THE ESTABLISHMENT OF AN ARGENTINE STEM WEEVIL
PARASITOID AT ITS RELEASE SITESS.L. GOLDSON¹, G.M. BARKER² and B.I.P. BARRATT³¹AgResearch, CASC, PO Box 60, Lincoln²AgResearch, Ruakura, Private Bag 3123, Hamilton³AgResearch, Invermay, Private Bag 50034, Mosgiel**Keywords:** Argentine stem weevil, establishment, release sites, parasitoid, *Microctonus hyperodae*

This contribution summarises the releases of *Microctonus hyperodae*, a parasitoid of the Argentine stem weevil (*Listronotus bonariensis*), the dates of the parasitoid's first recovery and the observed peak levels of parasitism (given variable intensities of monitoring) up to autumn 1994.

During 1989-90 seven presumed 'ecotypes' (geographically diverse populations) of *M. hyperodae* were imported into New Zealand quarantine from Brazil, Uruguay, Argentina and Chile (Goldson *et al.* 1990). Additionally a single individual from Mendoza, Argentina was introduced (Goldson *et al.* 1994). Based on a preliminary study, *M. hyperodae* had earlier been found to be far more abundant in South America than initially expected (Goldson, unpublished data) based on the observations of Loan and Lloyd (1974). Host range testing in New Zealand quarantine showed *M. hyperodae* to be sufficiently oligophagous for permission to be granted for it to be liberated as a potential control agent of Argentine stem weevil (Goldson *et al.* 1992). This authorisation resulted in several releases, the majority of which were made during the winter of 1991 when 100 000 parasitoids were reared and released in the northern North Island, Canterbury and Otago/Southland (Goldson *et al.* 1994). On all occasions except one, which comprised a very small release in Blenheim (Fig. 1), equal numbers were reared from each ecotype and released at all locations. On this basis it was hoped eventually to measure the importance of preadaptation in biological control and thereby define what biological characteristics conferred advantage to this parasitoid. It was noted that such an approach should eventually add to overall biological control theory.

The release sites and associated details throughout New Zealand are presented in Fig. 1. Post-release sampling intensity at these various locations was variable; the most intensive studies were conducted in the Hamilton, Lincoln and Ophir districts where sampling was carried out at least monthly. During this work it was noted that overwintering parasitism levels (diapause) in both the Hamilton and Lincoln areas were stable at around 40-50% and found to increase to 70-80% in the summer (Goldson *et al.* 1994). Summer parasitism was found to be more variable than in the winter because of the influence of varying emergence patterns of new generation adults and varying rates at which the resident adult parasitoids were able to infect them. In general, the overall build up *M. hyperodae* parasitism at the release sites was very rapid compared with other species and there were concomitant decreases in all of the stages of Argentine stem weevil (unpublished data; Goldson *et al.* 1994). The parasitoid's dispersal rate appeared to be relatively slow, perhaps 3 - 5 km p.a. (unpublished data; Goldson *et al.* 1994).

Observed lower rates of parasitoid build up in the Otago/Southland region (Fig. 1) may simply have reflected the cooler conditions but the trend could still well be towards equilibria similar to those noted further north. Alternatively however, differences in the weevil's phenology may have resulted in reduced parasitism; certainly results to date have indicated that the population behaviour of Argentine stem

weevil in some Otago/Southland regions may well be different from that observed elsewhere in New Zealand (Barratt unpublished data).

Based on the results to date (Fig. 1) it may be speculated that release of a small gene pool and/or limited ecotypic range may have resulted (perhaps predictably) in limited parasitoid build up. In Blenheim (Fig. 1) only c. 700 of one ecotype were liberated (ex the Rio Negro Valley, Argentina (Goldson *et al.* 1990)) and the resulting very low level of 7% parasitism some 30 months after release may have been because the biotype was not well adapted. Similarly parasitoid build up may have been slow or limited in areas where the weevil population was sparse and/or the habitat inhospitable. For example, after three years, the March 1994 level of parasitism in Hororata was only c.5% compared to c.50% in Lincoln at the same time (Goldson, unpublished data). It is important to emphasise, however, that such interpretations at this stage are speculative. Future data collection and analysis of the process of parasitoid population equilibration will undoubtedly clarify these issues; particularly once quick methods of ecotypic differentiation have been developed (eg. Phillips and Baird 1994). Such an opportunity to develop insights into ecological principles based on regional differences highlights the value of nationally-coordinated release programmes for biological control agents.

Figure 1: Release and recovery details of *Microctonus hyperodae*, a parasitoid of *Listronotus bonariensis*, to April 1994.

In view of these promising initial results and increasing commercial interest, the decision was made in early 1994 to fund all releases thereafter on an entirely commercial basis. A corollary of this, however, is that they must be carefully controlled to ensure that they contain the full ecotypic mix. In this way the full value of analysis of the importance of parasitoid preadaptation and the factors that contribute to adaptive fitness will be maintained.

In general there now seems to be little doubt that in many New Zealand regions, *M. hyperodae* will become a major component of IPM systems using endophyte and grasses resistant to Argentine stem weevil. These interactions have yet to be studied in any detail. However, current research is moving strongly in this direction as is research to try to develop an understanding of Argentine stem weevil.

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