NOTES ON THE BIOLOGY AND DISTRIBUTION OF THREE RECENTLY DISCOVERED EXOTIC WEEVIL PESTS IN HAWKES BAY

M. J. ESSON

Entomology Division, DSIR, Palmerston North.

Summary

Notes on the presently known distribution, biology and life cycle in New Zealand, of *Atrichonotus taeniatulus* (Berg), *Floresianus sordidus* (Hustache) and *Sitona humeralis* (Stephens) are given. Their potential as pests of crops and pasture is discussed.

INTRODUCTION

In recent years three potentially serious weevil pests have been discovered to be established in the Hawkes Bay area. Two species, the small lucerne weevil *Atrichonotus taeniatulus* and the Flores (or River Plate) weevil *Floresianus sordidus* originate in South America, the third, sitona weevil (*Sitona humeralis*) comes from Eastern Europe. Sitona weevil is also present in North America, Central Asia and several Mediterranean countries, all three species are known to occur in Australia. It is considered likely that the New Zealand populations have arrived from Australia. The adults of these weevils are long living and will readily shelter in any available cover, such as agricultural produce, so being easily transported from place to place. The eggs too with the possible exception of sitona weevil, are readily transported, being very resistant and laid on foliage and the soil surface in a similar manner to those of the white-fringed weevil *Graphognathus leucoloma*. The importation of lucerne hay, horse fodder etc. from Australia could possibly be the means of their accidental introduction.

Studies on the life cycles of these species in New Zealand, and surveys to determine the limits of distribution and to monitor the rate of spread, are being undertaken. The presently known distribution is given in Fig. 1A.

BIOLOGY AND LIFE CYCLES

Flores weevil

This small grey weevil, approximately 6 mm in length, is at present limited to an area of about 700 ha in the Hatuma district near Waipukarau in Central Hawkes Bay. It was first discovered attacking pasture by Mr K. Bimler (MAF, Hastings) in 1972. In Australia it has been recorded (Chadwick 1970) as being damaging to Iceland poppies (*Papaver nudicaule*), beans (*Phaseolus vulgaris*), *Clerodendron*, lilies, May bush (*Spiraea* sp.), roses (*Rosa* sp.), bent grass (*Agrostis* sp.), oats (*Avena sativa*) and clover (*Trifolium* sp.) but is not regarded as a particularly serious pest. In New Zealand however, quite severe pasture damage has resulted, with infestation levels of 4 to 500 larvae/m² being not uncommon in patches. Leguminosae species are apparently the preferred larval food plants, with subterranean clover (*Trifolium subterraneum*) and white clover (*T. repens*) being the first species to disappear from the sward but in more advanced attacks areas of complete pasture loss are evident. The adult weevils feed readily on a wide range of legumes including *Medicago* spp., *Melilotus* spp. and *Trifolium* spp. but the range of food plants is probably very much greater.

Proc. 28th N.Z. Weed and Pest Control Conf.

The rate of spread of this species is apparently quite a steady one and it is now present approximately 5 km north of the original site of discovery. This is some 2 km further than the limit of its distribution in a survey conducted by May and Bimler in April 1973. Further surveys are being carried out by the author to monitor its rate of advancement.

The weevil can be recognised by the short rostrum and the presence of two 'chevrons' of black spots on the elytra. These markings may be difficult to detect, as the adult weevil becomes covered with soil particles rendering it well camouflaged and inconspicuous (Fig. 1B).

Fig. 1A: A map of the Hawkes Bay area showing the presently known distribution of the three species of weevils. The distribution of *Sitona humeralis* and *Atrichonotus taeniatulus* overlap, with *sitona* being present down the coastal strip only.

Fig. 1B: Adult *Floresianus sordidus* weevils.

Fig. 1C: Adult *Atrichonotus taeniatulus* on the left compared with an adult *Graphognathus leucoloma*. Both species have a 'white fringe' around the margins of the elytra.

Fig. 1D: Adult *Sitona humeralis* weevils.

Insect Pests

The larvae typical of the group to which they belong, have the head capsule withdrawn into the body, leaving only the well developed mandibles exposed. They are white in colour, legless and about 6 to 7 mm in length when fully grown. The life cycle is a fairly complex one, with most life stages being present throughout the year. New generation weevils first appear in January reaching a peak by mid-March and then slowly diminishing in numbers during the remainder of the year, with some lasting until November.

The adults lay small batches of 4 to 5 eggs around the base of the pasture plants and the larvae feed actively during most of the year. It seems probable that they are univoltine but more work is needed to completely ascertain this point.

Small lucerne weevil

The presence of this species in New Zealand has been known for a number of years. T. A. Carthness detected its establishment while surveying the insect fauna at Napier airport in 1965 and K. G. Somerfield found it near the Hastings aerodrome in 1970 (Kuschel 1972). Recent surveys conducted by the author showed it to be present, often in very high numbers, right throughout the Heretaunga plains and further sampling will be required to detect the full limit of its distribution. Captures of the weevil were made from roadside samples, pasture, and from legume crops, particularly lucerne which showed the greatest number of adult weevils (on one occasion 20/m²). Kuschel records the weevil as feeding on a wide variety of plants but with a distinct preference for legumes including *Medicago*, *Melilotus*, *Trifolium* and *Galega* species.

The weevil 6 to 10 mm long is in appearance very similar to the white-fringed weevil differing from it mainly in size. Fig. 1C shows a comparison between the two species. The larvae are very similar to those of Flores weevil in size and appearance. Adults first appear at the end of January rapidly building in numbers until the end of February and then disappearing by mid April except on the coast where they survive until the end of April or early May. The eggs are laid in batches of 10 to 20 cemented to the base of plants in a very similar manner to those of the white fringed weevil. It is a parthenogenic species and it is difficult to say if it is univoltine or not. Larvae collected in late November showed a very considerable variation in size indicating that not all would successfully complete their development through to the adult stage in that season.

Sitona weevil

This weevil is the most recently established species of the three. It was found in the larval stage by the writer on the foreshore at Awatoto near Napier in September 1974, while surveying the area for other weevil species. The larvae were identified by Mrs B. May as belonging to the genus *Sitona*, and a wide search was made in October to determine the extent of the infestation. This survey proved the pest to be established (in some places in extremely high numbers) from Tangoio in the North, to Clifton in the south, a distance of some 35 km, along a narrow coastal strip, a total area of about 3,500 ha. The larvae were all found feeding on the roots of bur medick (*Medicago polymorpha*). The numbers found and the widespread nature of the infestation, indicates that the weevil may have been present for some years. So far in spite of careful searches, no sitona weevil have been found in lucerne (*Medicago sativa*) crops in the area, although laboratory tests have shown that it will readily feed on lucerne.

The adults about 4 to 5 mm in length are recognised by the short broad rostrum, the presence of three yellowish stripes on the prothorax and the square "shoulders" of the elytra (Fig. 1D). The larvae approximately 5 mm in length when fully mature, are distinguished by the presence of a well developed orange-brown head capsule.

The life cycle in New Zealand has not been fully determined at this stage. Well matured larvae were present in September and by October a large percentage had pupated with one adult weevil being captured. Adults were quite plentiful in November and no larvae could be found at this time. However, in spite of widespread searches no further specimens of sitona weevil were captured until March, when bur medick started regrowing along the coast, and a few adult specimens were found. A subsequent dry spell in late March-April resulted in this regrowth dying back and once again the weevils disappeared.

Dorothy Jackson (1920, 1922) writing on related *Sitona* species in Britain, states that there is only one generation per year. The life cycle is somewhat complicated by the long life of the adult weevil, which lasts about 12 months. Overwintering adults recommence egg laying early in spring, continuing until late summer or early autumn when the adults die off. Adults resulting from the spring-early summer laid eggs emerge and commence egg laying about six weeks later. Late laid eggs, larvae hatching from the eggs of the new generation weevil adults all overwinter. The eggs require about three weeks to hatch and the larvae (apart from those overwintering) require 11 to 14 weeks to complete their development. A life cycle of this nature means that by late summer enormous numbers of adult weevils are present, both old and new generations. What the situation is in New Zealand is consequently a great mystery. The adults are highly mobile, and White (1974) while conducting aerial surveys of flying insects over South Australia, captured adult sitona weevil at a height of 160 m. It is possible that the coastal populations migrate to other, as yet undiscovered, areas during summer.

DISCUSSION

The establishment of these three weevils in New Zealand is potentially serious, although up until the present no cases of severe damage have been reported. In economic terms, lucerne is the crop most likely to suffer from their depredations. It is being grown on a greatly increased scale, for both the lucerne meal trade and as a means of combating the effects of grass grub attack. All three species are known to feed on this plant, with the adults feeding on the foliage and the larvae on the roots and nodules. Of the three sitona weevil is probably the most serious threat as European work has shown that yields of lucerne may be reduced by 20 to 30%. Larval feeding destroys nodules resulting in a drop in the nitrogen content of the above ground parts of the plants and a lowering of protein percentage.

The small lucerne weevil is another species which could become a pest of note. No definitive work on crop losses have been reported in literature but larvae feeding on the roots and adults feeding on the aerial parts cause a loss of vigour and can result in much lower plant yields. Both this weevil and the Flores weevil with their preference for legumes in general, have a potential for lowering pasture production to a serious extent.

During the course of field work on these weevils in Hawkes Bay, adults and larvae of a number of other weevil species were collected, often in high numbers. Those taken on lucerne crops included white-fringed weevil (very common), Fuller's rose weevil (*Asynonychus cervinus*) (common), *Desiantha diversipes lineata* (common), *Phlyctinus callosus* (plentiful in some crops), *Listroderes delatigui* (occasional) and *Ireninus*

Insect Pests

sp. (occasional). Weevil larvae are generally difficult to control, but the potential of these weevils to damage legumes would warrant a very considerable amount of chemical control trial work to try and find some solution to the problem.

ACKNOWLEDGEMENTS

The writer is indebted to Dr G. Kuschel and Mrs B. M. May, Entomology Division, DSIR, Auckland for the identification of the specimens and gratefully acknowledges the help and information supplied. The assistance of Mr P. Watts, DSIR, Palmerston North during field work is acknowledged.

REFERENCES

- Chadwick, C. E., 1970. South American weevils (Col., Curculionidae) established in Australia. *Aust. J. Sci.*, 32 (7): 293-294.
- Jackson, Dorothy J., 1920. Bionomics of weevils of the genus *Sitona* injurious to leguminous crops in Britain. *Annals of Applied Biology* 7: 269-298.
- , 1922. Bionomics of weevils of the genus *Sitona* injurious to leguminous crops in Britain. *Annals of Applied Biology* 9: 93-115.
- Kuschel, G., 1972. The foreign Curculionidae established in New Zealand (Insecta: Coleoptera). *N.Z. J. Sci.*, 15 (3): 273-289.
- White, T. C. R., 1974. Semi-quantitative sampling of terrestrial arthropods occurring in the air over South Australia. *Pacific Insects*, 16 (1): 1-9.