# Release the beast!

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In the first three years of the giant willow aphid (GWA) biological control programme we focussed on finding and testing a safe and effective parasitoid. In December 2019, we received the news that our efforts had been successful; we had approval from the Environmental Protection Authority to release the beast!

Our team imported the aphid parasitoid, *Pauesia nigrovaria*, into containment in Rotorua from California in 2017. It was rigorously tested against non-target species to ensure it was safe for release into the New Zealand environment. We initiated releases of *P. nigrovaria* in February 2020 as the seasonal GWA population began to grow. By early June 2020, 23 separate releases had been carried out at 15 locations (release sites in close proximity to one another are grouped on the map on page 2).

Most of the parasitoid releases involved sending containers of parasitoids by courier to members of the project team, various regional council staff, individual beekeepers and landowners. Containers were opened at release sites underneath GWA colonies and parasitoids were permitted to walk or fly out (Figure 1). The parasitoids proved keen to get down to business, with females often observed to immediately lay eggs into live GWA.

**Figure 1.** Pauesia nigrovaria *being released under a colony of giant willow aphids.*

At a limited number of sites, parasitoids were released into mesh field cages containing small infested willow trees (Figure 2). The cages helped to foster a larger starting population of *P. nigrovaria* and were removed a few weeks after the release. Caging also created the opportunity to more closely monitor parasitoid development.

**Figure 2.** *Field cages employed at a Bay of Plenty Regional Council release site.*

In total, 458 mated female parasitoids were released. At the three earliest release sites where field cages were used, establishment of *P. nigrovaria* was confirmed by the presence of aphid 'mummies' indicating that a new generation had developed. These mummies are dead aphids found on willow stems, each either containing developing *P. nigrovaria* larvae or with an exit hole showing that the parasitoid has become an adult and already exited its mummified nursery (Figure 3).

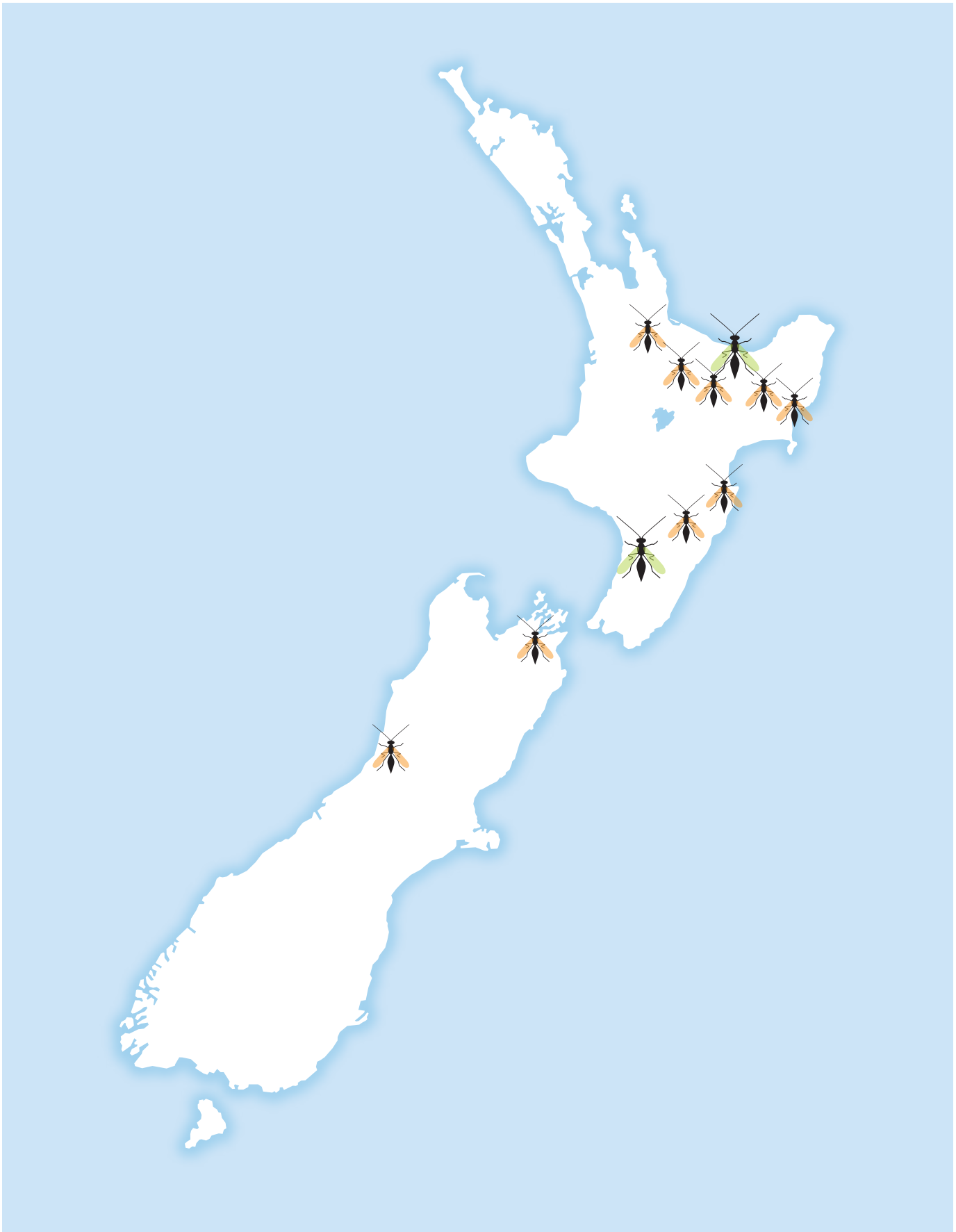
One of our earliest release sites was the NZ Poplar & Willow Research Trust's willow collection at Massey University in Palmerston North. Five weeks after releasing *P. nigrovaria* at this site, 1461 aphid mummies were counted on the caged willow trees. This means an average of 28 offspring were produced per female, which closely aligns with the average number of offspring of 30 recorded in the laboratory. Therefore, we estimate a first generation of up to 13,000 in the field.

The number of generations per year and the winter/spring habits of *P. nigrovaria* remain unknown. In the laboratory at a constant 20°C, development typically takes about 2.5 weeks. However, the first generation from the summertime releases took closer to one month because of colder overnight temperatures. Nevertheless, a second field generation has been confirmed at the Palmerston North site, after mummies were found in May and June on willows several metres from trees that had been caged.

At each release site, the existing population of GWA was measured at the time of the initial release. GWA numbers at these sites will be measured again in 2021 and 2022. This monitoring will allow us to gauge the early impact of the parasitoid on GWA populations and make predictions about the success of the biological control programme.

Further releases of *P. nigrovaria* are planned for 2021. Releases and monitoring are supported by a new three-year MPI Sustainable Food & Fibre Futures (SFFF) project, with co-funding from the NZ Honey Industry Trust, Zespri International, the Regional Council River Managers Forum, the Neil Barr Farm Forestry Foundation, Terra Preta Truffles, and others.

**Figure 3.** *Mummified giant willow aphids, from which the next generation of* Pauesia nigrovaria *have emerged.*



**Map.** *Release sites for* Pauesia nigrovaria*, the biological control agent for giant willow aphid* Tuberolachnus salignus*. Releases took place between February and June 2020, and establishment of subsequent generations has been confirmed at those sites shown in green.*

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