

Responses to public consultation on the proposed introduction of two biological control agents for moth plant

The scope of consultation

Moth plant (*Araujia hortorum*) occurs sporadically north of Blenheim and is abundant north of Tauranga. It threatens conservation and amenity values in northern New Zealand. An application to introduce the moth plant beetle, *Colaspis argentinensis* was approved in 2011 (APP 201039). The current application seeks to introduce the rust fungus, *Puccinia araujiae*, and is the second application in the biological control programme against moth plant. In both cases, extensive general consultation was undertaken before the applications were written, to elicit subjects to be addressed in the applications (consultation with Iwi is reported elsewhere).

1. Meetings were held to discuss issues with ERMA/EPA and Department of Conservation staff were consulted.
2. Regional councils and Unitary Authorities from Marlborough northwards were consulted
3. A range of organisations were asked to comment on the proposals including Federated Farmers of New Zealand, NZ Forest Owners Association, Nursery and Garden Industry Association of NZ, Royal Forest and Bird Protection Society of New Zealand, Queen Elizabeth II National Trust, NZ Landcare Trust, Conservation Groups, Moths and Butterflies of NZ Trust, science societies, and the National Poisons Centre.

Here are the summarised responses received that are:

1. Specific to the current application and received in 2014/15
2. Relevant to the current application but received in 2011 in relation to APP 201039

Responses to general consultation on the current application (2014)

The Northland Regional Council is the nominal applicant, acting on behalf of the National Biocontrol Collective, a consortium of organisations responsible for biosecurity that comprises the Department of Conservation and regional and Unitary councils. This proposal is sanctioned by their Regional Pest Management Strategies. The Biosecurity Act 1993 requires councils to consult with local communities on the preparation of RPMSs. North Island regional councils and Marlborough District Council were asked for comment on this proposal.

David Havell, Department of Conservation, Technical Advisor Northern Threats Team, Transformation and Threats

(This updates a submission provide in 2011 in relation to APP201039)

Summary

Moth Plant, *Araujia hortorum*, is a common, widely distributed plant in the warmer areas of New Zealand, occurring in a variety of habitats from retired pasture, shrublands, secondary forest, forest light gaps and margins, gardens, and road sides. Moth plant can smother small trees and shrubs by forming a dense cover. Several threatened plants and naturally uncommon plant communities are at

risk from moth plant. Lowland bush relics and restoration plantings which are often relatively open to weed invasion can be damaged by moth plant vine growth. Despite a relatively short lived seed bank, infestations are persistent and often difficult to detect until flowers or the ripe pods become visible in the upper canopy. Herbicide control can be difficult to apply because other sensitive plants are present. Physical control such as hand pulling and pod removal is dangerous because the sap, which readily leaks out of cut stems is toxic and causes rashes and sore eyes.



Figure 1. Moth Plant Distribution in New Zealand, DOC Bioweb Map

To date the most successful DOC moth plant eradication operations have been localised outlying patches where the threat of reinvasion is reduced. Most control operations are limited by ongoing invasion and the persistence of seed and seedling banks. Several programmes are at least 10 years old.

Moth plant rust is a not threat to native plants, and the introduction of rust plant rust is likely to benefit moth plant control programmes.

Distribution

Moth plant, (*Araujia hortorum*) is widely distributed within the northern North Island and in scattered location in Gisborne, the lower North Island (Wairarapa and the Horowhenua), Christchurch, West Coast and Nelson, Figure 1. The seed is wind dispersed, and based upon known distributions, seed has the potential to disperse over 22 km. Plants are known to have been spread as seed in bagged plants.

Moth plant appears to be limited by soil moisture, and winter temperature, but records from the Wairarapa, including Te Kopi indicate that moth plant has some frost and drought tolerance and suggests that moth plant has not yet reached its full distribution in New Zealand.

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 the Wairarapa and the South island, and most moth plant management occurs as part of site led weed programmes.

Moth plants can be relatively common and reach high densities within local vegetation.

Figures 2, shows the distribution of moth plants within moth plant control programmes on Rangitoto Island . While much of Rangitoto Island is free of moth plant, there are high density patches around the summit and coast. Motutapu Island has extensive patches along the coastal fringe, in bush relics, and on cliffs where abseiling techniques are required.



Fig 2 (a) Moth plant infestations – Rangitoto Island

Moth plant seedlings readily grow in shady conditions and light wells, and in low open vegetation such as rank grass and restoration plantings, and gardens , Figure 3. which Illustrates drought tolerance of seedlings. Physical control is required as moth plant is growing over a valuable specimen tree.

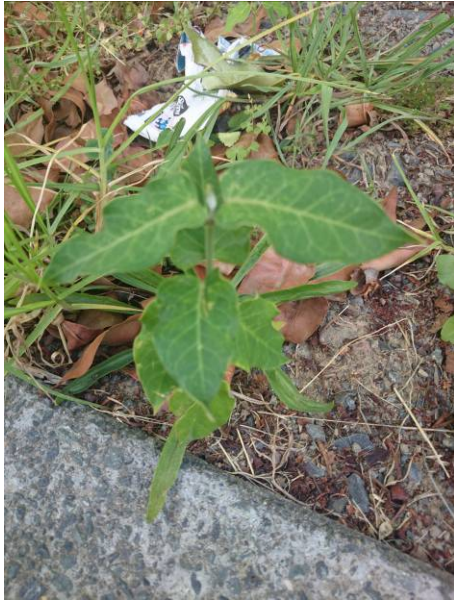


Figure 3. First year Moth plant seedlings, garden path, Auckland Hospital, February 2015 Auckland.

Impacts

Moth plant is a good climber and appear to be capable of climbing at least 10 metres. It forms a smothering canopy over trees, shrubs and grassland, Figure 5. The plant releases a sap when damaged which is toxic, Figure 4.

The rapid growth and widespread number of infestations in community restoration projects causes low morale, as many of the infestations are hard to get and infestations can be very persistent due to the persistent seed bank and efficient dispersal mechanisms of moth plant.

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DOC has moth plant control programmes and surveillance programmes on at least five remote offshore islands where endemics and threatened plants such as *Lepidium oleraceum*, *Picris burbridgeae*, *Strebulus banksii*, *Senecio scaberulus*, and *Pisonia brunoniana* occur. These plants are at risk from moth plant. The islands are up to 23 kilometres from the mainland which illustrate that moth plant has effective long distance dispersal abilities. Some infestation have persisted for over 10 to 16 years. Island weed programmes require boat charters, and living and working in challenging conditions, sometimes in tents. At least 12 national priority biodiversity management units and 40 reserves contain moth plant infestations, and at least 4 community groups run moth plant programmes on public conservation land managed by the Department of Conservation. For example the Motutapu Restoration Society has a volunteer weed programme to remove moth plant from its

plantings and bush relics. Costs are difficult to determine as moth plant is usually managed as part of general weed programmes, costs range from a day's hire of a helicopter to carry out surveillance and control, running island weed teams, to spending a day a year controlling seedlings at eradication sites. Estimated costs for major control programmes vary from \$93,000 and \$31,000 to approx \$5000 per year per site. Given that a programme may last 10 years or more, the costs could range from approximately one million dollars to \$500,000 to achieve an eradication to over \$300,000 to contain a small infestation for 20 years. 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 the Wairarapa and the South island, and most moth plant management occurs as part of site led weed programmes.



Figure 5(a)
Moth Plant in



restoration planting.
Figure 5 (b) Moth plant
climbing Pohutukawa.



Figure 6. Moth plant flowers and fruit,

pohutukawa canopy, incomplete control. This illustrates how difficult it is to control even small infestations. Stems can be difficult to detect, especially in shrubland and grassland.

Control methods

Moth plant is controlled either by physical removal or by herbicides. The recommended herbicides include herbicide gel which 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 for Moth plant, and as moth plant is usually found growing over or through other plants, non-target damage from the herbicides occurs, especially in hot conditions. Where some of the above herbicides are used on public conservation land, trained supervisors must be present. Manual control is often used in plantings and around sensitive plants. From experience gloves and safety goggles should be used as cut stems and fruit stalks readily leak a toxic sticky white sap which causes rashes and sore eyes, Figure 7.



Figure 7. Moth Plant Sap from fruit stalk. Sap is under pressure as the sap flows freely out the fruit. The seed bank requires ongoing management for at least 5 years, possibly as long as 16 years.

Limitations of current methods

The most serious factors affecting the moth plant programmes are the ongoing invasion of seeds into control sites where the surrounding landscape contains numerous infestations, the persistence of infestations and the detections of new infestations before they fruit due to the terrain and covering vegetation. Where the infestation is a remote outlier due to human transfer of seeds or plants, the main factors appears to be detection before the plants fruit and the persistence of the seed bank. Plant produce many pods, and each pod may produce many seeds, Figure 8.



Figure 8. (a) Cut open pod to show seeds

(b) Moth plant pods on vine.

Puccinia araujiae.

The discovery and biology of *Puccinia araujiae* as a potential biocontrol agent is outlined by Waipara et al, (http://www.nzpps.org/journal/59/nzpp_590180.pdf). *Puccinia araujiae* was found in association with severely infected and damaged moth plants.

Potential native hosts in the New Zealand Flora

Moth plant is a member of the dogbane family, Apocynaceae . The Apocynaceae are represented in the New Zealand flora by the genus *Parsonsia*. There are at least 3 species of *Parsonsia* in New Zealand, *Parsonsia capsularis* ,(not threatened) *Parsonsia heterophylla* (not threatened) and

Parsonsia praeruptis nationally endangered, there are several varieties of *P.capsularis* which are not threatened .

Systematic studies (<http://www.mobot.org/MOBOT/research/APweb/welcome.html>) indicate that *Parsonsia* is not closely related to moth plant as moth plant occurs in a different subfamily of the Apocynaceae, (Asclepiadoideae).

Risks to endemics and native plant species

Host testing by landcare, (<https://www.landcareresearch.co.nz/science/plants-animals-fungi/plants/weeds/biocontrol/approvals/current-applications/moth-plant/preliminary-host-range-testing>) indicates that only genera in same subfamily are likely to be affected by *Puccinia araujiae*.

As there are no native members of the genus *Araujia* in New Zealand, or native members of the subfamily Asclepiadoideae in New Zealand, it is very unlikely *Puccinia Araujia* poses a risk to the New Zealand flora, especially New Zealand *Parsonsia*

Some members of the Asclepiadoideae such as swan plants are used to support Monarch butterflies, but swan plants are invasive in parts of New Zealand.

Conclusion

Moth plant is a serious threat to conservation values, especially in coastal and warmer areas, and for shrubland, small trees, open, low-growing open vegetation. Disturbance communities such as on sea bird dominated islands and restoration sites are especially at risk. Conventional methods are limited by detection issues, infestation persistence, high seedling output, and efficient seed dispersal mechanisms. In some regions the numbers and distribution of moth plant infestations is too extensive to limit spread and impact at every site. Moth plant and the terrain in which moth plant occurs are often dangerous for staff. A biocontrol agent with good dispersal abilities, which limits moth plant growth and seed production will be a useful addition to our control techniques. Given that moth plant rust – *Puccinia araujiae* does not infect native plants, and reduces the growth of Moth Plants, moth plant rust will be a useful addition to methods to control moth plant.

Randall Milne, Southland Regional Council

Moth plant is not an issue in Southland.

Shane Grayling, Senior Biosecurity Officer, Bay of Plenty Regional Council

All three species are listed as Restricted Pests under our current RPMP, in our RPMP this means the plant is either too widely spread, therefore fails the cost-benefit analysis, or its environmental impacts are not deemed high enough to warrant active management. Japanese honeysuckle is extremely widespread, Privet is relatively widespread, moth plant is not particularly widespread but on the increase. Restricted pests are not required to be controlled by landowners and BOPRC's role is to provide advice and education to those wanting to control the pests of their land

Due to the classification in the RPMP, BOPRC to not collect information on spatial distribution or control effort either internally or externally

We only get a few calls a year regarding honey suckle and moth plant and they are usually wanting information on how to control.

We have had the odd caller concerned about the impact of moth plant sap as a irritant and wanting BOPRC to enforce landowner control.

Darion Embling, Biosecurity Officer, Waikato Regional Council

Moth Plant

WRC plan: Progressive containment

Active/Historic sites: 860 (predominantly an urban problem)

RPMP, regional passive surveillance, infestation information collected when localized surveys (e.g. road survey)

We don't know of many community groups destroying moth plant.

CBA is 2002 so quit old. (see link

http://www.waikatoregion.govt.nz/PageFiles/21542/Appendix_1.pdf) (Page 202)

Darin Underhill, Biosecurity Team Leader – Plant Pests, Hawke's Bay Regional Council

In regards to Mothplant it isn't in our Regional Pest Management Strategy. However staff time is spent on the plant in respect to some publicity and control costs.

We would receive between 20-30 phone calls on this plant per annum with an approximate cost in staff time being around \$1,500/year.

Phil Karaitiana, Biosecurity Team Leader – Plant Pests, Gisborne District Council

The three targeted weeds are presently listed in the RPMS for the Gisborne District Council and have a "Limited Control" status. Essentially weeds in this category are widely spread, established in suitable habitats and cause adverse effects in specific areas. Council's approach is on awareness, education, identification and advice to landowners on suitable control options to manage infestations. Control of such weeds is at the landowners discretion and costs.

All three targeted weeds have a negative impact in this region environmentally, socially and economically. The proposal to introduce biological control agents to assist in controlling any of the three targeted weeds in my view is supported as the potential benefits from successful control outcomes outweigh any risks and costs.

Unfortunately I do not have any cost benefit information to assist with your proposal. I hope the information is helpful none the less.

Richard Grimmett, Wellington Regional Council

Our team (Harvey great majority) have put together some thoughts for the species in question and there are only figures for Moth plant over the last 5 years, but these are accurate.

Cost benefit analyses - No doubt this was carried out at the beginning, but these figures if available would be out of date

Information about levels of infestation, real costs of control - Because this is a Total Control species infestations levels are well below any measurable figure, but the costs for the last 5 years are as follows

- 2009-2010 \$9,595.84
- 2010-2011 \$5,914.45
- 2011-2012 \$5,892.02
- 2012-2013 \$6,715.30
- 2013-2014 \$8,682.90

While the amount of resource put towards this species is quite low (\$36,798 since 2009) it is well documented of the potential of this plant if allowed to establish and spread uninhibited. 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) and the only hope of reducing the threat it poses is now to use bio-control. When a plant reaches this point it has become too expensive to control but has **only just started** 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).

Although the amounts spent on this species in the Wellington region is small, if an effective agent is introduced into the country, Greater Wellington may be able remove Moth plant from the Total control category and redirect the funds to another species where no such effective control agent is available.

Bill Dyck, Forest Biosecurity Manager, Forest Owners Association (2014)

I have canvassed some of our members to see how much of a problem honeysuckle, privet and the moth plant are it and it seems the answer is "not much". However, there was no adverse response to releasing biological agents to control these weed pests and only positive comments

Jacqui Knight, Moths and Butterflies of New Zealand Trust

Thanks for the opportunity to comment on these proposed introductions. We will be making a formal submission when it is appropriate to do so and would be grateful if you would keep us updated.

While we appreciate the need for a moth plant biocontrol agent we do have concerns about the proposed introduction of the moth plant rust, *Puccinia araujiae*. The Moths and Butterflies of New Zealand Trust have thoroughly read all available information on the host -range testing you have conducted to date. However, we note:

"Several ornamental species are related to moth plants, notably tweedia (*Oxypetalum caeruleum*) and swan plant (*Gomphocarpus fruticosus*, *G. physocarpus* and *Asclepias curassavica*). These plants are particularly valued by those fostering butterflies such as Monarchs. Tests indicate that the rust should

not attack the two species of swan plant tested (*G. fruticosus* and *A. curassavica*). It was not possible to test tweedia so this plant could be at risk from incidental infection by this rust. Tweedia also proved marginally acceptable to the first control agent considered, *Colaspis argentinensis*"

We also note that your host-range testing has included only a limited number of milkweed species and small sample sizes of the species that have been tested. The Moths and Butterflies of New Zealand Trust would like to highlight the social and economic value of milkweed species to New Zealand. 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. Children particularly benefit from observing and learning about metamorphosis through observing the entire process. The swan plant is also 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 the following of the following species in the host range testing; *A. incarnata*; *A. syriaca* and *G. physocarpus*
- Inclusion of tweedia (*Oxypetalum caeruleum*) is also crucial

While we recognise the importance of biocontrol in combating environmental weeds such as moth plant we also know that in the past some biocontrol agents have been introduced to this country with disastrous results. This would be unacceptable in this case and expanded rigorous host-range testing would ensure this does not occur.

Mark Ross, Federated Farmers of New Zealand.

In relation to your request I put a message out to our members and so far have only received feedback from one farmer (see below). I realise that this is not overly helpful and will try to chase up further.

We will definitely comment on the submissions and supportive of your on-going work.

"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"

Gareth Eloff, Genevieve Bannister, QEII National Trust

Since 2010, we have only had 5 externally funded projects targeting Japanese honeysuckle, Chinese privet or tree privet. We have had no projects targeting Moth plant. 4 of those 5 targeted Japanese honeysuckle with 1 also targeting Chinese privet. 1 project targeted Tree privet alone. The total amount granted to those projects from the Biodiversity Condition Fund was \$105,948.07 +GST. QEII National Trust spent \$11,620.56 +GST in monitoring and administration of those projects. The

landowners spent \$62,695.56 +GST towards this control and Hawke's Bay Regional Council contributed \$9,975.13+GST towards 3 of those projects as the work took place in their area.

Below please find an initial assessment of the extent of the records for each of the species you listed broken down to the three regional councils you mentioned. Please note, that this is largely based on a presence/absence recording and not an in depth analysis of the degree of infestation. In all cases, it would appear as if the species are targeted for progressive control or containment, meaning an ongoing attempt to control and eradicate where possible, unless part of a greater landscape wide eradication program which Genevieve could highlight if they exist.

MP

Total number of covenants recorded 119

Northland Regional Council 90

Responses to consultation on the application to introduce the moth plant beetle (2011)

An application (APP 201039) was submitted to ERMA in 2011 to introduce *Colaspis argentinensis*, a root-feeding beetle that attacks moth plant. Many of the responses to pre-application consultation on this application are relevant to the current application and are reproduced here. Submissions related to the following ecological and environmental values

- Possible effects on tweedia as a garden ornamental
- Possible effects on food for monarch butterflies, and distrust of exotic insects
- The poisonous nature of moth plant
- The impact of moth plant on biodiversity values
- The threat of moth plant to regional values
- The threat of moth plant to other businesses and organisations

Possible effects on tweedia as a garden ornamental

The prospect of possible attack by *Colaspis argentinensis* on the roots of the garden ornamental tweedia (*Oxypetalum caeruleum*) was raised in a message to the weekly 'Get Growing' newsletter associated with the 'New Zealand Gardener' magazine. The views expressed in emailed responses were mixed :

'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.'

'I work in conservation/riparian margin restoration in Waitakere City and so know all about the moth plant and how damaging it can be to native regrowth and vegetation. So I welcome any way to control this invasive weed that doesn't harm the natives.'

'I love Tweedia - my mother grew it in abundance in her very beautiful Waikato garden - so I would prefer it not to be so vulnerable to attack - however if this would definitely be the only casualty in the proposed biological control of the moth plant - then protection of the native plants must come first'.

'I have tweedia in my garden from a planting when I first put my garden in at least 15 years ago. It just keeps self-sowing and producing no matter. It's pretty but of no consequence. Haven't noticed any obvious monarchs around it!'

'I read with great interest the article regarding Tweedia and its close cousin the Moth Plant vine. I believe you will be presenting a paper on a beetle to use as a biological control. After an **enormous** problem with the moth plant vine entwined over and around a huge and very old plum tree at our section at Waiheke I seem to see this vine everywhere and I am alarmed at what is happening! I do appreciate that Tweedia is a very attractive small plant and although it would be a shame to lose it, this sacrifice would be well worth it

.....if we could rid seeing "the vine" smothering hedges in Remuera (ripe with the pods)! Entwined around and in amongst hydrangea bushes. Overtaking, and I mean really overtaking a rented property in Te Atatu. Overwhelming a vacant section. The list goes on and on! When I see this all around me as I walk along the roads I would dearly love to knock on doors or post information in letterboxes to let people know what a timebomb they have at their back or front doors but of course I just carry on, my step a little heavier that I did not have the courage to do something. I believe it is an offence to have this growing in private property on Great Barrier. The longer it is left to grow, the more it spreads and the harder it is to get rid of it. We can no longer have bonfires and it is not wanted at the green waste stations. The only solution is landfill, and really that is no solution!

As you can see the information provided in the Get Growing email I received from NZ Gardener has hit a raw nerve! If this little beetle can eradicate the Moth Vine plant and be proven to be safe to all other plants not related, I think it would be wonderful to have this brought in to NZ.'

Possible effects on food for monarch butterflies and distrust of exotic insects

Moth plant and tweedia are likely to be damaged by *Colaspis argentinensis* in the field. Although monarch butterflies do not lay eggs on these species, and cannot normally complete development on these species alone, harvested foliage of these plants can be used to feed mature larvae if swan plant is not available. Discussion of potential attack on tweedia was initiated in the public forum of the

Monarch Butterfly NZ Trust website, and issues were addressed as they arose.

<http://www.monarch.org.nz/monarch/forum/topic/threat-to-tweedias>.

The issues raised on the forum were:

'In 1933 the wasp *Pteromalus puparum* was introduced to control the Cabbage White Butterfly. It also attacks our native Yellow Admiral and Red Admiral butterflies. The Red Admiral Butterfly is only found in New Zealand...I am extremely concerned about any plans to import another exotic pest, particularly one which attacks foodplants of the beloved Monarch Butterfly.

'I believe the scientists have got the research right! But then again, I Believe the earth is flat, the majority of politicians are honest and I was sent here on a hyperspace bypass from planet Zog!'

'I vote for Best moth plant control: *Danaus erippus*.'

'I will not agree about beetles as there are NO beetles with low risk of become pests in NZ. Exotic beetles are NO-NO to import to NZ. They have high risk of become pests here. Butterflies are low risk animals to import as long as they are healthy & free of diseases and parasitoids.'

'There are numerous reasons why people cannot and must not bring in new species whenever they feel like. For example the Cat, Dog, Deer, Ferret, Goat, Hedgehog, Mouse, Pig, Possum, Rabbit, Rat, Stoat, Himalayan tahr, Weasel, German wasp, Common wasp, Asian paper wasp, Varroa destructor, Sea squirt, Grass carp, Gambusia, Rudd, Catfish, and Trout might have been "*healthy & free of diseases and parasitoids*" when they were imported, but that didn't stop them becoming an invasive species once they got here!'

'I am not anti Colaspis per se, and to me biological control is preferable to the usual "kiwi way", which is to dump tons of 2,4,5-T, or 10-80 on any problems. But one can always stop spraying, once a new species is released it is usually here to stay. So my first response is to urge extreme caution.'

'We have to be very cautious & careful in importing insects as colaspis beetles which might eat swan plants & tweedias once they run out of moth plants.'

'I am agree with ... about colaspis beetles would be trialed on moth plants, tweedias, and swan plants and milkweeds and be studied on their willing or not willing to eat swan plants & tweedias & milkweeds, pine, soybean. I had researched about colaspis beetles and found the colaspis beetles are pests and had caused damages to pine trees and grapes and banana plants and sugarcanes, beans, peas, soybeans, tomatoes and potatoes, corns. Larvae (grubs) of colaspis beetles eat roots of plants above, cause plants to fell or have stunted growth.'

The poisonous nature of moth plant

Jenni Jones, Poison Information Officer, National Poisons Centre

Thank you for your enquiry regarding poisoning exposures to these plants. The National Poison Centre has been contacted about exposures to both these plants. Ingestion of *Araujia sericofera* can cause gastrointestinal symptoms such as nausea, vomiting and diarrhoea. The sap from this plant can also cause skin or eye irritation.

(From 1 June 2002 – 15 July 2011 there have been 16 calls, concerning eyes (2), ingestion (7), and skin (5) involving 14 human exposure, plus one cow and one dog)

The impact of moth plant on biodiversity values

Motutapu Restoration Trust

The 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. That's 2,000,000 potential moth plants nipped in the bud!"

Nan Pullman, Whangarei regional representative, QEII National Trust

'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. '

Heather Taylor, Guardians of the Bay (Bay of Islands)

'The Guardians of the Bay is a community group working with DOC to restore (using this word very loosely) the Eastern Bay of Islands aka ipipiri. 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. You might want to speak with Fleur Corbett who is part of this group and also works for Doc in Kerikeri (Bay of Islands Area) office. She can put you in contact with one of the operational leaders of the group who bust the weeds.

Cynthia Roberts, DOC, Waikato Conservancy

'Moth plant is a huge concern on the Coromandel with DOC only able to focus on the conservation estate. Places such as Cathedral Cove has a huge infestation with no easy solution for the management of this weed.

For example, when mature plants are removed allowing light in, the moth plant seed bank is such that 1000 seedlings per square metre quickly cover the ground outcompeting native seedlings impacting on native regeneration and biodiversity values of the site. Without this ongoing work the area over time would become covered in moth plant. Steve estimates approximately 10% i.e. \$10,000 of his weed budget would be spent on controlling moth plant in the Coromandel region (not including Cuvier Island) where it is found in most conservation areas of significance including Moehau. ...'

'The project recently obtained some funding from Doc for spraying weeds so that the seeds are not blown across the sea to Little Barrier Island.

Moira Cursey, Waikato Biodiversity Forum, c/o DOC

'I can't give any estimates of expenditure to manage moth plant. The Waikato Biodiversity Forum is in touch with a variety of community groups doing weed pest management but I am not sure how many groups are controlling. If there was a safe biological control that did not have any potential damaging effects on native flora and fauna or fruit trees and exotics for that matter then the Waikato Biodiversity Forum would welcome the beetles introduction to control this invasive weed. '

Monica Valdes, Department of Conservation, Whangarei

'Moth plant is currently too wide-spread in Northland to consider it a weed-led project, so it has been controlled as site-led project on the Poor Knights and Hen & Chickens Is, Bream Head and Manaia Scenic Reserves (part of Whangarei Area Office).

The weed control on the off-shore islands started in 1994 and we have kept a database containing location of sites, number of plants pulled (adults and juveniles). Over time we have been able to plot this numbers and see how the numbers have shown an steady decline. However the threat of new incursions is alive as the mainland (coastal areas) are abundant in moth plant, therefore the risk of seeds been constantly blown over is high. We don't have an exact figure for the costing of the operation as moth plant is only one of the species we target (together with pampas, mexican devil, mist flower, and purple groundsel amongst others).

In terms of the general impact, on the islands fortunately hasn't been major as we started early and we've been able to control it since. There are areas on the mainland however (parts of Bream Head Scenic Reserve for example) where we have found extensive areas covered with seedlings and many adult vines growing on top of natives.

Currently I'm compiling the report for the weed control done in the last financial year on the islands. Back in 08/09, 6% of the existing sites were moth plant, and 10% of the sites visited were moth plant....'

Graeme LaCock, DOC, Wanganui

We don't have major infestations of either of these. ...We have 4 records of moth plant for Tongariro/Whanganui/Taranaki Conservancy (basically combined old Wanganui and T/T, One was

in New Plymouth in 2006 (treated), the other 3 in Wanganui, although I've personally passed on details of another couple of urban sites to Horizons Regional Council. The closest to a natural area would have been Virginia Lake. Normally just one or two plants. So not really an issue for us. But I do see it as a problem in warmer areas, and we'd be worried about it getting out to the Sugar Loaf islands in New Plymouth.

Kevin Matthews, The Bushland Trust, Kaitaia

'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 not without its pitfalls! NRC are trying to draw a line in the sand at Houhora or there about. '

The threat of moth plant to regional values

John Mather, Environment Bay of Plenty

Moth plant is a Restricted Pest Plant in our proposed RPMS. This is an advisory type category where we may also assist the community with approved programmes. We didn't undertake a CBA for the Restricted Pests.

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. The plant is difficult to control organically as it snaps off just below the surface if hand-pulling. It then coppices and regrows from this point. It is very difficult to control with herbicides in the orchard situation. Moth plant is also well established in urban areas. 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.

Holly Cox, Auckland Council

There is a large programme on Waiheke supported by both the ex ARC and ACC , now AC.

Here are the estimates from our Biosecurity Officer on Waiheke

"Biosecurity currently spends \$8000 per year on moth plant on Waiheke. We do have the records for 300+ properties on Waiheke but I am currently having problems with my contractor in getting the final data for 2010-2011. This work covers both surveillance and control (this is just contractor hours not Biosecurity hours).

Additional to this we have the annual campaigns through Weedbusters, free vigilant supply and as you mention we have the day to day site visits and treatment recorded in the PDA's and enquiry forms.

According to Gary, AC on local parks on Waiheke spends approximately \$25,000 on moth plant in public land.

We have several dedicated moth plant spotters who work on both private and public land for free I would estimate this time to be 8hrs per week , 416hrs per year of volunteer time. We pay contractors 40- 50 per hour so equivalent would be \$18,720.

The amount the general public spend on moth plant is very difficult to gauge I would guess at least 4 times what we (AC spend), \$132,000.00+.

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. Rob Fenwick and Kerry Tichener are examples of landowners coping with large scale problems. Robs would probably be a \$30-50,000.00 annual cost if being done successfully. I have also recently been dealing with Watercare services who will need to invest a substantial amount into moth plant control on a wastewater site in Matiatia.”

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

In terms of Regional Parks, \$11,000 is spent per year on moth plant control and surveillance on Regional Parks by contractors. This is an under estimate given the fact that we pay contractors for their travel, overnight allowances and reporting, and also they report on a range of plants during those hours not just solely moth plant. This would have been greater in the past as moth plant is targeted for zero density on all the parks and we are mainly treating seedlings.

Tawharanui is one of our regional parks that has regular volunteer effort for weed control.

“Roughly vols/staff invest about 5 person days/year of dedicated moth plant work (follow ups on known sites) or dealing to incidental discoveries. (So this would be equivalent \$1800)

The less easily definable figure is the opportunistic work (the ‘search effort’) as most recent moth sites have been found coincidentally in the course of other work. In a way they are the result of 100’s if not 1000’s of hours on the ground from observant eyes.”

And local Biosecurity Officer’s efforts:

“I would spend about 5 days per year on moth plant control along Bethells road, Bethells beach and Muriwai beach near the end of Rimmer road.” (So this would be equivalent \$1800)

Hunua Biosecurity Officer spends roughly 12 days per year independently controlling moth plant sites. (So this would be equivalent \$4320)

Volunteer efforts:

North Shore volunteer spends roughly 5 hours a week controlling solely moth plant. Biosecurity supplies her with herbicide and equipment. This is 260 hours a year- So this would be equivalent \$11,700.

Auckland Central volunteer (connected to Motutapu Restoration Trust) has in the last 3 months handed in 21 rubbish sacks full of moth plant pods. He spends 3 hours a week with another volunteer so this adds up to 312 hours a year on moth plant- so this would be equivalent \$14,040.

\$8000 of Biosecurity money was spent on Sir Doug Myer Robinson Park directly supporting his volunteer effort as this park is located on Auckland's waterfront within distance of Motutapu.

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	\$1,131,660 per year.

Catherine Law, Taranaki Regional Council

'Because I have seen moth plant "all over" Auckland, we control it when we become aware of an infestation & as time permits. We have 16 records of moth plant, 15 in New Plymouth city but not all in gardens & one in a Stratford garden. This is certainly NOT all the moth plant in the province. The climate is quite suitable for moth plant in much of Taranaki, especially the coastal zone.

I think there is little public awareness in Taranaki of moth plant's bad points so is not generally perceived as a problem (& probably rarely recognised) except by a few folk on whose properties we have controlled the plant and they let us know when it reappears. 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. Some of the infestations we control are close to Pukekura Park and to the Waiwhakaiho River.

I estimate we would get about 3-5 enquiries a year about moth plant.....We spend perhaps a day in total/year controlling moth plant, so only 8 hours excluding travel.'

Richard Grimmett, Darryl Kee, Greater Wellington Regional Council

'We have completed delimit surveys around each of our known Total Control sites, now completed, during 7 years to June 2011. Average of around \$7000 annually to control 187 sites, currently 104 active this season, 17 monitored and 10 eradicated - probably our best performing eradication species. Overall controlling seedlings with very few mature plants found. DoC has a few sites in their estate.'

Sara Brill, Biosecurity Officer, Northland Regional Council

'We have a Community Pest Control area that has been battling moth plant ... as one of their serious pests. Initial contractor knock down costs were \$3937.50 on 22/6/2007happy to fill you in on what

the group has been doing on this plant. has spent 1-3 days per year spraying this plant for the group from 2007 – 2010’.

The threat of moth plant to the public, other organisations and businesses

Tom Barber, Queen Elizabeth II National Trust

‘When it comes to hard numbers, unfortunately I can’t give you a dollar value on how much is spent controlling these species as most of the work is generally carried out by our landowners. As our covenants are on private land there is also a limited amount of data I can give you without consent from each of the landowners. However, I can tell you that moth plant is recorded as a threat in 80 of our registered covenants, and that lantana is recorded as being a threat in 13.’

Royal Forest and Bird Protection Society, North Taranaki Branch

I do not recall having ever seen either plant in the wild here.....

I have no knowledge of either of these plants in our region.

Ngairie Tyson, New Zealand Landcare Trust

I have forwarded your email on to the Poroti Landcare Group who may be of interest to your project. They are a weed led, or more specifically, moth plant led community group operating up here in Northland near Maungatapere. Their goal is remove moth plant that has invaded hedgerows in a horticultural area. Ross Johnson in the Biosecurity Team at the Northland Regional Council has had more recent dealings with them than I. He could be another good source of info.

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.

Sam Middlemass, Rayonier Forests, Northland

I haven't noticed any Moth plant in our forests in Northland yet. It may be..... around the Whangarei Heads area though as it is reasonably common along public roadsides in the area. Cost to Matariki forests to date = Nil.