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BIOLOGICAL CONTROL OF *PAROPSIS CHARYBDIS*

Paropsine beetles (Coleoptera: Chrysomelidae) are extremely diverse and abundant in their native Australian range but have emerged as significant defoliators only since the expansion of managed plantation forestry, particularly when host trees are planted outside their native range. Since its arrival in New Zealand in 1916 *Paropsis charybdis* has effectively prevented the commercial viability of several favoured *Eucalyptus* species, including *Eucalyptus nitens*, until the successful introduction of the egg parasitoid *Enoggera nassau* (Hymenoptera: Pteromalidae) in 1988. Scion entomologists have been involved intermittently in the search for classical biological control agents for *Paropsis charybdis* for nearly fifty years, and this appears set to continue for at least another two years.

Paropsis charybdis is bivoltine in New Zealand. The first generation of eggs are laid in spring from October onwards and those laid early often escape their natural enemies. After appearing in November *E. nassau* can control the latter portion of first generation eggs and the second generation of eggs laid in summer time are controlled by *E. nassau* as well as by a self-introduced primary egg parasitoid (*Neopolycystus insectifurax* (Hymenoptera: Pteromalidae)) which was first found here in 2000.

At the urging of members of the forest industry Scion had a fresh look at biological control prospects available to us for targeting the first generation of *P. charybdis*. An obvious first choice for consideration was a braconid wasp *Eadya paropsidis* (Hymenoptera: Braconidae), being univoltine, and responsible for high percentages of first generation parasitism of *Paropsisterna agricola* in *E. nitens* plantations in Tasmania. The first priority was to establish whether *P. charybdis* would be a suitable physiological host for *E. paropsidis*. An initial visit to Tasmania in December 2011 to investigate this was made possible by financial support from Southwood Exports Ltd, and some good luck on the part of our Tasmanian collaborators from the University of Tasmania/Tasmanian Institute of Agriculture, Geoff Allen and Vin Patel. Vin managed to establish a laboratory colony of *Paropsis charybdis* (which

is not always easy to locate in Tasmania) from which we could obtain larvae for experiments.

The next step was to locate *Eadya paropsidis*. Flying adults were caught “on-the-wing” in *E. nitens* plantations in northern Tasmania in December 2011 and brought back to the laboratory in Hobart for testing. Using a sequential no-choice testing method to observe individual females, 9 of 10 of the female wasps attacked *P. agricola* larvae, then 7 of those 9 also attacked *P. charybdis* larvae.

Those *P. charybdis* larvae attacked were quickly shown to be a suitable physiological host for *E. paropsidis* development; parasitoid larvae emerged from the paropsine larvae they had killed, and were significantly larger from *P. charybdis* than from *P. agricola*. Unfortunately over the whole experiment only 8% of *E. paropsidis* larvae successfully pupated; instead they wandered around the dishes without settling. This suggests that appropriate conditions for pupating were not supplied, something we will have to perfect in the future if they are to be successfully reared in the laboratory.

Eadya paropsidis is an exciting prospect for biological control, as it is likely to be strongly host specific to eucalyptus leaf-feeding beetle larvae and be active in



Eadya attacking larva

spring when few other agents are currently exerting much parasitism. Also *E. paropsidis* can attack all larval stages, from the tiniest first instars, through to the large fourth instars, they just take longer to reach full development when they lay their eggs in first instar larvae.

Whilst being attacked by *E. paropsidis*, *P. charybdis* larvae were observed to thrash more violently to defend themselves against ovipositor-probing, than did *P. agricola*. The eversible glands on the backs of paropsine larvae contain some vile substances that upon contacting the parasitoid wasps cause them to retreat in disgust, and spend up to hours grooming their bodies until they deem themselves clean enough to resume larval attacks!

Unlike *P. agricola* larvae which are gregarious on juvenile leaves, *P. charybdis* larvae feed independently and disperse all over the branches bearing adult flush foliage, making locating hosts potentially even more challenging for *E. paropsidis*.

This project is now set to continue with confirmation that it will be collaboratively funded by the Ministry for Primary Industries' Sustainable Farming Fund, Southwood Exports Ltd, Scion, Future Forests Research Ltd, the NZ Farm Forestry Association, Carter Holt Harvey Pulp and Paper Ltd, and the Forest Owners' Association. In the summers of 2013 and 2014 additional field research will be conducted in Tasmania. Using *P. charybdis* from the laboratory colony, a sentinel field trial may reveal other currently unknown spring-active biological control agents.

Additional host testing will be undertaken on *Eadya paropsidis* to ensure it can overcome the formidable behavioural defences of the *P. charybdis* larvae, and choice tests will reveal its preferences for different paropsine species. If results are successful after the next two years, then the most promising biological control agent identified will hopefully be imported into New Zealand for host specificity testing in 2014. So watch this space as the war against *Paropsis charybdis* resumes.

Toni Withers

AUSTRALIAN SUBTERRANEAN TERMITES

Recently the Ministry for Primary Industries announced that an incursion of Australian subterranean termites (*Coptotermes acinaciformis*) has been eradicated from a property in Coatsville, Auckland. The termites were first found there in 2007 and are thought to have arrived in Australian hardwood railway sleepers used for garden landscaping. The last live termites were found at the site in 2008.

Australian subterranean termites (*Coptotermes acinaciformis* and *C. frenchi*) were first found in New Zealand in 1938 in Auckland. There were hundreds of discrete infestations all associated with imported Australian hardwood utility poles and tram sleepers. The problem was so severe that in 1940 the Termite Act was passed by government. This Act and its associated regulations formed the basis of a "termite control campaign." This Act was repealed in 1976. Subterranean termites are now dealt with under the Biosecurity Act.

The Ministry for Primary Industries is currently managing three other responses to this termite in Nelson, Pukekohe and Point Wells. Let's hope these meet with the same success as all the other subterranean termite programmes.

For further information see Forest Health News 159 (2006).

John Bain

NEW STAFF MEMBER

Recently Martin Bader joined the Forest Protection team at Scion. After completing his Master's degree in Biology (Botany major, Entomology minor) at the University of Waikato with a thesis on the ecophysiology of New Zealand tree ferns, Martin returned to Europe where he earned a PhD in plant ecology from the University of Basel in Switzerland. His postgraduate research on tree responses to elevated atmospheric CO₂ was part of a large global change study where the canopy of a mature temperate forest was exposed to free air CO₂ enrichment. During this time he gained extensive experience with various modern statistical modelling techniques. Prior to his appointment as biometrician/ecophysiologicalist at Scion, Martin held postdoctoral positions at universities in Switzerland and Australia where his research focused on global change ecology, particularly terrestrial carbon cycling and plant water relations.

In his spare time Martin enjoys mountain biking and playing bass guitar with his band. He also likes hiking and is passionate about plants and insects.