the risk to tweedia is also likely to be minimal. If tweedia becomes so susceptible that its value as an ornamental is threatened, gardeners could protect plants from egg-laying adults using the pesticides commonly used to protect roses from damage by bronze beetle, although fortnightly application might be required. Tweedia also provides nectar for butterflies, but is one of many garden species that can fulfil this role.

Host plants for monarch butterflies

The closely-related sub-tribe Asclepiadinae contains the swan plant (*Gomphocarpus fruticosus* and *G. physocarpus*) and scarlet milk weed (*Asclepias curassavica*) (Figure 3). Swan plants are important amenity plants in gardens, and are the sole true host of the monarch butterfly. In 2011 the Moths and Butterflies of New Zealand Trust highlighted the social and economic value of these species to New Zealand and questioned whether sufficient testing had been done to ensure that the well-being of monarch and other butterfly populations would not be adversely affected by biological control of moth plant.

> As the host plant for Monarch butterflies they are an important species that provide an opportunity for the wider public to learn about biodiversity and experience 'wildlife' at close quarters … [and an] important commercial crop, with thousands of these plants being grown and sold during the spring and summer each year. Therefore, host-range testing of milkweed species and monarch host-plant species must be rigorous.
>
> We would like to see further host-range testing namely: Increased sample sizes tested of G. fruticosus and A. curassavica, Inclusion of … A. incarnata; A. syriaca and G. physocarpus. Inclusion of tweedia (Oxypetalum caeruleum) is also crucial. (2011 consultation)

The applicants believe the test results summarised in section 3.1.4 and Figure 4 are adequate to predict that the host range for *Freudeita cf. cupripennis* falls within the sub-tribe Oxypetalinae, and that *G. physocarpus* and *A. curassavica* will not be hosts. Similarly, the much rarer hosts for monarch butterfly larvae belong to a different sub-tribe and will not be hosts of the moth plant beetle

6. Pathway determination and rapid assessment

Under sections 38I and 35 of the HSNO Act your application may be eligible for a rapid assessment. The pathway for your application will be determined after its formal receipt, based on the data provided in this application form. If you would like your application to be considered for rapid assessment (as per the criteria below), we require you to complete one of the below sections. **Fill in the section that is relevant to your application only.**

6A. New organism that is or is contained within a veterinary or human medicine (section 38I)

6.1. Controls for organism

Describe the controls you propose to mitigate potential risks (if any). Discuss what controls may be imposed under the ACVM Act (for veterinary medicines) or the Medicines Act (for human medicines)

Not applicable

6.2. Discuss if it is highly improbable (after taking into account controls if any):

- The doses and routes of administration of the medicine would have significant adverse effects on the health of the public or any valued species; and
- The organism could form an undesirable self-sustaining population and have significant adverse effects on the health and safety of the public, any valued species, natural habitats or the environment

Do not include effects of the medicine or new organism on the person or animal being treated with the medicine

Not applicable

6B. New organism (excluding genetically modified organisms) (section 35)

6.3. Discuss if your organism is an unwanted organism as defined in the Biosecurity Act 1993

There are no *Freudeita* species listed in the Ministry for Primary Industries Unwanted Organisms Register (https://www1.maf.govt.nz/uor/searchframe.htm)

6.4. Discuss if it is highly improbable, after taking into account the proposed controls, that the organism after release:

- Could form self-sustaining populations anywhere in New Zealand (taking into account the ease of eradication)
- Could displace or reduce a valued species
- Could cause deterioration of natural habitats,
- Will be disease-causing or be a parasite, or be a vector or reservoir for human, animal, or plant disease
- Will have adverse effects on human health and safety or the environment

6.4.1 Risk of unwanted populations

It is very unlikely that the agent could be successfully eradicated once established, so release into the New Zealand environment should be considered irreversible (section 3.1). The object of introducing moth plant beetle is to establish desirable self-sustaining populations wherever moth plant infestations exist in New Zealand. This species would only be considered undesirable if it adversely affected valued native plants or ecosystems. Moth plant beetle is not expected to have significant adverse economic or environmental effects in New Zealand (see sections 3.1.4, 5.1.2, & 5.4.2) but could potentially damage the ornamental plant tweedia (see section 5.4.2). Given the potential benefits of the introduction, populations of moth plant beetle will not be unwanted.

6.4.2 Risk of displacement of valued species

Significant displacement of valued species is considered improbable for the following reasons.

- The evidence presented in sections 3.1.4 and 5.1.2 indicates that native plant species are not at significant risk of attack by moth plant beetle.
- With the exception of potential damage to tweedia plants, exotic plant species are not at significant risk (sections 3.1.4, 5.3.2).
- It is improbable that any native plant or invertebrate species would be significantly displaced (section 5.1.2). There appear to be no native invertebrate species commonly associated with moth plant that could be significantly displaced by moth plant beetle (Winks et al., 2004).
- Any change in moth plant abundance resulting from biological control is likely to be gradual, over years. It is highly improbable that this control agent will cause catastrophic decline in any moth plant infestation that might then lead to widespread rapid change in any native habitat. Successful biocontrol will tend to restore affected areas to a pre-invasion state over time.
- Permanent reductions in moth plant biomass could theoretically result in replacement in existing sites by equally or more damaging invasive species (see section 5.1.2). This potential effect is not considered significant because it is unlikely that those weeds would be any more damaging than moth plant in affected habitats. In native habitats moth plant is more likely to be displaced by native species. Any effect is likely to be variable from place to place.
- Nadein and Leschen (2017) record 19 indigenous species of four genera in the tribe Eumolpini (family Chrysomelidae; sub-family Eumolpinae). None of these species belong to the genera *Freudeita* or *Colaspis.* It is highly improbable that *F.* cf *cupripennis* could successfully hybridise with native species.

6.4.3 Risk of deterioration of natural habitats

Founding populations of moth plant beetle will be relatively small, and it will take several years before the density of beetles on moth plant reaches damaging levels. Moth plants are perennial, with significant reserves. Suppression of growth or deterioration of vines will be gradual, and it is unlikely that the control agents could kill a plant within a single season. Change in moth plant biomass and abundance will therefore be gradual, allowing surrounding vegetation time to regain the space occupied by moth plant. Deterioration of natural habitats is therefore highly improbable.

6.4.4 Risk of carrying disease

Moth plant beetle does not form disease in its own right, and is not parasitic on vertebrates. A small number of adult chrysomelid beetle species are known vectors of viruses (Selman 1988; Table 2 in Nault, 1997) in several crops of high economic importance, including rice and beans. Viruses are acquired and transmitted from plant to plant through leaf tissue macerated by beetle feeding. Some viruses have been isolated from the haemolymph, but viruses do not appear to multiply in their beetle vectors. There is no evidence that virus is transmitted between insect stages (Nault, 1997, p. 534).

It is improbable that introduced beetles would carry virus into New Zealand, because both imported beetles and the plants on which they are reared will be destroyed while in containment. Transmission of virus from adult chrysomelids to eggs has not been recorded (Nault, 1997). The moth plant beetle has a narrow host range. Significant feeding by adults was restricted to moth plant and tweedia in laboratory tests (see section 3.1.4). Given the rarity of feeding on non-hosts, it is improbable that moth plant beetle will acquire and then transfer viruses to hosts outside the sub-tribe Oxypetalinae. However, beetles could potentially transfer viruses between moth plant vines and to tweedia plants, an acknowledged host. It is not known if moth plant or tweedia have viruses in New Zealand.

6.4.5 Risk of adverse effects on human health

Most of the life cycle of moth plant beetle (eggs, larvae and pupae) is spent in the root zone of the host plant with no prospect of interaction with humans. A short literature search (PubMed) revealed no records of chrysomelid beetles implicated in adverse effects on human health. No credible mechanism for chrysomelid beetles having adverse effects on human health and safety has been suggested. Significant adverse effects on human health are improbable (see section 5.2.2)

7. Other information

Add here any further information you wish to include in this application including if there are any ethical considerations that you are aware of in relation to your application.

This application raises no known ethical considerations.

7.1 Post-release monitoring and measurement of impact

The development of biocontrol agents for weeds is mostly funded by the National Biocontrol Collective. The collective has stated its commitment to the evaluation of target and non-target effects of the agents developed, as and when this is appropriate, with the support of MWLR. MWLR will provide founding populations of moth plant beetle to the applicant, regional councils and other organisations. Release sites will be monitored for establishment success, and simple baseline estimates of weed abundance will be made (https://www.landcareresearch.co.nz/__data/assets/pdf_file/0005/83318/Basics_National_Assessment_Protocol.pdf). If the moth plant beetle becomes abundant, members of the collective will then undertake measurement of its effects.

MWLR is focused on constant improvement in the biological control of weeds in New Zealand, including world-leading research into minimising the interactions of introduced agents with existing trophic webs (Paynter et al., 2010; Fowler et al., 2012), better prediction of success (Paynter et al., 2012), how agents disperse (Paynter & Bellgard, 2011), the accuracy of host range testing in predicting eventual host range following release (Paynter et al., 2014), and monitoring the safety of biological control using insects in New Zealand (Paynter et al., 2004).

8. Checklist

This checklist is to be completed by the applicant

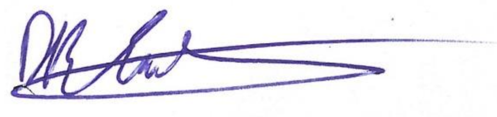
Application		**Comments/justifications**
All sections of the application form completed or you have requested an information waiver under section 59 of the HSNO Act	☒ Yes ☐ No (If No, please discuss with an Advisor to enable your application to be further processed)	
Confidential data as part of a separate, identified appendix	☐ Yes ☐ No	N/A
Supplementary optional information attached:		
• Copies of additional references	☒ Yes ☐ No	
• Relevant correspondence	☐ Yes ☐ No	
Administration		

Are you an approved EPA customer?	☒ Yes ☐ No If Yes are you an: Applicant: ☐ Agent: ☒	
If you are not an approved customer, payment of fee will be by: • Direct credit made to the EPA bank account (preferred method of payment) Date of direct credit: • Cheque for application fee enclosed	☒ Yes ☐ No ☒ Payment to follow ☐ Yes ☐ No ☐ Payment to follow	
Electronic, signed copy of application e-mailed to the EPA	☒ Yes	

Signature of applicant or person authorised to sign on behalf of applicant

☒ I am making this application, or am authorised to sign on behalf of the applicant or applicant organisation.

☒ I have completed this application to the best of my ability and, as far as I am aware, the information I have provided in this application form is correct.



19 December 2018

Signature **Date**

Request for information waiver under section 59 of the HSNO Act

☐ I request for the Authority to waive any legislative information requirements (i.e. concerning the information that has been supplied in my application) that my application does not meet (tick if applicable).

Please list below which section(s) of this form are relevant to the information waiver request:

Appendices and referenced material (if any) and glossary (if required)

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