ASSESSMENT OF THE DISPERSAL OF *SITONA LEPIDUS* (CLOVER ROOT WEEVIL) IN THE NORTH ISLAND OF NEW ZEALAND

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ABSTRACT

Sitona lepidus Gyllenhal (Coleoptera: Curculionidae) (clover root weevil) was first identified in New Zealand pastures in 1996. A survey of its distribution in that year revealed two areas of establishment, one centred north of Auckland and the other in the Waikato region. This paper reports on a survey conducted in April 1997, that revealed this species had spread 10 to 70 km over the period April 1996 to April 1997 and confirms that the two areas of establishment have remained discrete.

Keywords: *Sitona lepidus*, clover root weevil, distribution, pasture

INTRODUCTION

Sitona lepidus Gyllenhal (clover root weevil) was first identified in New Zealand pastures in 1996 (Barratt *et al.* 1996). Examination of stored weevil specimens established that it had been present in the Waikato in 1995 (Barker*et al.* 1996). A survey conducted in the autumn of 1996 demonstrated that *S. lepidus* was established in two regional localities, one centred north of Auckland and the other in the Waikato/coastal Bay of Plenty area (Barker *et al.* 1996). It had at that point not established more widely in the North Island. There is no record of the presence of *S. lepidus* in the South Island.

The species is of European origin and has become widely distributed in North America since its establishment there in the 1870s (Bright 1994). Mowat and Shakeel (1988) reported on the importance of*S. lepidus* as a pest in ryegrass-white clover swards in Ireland. Their studies indicated that it contributed to the disappearance of clover from a mixed sward. Because of the importance of legumes for nitrogen fixation in New Zealand pastoral systems,*S. lepidus* therefore has the potential to become a major pasture pest. The adults feed on the foliage of white clover and other*Trifolium* spp., and the soil-dwelling larvae feed on roots and root nodules of these species (Clements and Murray 1991; Murray and Clements 1992; Murray *et al.* 1995).

This paper reports on the results of a survey undertaken to establish the current distribution of *S. lepidus* in relation to the survey conducted in April 1996 (Barker *et al.* 1996) . Observations are made on the extent to which it has spread and factors that may affect the rate of spread.

METHODS

A pasture survey was undertaken in 1997 between the 26th March and the 2nd April. Using the areas where *S. lepidus* was established as defined by Barker *et al.* (1996) in the previous season as a basis, pastures on the margins of these areas were sampled to establish the current distribution of*S. lepidus* in the North Island. Pastures were sampled using a suction apparatus. Each sample consisted of a 180 m (by 110 mm, this being the diameter of the suction tube) transect and the presence of *S. lepidus* and other weevil species was recorded from the litter. The sample pattern was dictated by road access and extended out from the margins to a point where no *S. lepidus* were detected in a field examination of the insects collected. Samples were more closely examined and recounted in the laboratory. Sites sampled were predominantly dairy pastures.

RESULTS

The 1997 survey revealed that *S. lepidus* had extended its range some 30 km north of the northern margins of the Auckland establishment loci in the 12 months since the

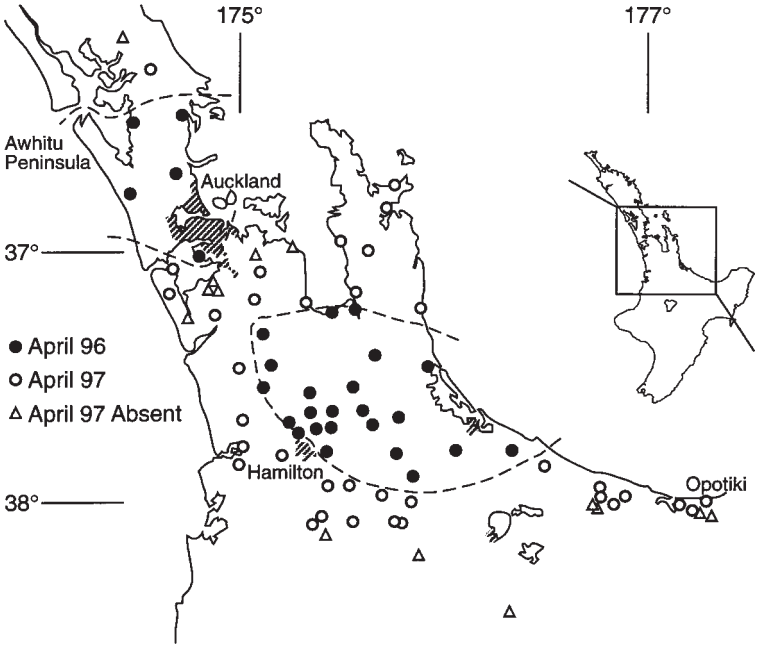

FIGURE 1: Distribution of *Sitona lepidus* (clover root weevil) in the North Island of New Zealand in April 1996 (●) and April 1997 (❍).

previous survey (Barker*et al*. 1996) (Fig. 1). While the Auckland metropolitan area was not sampled, the absence of *S. lepidus* to the south of it may indicate that it has afforded a temporary barrier to the southern spread of this population. The presence of *S. lepidus* was recorded in suction samples at Big Bay on the northern tip of the Awhitu Peninsula in December 1996. (Marshall pers. comm.). This survey placed the current distribution near the base of the Awhitu Peninsula at 12 km north of Waiuku, a distance of 27 km to the south.

At the time of the current survey the two apparent 'centres of establishment' around Auckland and the Waikato remain discrete, with *S. lepidus* not being detected in the south Auckland region. This zone was approximately 10 km wide and extended from the west to the east coast.

From the Waikato, *S. lepidus* distribution has extended to the north to include the Coromandel Peninsula. This region was not surveyed by Barker *et al.* (1996) The distribution to the west ranged from 15 km in the north west to 40 km along the broad fertile valley between Hamilton and Raglan. Distribution of *S. lepidus* to the south of the 1996 establishment zone revealed a consistent 15 - 20 km rate of spread. The eastern Bay of Plenty coastal region revealed the highest measured rate of spread of 70 km.

Where the adult weevils were undetectable and populations represented by only 1 weevil in the 180 m transect were taken to delineate the margins of the "centres of establishment". Numbers of *S. lepidus* collected in samples varied greatly between sites with a range of 6 to 207 weevils per transect.

Other weevil species identified in the course of the survey in order of relative abundance were Argentine stem weevil (*Listronotus bonariensis* (Kuschel)), dock weevil (*Rhinoncus australis* Oke), and *Irenimus* sp. Occasionally present were whitefringed weevil (*Naupactus leucoloma*(Boheman)), sub-clover weevil (*Listroderes*

delaiguei), *Mandelotus* sp., and lucerne weevil (*Sitona discoideus* (Kuschel)).

DISCUSSION

The current survey indicated that *S. lepidus* has extended its range over a year by an average of 35 km (range 10-70 km). The limited number of survey points necessitates a degree of interpretation. The Auckland metropolitan area apparently imposes a barrier to the southern spread of the Auckland *S. lepidus* population. This was assumed to be a resource limitation and an assumption was made that aforrested areas would play a similar role. Consequently they were not sampled. The Coromandel Peninsula was not sampled in 1996 Barker *et al*. so it is not known whether or not *S. lepidus* was present there then. Data from this region were not used to interpret the range extension of *S. lepidus*.

The variation in dispersal rate may reflect the influence of temperature on rate of development and fecundity. *S. lepidus* in Europe is univoltine with over-wintering adults (Markkula 1959) This is contrary to the preliminary findings of Addison (unpubl. data) who contends there may be two generations under dairying conditions in the Waikato with larvae and adults over-wintering. *S. lepidus* have a 270 day-degree egg hatch requirement (Mowat and Clawson 1996). The more rapid extension down the eastern seaboard may be related to warmer temperatures in this coastal region reducing the time for eggs to hatch and larva to develop. This may lessen exposure to predation and desiccation at a vulnerable life stage. The presence and/or abundance of suitable natural regulatory agents such as predators and entomopathogens in a situation of recent incursion by a potential pest will also affect the rate of dispersal. Mowat and Clawson (1996) also demonstrated that increasing temperature up to 15ºC resulted in increased weevil egg production and that the presence of clover was required to stimulate oviposition. The latter finding may help explain the authors observations that *S. lepidus* appears to establish more readily in clover dominant dairy swards. Murray *et al*. (1996) demonstrated that *S. lepidus* feeding preference, fecundity and longevity were greater on white clover compared to many other legumes. It is possible that some aspect of pasture management, white clover morphology and/or physiology in dairy pastures favours the establishment of *S. lepidus* infestations. This observation may have implications for the management of this pest.

Populations of clover root weevil were identified on dairy properties to within 10 km of the coast in the fertile corridor between Hamilton and Raglan. This represents a spread of 40 km against the prevailing winds from the 1996 survey boundary. The distribution to the west appears to reflect the pattern of land use. Establishment does not appear as readily achieved in the less fertile pasture of sheep and beef properties in this area, the range extension here being limited to 10 - 12 km.

Massed flights of adult weevils have rarely been reported, although flights do occur. *S. lepidus* is considered not to be a migratory species compared with some *Sitona* species such as *S. discoideus* (Murray *et al*. 1995). The discrete spread of this pest from its original loci of infestation may indicate that walking and short flights may play an important role in emigration.

The authors are not aware of the establishment of new loci of infestation beyond the areas defined by Barker *et al*. (1996). Fears that this pest would establish in other regions of New Zealand through inadvertent transport with stock and on vehicles do not appear, as yet, to be realised.

ACKNOWLEDGEMENTS

This work was funded by the Foundation for Research, Science and Technology through its contingency fund. We thank Fiona Kettlewell and Benn Watson for technical assistance and B.I.P. Barratt for editing the manuscript. We also thank the numerous farmers who allowed us access to their properties for sampling.

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