FURTHER NOTES ON THE WOOLLY APHIS PARASITE **Aphelinus mali** Hald.

By E. P. Venables
Dominion Entomological Laboratory, Vernon, B. C.

In 1931, a short paper was presented before this Society, dealing with the introduction of **Aphelinus mali** Haldman, into the Okanagan Valley. No information was available at that time regarding the effect of the parasite on the seasonal abundance of the woolly aphis, **Eriosoma lanigera** Hausman, as the parasite had only been introduced two years previously.

During the four years following its introduction, the parasite was reared in large numbers on caged apple trees at various points throughout the Okanagan, between Vernon and Oliver, and from these centres its further spread was attained by various measures, some of which may be briefly mentioned.

This parasite, in the adult stage, is a very small Hymenopterous insect which becomes active when disturbed, but usually prefers to crawl slowly over the leaves in search of its host, or to proceed by short hops from twig to twig, rather than to indulge in long flights. They were found most commonly on the lower sides of the leaves rather than on the upper surface, and most of those collected were taken from beneath leaves on the lower branches. Various means were tested for collecting the adult parasites in the cages and for transporting them to the locality in which they were to be released.

The use of a suction apparatus, attached to a glass vial and operated by the mouth, proved to be satisfactory for capturing the insects on the leaves and also on the walls of the cage. Tests were also made in which small two year old trees were enclosed in drop cages of cotton, which could be removed, and replaced by a tight, dark box with glass vials inserted in the sides to capture the insects. Although attracted to the light, they were not captured in sufficient numbers to warrant the general adoption of this method. It might be practical under certain circumstances.

Owing to the abundance of the parasites in the larger cages, and the vast numbers of aphids on the water sprouts and spurs which contained both larval and pupal parasites, the most satisfactory plan was to cut sections of twigs and sprouts heavily infested with parasitized aphids and to stand these in a tight tin box with damp sand. Large consignments could be collected in this way, and any live aphids present continued to feed, and the parasites to develop, for several

days after the cuttings had been taken. These infested shoots could be placed in the trees it was desired to infest and successful inoculations could generally be secured. The long distances between the breeding cages in the different districts and the amount of travelling necessary to take care of all the material, made it difficult to keep up with the emergence of the parasite in all the cages during the season, and in order to avoid waste of material, a section of the cotton wall of each cage was replaced with wire netting through which the parasites could escape to nearby trees.

Distribution of cuttings from the cages was also undertaken by the local Provincial Field Inspectors in the district where the cages were operated.

The comparative abundance and spread of **Aphelinus mali** has been watched carefully and it has been found to occur in practically every section of the Valley, and may be observed in almost every orchard. The very wide distribution of the insect from the original points of liberation is remarkable. In two seasons it was found to have crossed Okanagan Lake, a distance of about two miles. At Kelowna, the insect is common three miles from the nearest orchard in which it was released four years ago, and at Penticton, it has been recovered at long distances from the points of release.

The woolly aphis has not occurred in outbreak form since **Aphelinus mali** was introduced, but owing to the lack of information regarding its seasonal abundance over a period of years, we cannot as yet place the scarcity of the pest to the credit of **Aphelinus mali.** We know that outbreaks of woolly aphis have occurred periodically in the past, and it is to be regretted that we have no data by which to compare outbreak conditions over a longer period. Such information might help to a better understanding of the actual influence of **Aphelinus mali** on the comparative prevalence of its host.

In the cages, the parasite never actually destroyed all of the aphids, and reinfestation occurred each year in all cages. Conditions affecting the abundance of the aphis seem also to affect the prevalence of the parasite. At Penticton, in one of the cages erected when the general woolly aphis infestation was on the decline, the aphis failed to develop to any extent in the cage; although many colonies were introduced from time to time. **Aphelinus mali,** although placed in this cage in some numbers, never produced a strong infestation at any time and both parasite and host remained at a fairly low ebb compared to other cages in previous years, when aphis infestation was heavy.

Whilst this paper deals with general conditions rather than detailed observations, a few notes on the development and activity of this parasite may be of interest. The presence of the larva of **Aphelinus mali**

within its host is first indicated by the body of the aphid becoming swollen and of a pale yellowish colour. Up to this time, the aphid continues to exude honey dew and to moult, but soon after the yellow colour is assumed, the insect dies, and the skin becomes black and brittle, covered to some extent with the woolly powder produced in life. The body of the aphis may turn black within eight to ten days following oviposition by the parasite. In experiments to determine whether the parasitism of the young aphids prevented their reproduction later, it was found that in the case of aphids in the second instar, death occurred in from nine to thirteen days, and that no reproduction occurred.

Aphelinus mali appears to be of particular value in the early summer at the time of the migration of its host to the terminal growth, where they settle down in axils of the leaves above the new buds. The presence of the aphids in this position is easily overlooked, although 75% of the leaf axils may harbour from one to three insects or more. In a series of counts, it has been shown that over 60% of these isolated and incipient colonies may be destroyed by **Aphelinus mali** and later infestation thereby checked.

An examination was made of forty colonies of woolly aphis to determine the percentage of colonies attacked by the parasite, and the number of individual aphids destroyed in each colony, with the following results:-

Of the forty small colonies, thirty-three had been attacked and contained black aphids. In these forty colonies, there were 126 insects, of which 53 had been killed by the parasite. This does not take into account those insects containing the eggs or larvae of **Aphelinus.** Six of these colonies had no live aphids present and these may have been destroyed by predators, as no steps were taken to exclude either **Coccinellids** or **Syrphid** larvae.

In order to understand what influence **Aphelinus mali** will exert on woolly aphis outbreaks in the future, a better understanding of the periodical cycles of its host is necessary. Information of this kind is lacking in the case of some of our commonest insect pests and should be remedied by systematic observations each season, rather than depending on memory, or upon records compiled during the winter months, long after the insects concerned have disappeared.