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Adult Periodicity of *Costelytra zealandica* (Wh.) (Fam. Scarabaeidae) in New Zealand, as indicated by the use of Survey Type Light Traps*

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Abstract

THE adult periodicity of the common grass grub, *Costelytra zealandica* (Wh.) which is one of the worst pasture pests in New Zealand, has been measured by the use of mercury vapour survey type light traps. The grubs of this beetle are subterranean and feed on the roots of pasture grasses from summer through winter to early spring. Adults appear in October and fly in the summer months and the greatest proportion of those attracted to light traps may be males. The females on the other hand tend to mate and return to the soil where they remain until oviposition is completed.

The light traps were situated at six stations throughout New Zealand and useful data on adult periodicity were obtained for five seasons from one station, four seasons at two stations and for lesser periods at the other three stations.

Until recently control was effected by the use of DDT/superphosphate mixtures, until undesirable residues were discovered in primary produce. This led to a search for other forms of DDT and alternative materials.

The search for more suitable forms of DDT has led to the development of prill and granular formulations which are slower in action than DDT/superphosphate mixtures. Of the other types of insecticides investigated the organophosphorus materials have proved the most efficient, but their disadvantage is their short effective life, and application needs to be repeated every year compared with every three years for DDT/superphosphate mixtures.

This limited effectiveness means that greater understanding of grass grub behaviour is now required. Chemicals give best control when present in the soil at the most susceptible stages of the life cycle.

The present paper records the measurements on adult periodicity made to date.

INTRODUCTION

IN June, 1964, restrictions were placed on the use of organochlorine compounds on pastures for the control of grass grub (*Costelytra zealandica*) in New Zealand. These became necessary because traces of organochlorine residues appeared in New Zealand primary produce. Now, the only formulations that can be applied without a permit are pelletted or granular forms of DDT of up to 2lb of active ingredient

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per acre and certain organophosphorus materials. This greatly limits available methods of control for grass grub compared with the former method of using wet and dry mix DDT/superphosphate mixtures.

This limitation of control has led to a search for the more efficient use of DDT, especially in pelletted form, and for alternative materials mainly among the organophosphorus insecticides. These are very short lived in their action. For this reason their use must be very carefully timed, and this also applies to the use of pelletted and granular forms of DDT.

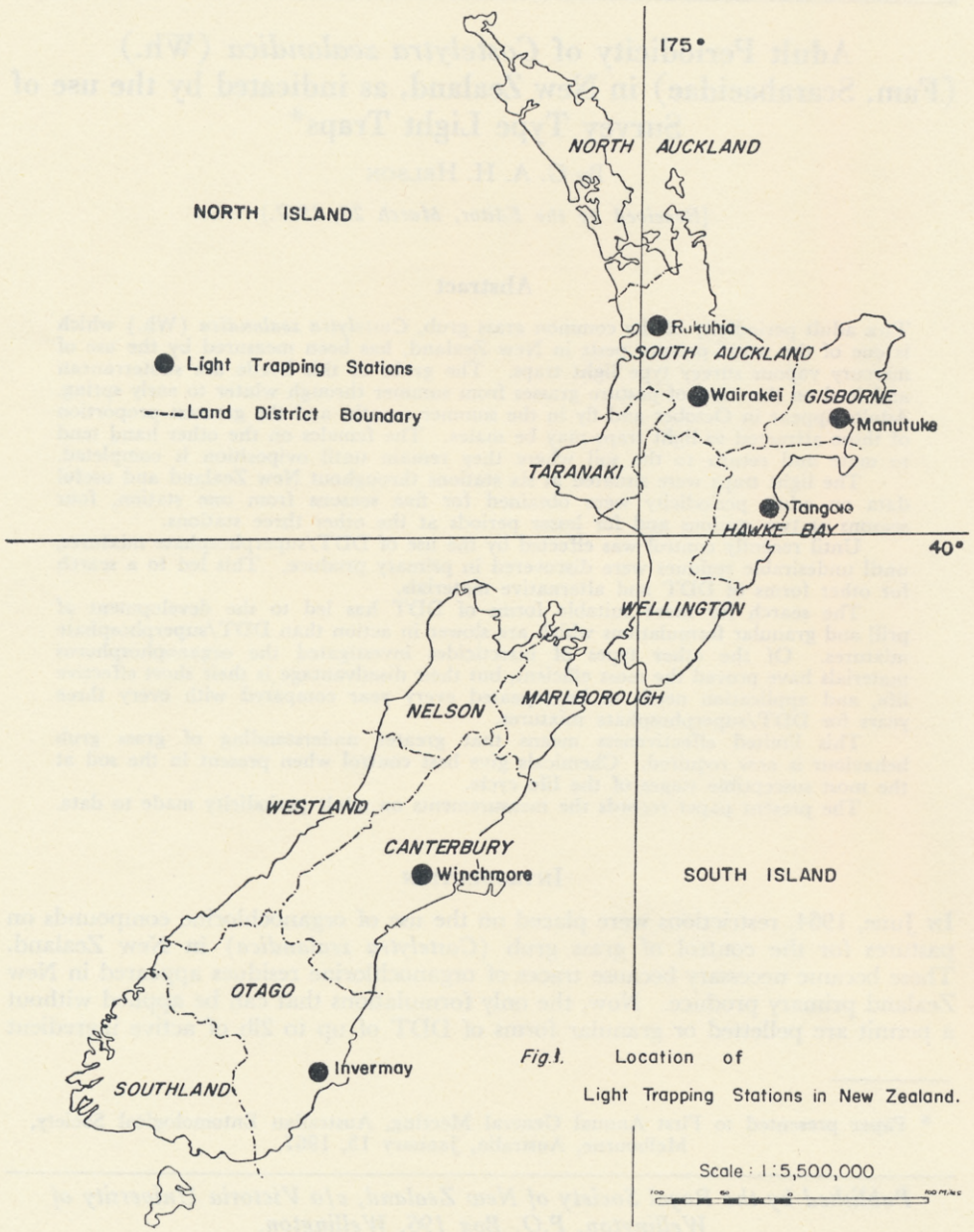

Fig. 1. Location of Light Trapping Stations in New Zealand.

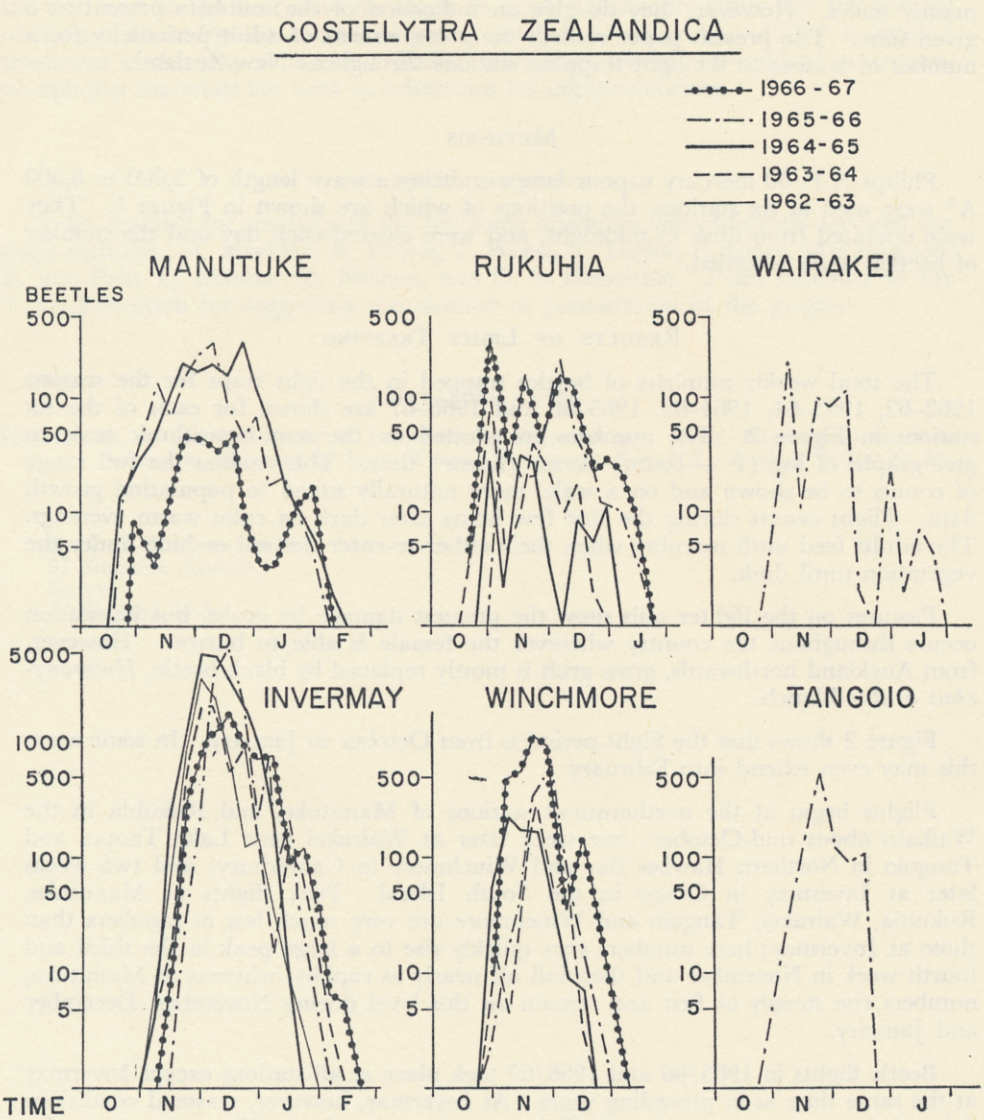

FIG. 2 Flight Seasons of Costelytra zealandica beetles caught weekly at six light trap stations in New Zealand. Plotted on semi-logarithmic scale of log (1+count) versus linear (time).

The development of these materials is probably independent but their application has made an increased knowledge of insect periodicity desirable so that the materials can be applied at the right stage of development to give the maximum effect. One such way of measuring periodicity of adults is by the use of survey type light traps (Helson, 1967). These have the disadvantage that they may trap

mainly males. However, they do give an indication of the numbers present at a given time. The present paper records the measurement of adult periodicity for a number of seasons at six light trapping stations throughout New Zealand.

Methods

Philips H.P. 80 mercury vapour lamps emitting a wave length of 3,000 to 8,000 A° were used at six stations, the positions of which are shown in Figure 1. They were operated from dusk to midnight, and were cleared each day and the number of beetles taken recorded.

Results of Light Trapping

The total weekly numbers of beetles trapped in the light traps for the seasons 1962–63, 1963–64, 1964–65, 1965–66 and 1966–67 are shown for each of the six stations in Figure 2. The numbers are plotted on the semi-logarithmic scale to give graphs of log (1 + count) versus (linear) time. This enables the full range of counts to be shown and on a scale. more naturally suited to population growth data. Flight occurs during the first few hours after dark on calm warm evenings. The adults feed until morning when theiy either re-enter the soil or hide under the vegetation until dusk.

Pastures on the lighter soils show the greatest damage by grubs, but infestation occurs throughout the country wherever the female is able to burrow. However, from Auckland northwards, grass grub is mostly replaced by black beetle, *Heteronychus arator* Blanch.

Figure 2 shows that the flight period is from October to January. In some areas this may even extend into February.

Flights begin at the northernmost stations of Manutuke, and Rukuhia in the Waikato about mid-October; one week later at Wairakei near Lake Taupo, and Tangoio in Northern Hawkes Bay and Winchmore in Canterbury; and two weeks later at Invermay in Otago in the South Island. Peak flights at Manutuke, Rukuhia, Wairakei, Tangoio and Winchmore are very much less in numbers than those at Invermay; here numbers very quickly rise to a large peak in the third and fourth week in November and then fall off nearly as rapidly, whereas at Manutuke, numbers rise steeply at first and remain on this level during November, December and January.

Beetle flights in 1965/66 and 1966/67 took place at all stations except Invermay at the same time as in preceding years. At Invermay, however, seasonal conditions delayed first emergence and peak flight a week to ten days. However, except for this, the general shape of the graph of periodicity corresponds very closely to those of other seasons. The total numbers trapped during the various seasons at each station remained approximately constant.

Discussion

The study of light trap records at six stations has shown that the numbers of beetles trapped at each station over the period of observation has remained fairly constant, and that there was only approximately two weeks' difference in the time of emergence of beetles between the most northern and the most southern stations. This time of first emergence has so far been very constant with the exception of 1965/66 and 1966/67 seasons at Invermay. If this is found to hold for subsequent seasons, then it may be possible to predict when female activity is taking place in

the soil, and so the best time in which to apply treatments either for the control of the adults, or for the control of young newly-hatched grubs. Ability to predict treatment in this way would be a distinct advantage where non-residual or organophosphorus materials are used as substitutes for organochlorines.

ACKNOWLEDGMENTS

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LITERATURE CITED

HELSON, G. A. H., 1967. Adult Periodicity of *Wiseana* spp. (Fam. Hepialidae) in New Zealand as Revealed by Light Traps. *Trans. roy. Soc. N.Z., Zoology* 9(8): 79–91.

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