THE RELATION OF THE PREDATORY MITE "HEMISARCOPTES MALUS" Shimer TO THE OYSTER-SHELL SCALE IN BRITISH COLUMBIA

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The careful researches of Dr. J. D. Tothill upon the distribution and habits of this mite within the Dominion are recorded in Vol. 9 of the Bulletin of Entomological Research for 1919.

We find that during the year 1916-1917 samples of scale-infested wood were received by him from all the Provinces within the Dominion, and were examined for the presence of this predatory mite; whilst occurring in all the fruit-growing sections east of the Rocky Mountains, the mite was, for some reason, absent from the material sent in from British Columbia. The samples from this Province were taken in the following localities: Kaslo, Grand Forks, Vernon, Lillooet, Agassiz, Harrison, Nicomen, North Vancouver, Kuper Island, Victoria, Alberni, and Duncan.

As regards the presence of the mite within the North American Continent, it is known to occur in Nova Scotia, New Brunswick, Quebec, Prince Edward Island, Ontario, Massachusetts, Ohio, Illinois, and Iowa. No examples were secured from the Prairie Provinces, this being probably due to the absence of suitable food plants for the Oyster shell scale.

From the very high destruction wrought by this mite among the eggs of the scale in certain of these localities, reaching in some cases as high as 90-95%, it became apparent that the introduction of the **Hemisarcoptes** into the Province of British Columbia was a matter of some moment, and to achieve this result the following method was employed:

Consignments of scale-infested twigs harbouring the mite were secured from New Brunswick in 1917, and were placed upon trees infested with Oyster Shell Scale at various points in the Province of British Columbia as follows: Royal Oak (Brydon Farm), Mission (near Catchpole Farm), at Agassiz Experimental Farm, and at South Vernon. The twigs as received were tied upon trees to be used as centres of distribution; these included Hawthorne, Red Osier Dogwood, and Apple trees, the Dogwood being found to be a very favourite food plant attacked by the scale.

The trees selected for the liberation of the mite in the Vernon district were situated some two miles from the city, and were growing on a piece of waste land on the banks of the Vernon creek. These trees, three in number, had been very heavily infested with the scale for some years, and were growing in close proximity to the native timber fringing the

creek banks, much of which was coated with scale, more especially the Red Osier Dogwood. In the Spring of 1920, these trees were carefully gone over for the purpose of ascertaining whether the mite had become established, cuttings being taken and the scale examined under the binocular. These investigations revealed the fact that the **Hemisarcoptes** was numerous, and that many eggs had been destroyed. At the same time the native vegetation was gone over to some extent and the mite discovered some 200 yards distant from the point of liberation in 1917.

In the Spring of 1921, a more extended search was undertaken, and as a result the mites have been found to be quite numerous at a distance of one and a-half miles from the originally infected trees. In this district the mite was, as far as obsevations have been carried out, almost entirely confined to the native vegetation along the creek banks; this may be due to the fact that the trees infected in 1917 were isolated by at least one-half mile of open country on one side before the nearest apple trees were encountered, and upon the other by a belt of willows, and various indigenous trees which follow the course of the creek. All the cultivated orchards lay beyond the creek on that side.

The accompanying chart shows the distribution of the **Hemisarcoptes** in this locality, and gives some idea of the condition already referred to. In order to carry the infection to districts somewhat distant from the points of recovery, in 1921, scale-infested twigs were taken in the south Vernon area from trees known to harbour mites, and were placed upon trees at the Coldstream; apple and dogwood were used in all these cases for the introduction of the mite. In all, nineteen separate infections were made during the spring and summer of 1920-21, the same procedure being followed as in the original transference carried out in 1917.

THE HABITS AND APPEARANCE OF HEMISARCOPTES MALUS

In order that the relation of the **Hemisarcoptes** to the Oyster shell scale may be clearly comprehended, a brief summary of the life history of the latter insect is advisable. Much of the following account is taken from the paper of Dr. J. D. Tothill, already referred to.

In the Okanagan the eggs of the scale hatch approximately during the end of May, or early in June, dependent upon climatic conditions. The newly hatched nymphs, after wandering around for a few hours, settle down and insert their mouth parts in the bark, in which position the insect remains fixed for the remainder of its existence; the scaly covering, which consists of the moulted skins of the individual being gradually enlarged until maturity is reached, which, in the Okanagan Valley, will be some time in late July, or early August, and at that time the eggs of the scale insect will be found to have made their appearance. These eggs remain beneath the parent scale until the following May or June, a period of ten or eleven months, and during practically the whole of that period the predatory mites have undisturbed access to them.

In looking over specimens of the Oyster shell scale in search of examples of the **Hemisarcoptes,** there will be found no external evidence of their presence, but, on the scale being inverted, the appearance of the eggs, if attacked, is quite characteristic. Even if no mites are found, a number of empty eggshells being in evidence with a certain percentage of injured eggs of a shrivelled appearance lying in confusion, the mites being found amongst these, and also scattered amongst the undamaged eggs.

The mites are shining white in colour, and are approximately of the same size as the eggs of the scale insect. The body is oval in outline; the legs, eight in number, are provided with "tarsal suckers," which are of service to the creature in walking over slippery surfaces; there will be found arising from the hind tarsi a number of long hairs, which are dragged along by the mite in its wanderings; these hairs are evidently of of some service to the mite in enabling it to find a foothold, the hairs being closely applied to the surface upon which the mite is resting, even an inverted plate of glass appearing to offer no obstacle to their progress. It is a well-known fact that this mite is never to be found beneath old, empty scales, but is always discovered in the presence of healthy eggs, or under those scales harbouring the parent female, for it appears, from the observations of Ewing, Webster, and A. R. Baird (Tothill, l. c. p. 194), that the **Hemisarcoptes** feeds also upon the parent scales themselves. From the above facts, and also from the appearance of the mite when compared with certain species of scavenger mites, also found in association with the oyster shell scale, the matter of identification is not a difficult one. The number of mites to be found beneath a single scale varied, in those examples examined at Vernon, from a single adult to six or seven individuals, both adults and young nymphs; the latter being provided with only six legs, mature specimens possess eight in all. The eggs of this mite are deposited beneath the caudal margin of the scale, and occurred in numbers varying from six to fourteen in those cases noted at Vernon. Individual eggs are somewhat less than half the size than the eggs of the scale insect, shining white in colour and oval in outline.

The maximum period of oviposition of this mite appears from local observations to be during April and May, although eggs have been found during the entire summer. Lignieres, in his observations on the oviposition of the mite in France, states that eggs were found at all seasons of the year, the minimum number being found from November to January. Ewing and Webster, in their Iowa observations recorded in "Psyche, Volume XIX., No. 4," noted a similar set of conditions to the above, finding eggs and mites numerous beneath the scales on March 29th, and also during April and May.

Local notes at Vernon are quite incomplete as regards the period of oviposition; no eggs were found during March, the first eggs noted being on April 14th.

It has been frequently observed, in examining scales for the presence of this mite, that the only indication of its work will be a cluster of eggs lying just beneath the caudal margin of the scale, the parent that deposited them having evidently moved off to some other location. The number of eggs laid by a single female does not appear to be known, but, from information gleaned during the work with the mite at Vernon, it would appear that individual females deposited a few eggs beneath a number of scales, as the eggs when found varied in numbers from half a dozen to fifteen or twenty. Between May 7th and 18th, 119 scales were examined for the presence of the mite, these scales being taken from various localities in the mite-infested area; it was found that mites were present beneath 22 of them, six individuals being the greatest number seen beneath a single scale. The fact that this mite feeds upon the San Jose Scale has been well established. Mr. Dearness, in 1899, received samples of this scale from Kent County, Ontario, and found numbers of the mite feeding upon the mature female scale insects, as many as eighteen larval mites being observed beneath a single scale.

Various other species of mites will be encountered beneath the empty scales of the oyster shell scale; among these may be noted two species known to occur in British Columbia, **Tydeus gloveri,** a gregarious species, which may be found to the number of 15 or 20 beneath a single scale; this species is recognizable by the median line on the abdomen.

A species of **Gamasus** will also be found hibernating beneath the empty scales; this is a fairly large mite, possessing two conspicuous whitish markings extending almost the whole length of the body.

INSECTS OF ECONOMIC IMPORTANCE IN THE FRASER VALLEY IN 1921

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On several occasions in the past ten years, since the resuscitation of the Society, members have given papers dealing in a general way with insect conditions during that year in the various districts that they happened to be located in.

These may be found in the Proceedings under such titles as: "Report from Vancouver," "Report from Okanagan District," "Insects of the Lower Fraser Valley," etc., etc., and have been contributed by such respected members of our Society as the late Messrs. Thos. Cunningham and Tom Wilson, Messrs. Treherne, Ruhman, Venables, Brittain, and others. These papers, with the Reviews of Applied Entomology contributed from time to time by Mr. Treherne, while possibly of only passing interest at the time, will undoubtedly form a very valuable history of Economic Entomology in this Province, their value increasing with age.