



## **Towards determining the origin of Painted Apple Moths in Auckland, NZ, using stable isotope ratio measurements**

R.D. Frew (1), D.M. Suckling (2), and R. van Hale (1)

(1) University of Otago, Dunedin, NZ (rfrew@chemistry.otago.ac.nz), (2) Plant & Food Research. PO Box 4704, Christchurch, New Zealand (msuckling@hortresearch.co.nz)

The painted apple moth (PAM, *Teia anartoides*,) is a native Australian pest accidentally introduced to New Zealand. The moth is a minor pest in Australia but poses a much more serious threat to New Zealand gardens, crops, forests, native bush, and the communities that depend on them. The painted apple moth was discovered in Glendene, west Auckland, in mid 1999 and has since been found in neighbouring suburbs. The Ministry for Agriculture and Forestry (Biosecurity NZ) undertook a NZ\$65 Million eradication programme to wipe out the painted apple moth using ground and aerial application of *Bacillus thuringiensis kurstaki* and the sterile insect technique (Suckling et al. 2007).

On 6 May 2005 a PAM male was caught at Otahuhu in a trap close to the margins of the trapping grid established for the PAM eradication programme in western Auckland. The last catch before this was on 16 January 2004. Following this catch discussion about the feasibility of using stable isotope techniques to assist in determining the origin of trapped moths commenced. The principle question to be answered being: is this moth from the Auckland population (i.e. the eradication was not successful) or, is this a new arrival from elsewhere?

The recent development of hydrogen isotope composition of feathers has provided a powerful tool in determining movement of migratory birds. The basis is that predictable continental-scale hydrological patterns in hydrogen isotopes in rainfall strongly correlate, through local diet, with hydrogen isotopes in locally grown feathers. This has also been utilised to determine the origin of monarch butterflies caught in North America and Cuba (Hobson et al. 1999; Dockx et al. 2004).

In this paper we present the results from the initial testing of the PAM and from subsequent feeding experiments using light brown apple moths to test some of the assumptions about the transfer of the isotopic signal through to the moth wing.

### References:

- Dockx, C. L.; Brower, P.; et al. 2004: Do North American monarch butterflies travel to Cuba? Stable isotope and chemical tracer techniques. *Ecological Applications* 14: 1106–1114.
- Hobson, K. A.; Wassenaar, L. I. et al. 1999: Stable isotopes ( $\delta D$  and  $\delta C-13$ ) are geographic indicators of natal origins of monarch butterflies in eastern North America. *Oecologia* 120: 397–404.
- Suckling, D. M., A. M. Barrington, et al. 2007. Eradication of the Australian Painted Apple Moth *Teia anartoides* in New Zealand: Trapping, Inherited Sterility, and Male Competitiveness, pp. 603-615. In M. J. B. Vreysen, A. S. Robinson and J. Hendrichs (eds.), *Area-Wide Control of Insect Pests From Research to Field Implementation*. Springer, Dordrecht, The Netherlands.