Biological control of giant willow aphid

ANNUAL NEWSLETTER ■ JUNE 2021

Photo: Stephanie Sopow.

Members of the biological control project team looking for aphid mummies near Whakatane, March 2020. From left to right: William Dobbie, willow grower; John McLean, ApiNZ Science and Research Focus Group; Trevor Jones, Plant & Food Research; Belinda Gresham, Scion; Elaine Gould, (formerly) Zespri International.

New Zealand wide effort

Stephanie Sopow and Belinda Gresham (Scion)

Giant willow aphid (*Tuberolachnus salignus* or GWA) is widespread in New Zealand and causes a host of problems. The aphids feed on the sap of willows, causing branch dieback and occasionally tree death. As they feed, aphids secrete honeydew, causing sooty mould growth on and beneath infested trees. Many insects, including pest wasps and honey bees, are attracted to the honeydew. Beekeepers are losing bees to wasps attracted to the honeydew, and the bees that collect the honeydew produce granular honey that can't be extracted from the comb.

A search for a safe and sustainable solution for GWA prompted an investigation into biological control. A promising aphid parasitoid candidate, *Pauesia nigrovaria*, was located overseas in 2016. It was brought into containment in New Zealand in 2017 for thorough host-specificity testing, with the Environmental Protection Authority granting approval for its release in late 2019. The first releases took place between February and June 2020, with further releases conducted between December 2020 and June 2021.

In total, more than 30 releases have been carried out, covering the length and breadth of New Zealand (Figure 1).

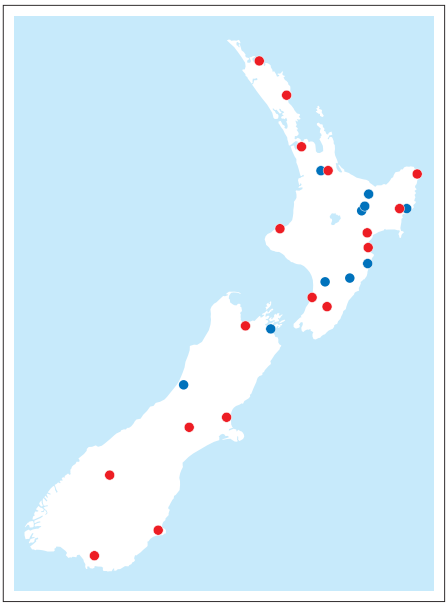

Figure 1. *Map of New Zealand showing* Pauesia nigrovaria *release sites as at 29 June 2021. 2020 release sites are shown in blue; 2021 release sites are shown in red.*

Adult *Pauesia nigrovaria* females lay their eggs inside the aphids (one egg per aphid) and these hatch into larvae which consume the aphid from within. The aphid dies in approximately 10 days, and the resulting aphid mummy becomes fixed to the stem. Roughly a week later, a new adult parasitoid chews a hole through the body of the aphid mummy and exits, ready to start a new cycle. Aphid mummies persist on the willows for months, allowing us to confirm presence of the parasitoid, long after they have emerged (Figure 2).

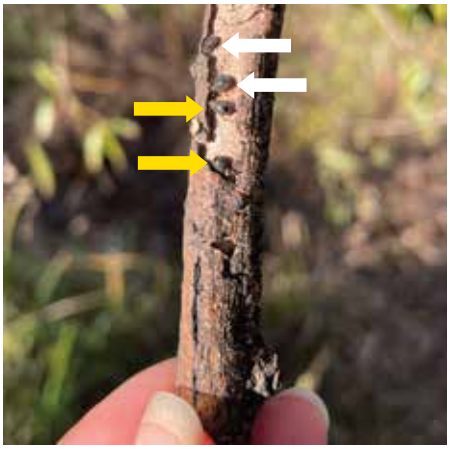

Photo: Stephanie Sopow.

Figure 2. *Giant willow aphid mummies on a willow stem, some still containing parasitoids (white arrows) and some with emergence holes (yellow arrows).*

Scion has maintained a *Pauesia nigrovaria* rearing colony throughout the biological control programme. During the release phase, adult parasitoids emerging from aphid mummies were mated, grouped and shipped overnight to willing participants which included beekeepers, caretakers of arboreta, regional council staff and other individuals.

Parasitoids were released at each site by opening their containers, allowing them to walk out onto a GWA-infested willow stem and begin doing their good work. Local GWA abundance was measured at the time of release, so that future monitoring can determine whether the parasitoid has caused a decrease in GWA numbers.

The release programme has been a New Zealand-wide community effort, with most releases conducted by individuals volunteering their time.

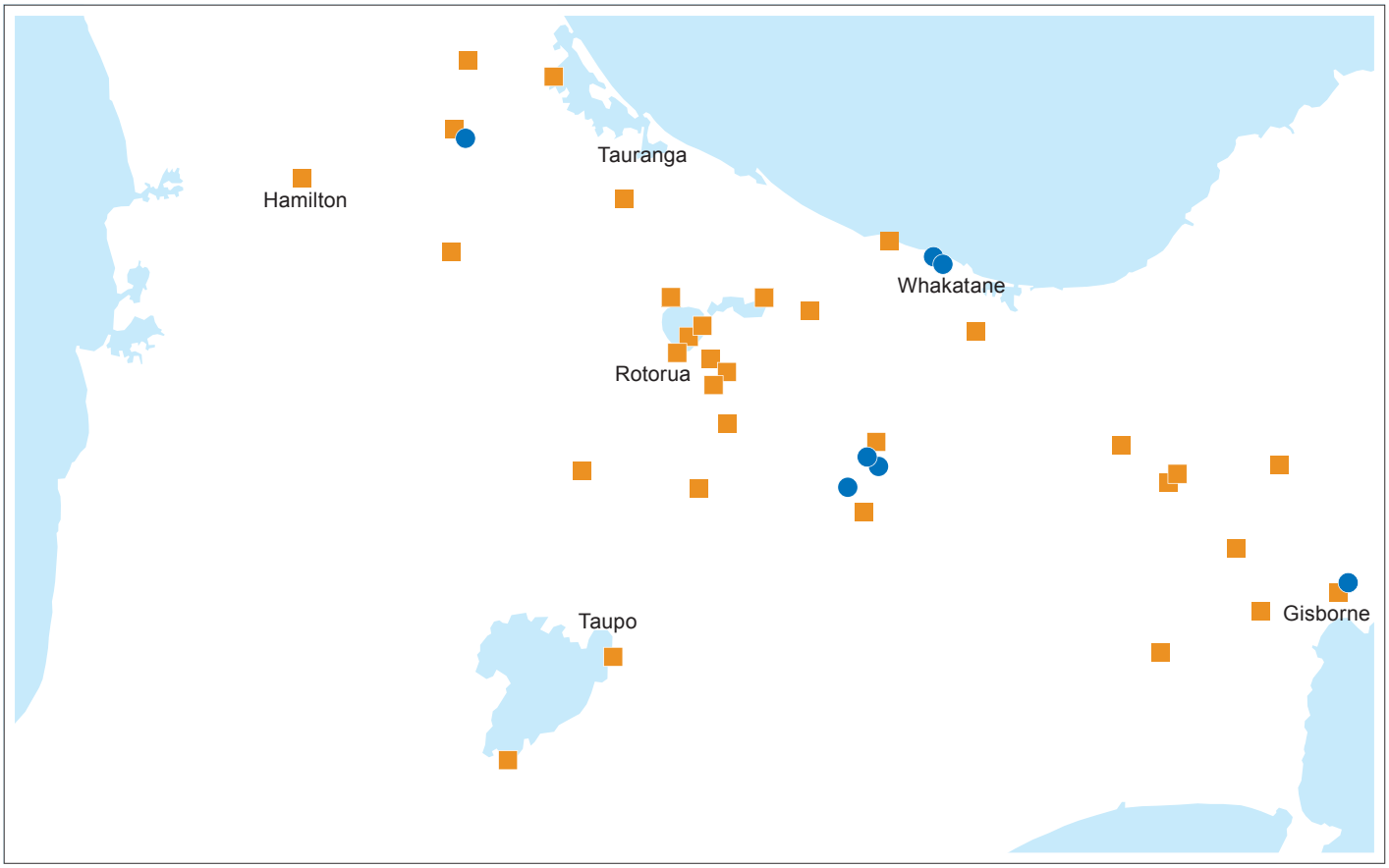

Figure 3. *Known distribution of* Pauesia nigrovaria *in the central North Island of New Zealand, as at 29 June 2021. 2020 parasitoid release sites are shown in blue, additional sites where parasitoid establishment has been confirmed are shown in orange.*

As we move into the monitoring phase, citizen scientists are asked to assist by posting images of GWA mummies on iNaturalist and labelling these finds as *Pauesia nigrovaria*, even if the mummies are found empty. Photos and location details can also be emailed to stephanie.sopow@scionresearch.com

Early surveys of the central North Island from March through June 2021 found *Pauesia nigrovaria* to be well-established throughout this region and to have spread considerably, being found as far as 98 km away from the nearest release site, one year later (Figure 3).

This incredible news has been dampened somewhat by the discovery of hyperparasitism, in which the primary parasitoid is itself attacked by a secondary parasitoid. A proportion of field-collected mummies have yielded hyperparasitoids, predominantly *Dendrocerus carpenteri*, a generalist hyperparasitoid known to be present here for some time. This finding was not completely unexpected, since hyperparasitoids are a natural part of this food web. As an example, 50% of the GWA mummies originally imported into New Zealand from California yielded hyperparasitoids.

Time will tell whether *Pauesia nigrovaria* will bring about effective control of the aphid. Benefits we hope to see are healthier willow trees, thus improving bee nutrition and soil conservation efforts, and a reduction in GWA honeydew, leading to less sooty mould, fewer pest wasps and fewer beekeeping issues.

The biological control programme is an MPI Sustainable Food & Fibre Futures 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.

'Biological control of giant willow aphid' is a Ministry for Primary Industries' Sustainable Food & Fibre Futures project.

Ministry for Primary Industries
Manatū Ahu Matua

This work is supported by many enthusiastic individuals and groups, regional councils and:

For more information contact Stephanie Sopow, Project Leader, at stephanie.sopow@scionresearch.com
www.giantwillowaphid.co.nz