**FACTORS AFFECTING THE DISTRIBUTION OF
LISTRONOTUS BONARIENSIS (KUSCHEL) (COLEOPTERA:
CURCULIONIDAE) IN OTAGO AND SOUTHLAND**

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Listronotus bonariensis (Kuschel) (Argentine stem weevil) is a major pest of graminaceous plants in New Zealand responsible for losses between \$78 and \$251 m per year (Prestidge *et al.* 1991). While adult feeding on cotyledon seedlings can be destructive, larval damage to stem vascular tissues, is considered more important. Until recently little research on this pest has been carried out in Otago and Southland, and its biology, pest status and distribution are poorly understood.

The extent of *L. bonariensis* infestation in the southern South Island was investigated by quantitatively sampling 81 pastures, comprising predominantly perennial ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*), but otherwise selected at random, between October 1991 and May 1994. Fifteen to thirty 150 x 150 mm turves 30 mm deep were taken per site and adult *L. bonariensis* extracted using Berlese funnels (Proffitt *et al.* 1993). At the 25 sites sampled in 1994, the incidence of the endophytic fungus, *Acremonium lolii* in ryegrass, which confers resistance against *L. bonariensis* (Barker *et al.* 1984), was measured by taking twenty 50 mm dia. cores x 50 mm deep of pasture per site and allowing them to grow in a greenhouse at 20°C until the grass tillers were between 75 mm and 125 mm long. A two to three cell thick, 10 mm length of leaf, from the base of each of two ryegrass tillers taken at random from each core, was stained using lactophenol blue and examined under a light microscope for *A. lolii* hyphae. The pasture species in these cores were identified to assess pasture composition. For each locality sampled, long term average degree day estimates (NZ Meteorological Service 1978) and, for sites sampled in 1994, current degree day estimates were calculated using a formula derived by Barlow and Dixon (1980) using National Institute of Water and Atmosphere climate data.

The sampling dates varied between years so comparisons could not be drawn directly between sites or localities. *L. bonariensis* was found at 66 of the 81 sites sampled. Densities varied within localities (Table 1) with moderately high populations ($\geq 100/\text{m}^2$), found at seven sites within four localities. Sites in the Maniototo, the East Otago Plateau, South Otago and coastal Southland had generally low densities (Table 1). In South Otago and the MacKenzie Country no infestation was found at 50% and 63% of the sites respectively. It was observed that non-irrigated dryland sites (Central Otago, Maniototo) generally supported low densities compared with irrigated sites at the same localities.

When sampled in 1994, *A. lolii* was found at all localities often infecting a high percentage of ryegrass tillers (Table 1). Overall there was no relationship between endophyte levels and weevil density, but within some localities such a trend was apparent as suggested by Barker *et al.* (1984).

Although perennial ryegrass was dominant at most sites in 1994 significant proportions of other grasses suitable as oviposition sites and larval food plants, mainly dogstail (*Cyanosurus cristatus*) or *Poa* spp., were generally present (Table 1). These grasses along with non infected ryegrass may have provided a suitable habitat for *L. bonariensis* at sites where high levels of *A. lolii* occurred (Prestidge and van der Zijpp 1985).

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TABLE 1: Adult *Listronotus bonariensis* densities (No./m²), percent pasture composition and percentage of ryegrass tillers infected with *Acremonium lolii*

	<i>L. bonariensis</i> density (No/m ²)		% ryegrass		% other grasses	% ryegrass with <i>A. lolii</i>
	n ¹	median (range)	n ¹	median (range)	median (range)	median (range)
MacKenzie Country	8	0 (0-144)	-	-	-	-
North Otago	8	20 (0-55)	4	46 (28-58)	5 (1-24)	3 (2-80)
Maniototo	7	4 (0-12)	-	-	-	-
Central Otago	7	42 (26-83)	1	52	15	76
Strath Taieri	7	33 (8-105)	2	50 (17-82)	24 (17-30)	62 (33-90)
East Otago Plateau	5	4 (0-18)	4	46 (25-57)	23 (11-39)	49 (2-92)
Taieri Plain	8	46 (13-101)	-	-	-	-
South Otago	12	2 (0-22)	8	36 (19-79)	46 (21-66)	22 (0-90)
Coastal Southland	5	7 (3-23)	-	-	-	-
Central Southland	8	15 (0-45)	-	-	-	-
Te Anau Basin	7	78 (12-132)	6	43 (20-62)	23 (17-32)	53 (40-60)

¹ Number of sites sampled

Low heat accumulation, from early spring to the onset of diapause in autumn, may prevent the build up of high densities of *L. bonariensis* in the southern South Island. Goldson *et al.* (1982) and Barker (1988) have estimated development time from egg to adult as 277 and 454 degree days above a threshold of approximately 10°C respectively, but further analysis, based on recently collected field data, has suggested 360 degree days to be more appropriate (N. Barlow, pers comm.). Long-term average and 1993-4 heat accumulation (Table 2) indicate that in the localities investigated in this study one complete generation per year would normally be possible. Waikato and Canterbury data (Table 2) show that 3 and 2 generations could occur respectively.

TABLE 2: Heat accumulation at selected locations representative of sampling sites (Waikato and Canterbury sites are shown for comparison).

	Degree days >10°C Aug-Apr 1941-70	Degree days >10.4°C Aug 93-Apr 94
Tara Hills (MacKenzie Country)	729	524
Oamaru (North Otago)	793	-
Lauder (Central Otago)	754	598
Invermay (Taieri Plain)	655	592
Balclutha (South Otago)	615	-
Te Anau (Te Anau Basin)	544	520
Ruakura (Waikato)	1266	1192
Lincoln (Canterbury)	913	796

The survey shows that *L. bonariensis* are ubiquitous throughout the southern South Island, although at densities considered medium to low by comparison with Canterbury and the Waikato. The most likely factor preventing high densities occurring in the localities investigated is heat accumulation, which probably restricts the life cycle to a single complete generation per year. A partial second generation may occur but this would be a larval population susceptible to winter frosts and only a small

proportion of this population would survive through to the adult stage to give rise to a new spring population (Goldson, pers. comm.). Further work will concentrate on factors affecting *L. bonariensis* distribution in more detail at sites within selected localities.

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