NZASE scientist profile Jacqueline in Antarctica, helping with research on Adelie penguins.

Jacqueline Beggs

Birth and affiliations

1962, Palmerston North; her dad was in the Army at Linton Army Camp and her mum worked in the school office and taught music. Ko Pūtauaki te maunga, ko Tarawera te awa, ko Ngāti Awa te iwi, ko Te Tauwera te hapū, ko Iramoko te marae.

Schools and subjects

Waiouru School; Linden Primary School and Tawa College in Wellington, Rangitoto College in Auckland. Jacqueline took science, biology, chemistry and physics. Options to learn te reo were limited, so she took German instead.

How she got into science

"My real passion was biology but I didn't know you could have a career as scientist, so thought of medicine. But after moving away from my Wellington friends, I spent my last year of school goofing round. My grades dropped, and I was uncertain what to do, so I went to uni and studied science."

"Going on my first field trip made such an impression that for my second year, I chose all the courses that had field trips. Ecology had lots, and by the end of third year I loved it. The teachers were great, it was practical, and I loved the connection with the natural world."

Training and jobs

"I followed my boyfriend to Nelson, but in the 80s there wasn't much work around. I spent six months in a government work scheme building nest boxes for kākā and parakeets in the forest – I loved it."

"After seven years as a field hand, I could see if I wanted to keep on doing research work,



I needed a postgraduate qualification. I was able to build on my work experience and study the ecology of kākā in Nelson, for a Masters in Science at the University of Auckland." **Co-ordinator**, Conservation Corps, Ecology Division, DSIR (a government science agency). **Scientist**, running invasive wasp research, Landcare Research, Nelson.

PhD on invasive wasps, University of Otago. "I studied part-time while I did the wasp job full-time and had two kids. I had a really supportive whānau, employer and supervisor – they went out of their way to support me." **Scientist**, Landcare Research.

Lecturer in entomology (insects), University of Auckland.

Professor, University of Auckland, Director, Centre for Biodiversity and Biosecurity /Te Whare Tiaki Koiora mo te Orangatonutanga o tō tātou Kanorau Koiora.

Field of science

Ecology – "the study of the interactions between plants, animals and their environments" including forests, urban and agricultural systems.

Research examples

Kākā survival

"I was fascinated watching these birds, and seeing the competition from wasps taking honeydew and possums eating flowers and how kākā survived. At that time, we all thought that kākā, as a big, stroppy bird, wouldn't be as badly affected by predators as smaller birds."

"We realised that they were not able to breed successfully, and first thought it was lack of food. But we pieced together the evidence that it was stoats and rats; one colleague watching an attempt at nesting saw the female come out with a stoat attached to her leg."

That research took 12 years. During that time, the common wasp arrived in the South Island. "Within two years they had taken over from German wasps in our honeydew forests, and wasp numbers had skyrocketed."

Ecology & control of invasive wasps

Much of Jacqueline's research has focused on the impacts of these social wasps.

Restoration of ecosystems

"Most restoration research had focussed on the plants, but few studies had looked at whether replanting trees also allowed native invertebrates to thrive. Students studied this question on Motuora Island (in the Hauraki Gulf), which had been farmland. Most insects did return, but the decomposer insects didn't and we never figured out why. There are always more questions to answer".

"Another study found that scale insects (which produce honeydew) don't recolonise easily. This is similar to dung beetles, which A time line showing are also small and flightless, so we have to the help move them. We have a lot of flightless insects, just as we do birds."

population dynamics Lake Rotoroa. McDiarmid.

of common Biosecurity

wasps (Vespula Jacqueline worked with an MSc student on vulgaris) in how the introduced wool carder bee changes an invaded ecosystems. "They make nests by carding range, plant material. They're territorial and defend flowers from other visiting insects using a Photo spike on their abdomen." Jacqueline also courtesy supervised a PhD student studying how of Colin introduced millipedes affect our ecosystems.





Conservation of native species

"When I started research, there had been no ecology studies of our 14 species of native dung beetles. Dung beetles elsewhere specialise on mammalian dung, but here our students trialled bird, other insect dung, introduced mammal dung, and they collected it all, plus dead squid from seabirds. Dung beetles lay their eggs in it and the developing larvae eat it - it's full of nutrients."

Jacqueline collecting ants in Fiji with PhD student Darren Ward in 2004. Photo: Margaret Stanley.

How she finds things out

"I use a mix of field work and laboratory studies. We measure insect diversity and numbers with a variety of insect traps. We try to minimise kill trapping; we can live trap some insects once we've learnt how to identify them."

"Field experiments are very powerful. We define a factor that we systematically change and which can be replicated. An example is the effect of humans feeding birds in their backyards. One group of participants put out a certain amount of food at the same time and

> in the same way, and we compared that with other sites where birds were not fed."

"To find out what invasive wasps eat, we used to catch them returning back to the nest and examine what bits of insects and food they were carrying, but we usually couldn't tell. With environmental DNA tools, we extract the DNA from wasp poop, run it through in the lab, and see what they've been eating."

"Developing wasp larvae poop in the bottom of the cell, and it accumulates



through the season. We can collect all the dried poop and get a picture of what invertebrates have been fed to larvae for a season. On Great Mercury Island, we were able to compare what four species of invasive wasps were eating. The amount and detail of information from molecular tools is far beyond what we'd learned by capturing live wasps."

Most valuable results

1 "Being able to describe what impact invasive wasps were having at different levels in forest systems – honeydew, invertebrates and birds."

2"We were able to predict, by studying the density of wasps over time, that ~90 percent had to be killed in infested areas to retain the more vulnerable parts of our ecosystems. Killing 50 percent of workers – millions of wasps – still makes no difference to the number of colonies."

3 "We mixed fipronil and other toxins in a protein base such as fish bait, so honeybees didn't collect it, and it killed 90 percent of wasps."

What she likes about science

"Discovering things that nobody knows about a species – you can become the world's expert and help us look after them better. The ability to learn new things, and use that information to undo some of our damage to the earth."

"Working with students as they start their own scientific journey is such a privilege, and one of the best things I like about my job."



Jacqueline planting native wetland species to offset her carbon miles, <u>detailed in</u> <u>her blog post</u>.





Mātauranga Māori

"The holistic approach of Mātauranga Māori is one of the reasons that I'm drawn to ecology. Nature is not separate from us; the Māori view is that individuals, whānau and iwi can't be well without the environment being well. Research thinking doesn't have to be dominated by the scientific world view, and science is not divorced from our experience as humans."

Jacqueline says that she doesn't have a strong iwi connection, and has not carried out much research with Māori communities. She is keen to support more Māori to study science, and co-edited a <u>Mātauranga Māori issue of the</u> <u>NZ Journal of Ecology</u>. The co-editors wrote: "Working with interdisciplinary knowledge including mātauranga will be critical to halt further biodiversity loss and improve outcomes for the environment and people, in New Zealand and worldwide."

Links

• Beggs, 2020. <u>I'm taking action, here's how you can</u> too, Newsroom [article].

- Beggs, 2019, <u>Tackling the summer spike in invasive</u> <u>wasps</u>, Radio New Zealand [podcast].
- Kate Gudsell, 2017. <u>The mauri of our natural world</u> <u>has been diminished</u>, Radio NZ [podcast].
- NewsHub, 2017, <u>The Department of Conservation</u> <u>celebrates 30 years</u> [4m video].
- OneNews, 2016, <u>Wasps send nasty sting into native</u> <u>NZ insect and bird populations</u> [2m video].

• Project Matauranga, 2016, <u>Honeydew, The food of</u> <u>the ngāhere</u> [26m video].

Ngā Kupu

<u>Te aitanga pepeke</u> – Insect family <u>Kanorau koiora</u> – Biodiversity <u>Mātai hauropi</u> – Ecology (field of study) <u>Nga pāpapa</u> – Beetles <u>Te riha rāwaho</u> – Introduced pest <u>Te taiao</u> – The environment, nature <u>Whakahaumanu</u> – To restore <u>Whakamātau</u> – To experiment, trial <u>Whāomoomo</u> – Conservation <u>Ngā wāpi</u> – Wasps. <u>Te Aka Maori Dictionary and Paekupu</u>