autumn-sown permanent pasture. The temporary pasture may be left for 2 years if the sward is sufficiently strong. Short-rotation ryegrass would last longer than Italian ryegrass and would be more suitable for a pasture to be left down for 2 or 3 years.

Life Cycle of Pest

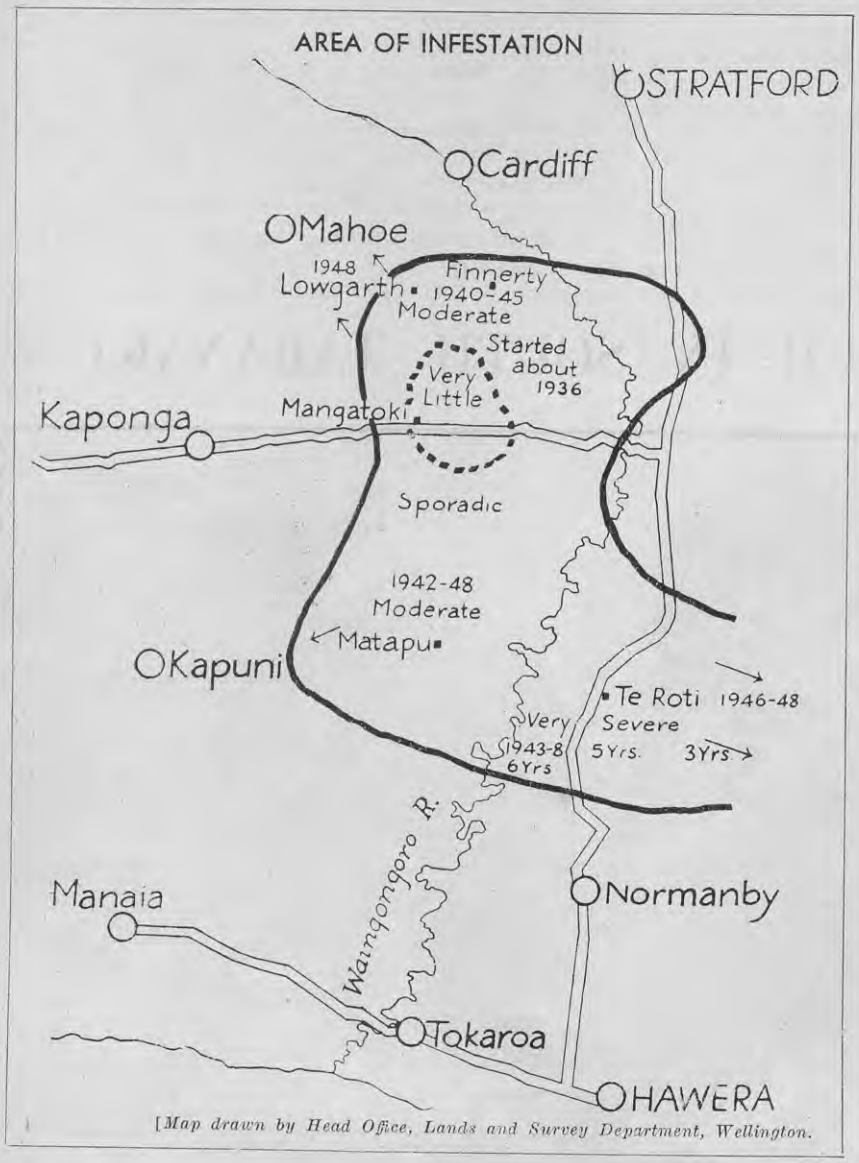
The main flights of beetles take place at dusk on calm nights, mainly in November, but times of flights vary with locality, season, and weather. Beetles on the wing were noted in south Taranaki on October 27 last year. Flights gradually increased and were strongest on suitable nights between November 15 and 22, despite much broken weather and heavy rains during that period. After that date the flights were small, though weather conditions were excellent. In 1947 the flight season was later and the strongest flight was on November 25, tailing off early in December. Flights frequently are over in about 20 minutes, but more straggling flights may continue for twice as long.

After emergence the great majority of the beetles fly low over the ground until host plants are reached. Though mating has been observed on pastures, it takes place mainly after the beetles have alighted on the host plant, where the female continues feeding while being mated. Host plants often become covered with mated beetles, but before daylight they all return to the ground.

When numerous, beetles are very destructive to cruciferous crops in the seedling stage, and this affects the time at which farmers sow such crops in some areas. Beetles feed on a wide variety of plants, including fruit trees, roses, strawberries, gooseberries, willow, hawthorn, honeysuckle, sycamore, karaka, several species of weeds, boxthorn, barberry, and even trees such as pines, macrocarpa, and lawsoniana. Plum trees are most noticeably stripped of their leaves by the beetle, and the young plums then fail to reach maturity.

Opinions vary about the condition of pasture which the beetles prefer for egg laying, and very little reliable evidence can be submitted. Well-consolidated ground with a dense, vigorous cover and a well-balanced clover content appears to offer more resistance to heavy infestation than open swards on unconsolidated ground. For example, roadsides maintain a good, unbroken cover in a heavily-infested area, though ryegrass may be the main grass species.

According to Dr. D. Miller, of Cawthron Institute, eggs are laid in batches of 10 to 20 mixed in the top inch of soil 8 to 14 days after mating. The eggs swell in contact with soil moisture and hatch after 7 to 16 days. Small grubs, which may be very numerous in the ground from December, gradually increase in size as they feed on the roots just below the surface. Much earth also passes through their bodies, which accounts for the loose, pulverised condition of the soil. As the weather becomes colder most of the surviving grubs cease feeding and hibernate at lower levels. In spring the remaining grubs begin a short feeding stage before changing into pupae. During the non-feeding chrysalis stage metamorphosis into the adult form of beetle takes place. From the pupal stage the beetle emerges, eventually digs up to the surface, and flies under suitable conditions to restart the life cycle. On October 8, 1948, at Fraser Road some grubs but mainly pupae were found in the soil. By October 19 beetles not ready for flight were general, relatively few pupae being found.



[Map drawn by Head Office, Lands and Survey Department, Wellington.

Natural Enemies

The grass-grub is preyed on by numerous birds, including starlings, blackbirds, pukeko, poultry, crows, and magpies. Magpies chase small birds away and are unpopular in south Taranaki. Starlings are of greatest benefit and should be fostered. Gulls following the plough and devouring grubs are a common sight on South Island arable lands near the coast. Spiders in hedges prey on the beetles.

The Cawthron Institute is endeavouring to find a parasite which will attack *Odontria zealandica* and at present 6 Australian species are under laboratory tests. One of these has shown some promise of being effective.

Experiments with Insecticides

The "grub-proofing" with lead arsenate of ground being prepared for new lawns, and the use of carbon bisulphide around plants in gardens, have a very limited application. Such methods are impracticable in farm routine for grass-grub control. However, D.D.T. spraying of host plants of the beetle, conducted by the Department of Agriculture in south Taranaki during the past two seasons, offers possibilities as a practical means of reducing the ravages of the pest in certain areas.

It was noted that during the flights of the beetles in November the tops and upper sides of the boxthorn hedges which surround almost every paddock on farms in the areas heavily infested