

Potential beneficial and adverse effects to be addressed in the EPA application to introduce one species of parasitoid fly, *Volucella inanis*, and the wasp nest beetle, *Metoecus paradoxus*, as biological control agents for the common and German wasps

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Over the past 10 years, the potential beneficial and adverse effects of the introduction of new biocontrol agents for terrestrial weeds and agricultural pests have been identified through formal brainstorming and through consultation with the public and professionals. This process showed that there is a suite of possible risks, costs and benefits that are common to most biocontrol proposals and other effects are specific to each biocontrol agent.

The potential beneficial and adverse effects associated with the introduction of biocontrol agents for *Vespula* spp. wasps in New Zealand were identified by a similar process and are outlined below. The effects of the introduction of exotic biocontrol agents can result from: (1) the introduction of a new organism into the New Zealand environment; and (2) a reduction in the target pest through successful biocontrol. Those considered to be significant (in terms of the magnitude of the effect and the frequency or the likelihood of the effect) are discussed more extensively in the application.

Please contact Bob Brown, preferably in December, if you have any comments about the approach used in the application, or to report additional potential effects.

Potential impacts on Māori values are addressed in a separate consultation process.

Potential Beneficial Effects

On the Environment

Reduced predation by <i>Vespula</i> wasps leads to increased invertebrate prey resources for native birds	See section 5.1.1.1
Improved ecosystem functioning of beech forests, i.e. more honeydew available for native species	See section 5.1.1.2
Reduced contamination of air, soil and water from poison baits & direct poisoning of nests	See section 5.1.1.3
Reduced predation on valuable weed biological control agents by wasps	Likely, but wasps have yet to be demonstrated to be directly reducing populations of weed biological control agents

Reduced risk of the loss of endangered or threatened native invertebrates such as the as forest ringlet butterfly

Increase in resources in affected forests and other sensitive habitats, resulting in reduced competition for resources with native species (insects, birds (including vulnerable native birds such as kiwi) and reptiles)

Increased native invertebrate biodiversity in bush and margins

Benefits to parasitoid, predator and disease relationships in NZ ecosystems

Wasps have yet to be demonstrated to be directly reducing forest ringlet butterfly populations, despite anecdotal evidence.

Wasps remove around 99% of the honeydew from beech forests over the 4 months each year in which their population is growing (Moller et al 1991). Benefits are highly likely but will vary with location

Depending on density, wasps remove 1.4 – 8.1 kg of insect prey, per hectare, per season, in beech forests (Harris 1991).

Benefits are likely but will vary with location

On Human Health

Reduced risk of injuries and deaths caused by fatal wasp stings

See section 5.2.1.1

Reduction in stings to gardeners, forestry workers, conservation staff, volunteers, trampers, farmers, school groups and tourists caused by disturbing wasp nests

See section 5.2.1.2

Improved health of land managers, gardeners, conservation staff and volunteers from reduced occupational exposure to insecticides

Insecticides used per manufacturers' recommendation should not pose a significant human health or environmental risk.

On the Market economy

Increased profitability of apiculture industry by reduced predation and hive robbing by wasps

See section 5.3.1.1

Reduced control costs for occupiers, regional councils, DOC, and others

See section 5.3.1.2

Reduced control costs and increased production in primary production sector

Wasps currently cost New Zealand around \$130M per year (management costs, losses to productivity) (MacIntyre and Hellstrom 2015).

Management of control agents creates business opportunities for Manaaki Whenua – Landcare Research

Not significant. Minimal, temporary benefit to single entity.

Pollination services increased

Fewer wasps should mean lower predation rate of pollinators by wasps.

Reduced health costs of wasps for ACC (A&E visits, hospital stays)

Likely. There is an average of over 1050 new ACC claims, at a cost of \$87,000, per year (since 2014) due to wasp stings.

On Society and Communities

Reduction in stress in conservation and forestry workers and managers

See section 5.4.1.1

Greater enjoyment of natural areas in late summer through autumn with less concern about potential stings

An expected long-term benefit

Reduced predation on beloved and beneficial butterflies such as the monarch and white admiral

Likely, but not a significant goal of the project.

Better employment of conservation volunteers and community resources

Successful biocontrol of wasps would mean lower resources needed towards control, but some nests will still need to be destroyed particularly near picnic and camping areas

Reduced need for wasp nest management by homeowners

An expected long-term benefit

Improved look and feel of native bush for visitors

Most tracks with high tourist traffic are being treated with Vespex during peak times, so there may not be a perceived difference.

Potential Adverse Effects

On the Environment

Decline of common and German wasp populations opens the NZ environment to invasion by worse social wasps

See section 5.1.2.1

The biocontrol agents attack native solitary bees, ants and wasps

See section 5.1.2.2

Food web interactions: introduction of a new prey species enhances predator populations, having an indirect negative effect on native prey species such as native hoverflies

See section 5.1.2.3

Food web interactions: the biocontrol agents are ineffective at reducing wasp

See section 5.1.2.4

populations, but are abundant in the environment, leading to competition with native pollinators

Preference or uneven control of wasps

Volucella inanis has been found in a similar proportion of German and common wasp nests surveyed in the native range. *Metoecus paradoxus* does exhibit a preference for common wasps

The new biocontrol agents negatively affect the current biocontrol agent, *Sphexophaga vesparum*

Unlikely. The current population of *Sphexophaga* is already very low and is ineffective at controlling wasp numbers

Selecting agent populations other than those identified for use as biocontrol agents lead to unpredicted non-target effects

Not a significant risk. The proposed BCAs will be collected as immatures directly from the nests of the common and German wasps in the native range. The identification of the proposed BCAs will be confirmed by a taxonomist prior to release.

Biocontrol agents hybridise with related resident insects

Not a significant risk. There are no native species in the same genus as either of the proposed BCAs. Intergeneric hybridisation has never been recorded in insects.

Swift evolutionary change in insect leads to unexpected non-target damage to valued social insects and/or alterations to food webs

Not a significant risk. There is little evidence of adaptive host range expansion to non-target species in both insect and weed biocontrol agents

Adults of the biocontrol agents feeding on nectar and pollen reduces food for native pollinators

Not a significant risk in the long term. There may be high densities in the short to medium term, that may have high pollen requirements locally

Successful control reduces habitat quality for native fauna

Not a risk. We expect the habitat quality to increase for native fauna.

Introduction of the hoverflies to native habitats adversely affects native parasitoid, predator and disease relationships

Not likely to be significant.

Successful control leads to reduced invertebrate biodiversity in bush margins

Highly unlikely. We expect the opposite to happen. BCAs are specific to *Vespula* spp. wasps and will not attack native insects

Adults of the biocontrol agents pollinate invasive alien plants.

Not significant. Proposed BCAs will not reach high enough densities in the long term to compete with honeybees and flies for pollination.

Biocontrol agents will vector disease to native insects

Not a significant risk. All consignments are disease tested before they are cleared for release from containment

On Human Health

Public fearful of insects (these two species of flies are visual mimics of wasps)

Uncommon and not an expected effect. Can be addressed by education, link to wasp biocontrol website, etc.

Hoverflies become a pest to homeowners and need spraying with adverse effects to humans

Not a significant risk. Numbers of BCAs will decline as wasp populations decline. Where wasp populations are small, BCA populations are expected to be correspondingly small

On the Market economy

The biocontrol agents attack honeybees or bumblebees

See section 5.3.2.1

Reduced wasp bait (Vespex) sales significantly affecting vendors' businesses (Vespex is only effective in specific situations)

See section 5.3.2.2

Reduction in revenue for pest control contractors and suppliers

See section 5.3.2.3

Adverse effects of BCAs require costly eradication campaign (but are not unwanted)

Highly unlikely. These agents are not expected to have significant adverse effects

Wasp venom sales impacted by lower wasp numbers

Not a significant industry. Successful biocontrol would make collecting enough wasps for venom collection more time consuming.

Decrease in sales of wasp larvae for human consumption (Japan)

Not a significant industry. Successful biocontrol would make collecting enough wasp nests more difficult.

On Society and Communities

Fear and distrust of exotic species and their possible non-target effects

This cannot be mitigated. The introduction of these biocontrol agents would not significantly add to this risk

Wasps remove garden pests, so by lowering wasp numbers there is potential for an increase in garden pests

Not a significant risk;

The hoverflies are visual mimics of wasps, and are a common sight in gardens in their home range, may make the public fearful

Not a significant risk

Cause nuisance indoors

Not a significant risk. Rare but possible.