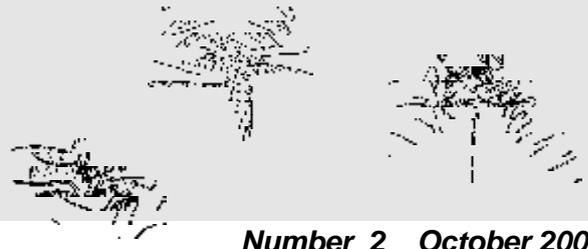


Stowaways



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Is that a scorpion in your weapon?

Cattle ticks were introduced to Victoria, Australia, via horses en route to Egypt in WWI. German wasps arrived in New Zealand in aircraft parts at the end of WWII. As armies have moved around the world, they have tended to take weeds and pests with them, accidentally stowed away in their equipment. The New Zealand Defence Force returning from East Timor is part of the biggest biosecurity programme ever undertaken for repatriating New Zealand troops.

This operation is particularly important because of the vast range of biosecurity hazards for New Zealand in East Timor. MAF Quarantine Service programme coordinator, Brian Whimp, explained, "There is a huge variety of potential stowaways in East Timor – snakes, spiders, scorpions

and fruit fly to name a few". The risk of invasive weeds is also high. Siam weed is a risk because it has hooked seeds that adhere easily to goods. It is likely to be invasive in New Zealand and the weed is toxic enough to kill young cattle.

All equipment will be visually inspected before it is shipped out from East Timor. This will include everything from boxes of plastic spoons to armoured personnel carriers, and the 47 television sets that will need the backs removed for careful inspection of the insides. As an example of how thorough inspections need to be, consider a box of immaculately clean kitchen knives, carefully packaged with polystyrene. But lurking underneath the polystyrene insert MAF inspectors found *Trogoderma* beetles known as a pest of stored products.





It may also be necessary to fumigate some items. "Things like trucks can be washed down and steam cleaned, but other items will be more difficult to deal with. A large number of camouflage nets have been in storage and are covered in spiders and seeds and who knows what else. It is not physically possible to remove everything from these nets, so fumigation is the way to go", says Mr Whimp.

The New Zealand Defence Force is working closely with MAF's quarantine service to complete the operation. The withdrawal started in mid-September in preparation for handing over to the Thai defence force in mid-November. The biosecurity operation aims to be completed so everyone is home in time for Christmas.

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Spiders in grapes

Fresh, juicy grapes – it's mid-winter and you look forward to the burst of summer flavours, courtesy of international trade. As you carefully select your treat from the supermarket, you are horrified to see a black spider scuttle from the bunch and seek sanctuary in an adjacent cluster. You may not suffer from arachnophobia, but where did that spider come from?

In September 2002, New Zealand approved the resumption of trade in table grapes from California. The trade was suspended in November 2001 after four live black widow spiders and a number of other exotic spiders were found at the border over a 3-month period. Ministry of Health Chief Technical Officer Sally Gilbert said that apart from permanently suspending trade, there was no way to guarantee spiders would not enter New Zealand via table grapes.

In 2000 and 2001, New Zealand imported more than 5700 tonnes of table grapes from California, and more than 4800 tonnes from Australia. Smaller volumes were imported from Mexico and Chile. Over this same 2-year period, there were 58 detections of exotic spiders in grapes, with most (86%) of these originating from California. More than 80% of the exotic spiders found made it past our border security and were discovered once they had been transported within New Zealand (see map). This highlights the difference in perception associated with different taxonomic groups. Imagine the outcry if 58 snakes were detected in New Zealand over the same period.

New Zealand Defence Force



New Zealand Army Mogs are being shipped home from East Timor, but first they will be cleaned and inspected to prevent plant and animal pests stowing away.

Spider bites

Most spiders have venom. However, few spiders are capable of biting people because they are not able to pierce human skin with their fangs. Spider venom is produced in glands behind the jaws and empties along ducts in the fangs and is used to paralyse or kill their prey. Some spider venom is

neurotoxic; that is, it affects the human nervous system beyond the site of the bite. Other spider venom is necrotic (e.g. the white-tailed spider *Lampona cylindrata*) and causes damage such as ulcers and blackening of the tissues surrounding the site of the bite. The toxicity of spider venom varies with the species.

The Ministry of Agriculture and Forestry (MAF) visually inspect between 600 and 920 bunches of grapes per consignment, giving MAF a statistical confidence level of 99% that the actual rate of infestation is no more than one detection per 200 bunches of grapes. The 5700 tonnes of grapes from California equates to about 14 million bunches of grapes. It is not surprising then that border inspection did not detect all 50 spiders originating from California because that is a rate of only 1 per 280 000 bunches of grapes.

Some spiders may well have escaped detection. There is some evidence for this – more large spiders are found than would be expected, perhaps because people are more likely to report finding a large spider than finding a small spider. So where did all the small spiders go? Or perhaps smaller spiders are more vulnerable to fumigation and cooling, so more large spiders survive and are reported.

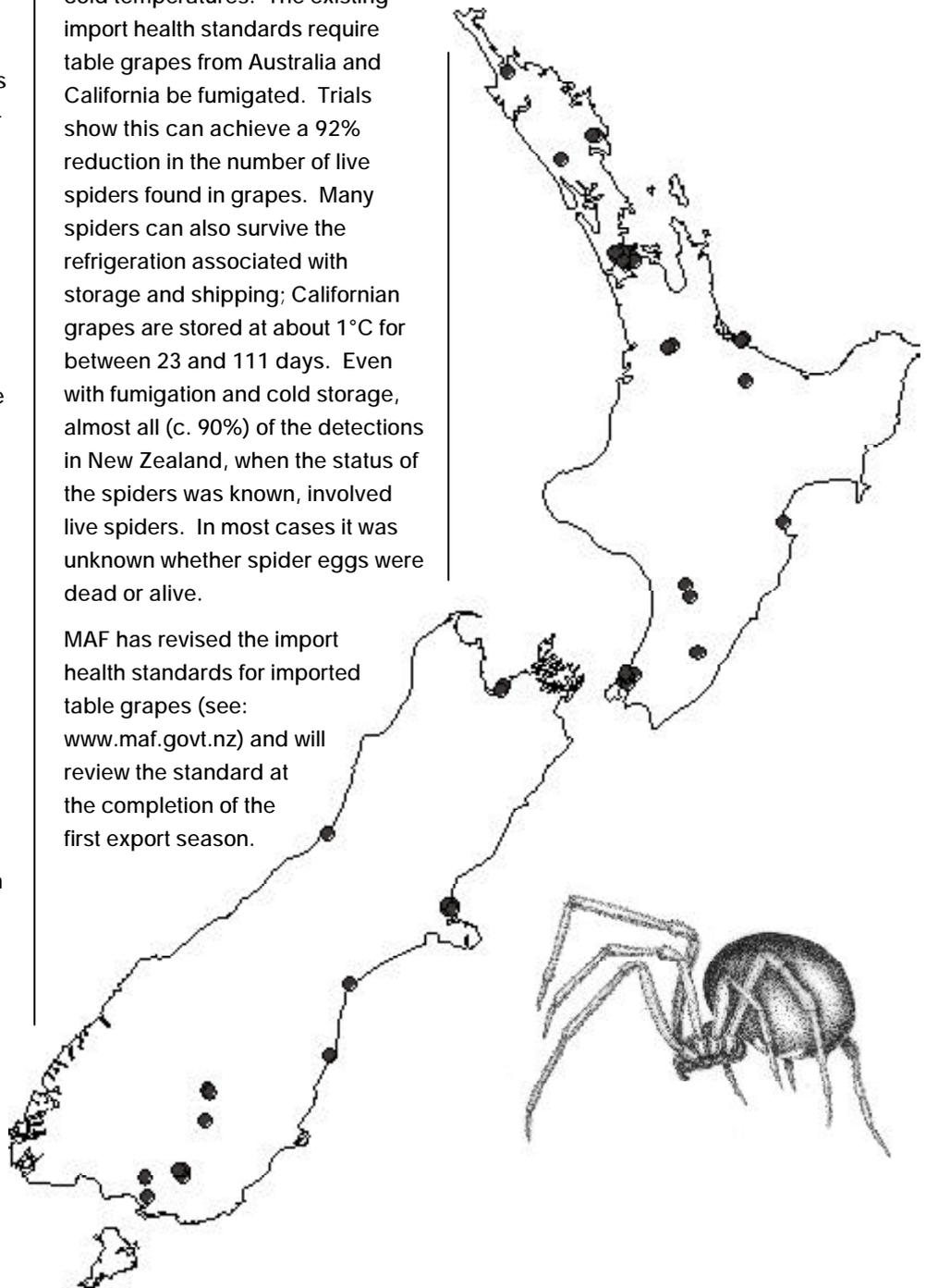
New Zealand has already been invaded by a number of exotic spider species, predominantly from Australia. Like many invasive invertebrates, they have mostly colonised human environments and modified landscapes. Nevertheless, some are found in natural ecosystems. There is good evidence that native katipo populations have been displaced by the arrival of exotic spiders. Spiders can be predators and competitors of native invertebrates, and potentially have flow-on effects throughout the food

web. For example, many of our native birds feed on spiders and other invertebrates.

Spiders have proved tough to kill – some can survive fumigation and cold temperatures. The existing import health standards require table grapes from Australia and California be fumigated. Trials show this can achieve a 92% reduction in the number of live spiders found in grapes. Many spiders can also survive the refrigeration associated with storage and shipping; Californian grapes are stored at about 1°C for between 23 and 111 days. Even with fumigation and cold storage, almost all (c. 90%) of the detections in New Zealand, when the status of the spiders was known, involved live spiders. In most cases it was unknown whether spider eggs were dead or alive.

MAF has revised the import health standards for imported table grapes (see: www.maf.govt.nz) and will review the standard at the completion of the first export season.

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Location of alien spiders found in imported grapes since 1998



Freshwater invertebrates

How vulnerable are New Zealand's freshwater ecosystems to invasion by new organisms and what are the consequences of such an invasion? How do invasive species arrive? Do interactions between freshwater, estuarine, and marine ecosystems affect invasions? We need to understand our freshwater ecosystems, and how they compare to similar ecosystems in other parts of the world to answer these questions.

New Zealand lakes and streams have their own special fauna. In contrast to most freshwater systems elsewhere, New Zealand has a high proportion of endemic species, a few endemic genera, and numerous genera and families that are shared with Australia and/or South America. For example, all New Zealand genera of stoneflies are endemic.

New Zealand's small size, isolation and geological history in the 80 million years since it was part of Gondwana have contributed to this. Short, shallow, swift and stony-bottomed streams provide the environment for much of New Zealand's running water invertebrate fauna. Larger rivers and streams on gentler terrain provide a further range of habitats including silt-bottomed, lowland channels and gravel-bedded braided rivers. There are also a variety of lake types.

Stream communities in New Zealand have a high species richness of browsers and a low species richness of shredders compared with those in six other regions of the world. It may be that a generalist feeder lifestyle is favoured in New Zealand streams because of the unpredictable nature of



A native stonefly (Order: Plecoptera)

resources in streams. A low supply of particulate organic matter is thought to account for the low numbers of shredders. These special features of New Zealand streams may have led to the evolution of a resilient fauna.

New Zealand's lakes and river ecosystems have already had ecological impacts from the introduction of plants, fish, and invertebrates. There are about 26 species of introduced freshwater invertebrates established in New Zealand. Most of these are cosmopolitan, or nearly so, but a few species (four molluscs, one beetle, and four mosquitoes) have spread from a limited native range to a limited or unknown range within New Zealand.

Endemic groups are vulnerable to extinction should they be displaced by an invading species, because they are found nowhere else in the world. However, they are adapted to their habitat in New Zealand and may be quite robust in the face of an

invader. We just don't know! Similarly, species with (geologically) recent relatives in Australia may be displaced by a more aggressive, related species from across the Tasman.

Impacts on native species

Rainbow trout are known to have reduced the populations of koura (*Paranephrops planifrons*) and crab (*Halicarcinus lacustris*) in Lake Waingata.

The endemic mollusc *Glyptophysa variabilis* has been replaced to some degree by the introduced mollusc *Physa acuta*.

The endemic mosquito *Opifex fuscus* appears to have been displaced by the introduced *Ochlerotatus australis* on the Otago coast.

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This research was funded by the Foundation for Research, Science and Technology

Sleeping dragons

There are sleeping dragons in your neighbourhood. There may even be some in your backyard!

The sleeping dragons are invasive invertebrates in the early stage of naturalisation. When a new species arrives, there is often a lag period between initial establishment and subsequent spread. In the case of invertebrates, the initial "sleeping" populations can go unnoticed, and the invaders can become widespread before we are aware of their arrival. A new Landcare Research project will investigate the prevalence of invertebrate sleepers and identify the best ways to sample for them.

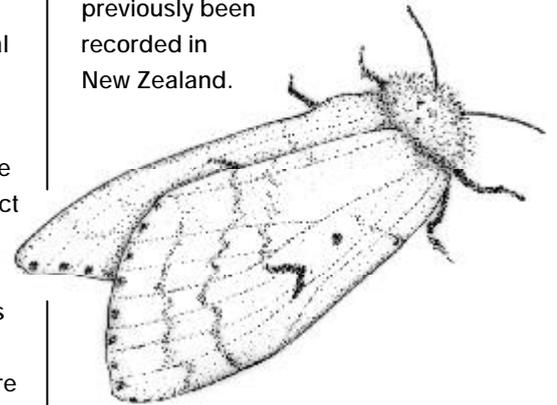
The main pathway for invertebrate incursions is trade and transportation between cities, so it is likely that the centres of colonising populations will be in urban areas. It is concerning, therefore, that there is very little general surveying of urban

invertebrates in New Zealand. If we are serious about stemming the tide of invertebrate invasions, it is critical that we are able to detect founding populations of newly naturalising species so risk assessments can be carried out while eradication is still a practical and affordable option.

Some preliminary investigations were started last summer. Tent-like Malaise traps were set up to collect flying insects at 16 residential properties in Nelson and Wellington. Other varieties of traps were trialled around Port Nelson. Although sample identifications are far from complete, and many insect groups have yet to be looked at, there are already a number of interesting results and some causes for alarm.

Traps around Port Nelson collected five species of ants, including one Australian species not previously recorded in New Zealand

(subsequently eradicated), and another new to the South Island. In the case of fungus gnats, the Malaise trap samples contained at least two (and possibly six) adventive species that have not previously been recorded in New Zealand.

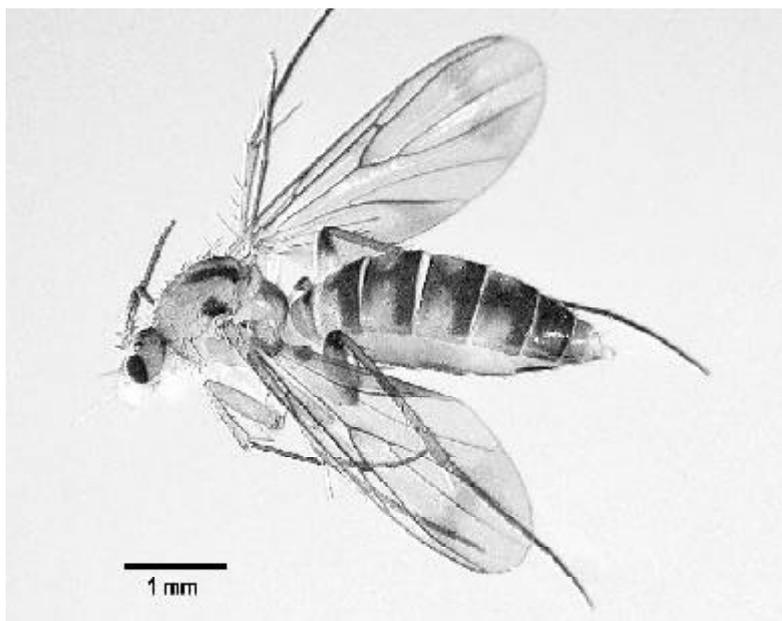


One of them, a South African species called *Leia arsona*, is the most common fungus gnat in urban Nelson. Results for moths include significant range extensions for two introduced species. One of these, previously known from Auckland and Northland, is an Australian species that mines the leaves of kanuka. The other, a citrus flower moth, was previously known from Northland and the Bay of Plenty.

Next summer we will expand the project by trapping in some new urban areas, such as Auckland, and continue to trial various sampling methods. Traditional advice is to let sleeping dragons lie, but we suggest that finding the lair gives us the option of slaying the dragon before it awakens.

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This research was funded by the Foundation for Research, Science and Technology



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Leia arsona is a South African fungus gnat making its home in New Zealand.



Mosquitoes of New Zealand

New Zealand has 12 endemic and 4 introduced mosquito species.

<i>Ochlerotatus notoscriptus</i> striped mosquito	Introduced pre-1918; also in Australia, New Caledonia, Papua New Guinea, and Indonesia
<i>Ochlerotatus australis</i> saltwater mosquito	Probably introduced; also in Australia
<i>Ochlerotatus chathamicus</i> Chatham Island mosquito	Endemic, Chatham Islands only
<i>Ochlerotatus antipodeus</i>	Endemic, Northland to Stewart Is
<i>Ochlerotatus camptorhynchus</i> southern saltmarsh mosquito	Introduced 1998; also in Australia
<i>Ochlerotatus subalbirostris</i>	Endemic, east coast Otago, Southland & Stewart Is.
<i>Opifex fuscus</i> saltpool mosquito	Endemic, widely distributed around NZ coast
<i>Culex asteliae</i>	Endemic, Northland, Auckland & Coromandel
<i>Culex pervigilans</i> vigilant mosquito	Endemic, Kermadec Is., all NZ, to Auckland Is.
<i>Culex quinquefasciatus</i> brown house mosquito	Introduced in the 1830s; virtually cosmopolitan with man
<i>Culex rotoruae</i> Rotorua mosquito	Endemic, Rotorua
<i>Culiseta novaezealandiae</i>	Endemic, SE Otago
<i>Culiseta tonnoiri</i>	Endemic, northern North Is. & western South Is.
<i>Cocquillettidia tenuipalpis</i>	Endemic, Auckland, Rangitikei, Westland, and Southland
<i>Cocquillettidia iracunda</i>	Endemic, Northland to Coromandel, Buller and Westland
<i>Maorigoeldia argyropus</i>	Endemic, throughout New Zealand

Name changes

The world wide genus of *Aedes* mosquitoes (900 species in 44 subgenera) has been split. *Aedes* now contains over 370 species, and 3 subgenera of *Aedes* have been elevated to generic rank: *Ochlerotatus* (560 species), *Verrallina* (90 species), and *Ayurakitia* (2 species). All New

Zealand *Aedes* are now in the genus *Ochlerotatus*.

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This research was funded by the Foundation for Research, Science and Technology



Michael Womack

An Asian tiger mosquito feeds on a human. At Port of Auckland in September 2001, 30 of these mosquitoes were found inside a ship from Japan.

Fact File

Mosquito-borne diseases

New Zealand is one of a few countries in the world with no known transmission of human arboviral disease such as dengue fever and Ross River fever.

A mystery case of malaria near London's Heathrow Airport has been blamed on a stowaway mosquito. The patient had not recently been to any country with malaria, but works near Heathrow.

An outbreak of West Nile encephalitis, a mosquito-transmitted viral disease from Africa, was first recorded in the US in 1999. Since then it has spread rapidly, and 47 people have died from the disease. The virus is also known to infect 110 species of bird.

Risk goods

Stowaway mosquitoes have been found at New Zealand's border in:

-  used machinery
-  used vehicles
-  used tyres
-  dirty containers
-  refuse drums
-  aircraft

Mosquito interceptions

Eight species of mosquito have been intercepted at New Zealand's border. Since 1 January 1998, there have been 14 interceptions of exotic mosquitoes of public health significance.

Name	Interception Details	Disease Transmission
<i>Aedes aegypti</i> yellow fever mosquito	Intercepted 1950; 1999, 2001; cosmotropical within 20°C isotherms	Dengue fever, yellow fever, Ross River fever
<i>Aedes albopictus</i> Asian tiger mosquito	Intercepted 1993, 1998, 1999, 2001; potential to survive in NZ; widespread	22 viruses including dengue fever and yellow fever
<i>Aedes vigilax</i>	Intercepted in 2002; the major coastal pest species for NSW, Australia	Ross River fever, Barmah Forest disease, and dog heartworm
<i>Ochlerotatus japonicus</i>	Intercepted 1993, 2001, 2002; potential to survive in NZ; originally from Asia	Japanese B encephalitis, West Nile encephalitis
<i>Culex annulirostris</i>	Intercepted in 1929, 1999; present in Australia, SE Asia, and the South Pacific	Murray Valley encephalitis, Ross River fever
<i>Culex australicus</i>	Unconfirmed interception in 1998; present in Australia, New Caledonia, and Vanuatu	Does not feed on humans
<i>Culex pipiens pallens</i> common house mosquito	Intercepted 2001; most common mosquito in the world	Several encephalitids, including West Nile encephalitis and Japanese B encephalitis
<i>Tripteroides tasmaniensis</i>	Intercepted 1993; present in Australia	Not known to carry diseases

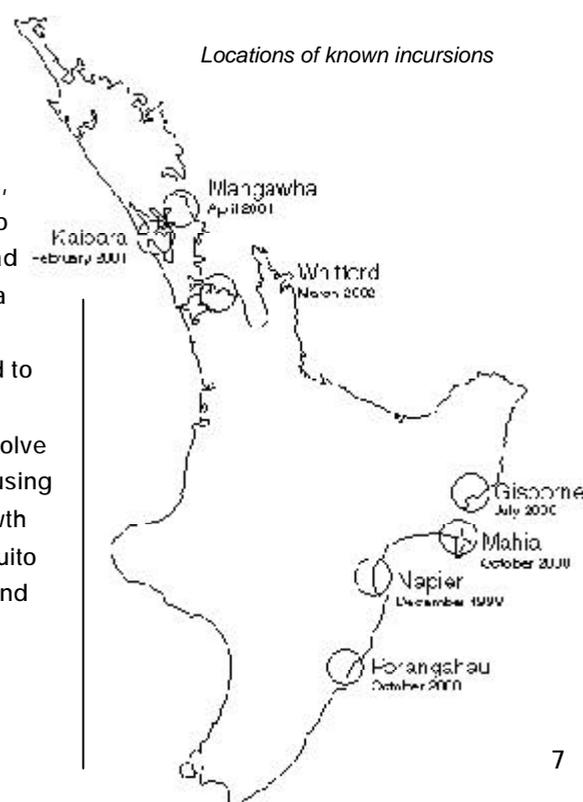
Southern saltmarsh mosquito update

The southern saltmarsh mosquito is known to transmit Ross River virus. The mosquito was first discovered in Napier in December 1998, when residents complained of being fiercely bitten during the day by large numbers of mosquitoes. Eradication operations appear to have been successful in the Napier area, but attempts to eradicate the more recently discovered incursions of southern saltmarsh mosquitoes from six other sites are continuing.

Around \$30 million will be spent in the next 4 years to eradicate the exotic mosquito from the Kaipara area, which covers a

potential habitat of almost 3000 hectares. Initially, the plan was to eradicate the mosquito in Napier, Gisborne, Mahia and Porangahau and to contain and control the spread of the mosquito in the Kaipara and Mangawhai areas. The Government has now decided to move to full eradication at all sites. The programme will involve aerial and ground spraying, using S-methoprene, an insect growth regulator that stops the mosquito pupae hatching into adults, and the biological spray Bti.

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BIOSECURE – prototype ready for trial

New Zealand as an island nation constantly battles the threat of introduced weeds and pests. With ever-increasing trade volumes and tourism, we must always be on guard against invaders. But with our limited resources, what should we be most vigilant against? Which invaders have the greatest potential to run rampant here, to the detriment of native ecosystems?

Landcare Research is leading a project to develop the most comprehensive, computerised, risk profile system in the world. BIOSECURE is a web-based system to help biosecurity managers decide where best to focus their

resources to stop pests arriving, establishing, and spreading. A prototype is now ready to be trialled by staff from the Department of Conservation and Ministry of Agriculture and Forestry. Users log on, fill out fields specific to their real or hypothetical invasive species problem, and BIOSECURE posts a result report.

Biosecurity agencies can run risk analyses with a wide range of environmental indicators, including climate, host plant distribution, soil fertility, and whether enemies and competitors are present. Invaders often thrive in new climatic conditions if they do not have their

usual enemies and competitors to keep their numbers down.

BIOSECURE also factors in the degree of human disturbance in New Zealand ecosystem such as deforestation and introduction of exotic plants. These disturbances make an ecosystem more vulnerable to invasion. As well BIOSECURE looks at an ecosystem's proximity to ports of entry, which countries these ports receive goods from, and how these goods spread out within New Zealand.

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Red imported fire ants

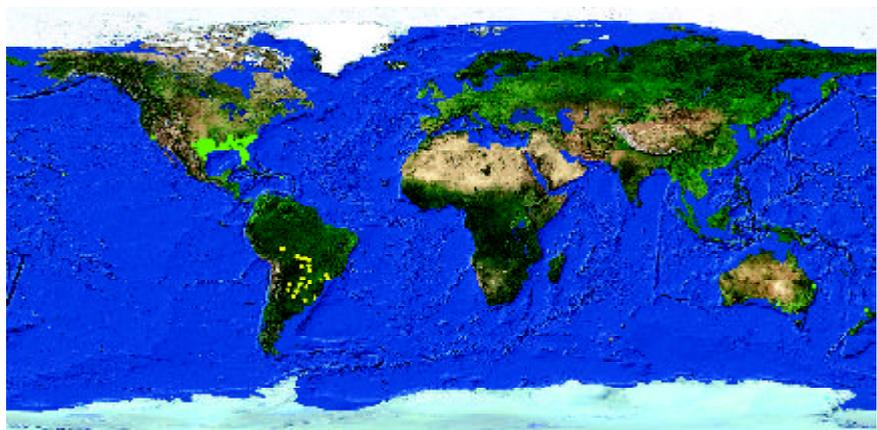
In early March 2001, a nest of red imported fire ants (*Solenopsis invicta*) was found at the Auckland International Airport. The nest was treated and all the ants killed. Surveys have not located any more of these ants in New Zealand. As well as a painful sting (hence their name), fire ants can alter the ecological balance by damaging plants and reducing food sources for native ant species and other insects. So, if we do not want this species established in New Zealand, how do we keep them out?

BIOSECURE – assessing fire ants

BIOSECURE can be used to assess the risk of red imported fire ant invading New Zealand; to predict where they are most likely to come from; how they will arrive; and where they will establish.

Firstly, BIOSECURE produces a world-map showing the native distribution of the fire ant and the location of introduced populations (Fig. 1).

Figure 1. Yellow dots are the native range of the ant, and bright green area represent locations where the fire ant has been found outside its native range.



Then, by overlaying location data on digital maps, BIOSECURE estimates biological and environmental parameters (such as temperature, rainfall, soil nutrients, invertebrate assemblage) for each location. These parameters are used to define the niche of a species or taxonomic grouping. For example, a digital map of global rainfall (Fig. 2) is used to estimate the range of rainfall in which the fire ant can survive. In this case, the darker the colour, the higher the rainfall.

Similarly, BIOSECURE compares the composition of ant communities found in different parts of the world (Fig.3) with what is found in New Zealand. In this case, we are still collecting data on ants in those areas of the world coloured grey.

Finally, BIOSECURE uses the information on niche to produce a likelihood score for a species surviving in a location. The scores are produced as maps and tables at a range of scales (from global to within-New Zealand). Figure 4 shows the likelihood of red imported fire ant surviving, based on minimum temperature. The darker the colour, the greater the likelihood of establishment.

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This research was funded by the
Foundation for Research, Science
and Technology

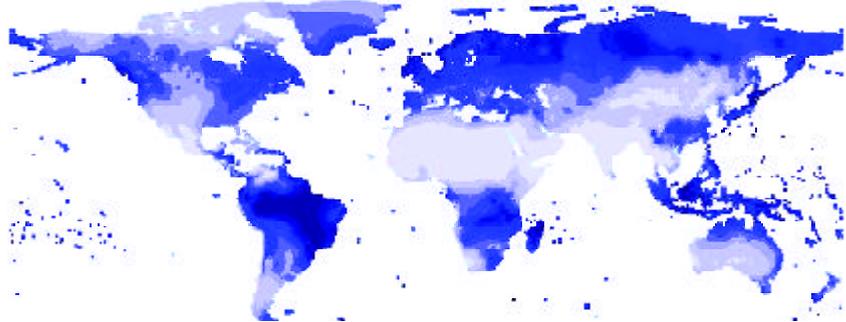


Figure 2. Rainfall

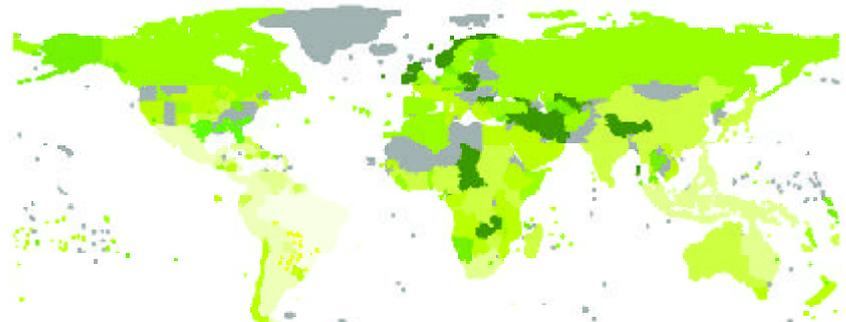


Figure 3. Composition of ant communities

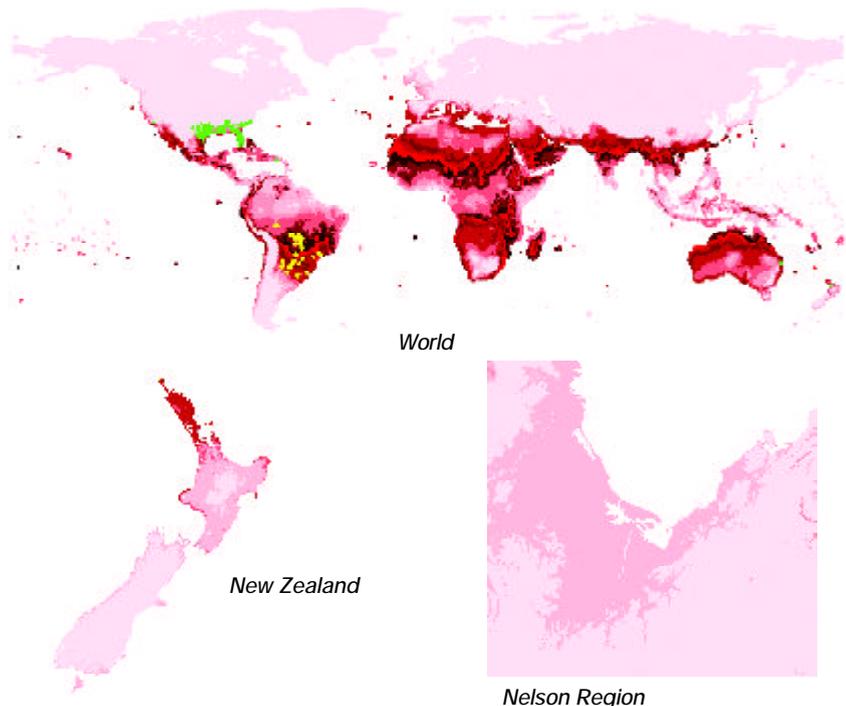


Figure 4. Likelihood scores for a species surviving in a location



Argentine ants spread

Where they are now?

Argentine ants continue to spread around New Zealand; new locations include infestations in Nelson and Christchurch. Argentine ants are slow to disperse naturally because they do not have a winged form. They are good stowaways, though, and are transported around New Zealand with human goods. Even so, it will take many years for them to spread to all favourable areas, especially isolated ones.

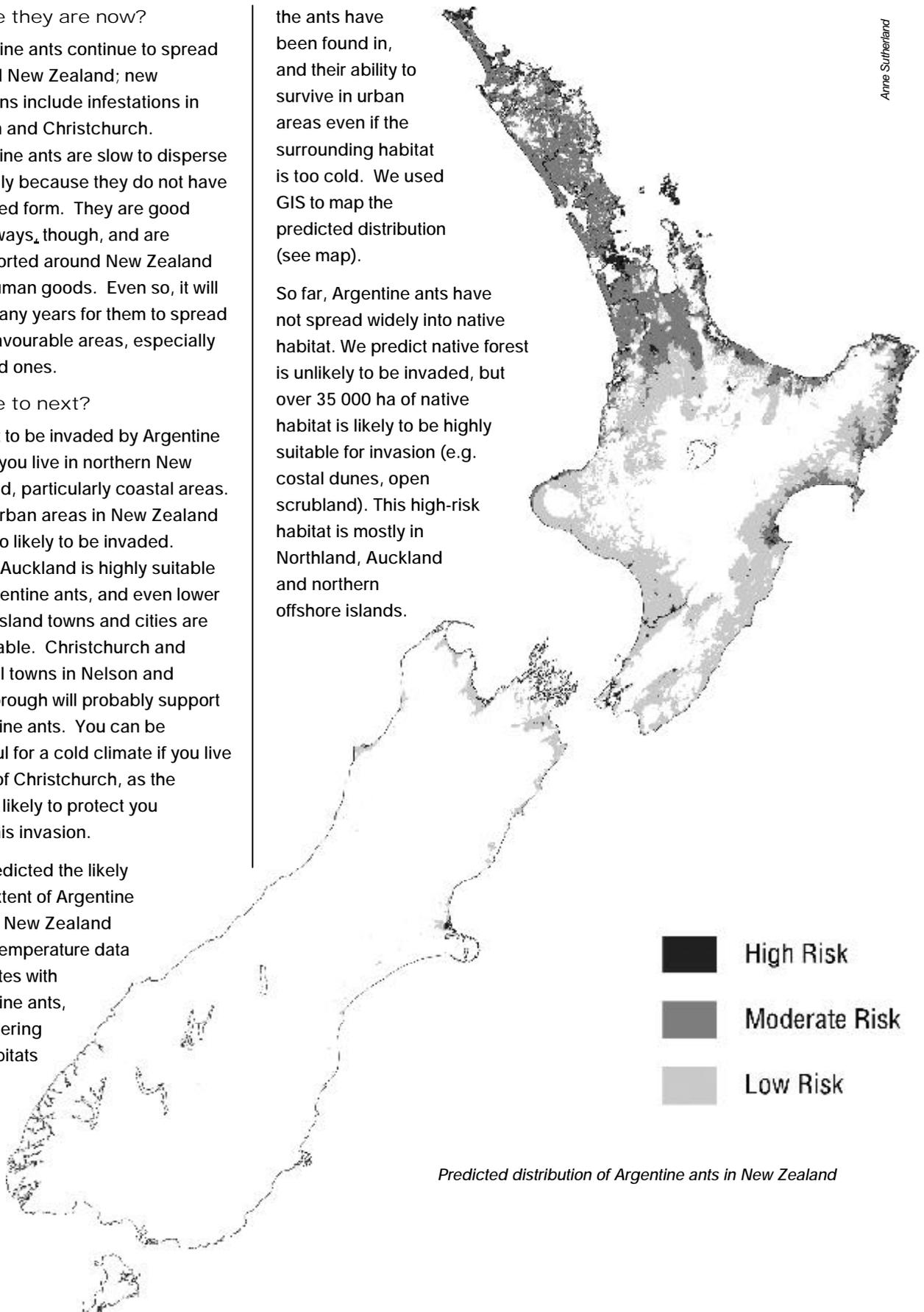
Where to next?

Expect to be invaded by Argentine ants if you live in northern New Zealand, particularly coastal areas. Most urban areas in New Zealand are also likely to be invaded. Urban Auckland is highly suitable for Argentine ants, and even lower North Island towns and cities are vulnerable. Christchurch and coastal towns in Nelson and Marlborough will probably support Argentine ants. You can be thankful for a cold climate if you live south of Christchurch, as the cold is likely to protect you from this invasion.

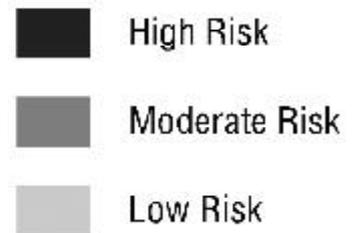
We predicted the likely final extent of Argentine ants in New Zealand using temperature data from sites with Argentine ants, considering the habitats

the ants have been found in, and their ability to survive in urban areas even if the surrounding habitat is too cold. We used GIS to map the predicted distribution (see map).

So far, Argentine ants have not spread widely into native habitat. We predict native forest is unlikely to be invaded, but over 35 000 ha of native habitat is likely to be highly suitable for invasion (e.g. coastal dunes, open scrubland). This high-risk habitat is mostly in Northland, Auckland and northern offshore islands.



Anne Sutherland



Predicted distribution of Argentine ants in New Zealand

Dead ants



Richard Harris

"One ant, two ants ... 12 ants," mutters Jo as she scours the Port Nelson site that was treated with poison bait to kill Argentine ants just over a year ago. Only one small colony is found. To have such a low tally after hours of searching is great news, and it is even better at one of the two sites treated on Tiritiri Matangi Island – no ants were found. Before treatment, the ants numbered in the tens of thousands. Next summer we will develop more-sensitive monitoring methods to detect low densities of Argentine ants, and then resurvey in detail the treated sites. And the final step to achieve eradication at these sites? Develop a method for eliminating any survivors before they have a chance to build up in numbers.

Putting out ant bait at Port Nelson

Key to New Zealand ants

It's black, has six legs, and dozens of them are swarming all over your driveway. You know it's an ant, but is it a native or an introduced species? And if it is introduced, has it been here for years, or is it something new?

Anyone who has access to a binocular microscope can use a new key on our website (<http://stowaways.landcareresearch.co.nz>) to identify worker ants.

Why is the identity of an ant important?

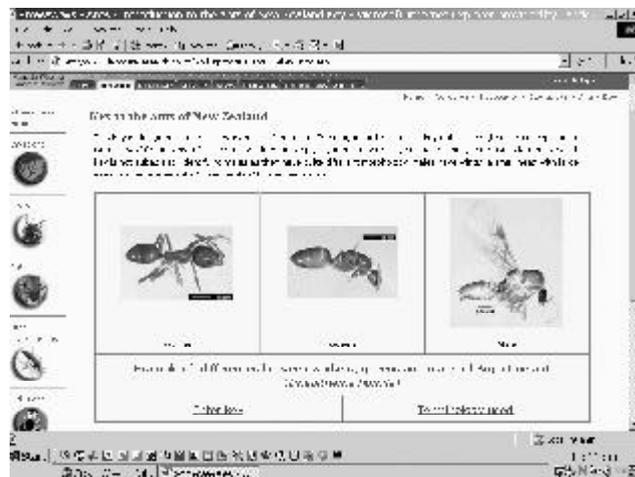
To keep out new invaders. Only by picking up newly arrived species early is there a chance of eradicating them. For example, detecting Argentine ants arriving on an offshore island, or a newly established colony of fire ants gives an opportunity for eradicating these pests before they establish and spread. Included in the key are

three species that are not established here but have made recent incursions and are highly invasive species we do not want (the red imported fire ant and two species of crazy ant).

Also, if you have an infestation of ants it is important to know which species they are to decide what treatment is appropriate.

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The Argentine ant research was funded by the Foundation for Research, Science and Technology, Department of Conservation, MAF Biosecurity, Environment Bay of Plenty and Port Nelson



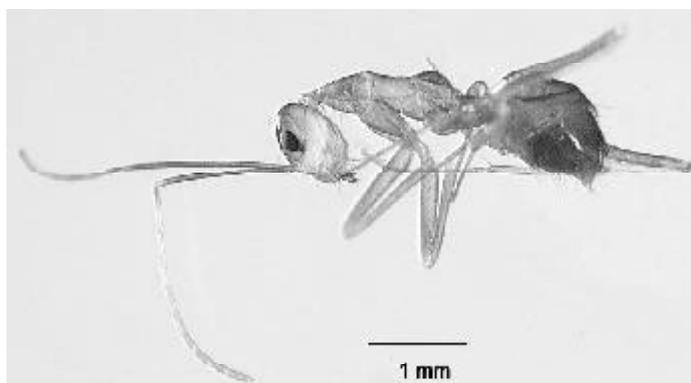


Crazy ant species found

The red imported fire ant surveillance programme has snared two more exotic ant species. Two species of crazy ants, *Paratrechina longicornis*, and the yellow crazy ant (*Anoplolepis gracilipes*), were detected at the Port of Auckland in April.

Only one nest of the yellow crazy ant was found, and this was destroyed. No further specimens have been found. This species is well known for the devastating impact it has had on the Christmas Island (Australian territory) land crab population.

The other species of crazy ant (*P. longicornis*), found in many parts of the world where it is known as an urban nuisance pest, was more widely spread within the port area. Specimens were subsequently found at a transitional facility in



Anoplolepis gracilipes (yellow crazy ant)

Mangere, Auckland, as a result of fire ant surveillance activity.

Eradication results so far are encouraging. The *P. longicornis* infestations have been treated, and monitoring continued over the winter to ensure that treatment was successful. Information has been sent to businesses within the Auckland port area, and to all transitional facilities in Auckland

that are known to receive containers from the port. People working in these areas have been asked to report any unusual ant activity. There will be further surveillance for crazy ants once temperatures rise again in the spring.

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Weed newsletters

"What's New in Biological Control of Weeds?" is produced quarterly to inform people about sustainable biological control solutions for weeds. "Wise up to Weeds!" is produced twice a year and features stories about how to identify weeds, new weeds to watch out for, and weed ecology. Both newsletters are available from www.landcareresearch.co.nz.

Contact Lynley Hayes to be added to the mailing list.

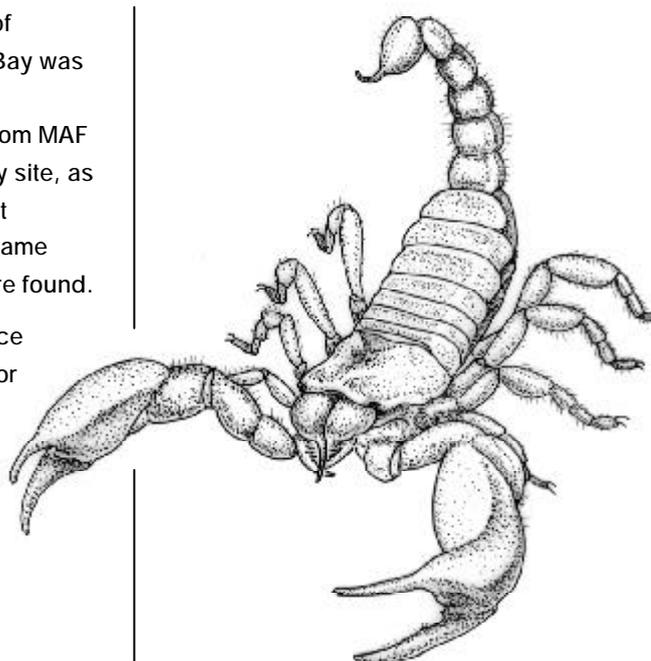
Lynley Hayes
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Scorpion Update

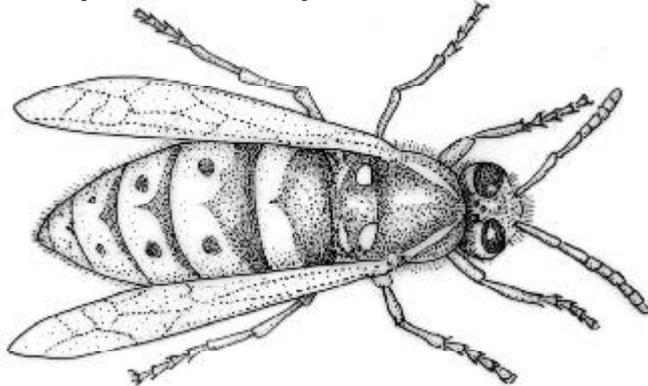
An unconfirmed sighting of scorpions in the Hawkes Bay was reported to MAF in 2000 (*Stowaways* No.1). Staff from MAF searched the Hawke's Bay site, as well as four other sites that received goods from the same source. No scorpions were found.

MAF continued surveillance around the sighting area for two months and no scorpions were found. The area was treated with a residual insecticide.

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New developments in wasp control

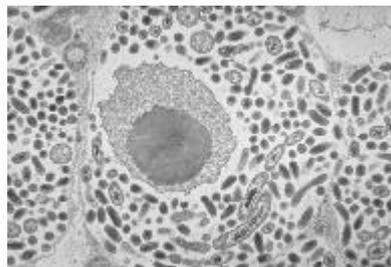


Landcare Research is developing a range of tools for controlling wasps. Some are for widespread long-term control, and others for localised short-term control. It is likely that several control tools will be needed to solve the wasp problem.

One approach to developing novel wasp control options is via a Trojan horse – using organisms that wasps don't recognise as a threat to defeat these persistent invaders. We are working on the idea that through genetic modification we can alter organisms that would otherwise be harmless associates of wasps to kill them.

What we need to make this process work is a microbe exclusively associated with wasps, so that no other insects would be affected. We are collaborating with researchers in Australia to screen wasps in both countries. All insects carry microbes, so we are looking to see what microbes wasps carry in their guts. So far, the results have been disappointing. Wasps do not have many bacteria in their guts and those they do have are picked up from the environment, probably with food. So, although we have been able to identify a number of bacterium from wasp guts, no single species of bacteria

that we are able to culture has been found in all wasps, and there are no obvious candidates for bacteria associated only with wasps.



Rickettsia in the fat body of an insect. The small particles are around 0.6 μm long

All is not lost, however, as Australian researchers have found an organism smaller than a bacterium which is present in their wasps.

This organism is not able to be grown outside a wasp body and is very likely to be specific to wasps. We are currently trying to determine if this sub-bacterial organism is present in New Zealand wasps, and working with the Australians to find out what it does (is it harmful, helpful or neither?). This organism may be our best chance to develop a self-sustaining control for wasps in New Zealand.

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Stowaway hit list

Currently the Invasive Species Specialist Group is developing a database on invasive species worldwide. Included in the database is a list of the "100 of the worst invasive species in the world".

Species were selected for the list according to two criteria: their serious impact on biological diversity and/or human activities and their illustration of important issues surrounding biological invasions. The list illustrates the incredible variety of species (plant and animal) that have the ability, not just to travel in ingenious ways but also to thrive and dominate in new places. Working out which species to include in the list was no easy task — there are so many contenders.

How many species on the list have already invaded New Zealand? Which ones are capable of breaching our borders in the future? What are the chances they will establish in New Zealand? All are key questions in our fight to prevent invasive species from destroying our environment.

Check out the list at <http://www.issg.org/database>

The database is funded by La Fondation TOTAL, and is part of the Global Invasive Species Database.

Illegal immigrant arrives unprepared

An unwelcome immigrant sailed into the Marlborough Sounds last summer, but might not have been prepared for a long stay. The unusual wasp was spotted foraging around some flowers by a keen-eyed gardener at Waikawa Bay, near Picton. Aware that this large and fearsome-looking wasp was not of the normal variety, the intrepid gardener struck it down with her shoe and took it to the local Department of Conservation office.

The wasp, identified by Landcare Research at Nelson, was a female yellow oriental paper wasp, *Polistes olivaceus*. This large, yellowish brown species is native to Asia, but has spread to many of the warmer parts of the world. It is widespread around the Pacific region, where it is known variously as the Pacific Island hornet, the Fiji hornet, and the redbrown paper wasp. It is renowned for its painful sting!

A search of the property where the wasp was found resulted in the discovery of a small nest, complete with four eggs. However, the position of the nest indicates that this immigrant was unprepared for the New Zealand climate – it was built in a cold, shady location under the eaves on the south side of the house. The yellow oriental paper wasp is adapted for warmer climates and has developed a strategy of nesting in the shade to protect its brood from the heat of the tropical sun.

This could be one



reason why this species has failed to establish in New Zealand, despite several known incursions in the past. A close relative, the Asian paper wasp (*Polistes chinensis*), is established in the Marlborough region, but it originates from more temperate lands, and invariably nests in north-facing sites to make full use of the sun's warmth.

The property on which the wasp and nest were found overlooks the small Waikawa Bay marina. This

suggests the wasp arrived as a hibernating queen aboard one of the overseas yachts that visited the marina over the summer months. Thankfully, it is unlikely that the yellow oriental paper wasp would survive the New Zealand climate, but this incursion is a sharp reminder of the biosecurity risk at all points of entry. The next sailor to jump ship may be better prepared.

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The yellow oriental paper wasp found at Waikawa Bay

Invasive alien species

Alien species: A species occurring outside its natural range is called an *alien species*. When that species is an agent of change and threatens native biological diversity it is known as an *invasive alien species*, or just an *invasive species*. A new organism can change the species diversity, and therefore the whole community, of its adopted habitat.

Paper wasp heads south

The Asian paper wasp, *Polistes chinensis*, is now well established in Central Otago. It was first recorded in New Zealand in 1979 at Whangaparaoa Peninsula, Auckland. By 1987 it had spread as far south as Taumaranui and Napier, and by 1990 it had established in Nelson. Now records show it is capable of surviving in southern New Zealand.



Richard Toft

In November 1999, three adult Asian paper wasps were observed in different parts of Alexandra. Since then, these wasps have been found each year from several locations in the town, where this species is now well established. It probably arrived as a stowaway from other parts of New Zealand, as in April 1999, a large paper wasp nest was found on a property in Alexandra in a container from Auckland.

Dunedin records are tenuous. An active nest was reported there in March 2001, but no individuals were seen in that locality this year, and in October 2001 a hibernating female of unknown origin was captured in a house in Dunedin. While the Asian paper wasp may not yet be established in Dunedin, it probably could establish there.

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Argentine ants kill wasps

Argentine ants have invaded Whangarei, and the ants are as aggressive as their reputation implies – taking over and killing an active wasp nest.

A German wasp nest had established in a cavity caused by the decay of an old palm rootstock, at the base of one of my banana palms. I intended to deal with the wasp nest in early to mid-March when it would be cooler and the wasps would, I hoped, be less active.

However, when I went to poison the nest (near the end of March), I found only the occasional wasp flying in and out of the nest. I saw several dead wasps outside the nest and about six wasps were crawling on the ground near the nest entrance. These wasps were struggling to move as if affected by something. I noticed they had very stout brown legs as if they were wearing socks. Crouching down, I noticed that the brown socks were actually several Argentine ants attached to each leg.

A closer inspection of the dead wasps showed that they had been

or were being consumed by ants. Even more interesting was the number of ants entering the nest. The ants had several nests themselves under the fallen and decaying banana leaves that form a dense mulch and detritus under the palms.

I monitored the nest for the next week and a half, after which all wasp activity ceased. During this time ants continued to come and go from the nest entrance and I observed ants attached to wasps right up until all wasp activity ceased.

I had not used any poison or other wasp control during the active wasp season, so ants were directly responsible for killing the wasp nest. However, in my opinion, the wasp nest was probably on its last legs anyway as it was near the end of the wasp season, so the wasps were probably a lot more vulnerable to attack.

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Invasion improves lakes

Lake Erie was once given up for dead because human activity added too much nutrient.

However, it is now clear of the organic matter that had been choking it, thanks to zebra mussel accidentally introduced from Europe to the Great Lakes in ballast water.

Crayfish numbers have dramatically increased at a natural reef in south-western Lake Michigan as a result of the zebra mussel invasion. Prior to the 1992 invasion, crayfish were sparse in

south-western Lake Michigan. By 1995, the population had increased 12-fold to six crayfish per square metre. By filtering the water, zebra mussels have increased the water clarity in Lake Michigan. Because the reef received more light, there was an increase in algae and in organisms that eat algae, such as insects. This has led to increases in the number of crayfish, which consume both algae and insects.

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Recent Publications

- Barlow, N. D.; Beggs, J. R.; Barron, M. M. 2002: Dynamics of common wasps in New Zealand beech forests: a model with density dependence and weather. *Journal of Animal Ecology* 71: 663–671.
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- Toft, R. J.; Harris, R. J.; Williams, P. A. 2001: Impacts of the weed *Tradescantia fluminensis* on insect communities in fragmented forests in New Zealand. *Biological Conservation* 102: 31–46.

Website

More information on wasps and ants is available on our website:

<http://stowaways.landcareresearch.co.nz>

Stowaways is available on this site too.

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