

Current status of biological control of *Cirsium arvense* in New Zealand



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Introduction

Cirsium arvense (Californian thistle) is an introduced weed of Eurasian origin, and one of the worst pasture weeds in New Zealand. Currently there is renewed effort to improve classical biological control of this weed which has resulted in recent releases of two biocontrol agents from Europe:

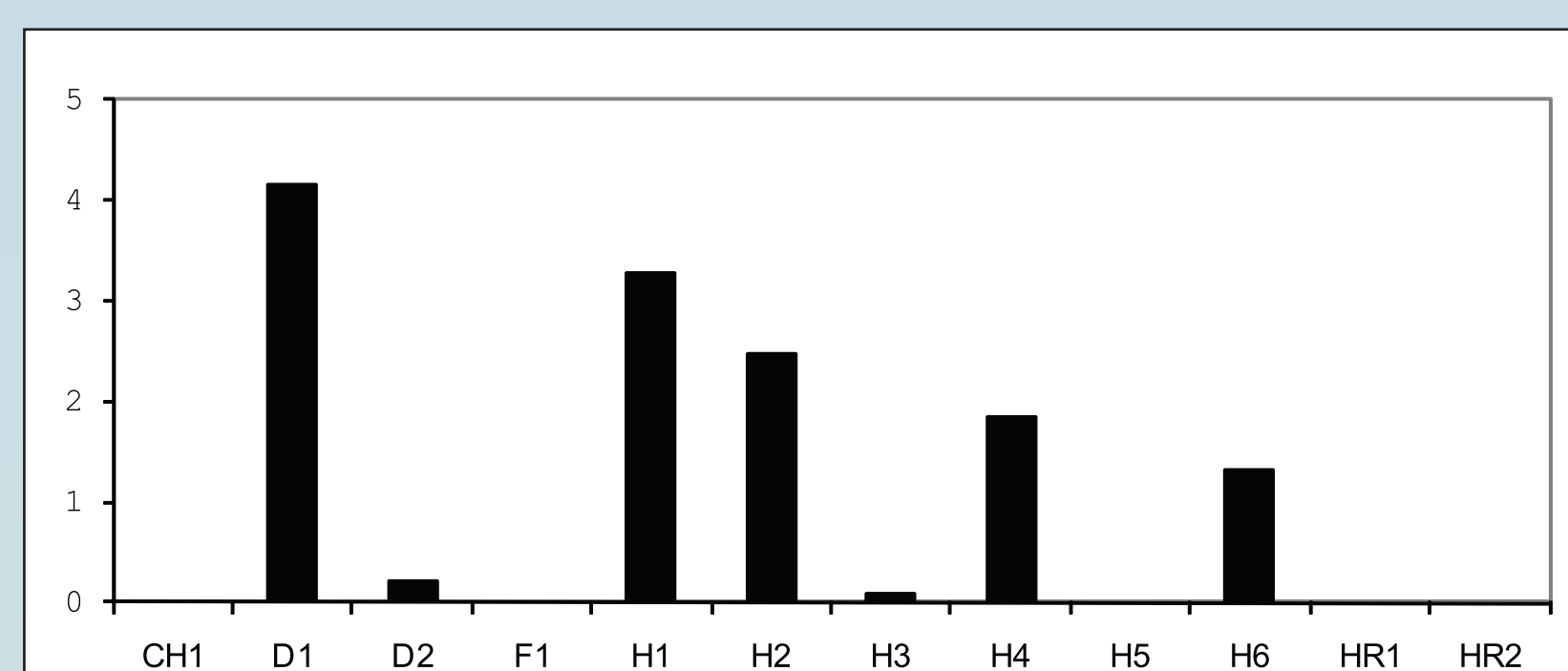
- *Ceratopion onopordi*, a stem-mining weevil thought to vector the rust pathogen, *Puccinia punctiformis*.
- *Cassida rubiginosa*, a leaf-feeding beetle thought to reduce biomass of *C. arvense*.

Methods

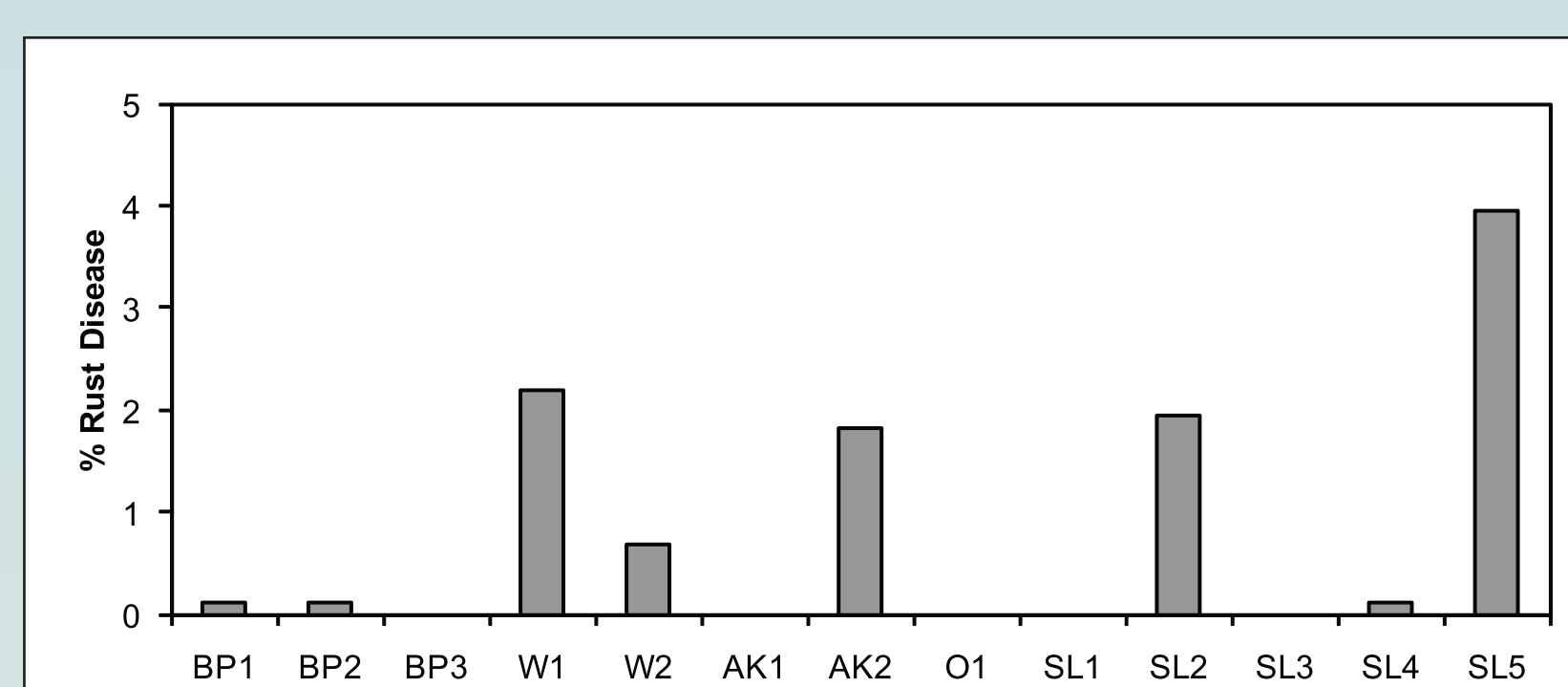
- Surveys were carried out in Europe and NZ where the proportion of rust disease was recorded. Also see Cripps *et al.* (2010) *Plant Ecology* 209:123-134.
- The impact of *Cassida* was assessed under different levels of competition with white clover + perennial ryegrass.
- The influence of natural enemies on the population dynamics of *C. arvense* was tested in by using pesticide exclusion in Europe and NZ.

Results

EUROPE



NEW ZEALAND

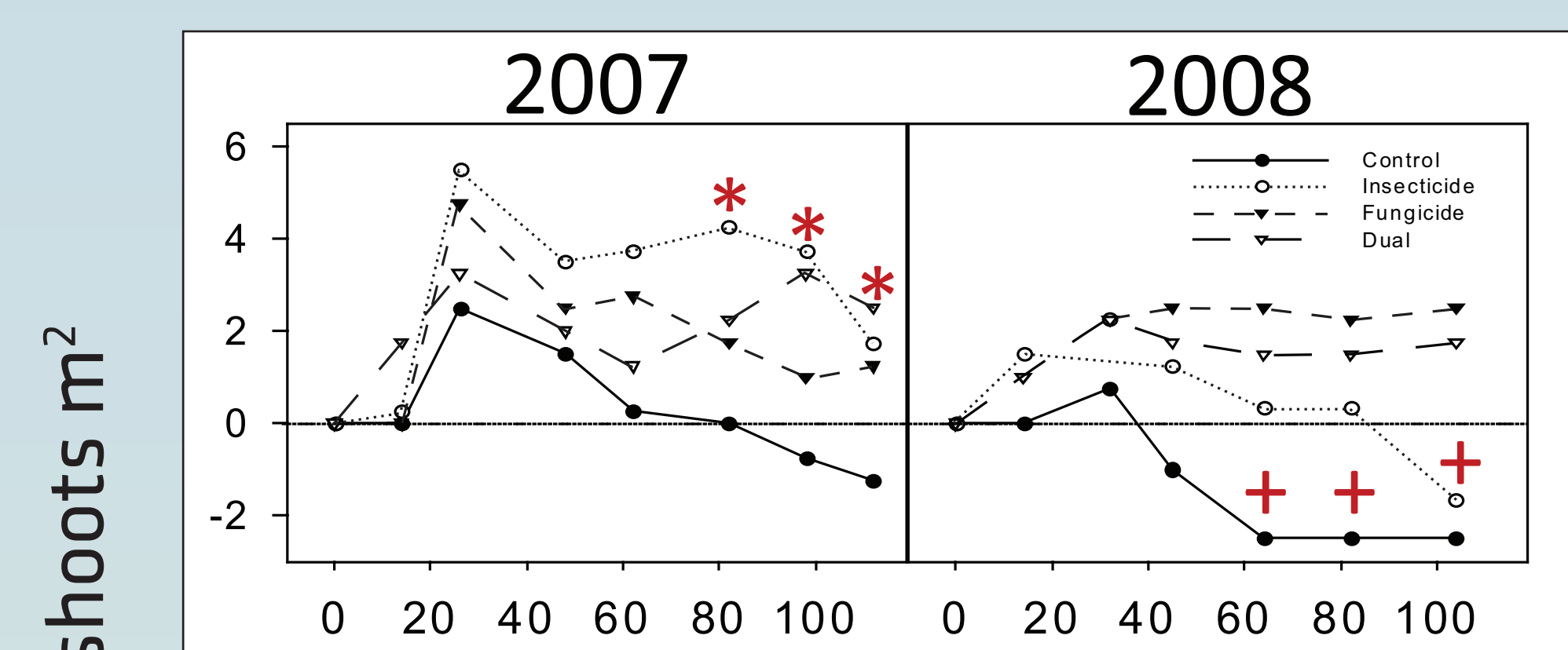


No difference in rust disease between Europe (supposed vector, *C. onopordi* present) and NZ (*C. onopordi* absent).

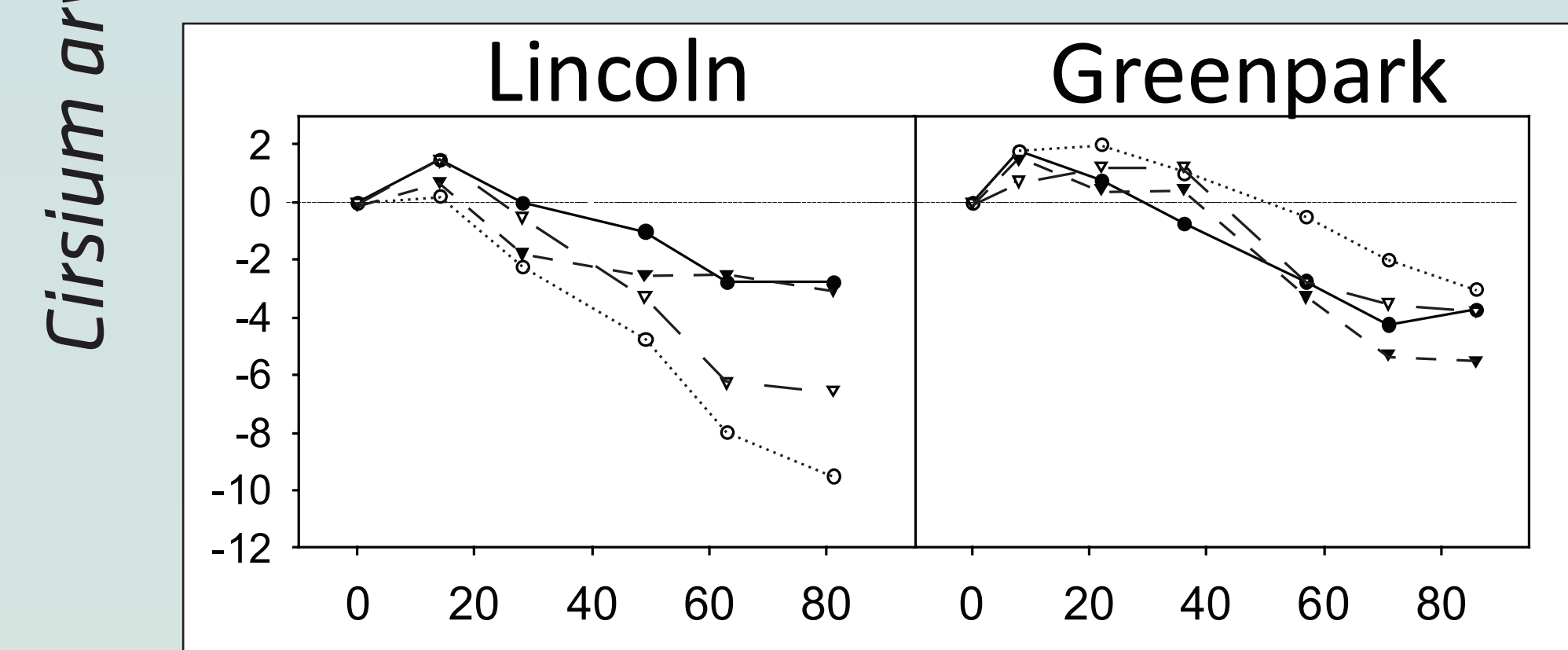
Cripps *et al.* (2009) *Biocontrol Science & Technology* 19:447-454.

Net change in population growth

EUROPE



NEW ZEALAND

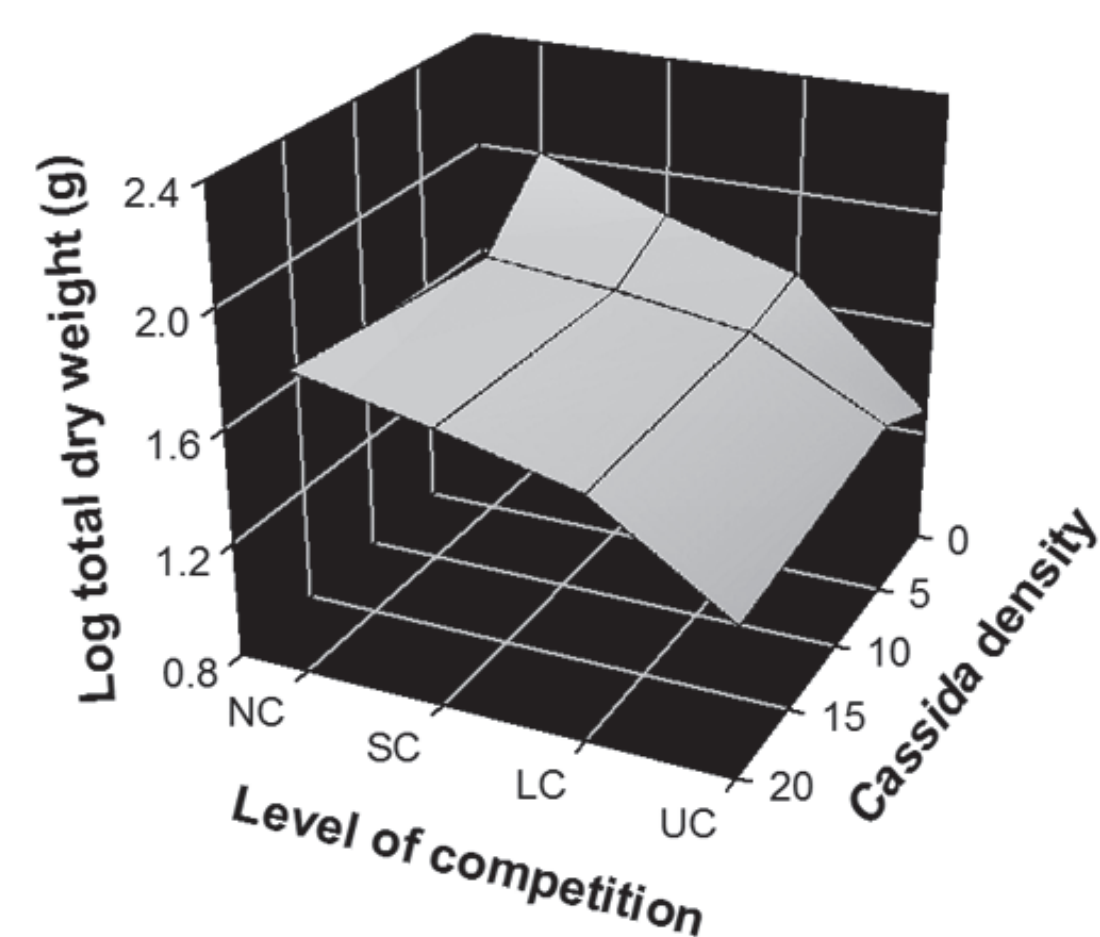
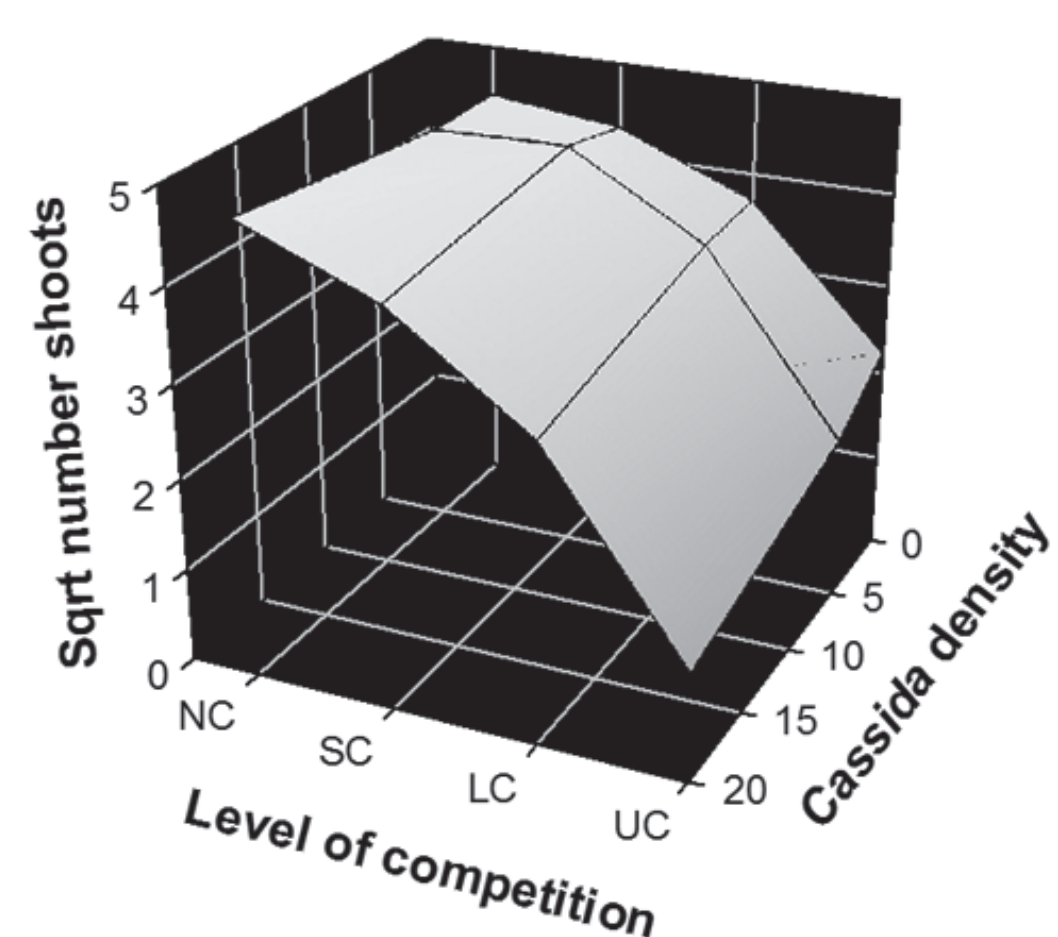


Days after first census

* Significant main effect of insecticide ($P < 0.05$).

+ Significant main effect of fungicide ($P < 0.05$).

There were no significant treatment effects in NZ.



- Plant competition caused a significant reduction in *C. arvense* growth
- *Cassida rubiginosa* larvae failed to have an impact on *C. arvense* growth at tested densities

Cripps *et al.* (2010) *Biocontrol Science & Technology* 20:641-656.

Conclusions

- The incidence of the rust pathogen is similar in both ranges, regardless of the presence of the supposed weevil vector, which is inconsistent with the weevil being an important vector, casting doubt on it fulfilling this role in NZ.
- Pasture-plant competition significantly reduces growth of *C. arvense*, however, high density "outbreak" populations of *C. rubiginosa* will be necessary to cause an effect.
- Insect herbivores can reduce population growth of *C. arvense* in its native range, but it is uncertain which species are responsible. Application of fungicide decreased growth of *C. arvense* suggesting it was either phytotoxic, or killed beneficial mutualistic species.
- Monitoring of *C. onopordi* and *C. rubiginosa* is necessary to determine their impacts in NZ.