

The Progress of Parasite Introduction in British Columbia

R. GLENDENNING,
ENTOMOLOGICAL LABORATORY,
AGASSIZ, B.C.

As far as is known the first parasite to be introduced into British Columbia for natural control purposes was **Hemisarcoptes coccisugus** (*H. malus*), a predaceous mite attacking our native oyster-shell scale.

The material was collected in Eastern Canada by Dr. Tothill and sent to British Columbia in 1917, when colonies were liberated at Mission, Vernon, and Agassiz. Further liberations were made at Agassiz in 1920 from material received from Vernon. At Agassiz and Vernon the mite has survived, and under certain conditions has effected excellent control, but has not spread greatly.

In 1922 Mr. Treherne sent material of **Aphelinus mali**, a small chalcid parasite of the woolly-aphis, which was liberated by Mr. E. Clarke in Vancouver. This also came from eastern Canada and has survived in Burnaby district though without completely controlling its host.

Further importations were made from Ontario in 1929 to Vernon

Shipments of **Calosoma sycophanta**, a predaceous carabid beetle were made to Saanich to combat the tent caterpillar in 1917 and 1918. They have not been seen for many years now and have apparently died out. This is a European insect imported to America to combat the gipsy moth, and the stock received here originated in the New England States.

The year 1928 saw the first shipment of parasites to this province direct from England. These were the first fruits of a scheme instituted by the Imperial Institute of Entomology to assist Dominions and Colonies in the biological control of insect pests.

This has resulted so far in the sending to Canada of parasites of the wheat-stem sawfly, the pine shoot moth, the greenhouse white fly, the European earwig and the lecanium scale, the latter two in British Columbia.

The European earwig and the lecanium scale (*Eulecanium coryli* L.) have caused much concern and considerable expense in control work in the coast cities in recent years. The Dominion Entomologist therefore submitted the name of these pests amongst others, that Canada would like to receive parasites for.

In response to this request, 1218 puparia of the tachinid fly **Digonochaeta setipennis** Fall were shipped in 1928, 1929 and 1930 to the Belleville laboratory in Ontario. They were sent packed in moss in cold storage, and at the proper time in the spring were placed in emergence

cages where the adults came out. The reason for the halt on the journey to British Columbia was to intercept any secondaries that might have been present in the puparia. This had to be performed at Belleville as no properly equipped parasite laboratory is yet established in this province.

From these puparia 761 flies were received alive in Vancouver. They had been sent in wire cages every few days as they emerged, usually about 30 to a cage by express from Belleville to Agassiz, the time occupied on this journey being four days. Only 52 out of 813 flies shipped died en route, most of these succumbing in one shipment through improper handling on the train. In 1930 only 11 out of 348 died, the improvement being due to better shipping cages.

Immediately upon receipt at Agassiz, the cages were inspected for food and moisture conditions and then taken direct to New Westminster where they were liberated. Westminster was selected in preference to Vancouver on account of heavier earwig population and absence of any large control measures.

Endeavours have been made each year since liberation to ascertain if these flies were established, collections of the host earwigs being made each August from the liberation points. Over 4700 were collected and caged in 1929, 1930 and 1931 but no recoveries have been made so far.

We do not know therefore whether *Digonochaeta* has become established as a result of these liberations. The chances of recovering even one puparia out of the 4700 hosts collected are very small as even supposing that one million pests are present per acre (not at all an exaggeration for earwigs in New Westminster) that gives 640 million per square mile. With 1000 parasites liberated there is only one parasite to each 640 thousand hosts, or granting a productivity of 64 young to each female parasite, which is about right for *Digonochaeta* only one in each 10 thousand would be liable to be parasitized.

Again supposing the effective reproductive rate of the parasite is twice that of the host each having one generation per year, 18 years will elapse before the parasite population equals that of the host, and even in the 14th generation the percentage of parasitism is only 3.†

Biological control does not usually give rapid results. Its value lies in eventually inducing permanent improvement.

The second parasite to be received was the small chalcid *Blastothrix sericea* Dalm. which studies at Farnham House had shown was the chief control factor of *Eulecanium coryli* in England. This scale has caused much damage in and around Vancouver since its accidental introduction in 1903.

On the 16th July, 1928, the first shipment of *Blastothrix* was received from England. These had been sent to Belleville, Ont., and had been sent on from there in situ. They had been three weeks on the road, and it seemed wonderful to look at living insects that had been born in England and had flown in the English sunshine. They were quite healthy, only a

†Adapted from statements of Dr. W. R. Thompson in "The Biological Control of Insect and Plant Pests." H. M. Stationery Office, London, England.

very few males being dead out of the 236 received. They were sent in 1 x 5 inch vials tightly corked without provision for air, and no moisture was provided other than that contained in the raisins pinned to the corks which also served as food.

These little travellers were promptly taken to North Vancouver and liberated in two previously selected locations where the host scale was abundant. Further shipments were received in 1929, consisting of 1032 individuals of which 253 arrived dead. In all 1300 adults have been received from England, just over 1000 being liberated alive in their selected home.

At the time of the liberations, July, their host was in the egg and newly hatched larval stage, and appeared too small for even these tiny insects to use for oviposition, and it was feared that they had arrived at the wrong time. Later studies of the life history, however, explained this.

Search was made in the spring and summer of 1929 for signs of the parasite, and material was collected from the 1928 liberation points, and caged, but no recoveries were made. In the spring of 1930 further collections of the host scale were made from the 1929 liberation points, and on the 29th June upon examining the cages containing the scale infested twigs I was rewarded by observing numerous adults of **Blastothrix** which had just emerged from the fully grown scale. Confirmation of my identification was later received from England where recovered material had been sent, and we then knew that the first successful establishment in British Columbia of parasite from England had been accomplished.

Later scouting over the areas adjacent to the liberation points in North Vancouver, showed that the parasite was freely established, and had been so even in 1929 though missed that year. The parasite colony now covers an area seven miles long by three miles wide and the percentage of scales parasitized this autumn runs from 11 to 53 per cent with an average of 40%. The greatest distance that the parasite was found to have spread from the liberation points was two miles. This distance was covered by last spring and involves three generations of the parasite. The limits of the fourth or present generations have not yet been determined.

From the above it will be seen that a phenomenal success has attended our efforts, and we have good reason to expect that in a few years we shall feel the beneficial effects of this parasite.

A third parasite recently introduced into British Columbia was the tachinid **Compsilura concinnata** Meig. This parasite was brought here primarily to combat the satin moth. It is a European insect originally brought to America in 1906 as a parasite of the gipsy and brown-tail moths, but it also attacks many other lepidopterous larvae.

The 1300 adults liberated in British Columbia in 1929 and 1930 were obtained from puparia received at Belleville from the United States parasite laboratory at Melrose Highlands, Mass. They were shipped here by express in similar cages to those used for the earwig parasite **Digonochaeta**, and liberated in 1929 at Coquitlam, and in 1930 near Capilano bridge, North Vancouver.

This parasite overwinters as an immature larva within its host, but it has been stated that it cannot do so in young satin moth larvae. The above liberation points were therefore chosen with the object of providing other winter hosts, there being large outbreaks of fall web-worm at these points the year previous. Unfortunately these web-worm outbreaks had just reached their peak and entirely disappeared in the year of liberation owing to native parasitism. In order to offset this condition 3000 web-worm larvae were transferred from Agassiz to the liberation point of 1930, but these also were so heavily parasitized that none survived to be attacked by **Compsilura**. There was also a total absence of the woolly-bear larva of **Diacrisia** in these localities so that no recoveries of **Compsilura** have yet been made.

These facts are related here merely to show how success may often depend upon phenomena entirely outside our control.

The establishment of **Compsilura** would be very beneficial in British Columbia as the satin moth has become a serious pest especially in the lower Fraser valley, and it has been found to parasitize as high as 70 per cent. of the larvae of this insect in the eastern United States.

