

Ecology and pest status of moth plant, *Araujia hortorum* Fournier

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This report reviews our knowledge of the biology and ecology of moth plant (*Araujia hortorum* Fournier) both in its home range and its exotic range. It summarises the weed status of moth plant and the current approach to weed management in New Zealand, and how the biological control programme fits with those strategies.

Biology and ecology of moth plant

Taxonomy

Araujia hortorum Fourn. belongs to the tribe Asclepiadeae of the Family Apocynaceae. This family belongs to the Order Gentianales. Amongst others, the name *A. sericifera* has also been used for moth plant in the past in New Zealand (Winks and Fowler 2000), but *A. hortorum* is now the preferred scientific name (Waipara et al. 2006, Champion et al. 2010).

Native range

Araujia hortorum is native to SE Brazil, Argentina, Paraguay and Uruguay (Flora Europaea).

Exotic range

Elsewhere in the world it is a garden escape, and has become naturalised in Europe, Turkey (Altinozlu and Donmez 2003), Africa (Henderson 2001), and North America, and elsewhere in South America (Winks and Fowler 2000). In Australia it is present in all temperate states. It is common in coastal New South Wales and SE Queensland and is regarded as a minor weed there (DAF 2014sed 2011, PIER accessed 2011).

New Zealand distribution

Araujia hortorum was first recorded in New Zealand in 1888 (Webb et al. 1988), and was originally introduced as an ornamental. Intolerance to cold restricts the southern expansion of moth plant in New Zealand, and the shallow root system is a limitation in dry soils. The risk of moth plant as a serious weed is probably restricted to lowland areas in the North Island and northern South Island because it requires a moist warm climate (Winks and Fowler, 2000). It has been recorded in Christchurch, but is thought to be fully naturalised only north of Blenheim. Only 37 sites are known in Greater Wellington Region (Hill 2011). It is suspected that seeds have blown from the mainland to offshore islands in the Hauraki Gulf (Esler 1988, Hill 2011). It is generally acknowledged that this plant is spreading and becoming more abundant in the North Island (ARC 1999, Hill 2011), but there are no quantitative studies to reinforce this view.

Biology

Moth plant is a perennial, broad-leaved, herbaceous climber or liane, with twining stems. On a supporting structure vines can grow to over 5 m, with almost oblong leaves measuring 3-11 cm.

Although it flowers in profusion, with clusters of small creamy-coloured tubular flowers (sometimes marked with pinkish mauve) formed between December and May, fruit set is low. Possibly 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 and Fowler 2000). The choko-like fruits, as big as a fist, contain about 400 parachute-like seeds, and mature fruits normally remain on the vines, giving the advantage of elevation for wind dispersal of the seeds as the fruit dries and splits. Seeds can germinate freely more than 5 years from the time of being shed (Winks and Fowler 2000).

Moth plant is a common weed in the urban environment in northern New Zealand, straggling over fences, walls and power poles. It establishes most freely in semi-shade but will tolerate exposure to full light once it reaches the canopy of shrubs, hedges, or trees.



Pest status of moth plant

Potential beneficial effects

Winks and 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”.

Adverse environmental effects

Moth plant climbs over shrubs and small trees, smothering and breaking them down. It also spreads over the ground, smothering native plants of small stature and regenerating seedlings. Moth plant therefore poses a high risk to peri-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 (2011). Moth plant is said to attract and trap insects (e.g. Weedbusters accessed 2011), but the importance of this on biodiversity values is uncertain.

Adverse social and economic effects

Both fruits and stems exude a caustic milky sap when broken. This white latex is sticky, and causes skin irritation in susceptible people. The sap can also cause skin or eye irritation. The latex is poisonous to humans (Landcare Research accessed 2011) and ingestion of the foliage of *Araujia hortorum* can cause gastrointestinal symptoms such as nausea, vomiting and diarrhoea. Other plant parts including seeds have been reported as 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 ($0.3 \pm 0.6\%$ of body weight). Violent symptoms appeared within 4 hours of eating the seeds and death occurred within 24 hours (in Winks and Fowler 2000). From 1 June 2002 – 15 July 2011 there were 16 calls to the National Poison Centre in New Zealand about exposure to eyes (2), ingestion (7), and skin (5) involving 14 human exposures, one cow and one dog (Jenni Jones, NPC, pers. comm. in Hill 2011).

Pest status for the Department of Conservation

There are no definitive 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. Its high pest status is acknowledged by commentary provided by weed managers and volunteers during consultation (see Hill 2011).

Pest status for regional councils

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>).

Region-wide benefits are considered sufficient for moth plant to be included in 8 Regional Pest Management Strategies. Approaches to management vary between regions (Table 1), for example:

- Moth plant occurs at only low frequency in certain parts of Auckland but its rapid spread throughout the region and potential to colonise new habitats in natural areas make it a major threat to the region. A regionally co-ordinated approach is deemed necessary to minimise the effect of the species on native ecosystems, especially those that are not yet infested. In order to keep it that way it is designated as a 'Total Control Plant' in places such as Waitakere and Hunua Ranges and many of the Hauraki Gulf Islands and Great Barrier Island.
- Moth plant is seen as a potential environmental and public threat throughout the Waikato region. Moth plant is still limited in distribution in the Waikato region but has the potential to become one of the region's most serious ecological weeds. It is already a problem in the 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 Environment Waikato in areas where control programmes are in place.
- In Greater Wellington Region it is considered to be sufficiently limited in distribution (187 sites, Hill 2011) for eradication to be feasible.

In most regions, all or some landowners and/or occupiers are required to remove moth plant from their property whenever it is found. This is a major impost on the resources of the general public, private enterprises and infrastructure companies. For example, in the control area designated by Horizons Regional Council roading authorities are particularly tasked with moth plant eradication in the road reserve to limit corridor spread.

Householders in the north of New Zealand detest moth plant. It is the second most frequent cause of weed-related enquiries to Waikato Regional Council. Regional field officers of Environment Bay of Plenty receive about 200 enquiries per year about this plant. Comments from householders are included in Hill (2011).

Current costs of moth plant management

Economic benefits would accrue if biological control reduced the costs of moth plant management to conserve environmental and social values. Information was sought from northern regional councils and the Department of Conservation to estimate the current costs of managing moth plant. Objective data was scarce, but commentaries were provided by a range of Department of Conservation (DOC) and regional council staff to indicate the economic cost of moth plant management to these organisations (Hill 2011).

Moth plant is too widespread outside of 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 indicate (Hill 2011) 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 2011). Moth plant is a particular issue in Coromandel, and local staff estimate that 10% (\$10,000) of the weed budget for the Coromandel office is spent on controlling moth plant. In addition, moth plant management on another offshore island (Cuvier Island) is a major focus for the conservancy. In Auckland there is a focus on keeping the Hauraki Gulf Islands moth plant-free. As with moth plant operations elsewhere, this relies heavily on volunteers (Hill 2011).

Auckland Council staff have estimated the resources expended on moth plant management in the region (Holly Cox, pers. comm., in Hill 2011). On Waiheke Island alone the council expends 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 2011).

Greater Wellington Regional council estimate the NPV 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.

Conventional control tactics

- Young plants are easily hand-pulled if growing in loose soil, or can be dug out.
- Large plants can be cut, and exposed stems painted with herbicide.

- Control can be achieved using a range of herbicidal sprays (<http://www.waikatoregion.govt.nz/Environmental-information/Plant-and-animal-pests/Plant-pests/Moth-Plant/#Heading1>) where the vine is growing on inanimate objects. However, where the vine grows on valued plants, herbicides can cause serious collateral damage. Aerial application would rarely be appropriate.
- Pulling vines down can damage the supporting plant, making the cure worse than the problem.
- It is advisable to wear gloves when handling this plant and weeders should avoid getting the sap in the mouth and eyes, or on the skin.
- Apart from non-target damage, the labour and material costs of herbicidal or physical control are high and only justified where the conservation values to be protected are high. Such methods are impractical at large scale, or in remote areas.

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Table 1. Control measures for moth plant required by Regional Pest Management Strategies modified from MAF website May 2011 (<http://www.biosecurityperformance.maf.govt.nz/>).

Region	RPMS Date To	Management Programme	Objective
Northland	2015	Community	Increase public awareness of the threat that pest plant poses to indigenous biodiversity and to horticultural areas. Encourage the establishment of community control areas which will be cleared of and kept clear of pest plant. Long term goal: Eradicate from or prevent establishment in high value biodiversity areas, horticultural areas, and areas where communities wish to eradicate pest plant, and create a controlled buffer zone around these areas.
		Community	PEST PLANT COMMUNITY PEST CONTROL AREAS: Require and maintain total control of the targeted pest plants in designated community control areas in accordance with the management strategy. Long term goal: Prevent the deterioration of areas with significant ecological and economic values, including associated soil resources, water quality, recreational and cultural values.
Auckland	2012	Community	To empower and assist communities to undertake pest plant control, in defined programme areas, throughout the Auckland region.
		Containment	a) To prevent the spread of and, where practicable, reduce infestations of moth plant over the next five years, from the Waitakere and Hunua Ranges Weed Control Zones, mainland sites and on the Hauraki Gulf Islands; and b) To restrict the further spread of moth plant by humans over the next 10 years.
		Surveillance	in all areas of the region, except for the Waitakere & Hunua Ranges Weed Control Zones and identified mainland coastal sites and Great Barrier Island: To minimise the further spread of Surveillance Pest Plants and NPPA Pest Plants in the region by preventing their sale, propagation, distribution and exhibition throughout the Auckland region.
Waikato	2013	Containment	Reduce the risk of spread, and where practicable, reduce infestations (see text).
Bay of Plenty	2008	Surveillance	Understand distributions, impacts and control options so that individual pests may be reassigned to other categories at next review. Voluntary control by land occupiers assisted by way of approved Council programmes.
Gisborne	2009	Limited Control	Reduce adverse effects through improved awareness and management.
Horizons.mw	2027	Containment	To control to Zero-density all moth plant within the Control Area by 2013 (Year 6).
Greater Wellington	2022	Total Control/ Eradication	Reduce density by 80% at all known sites by 2006. Eradicate from all known sites by 2011.
Marlborough	2012	Total Control/ Eradication	In association with the Department of Conservation, to eradicate pest plant from Marlborough.
Chatham Islands	2006	Pest	Prevent introduction to islands.

