A sting IN THE TALE

WORDS Chris Wootton
PHOTOS Supplied by DOC

Right now in a garden near you, a queen wasp is stirring, awakening from a winter's slumber. And like us, looking forward to the prospect of a glorious spring and long, hot summer.

These conditions will prove vital to the queen wasp's mission. Her role is to ensure the survival of her species by building an empire; instructions are imprinted in her genes. Spring is a signal to start. Through summer she will be at the height of her powers. By late autumn her life will end, as will her dynasty. Success means reproduction of other queens to ensure that her species survives another year.

The story of introduced vespulid wasp species and their success in Aotearoa New Zealand is also a story of destruction. Wasps need to be aggressive and rapacious in a ruthless annual competition to ensure their species' survival, resulting in immense consequences for our unique native biodiversity, which have only recently been better understood. This is a story of a highly successful and adaptive insect, introduced into a country with no natural predators and a seemingly bountiful range of food sources. Its annual cycle starts with the triggering of the queen wasps' senses by longer daylight hours and warmer temperatures in spring.

As the queen stirs, it is time to find a suitable warm, dry nest site and begin laying eggs. She has a busy schedule protecting and nurturing these eggs until larvae hatch. Fighting off other wasp queens and defending her nest site is the start.

Raising the young larvae through the pupae stage into adulthood before sending them forth to gather food and nest material is next. While these underlings perform their slavish duties, the queen lays more eggs. And so the process continues, with nest and wasp numbers increasing through summer. Ultimately, the aim of the queen is to produce as many fertile queens by the end of autumn as possible. These queens will then continue the life cycle

PHOTO Phil Lester

of the wasp, flying off to overwinter somewhere cosy before emerging again in the spring.

Like the seasonal visits of unpopular cousins or in-laws, wasps return annually just when we've managed to forget their last visit. Usually it's when most people want to enjoy the great outdoors. Whether you're cooking outside on the barbecue, swimming at the local river or just enjoying a convivial glass of wine, most people will experience the irksome and sometimes painful company of wasps. Not many parts of New Zealand escape the hordes. Depending on where you live and the nearby environments, the wasp problem can be classified as a minor nuisance or as a major dilemma.

In some parts of Hawke's Bay, wasps can build to plague proportions. Riverbanks are particularly notorious. Multiple nest sites can infest these areas and cause disruption to recreational users and neighbouring properties.

In 2016, the Hawke's Bay Regional Council closed a section of the Tukituki riverbank due to extreme wasp numbers attributed to a long warm summer. But numbers can be influenced by a variety of factors. Climatic conditions and weather events in prior years help determine current wasp levels. Cold, harsh and wet winters will reduce the number of queens overwintering and surviving to build new nests in the spring.

Entomologist and preeminent wasp expert Phil Lester, from the School of Biological Sciences at Victoria University of Wellington, agrees that there are some key variables that trigger high densities in summer. He has predictions for different parts of the country which are based on his observations.

"A key factor in the density of wasps in any one year is the density of wasps in the previous year. A low number of wasps last year will often mean higher densities in the following. We had few wasps here in Wellington, so expect more next year. In some areas where there were lots of wasps, expect fewer," Lester says.

Plentiful food sources also influence wasp densities, something well known in New Zealand's native beech forests: wasps thrive on honeydew droplets excreted through the anal tubes of scale insects sucking off the beech tree sap.

Giant willow aphids can also influence wasp numbers. These aphids are recent arrivals to the country and have established in rural areas, including Hawke's Bay. They excrete a sugary substance that attracts wasps eager for this high energy boost. Wasps will thrive when there is a localised explosion in aphid numbers.

Thousands of species of wasps and bees exist in New Zealand. Most are native and don't build to high levels, and they can be difficult to notice. Many of them are tiny and go about their specialised work with well-mannered discretion.

Natives include wood wasps, sawflies, parasitic wasps and hunting wasps. Native bees play a critical part in pollinating indigenous flowering plants, as well as vegetable crops, apple and kiwifruit orchards.

The wasps with bad manners that can build to high densities in New Zealand are either the German (*Vespula germanica*), which arrived in the late 1940s, or the common (*V. vulgaris*) wasp. The cost of an individual's interaction with a single wasp may be a sting (or multiple stings if they're unlucky), but the economic cost of wasps to New Zealand in general has been calculated to be $130 million annually in a study written by Peter MacIntyre and John Hellstrom. Included are costs to pastoral farming through loss of clover pollination and increased fertiliser outlay; costs to beekeeping from wasps attacking hives and robbing honey; and costs of over $1 million annually in treating wasp stings.

PHOTO E. Edwards

A large common wasp nest being excavated from a beech tree near Saint Arnaud in the upper South Island. Wasps are much more aggressive and determined to sting than bees, so researchers have to place duct tape over zippers and joins of the bee suits, otherwise the wasps will burrow their way in.

PHOTO L–R: Phil Lester and Kevin Loope

PHOTO Jenny Jandt

Wasp-related traffic accidents are estimated to cost $1.4 million each year as well. The study also considered over $60 million lost in unrealised honey production from our beech forests, where wasps take honeydew.

These quantifiable costs are incredibly high. But what about the less visible costs to our native biodiversity? We're expert at recognising costs of predators like rats stoats, weasels and ferrets on our native biodiversity. For wasps, this is a little more difficult. For example, the seasonal disappearance of wasps makes us less conscious of their impact.

The impact on our native ecosystems and species could also be less well understood because wasps are small and prey on other small things of which we often don't take much notice. It's not so easy to wander through a forest and note the paucity of spiders, beetles, centipedes, moths or butterflies. That is unless you're inclined to look, which is what Ruud Kleinpaste, better known to some as 'Bugman' and ambassador to the Hawke's Bay Cape to City project, has made a lifetime of doing.

He politely describes species (such as wasps) that don't comfortably fit into our ecological systems as 'unwelcome'. He also notes the culpability of wasps in the decline of other invertebrates in our native forests and our gardens. He finds wasps guilty as charged, having observed the disruptive and antisocial behaviour of these insects first-hand. Kleinpaste describes an impressive wasp attack on a native giant dragonfly, the wasps carting the dragonfly away in convenient cuts of protein to feed larvae in the nest. He has observed huge wasp nests underground, excavated from the clay soils in forests, parks and gardens.

"Summer is the time you'll find numerous clay pellets on the pavers and on your car's shiny paintwork. The workers simply gather water to soften the clay at the excavation site, then cut out a pellet and fly away with that.

"Imagine thousands of wasps working away in a forest and spreading that soil over rather large areas and you'll suddenly realise that this could well have a bit of an impact on the spread of, say, kauri die-back," Kleinpaste says.

The ecological impact may be wider than suspected. What is known is that the seasonal cumulative impact of abundant wasps is bad news for our native biodiversity. Predation on invertebrates and other food sources in different ecosystems can mean the disruption of the food web, with wasps removing food for native species, including other insects, birds and lizards. Native species can either adapt or be forced out, starved or consumed, themselves, by wasps.

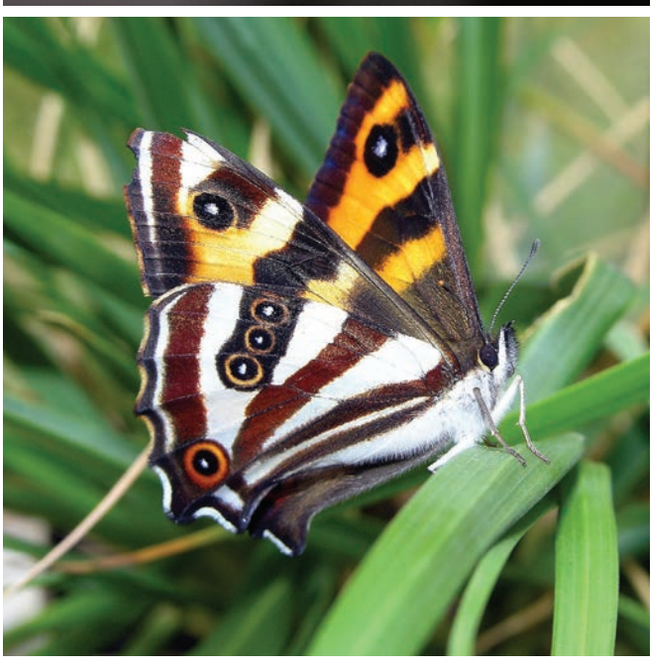
Wasps feeding out of Vespex bait stations

TOP TWO PHOTOS: Chris Wootton

Vespex being applied in bait stations

BOTTOM TWO PHOTOS: DOC

Dodonidia helmsii (Forest ringlet) is the largest New Zealand satyrine and the only forest-dwelling butterfly. It is endemic to New Zealand but under threat from wasp predation



PHOTOS Michael Reid

The extent to which wasps have influenced the abundance or rarity of endemic insects isn't well understood. But stand in a forest at the height of summer where wasp levels are high. You'll hear a droning and see wasps moving about harvesting food. It's difficult to believe how other insects or food sources can survive that level of onslaught.

In Hawke's Bay, we may not experience the widescale invasion of wasps so visible in areas such as beech forests. But impacts on local biodiversity, where wasp levels are high, can be equally destructive. Local impacts at smaller sites are less likely to be well researched or understood.

Phil Lester has spent a good part of his career working out what makes wasps thrive so well here. His book *The Vulgar Wasp: The Story of a Ruthless Invader and Ingenious Predator* is a worthwhile read for anyone wanting to better understand wasps.

Lester is convinced there have been local extinctions of native insects caused by their voraciousness. He points to the forest ringlet butterfly, which is no longer commonly observed. Many native insects only have a life span of hours due to wasp prevalence.

Tackling the invasion is something entomologists such as Ruud Kleinpaste and Phil Lester have an intense interest in. Landcare Research is investigating different species that may provide biocontrol by using wasps or mites as parasites.

Other research by Otago University is focusing on 'gene silencing' techniques. These target specific gene functions within wasps.

The most recent advance in wasp control is Vespex wasp bait. This fish-based bait uses fiprinol as a primary toxin and is dispensed in bait stations. Vespex is extremely effective in knocking wasps back but needs to be applied by an approved operator, with a high degree of planning, preparation and care.

Ruud Kleinpaste suggests that wasp control needs to be viewed with more urgency if their wider impacts on our lives and biodiversity are fully considered. With the current Predator Free New Zealand initiative focusing on mammalian predators responsible for wreaking havoc on our biodiversity, maybe it is time to widen the net and include marauding vespulid German and common wasps in the 'unwelcome' and unwanted category.

The introduced paper wasp, often referred to as the Asian paper wasp *Polistes chinensis* is also making an impact. Phil Lester confirms that another new arrival, the European paper wasp, *Polistes dominula*, is being recorded in high numbers in Nelson and other parts of the country.

These wasps are a different species from vespulid wasps and have very different feeding and social structures. Anecdotal evidence says they are responsible for a decline in both introduced and native butterfly species, as they favour live prey, including eggs and pupae of caterpillars and moths.

In Hawke's Bay, we're looking forward to our summer. But you can guarantee there will be an uninvited invertebrate guest boldly gate crashing your place, or personal space, very soon.

In the grander scheme of things, just feel lucky that you're not a freshly hatched native forest ringlet butterfly caterpillar, because it's likely your life span would be extremely short!

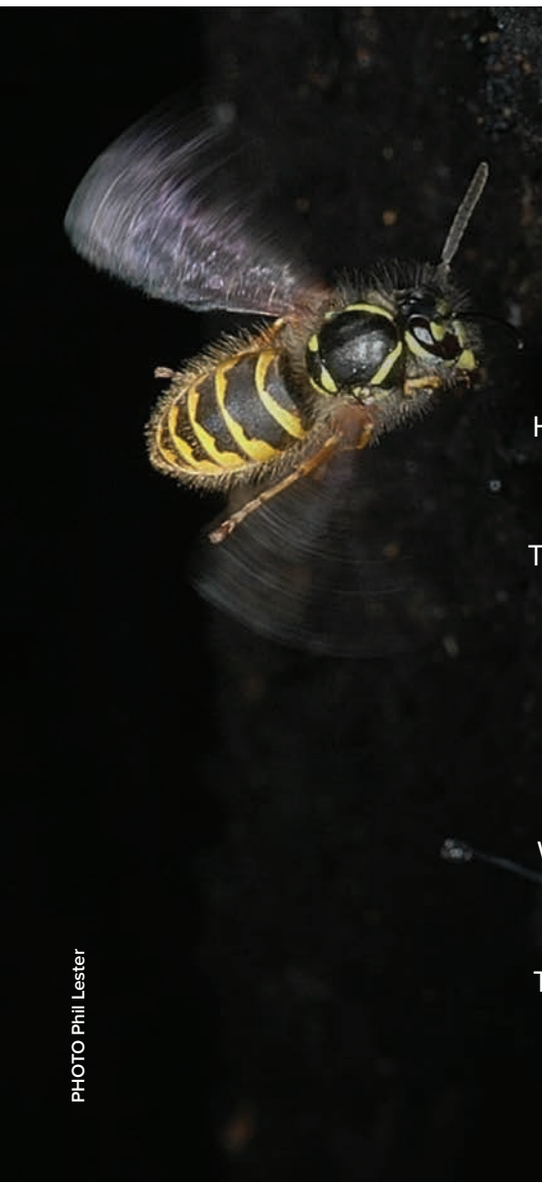


PHOTO Phil Lester

Wasp Facts did you know?

The German wasp (Vespula germanica) was first found near Hamilton in 1945; the common wasp (Vespula vulgaris) has been in New Zealand since 1978

The beech forests at the top of the South Island have the highest densities of wasps in the world. But wasps also occur in many other habitats across New Zealand

There is a greater biomass of wasps (3.8 kg/ha) in beech forest than all the native birds plus stoats and rodents put together

Wasps destroy or seriously damage 8–9% of honeybee hives in New Zealand each year

The largest nest ever found was four metres high and contained about four million cells