RECENT INTRODUCTION AND ESTABLISHMENT OF THE LEAFROLLER PARASITOID *TRIGONOSPILA* *BREVIFACIES* (HARDY) (DIPTERA: TACHINIDAE) IN NELSON

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ABSTRACT

To assist the natural distribution of the leafroller parasitoid *Trigonospila brevifacies* to horticultural areas in the Nelson region, 181 *T. brevifacies* pupae and 329 adults were released in 1999 at four sites adjacent to apple orchards near Motueka. Release material was supplied from field-collected parasitoids in Hawkes Bay and a laboratory colony held at the Mt Albert Research Centre in Auckland. Successful establishment of the parasitoid was recorded at all four sites and at a nearby non-release site in 2000. In 2000, 3-19% of fourth instar and older larvae were parasitised by *T. brevifacies*, while in 2001 parasitism was 11-66%. Important pest tortricid species including *Epiphyas postvittana* (Walker) (lightbrown apple moth), were among the hosts. The successful establishment of *T. brevifacies* in Nelson and its further natural dispersal will increase the potential for the reduction of economically important leafroller species by biocontrol agents.

Keywords: *Trigonospila brevifacies*, parasitoid, leafroller, Tortricidae, biocontrol.

INTRODUCTION

The polyphagous leafroller parasitoid *Trigonospila brevifacies* was introduced to New Zealand from Australia between 1967-73 to control the lightbrown apple moth *Epiphyas postvittana* (Walker) (Lepidoptera: Tortricidae), also a pest of vineyards (Thomas 1989). It is now widely established in the North Island, but failed to establish in the South Island, despite further releases at Nelson, Lincoln and Christchurch between 1981 and 1987 (Thomas 1989; Munro 1998a, b). However, in the summer of 1997/98 several *T. brevifacies* were collected from a Nelson garden (Munro 1998a) and in commercial boysenberry gardens on the Waimea plains (W.P. Thomas, pers. comm.). Munro (1998a) concluded that because there had been no post-release records of *T. brevifacies* in the South Island for 29 years, it had recently and naturally colonised the South Island from the North Island.

The key pest leafroller species in Nelson is *E. postvittana*, although three native tortricids (*Ctenopseustis obliquana*, *C. herana* and *Planotortrix excessana*) are also present in orchards (Suckling et al. 1998). *Trigonospila brevifacies* parasitises late instar leafroller larvae by laying one or more cream coloured eggs externally on the dorsal surface of the larva. The 2 mm long eggs are easily seen by the naked eye. The hatching larva enters the leafroller directly and develops within the host. Emergence is from the host prepupa or pupa.

In an effort to assist the dispersal of *T. brevifacies* in the Nelson area, releases were made during 1999/2000 at four sites in orchard environments where it had not previously been recorded. This paper details the releases and the level of leafroller parasitism by *T. brevifacies* over two seasons between 2000 and 2001.

New Zealand Plant Protection 54: 33-36 (2001)

METHODS

Parasitoid releases

Trigonospila brevifacies was released, either as pupae or adult flies, at four sites in the Motueka/Riwaka area (Fig. 1) during autumn and spring 1999. Between 15 March–6 May 1999, a total of 181 field-collected *T. brevifacies* pupae from Hawke's Bay were released at sites A, B and D, and 10 adults from the same source were released at site A (Fig. 1). Pupae were placed in small plastic field cages that had wire mesh ends with 5 mm holes to allow adults to disperse after emergence. These cages were hung up in trees or shrubs at the release sites. Because some pupae were eaten by earwigs, another consignment of *T. brevifacies* pupae supplied from a laboratory colony at the Mt Albert Research Centre was reared to emergence at the Nelson Research Centre, and 294 adults released at site A between 27 September and 11 October 1999. Most of the parasitoids were released at this site to increase the probability of establishment at, at least, one site. A further 25 adults were released at site C on 15 October 1999. Release sites were all within 40 m of pipfruit orchards and generally had areas of scrub (gorse, broom and blackberry) which supported large numbers of leafrollers. Site B included an area of native bush.

FIGURE 1: The location of monitored sites and the number of *T. brevifacies* (pupae and adults) released at each site.

Leafroller parasitism

To determine the establishment of *T. brevifacies* in the two years following release, leafroller larvae were collected and examined at each release site and one non-release site (E) during March–April 2000 and January–March 2001. Parasitism was determined either directly by recording the presence of eggs on larvae or by emergence of *T. brevifacies* adults from leafroller larvae reared on a general purpose diet (Singh 1983). Some *T. brevifacies* pupae were also found during the leafroller collections and these were included in the analysis. The 'percentage of leafroller parasitism' refers only to fourth instar larvae, or larger, and is a measure of late instar parasitism in the samples, not population parasitism generally.

Leafroller larvae were collected mainly from gorse, broom and blackberry, since these are important hosts for the key orchard pest leafroller species in Nelson (Suckling et al. 1998; W.P. Thomas, pers. comm.). Leafroller larvae were not identified to species. Parasitised non-pest leafroller species collected on *Convolvulus* spp. at site A and *Eucalyptus* spp. suckers at site E were identified by J.S. Dugdale.

RESULTS AND DISCUSSION

Trigonospila brevifacies was present at all release sites and one non-release site in March - April 2000. The percentage of parasitised larvae collected from the sites ranged between 3% and 19% one year after release and between 11% and 66% in the second year (Table 1). The substantial increase in the percentage of parasitised leafrollers at all sites except site C during the second season of monitoring indicate that *T. brevifacies* populations can increase rapidly during the early phase of establishment. It has been observed that there was over 70% parasitism of late instar leafrollers by *T. brevifacies* in boysenberry gardens on the Waimea plains near Nelson in 2001, three seasons after they were first recorded there (W.P. Thomas, pers. comm.).

TABLE 1: The number and percentage of fourth instar and older leafroller larvae parasitised by *Trigonospila brevifacies* in samples collected at four release sites (A-D) and another location (E) between 3 March 2000 and 7 March 2001. The number of *T. brevifacies* found as pupae are shown in brackets.

Year/Site	Leafroller collection date	No. of larvae collected	No. parasitised by <i>T. brevifacies</i>	% parasitised
2000				
A	3/03	23	1	4.3
	28/03	46	0	0
B	29/03	43	8	18.6
C	29/03	14	1	7.1
D	21/03	35	1	2.8
E(non-release)	12/04	51	8	15.6
2001				
A	7/03	32	21 (3)	65.6
B	8/02	71	37 (6)	52.1
C	26/01	35	4	11.4
D	16/02	37	15 (2)	40.5
E	26/02	67	28	41.7

Leafroller parasitoids were monitored at, or close to, sites A-E (Fig. 1) for several years until 1999 (Suckling et al. 1998; P.W. Shaw, unpubl. data) but no *T. brevifacies* were found in these samples. Munro (1998b) reported dispersal distances for *T. brevifacies* of between 4-19 km per year. The non-release site E is over 15 km from the recent discovery of the parasitoid on the Waimea plain so it is possible that it was colonised naturally from there. However, it is more likely to have dispersed there from release site D which is only 3 km away. The other release sites were 25-30 km away from the Waimea plain so it is likely that establishment of *T. brevifacies* in the Motueka area between 1999-2000 resulted from the releases rather than natural dispersal from the Nelson region.

The identity of adult leafrollers emerging from unparasitised larvae collected from gorse, broom and blackberry confirmed that *E. postvittana*, *C. obliquana*, *C. herana* and *P. excessana* were the main leafroller species present in the samples. Two non-orchard pest species, *Strepsicrates macropetana* (Tortricidae) collected from *Eucalyptus* sp. at site E and *Helcystogramma* sp. (Gelechiidae) on *Convolvulus* sp. at sites A and D were also parasitised by *T. brevifacies*. The polyphagous habit of *T. brevifacies* may assist its establishment in new geographical locations and can assist its survival in reservoir areas near orchards inhabited by alternative hosts (Cameron et. al. 1993).

The establishment of *Trigonospila brevifacies* will add to the leafroller parasitoid guild in the Nelson region. Where climate is not limiting in the South Island (Munro

1998b), the natural spread of *T. brevifacies* is expected to continue in future. Indeed, a specimen was found in a vineyard in Marlborough in the summer of 2000 - 2001 (G.M. Burnip, pers. comm.). The parasitoid should contribute to biological control of orchard pest leafrollers in integrated pest control programmes, primarily by reducing the external reservoir of pest leafrollers which invade orchards.

ACKNOWLEDGEMENTS

Funding for this project was provided by the New Zealand Foundation for Research, Science and Technology. The authors would like to thank John Dugdale for identification of leafrollers and Anne Barrington for supplying *T. brevifacies* for release.

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