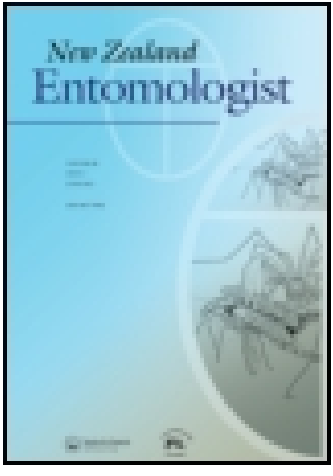

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Some protozoan pathogens of the Argentine stem weevil, Listronotus bonariensis (Coleoptera: Curculionidae), in New Zealand

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Abstract

Two microsporidian pathogens, tentatively identified as *Orthosoma* sp. and *Nosema* sp., and one unidentified neogregarine pathogen have been found infecting adult Argentine stem weevils, *Listronotus bonariensis* (Kuschel), from several sites throughout New Zealand. Changes in the incidence of *Orthosoma* sp. infections of adult weevils from 2 sites near Hamilton have been monitored from November 1982 to August 1983.

Keywords: Protozoa; microsporidia; neogregarine; pathogen; Argentine stem weevil; *Listronotus bonariensis*; Coleoptera; Curculionidae.

Since its introduction to New Zealand in the late 1920's (Marshall 1937), the Argentine stem weevil, *Listronotus bonariensis,* has become an increasingly serious pest of pastures and one recent estimate (Pottinger 1983) attributes one hundred million dollars of pasture damage each year to this pest. A search for protozoan

pathogens of this insect was begun in November 1982, in the hopes of finding a possible microbial control agent. A fungal pathogen, *Beauveria* sp., has been noted in adult weevils in the Waikato (Barker & Pottinger, personal observations), at Palmerston North (D. L. Gaynor, personal communication), and at Canterbury (S. L. Goldson, personal communication), but there have been no previous reports of protozoan pathogens of this insect.

Samples of live adult weevils were collected by suction at 14 to 30 day intervals from 2 pasture sites near Hamilton, 1 at Ruakura Agricultural Research Station (A3), and the other at Steel's Farm Research Area, Rukuhia (4A). Weevil populations at Ruakura were generally of a higher density than those at Rukuhia (Barker & Pottinger, unpublished information). Samples were also taken periodically from pasture in other regions. Weevils were dissected and smeared tissues examined as wet mounts or alcohol-fixed Giemsa-stained preparations using either phase contrast or bright field microscopy.

THE PATHOGENS

Two microsporidian pathogens (phylum Microspora) and one neogregarine (phylum Apicomplexa) were found infecting Argentine stem weevils. The first microsporidian species has uninucleate spores measuring $2.69 \pm 0.04 \times 1.69 \pm 0.03$ μ m (Giemsa-stained) and vegetative stages with variable numbers of isolated nuclei, and has been tentatively identified as an *Orthosoma* species. The second has binucleate spores measuring $4.69 \pm 0.04 \times 2.81 \pm 0.03$ μ m (Giemsa-stained) and vegetative stages with 2 or 4 nuclei in diplokaryotic pairs and has been tentatively identified as a *Nosema* species.

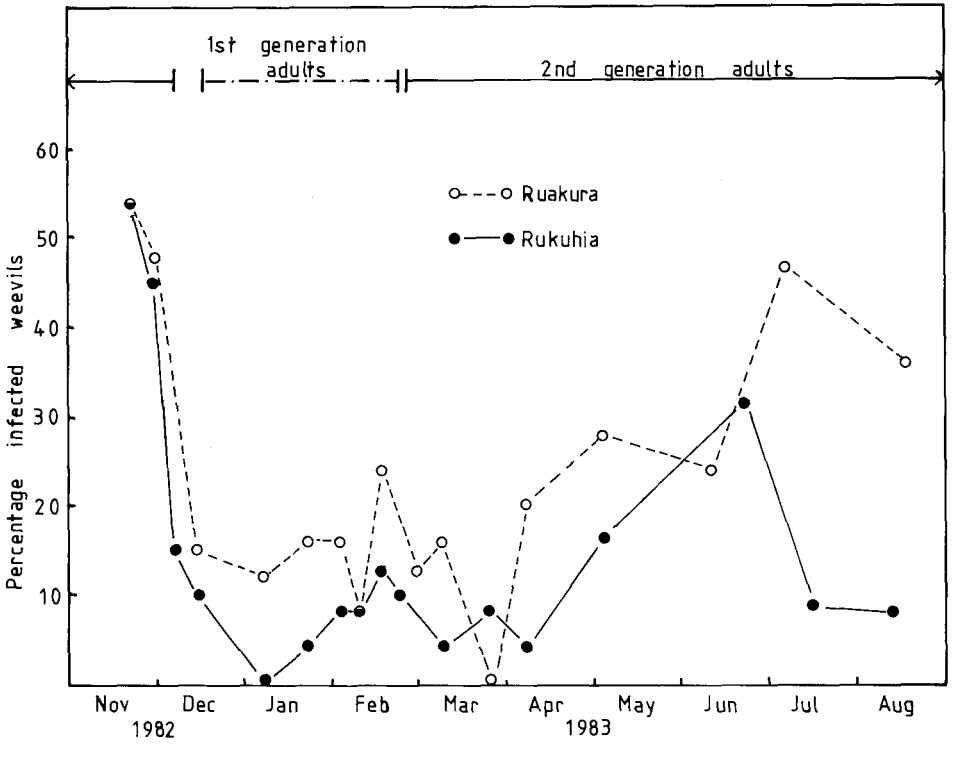

Fig. 1. Changes in incidence of *Orthosoma* sp. infections of adult Argentine stem weevils at 2 sites near Hamilton from November 1982 to August 1983. A3: Ruakura Agricultural Research Station, dairy pasture. 4A: Steel's Farm Research Area, Rukuhia, sheep pasture.

Table 1 Distribution of *Orthosoma* sp. among Argentine stem weevil populations.

Region	Sampling Dates (No. of samples)	Mean Percentage Infection	Sample Size
Hamilton, site A3, Ruakura Agricultural Research Station	Nov 1982 – Aug 1983 (16)	22	437
Hamilton, site 4A, Steel's Farm Research Area, Rukuhia	Nov 1982 – Aug 1983 (17)	22	418
Reporoa	Feb, May 1983 (2)	8	63
Wairakei	Feb, May 1983 (2)	6	54
Palmerston North	Dec 1982 (1)	67	15
Foxton	Nov 1982 (1)	62	8
Lincoln, Canterbury	Nov 1982,(2) Jan 1983	12	48

Orthosoma sp. was much more widespread than *Nosema* sp., occurring in nearly every sample taken from Ruakura and Rukuhia as well as all those from other sites (Table 1). *Nosema* sp. was found in only 5 specimens, 4 from Rukuhia and 1 from Ruakura.

The neogregarine protozoan remains unidentified and was noted in only 2 specimens from Rukuhia.

Detailed studies of the life cycle stages and ultrastructure of these pathogens are being conducted to provide more precise identifications and specific characterisations. These results will be published elsewhere.

Changes in the incidence of *Orthosoma* sp. infections in weevils sampled regularly from 2 sites at Hamilton are shown in Figure 1. The incidence of infection was high among the few weevils surviving winter of 1982. The incidence declined rapidly during November and December, as these infected weevils died and were replaced by large numbers of newly emergent adults, of which only a small percentage were infected. Levels of infection were generally low throughout the summer, but gradually increased with the onset of winter and the emergence of the long-lived second generation.

Orthosoma sp. appears to develop primarily in the gut cells of the weevils and so it is very likely that the spores of this microsporidium are passed out with the faeces of infected adults. Since second generation adult weevils go into reproductive hibernatory diapause between March and July (Goldson 1981) but continue to move about and feed, infected individuals may release spores throughout this period. Such spores could contaminate the food sources of other weevils, causing more infections and resulting in a steady increase in the incidence of *Orthosoma* sp. over the winter. The first generation is probably too short-lived for such an effect to be detected. The proportion of infected weevils at Ruakura was generally higher than that at Rukuhia, probably reflecting the larger population and hence a greater opportunity for disease transmission at Ruakura.

Orthosoma sp. does not appear to be a particularly virulent microsporidium, since even heavily infected weevils display no external symptoms and remain quite active. Some weevils dissected in November 1982 however, had deformed ovaries full of *Orthosoma* sp. spores, suggesting that the disease probably reduces fecundity and may be transovarially transmitted in some individuals.

Laboratory-based studies are planned in order to determine the effects of all three protozoan pathogens on both larval and adult Argentine stem weevils. Monitoring of disease incidence in the field populations is continuing.

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