

THE FOREST-INSECT PROBLEM IN STANLEY PARK.

BY R. N. CHRYSAL, FIELD OFFICER FOR FOREST INSECTS.*

For a number of years now the unhealthy condition of the coniferous trees in Stanley Park has been a matter for grave concern among the citizens of Vancouver and others interested in the preservation of this area of natural forest which adds so much to the charm of the Western city. The first investigation into the existing conditions was made during the summer of 1913 by Mr. J. M. Swaine, Assistant Entomologist for Forest Insects, Entomological Branch, Ottawa. Following Mr. Swaine's report a field laboratory was established in the park during the summer of 1914, the work being continued throughout the season of 1915. As a result of these investigations a considerable amount of information has been collected relative to the life-histories and habits of the injurious insect species which are responsible for the damage; while at the same time measures for efficient control of the pests and regeneration of the damaged areas have been proposed and partly carried into effect. This matter being one of interest to the members of the British Columbia Entomological Society, the following short account of the results thus far obtained is given below:—

GENERAL CONDITIONS.

Stanley Park was primarily a mixed coniferous forest composed of Sitka spruce (*Picea sitchensis*), Douglas fir (*Pseudotsuga mucronata*), western hemlock (*Tsuga heterophylla*), and western cedar (*Thuja plicata*); the area has been logged over, however, and the majority of the finest trees removed; the present stock being mainly second growth, intermixed with a considerable proportion of broad-leaved species, including maples, poplar, and willow; these in certain places taking sole possession of the ground.

The principal species will be considered in turn in relation to the insect pests associated with them.

THE SITKA SPRUCE (*Picea sitchensis*).

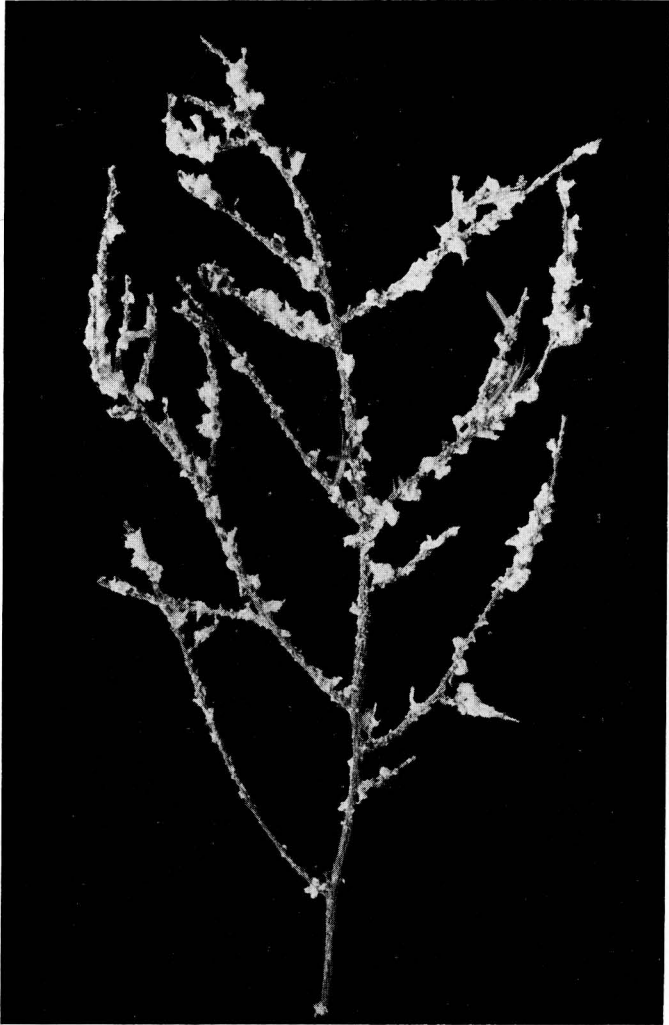
The Sitka Spruce Gall-louse (*Chermes cooleyi* Gillette).—This insect causes elongate cone-shaped galls to form on the young twigs of the spruce in the spring, the twig being killed as a result, and the health of the tree seriously affected when the attack is heavy. The study of the life-history and habits of this insect in Stanley Park resulted in its being identified as *Chermes cooleyi* Gillette, a species studied and described by Professor C. P. Gillette, Fort Collins, Colorado, in his paper entitled "Chermes of Colorado Conifers," Proc. Acad. Nat. Sci., Philadelphia, 1907. The life-history is interesting owing to the fact that the species has two hosts, spending part of its life on the Sitka spruce and migrating thence to the Douglas fir. A short paper on the results obtained in the park will shortly appear in the Transactions of the Entomological Society of Ontario, and in consequence no details will be given here.

The main conclusions drawn from the observed facts of the life-history of this insect are as follows: That this species has proved itself a serious enemy to the Sitka spruce in Stanley Park, causing the death of many trees, both large and small, a survey of the park showing a percentage of over seventy-five affected trees; and that the Douglas fir, the secondary host-tree, is not seriously affected by the presence of the insect. No gall is formed upon the fir.

The Sitka Spruce Aphis (*Aphis abietina*).—Two years ago this insect was reported by Mr. R. C. Treherne as causing serious damage to the spruce in the spring and early summer. When activity starts in spring the apterous viviparous females are to be found in great numbers on the old needles; the following generation develops wings in due course and leaves the spruce about the end of May and the beginning of June; the secondary host-plant is so far unknown.

*Contribution from the Entomological Branch, Department of Agriculture, Ottawa.

Although the work of this insect is very marked upon a limited number of trees in Stanley Park, the present theory is that at the moment it is important only as a very efficient secondary enemy to assist its more destructive ally, the gall-chermes. To form an idea of its potentiality for destruction, however, one need only go and visit the Beacon Hill Park at Victoria, where several large spruce have been seriously damaged by its ravages during the past two or three years. The work of the aphid is very characteristic, causing yellowing of the needles, which finally fall off, leaving



Work of western hemlock chermes, Stanley Park, Vancouver, B.C.
(After Swaine.)

the present year's crop in sole possession. This species has been studied in England by Professor F. V. Theobald (*Annals of Applied Biology*, Vol. I., No. 1, 1914, May, page 22), who found it destructive to various species of spruce. In 1915 it was also recorded by Professor H. F. Wilson from Corvallis, Oregon, who wrote in June, 1915, that this aphid had proved very destructive all down the coast of Washington and Oregon.

The Sitka Spruce Bark-beetle (*Dendroctonus obesus* Mannh).—In 1913, about the margin of Beaver Lake, three large spruce-trees were found to be attacked by this beetle; the spruce in this region had already been seriously weakened by flooding, consequent on the raising of the level of the lake, as well as by the attacks of *Chermes cooleyi*. Favourable conditions for the extensive spread of this destructive species thus obtained. By the early summer of 1915 the number of affected trees in the vicinity of the lake had increased to thirteen; and in consequence of this fact a survey of the whole park was made to endeavour to locate any other centres of infection. Two other groups were located in widely separated parts of the park, one of nine trees and another of five. All the infested trees were marked for removal in the spring of 1915, which was largely done, the stumps being completely barked to prevent their subsequent use as breeding-places. A further search made during the summer of 1915 only resulted in the finding of a few trees, some of which had been omitted in 1914 owing to their being in use as telephone-poles; these have been marked for removal this spring.

THE WESTERN HEMLOCK (*Tsuga heterophylla*).

Over a large area of the park the western hemlock constitutes the principal species; this tree has been badly attacked and in places entirely killed out by a defoliating Geometrid caterpillar of the genus *Therina*. The moths were in great abundance during the fall of 1913, but in 1914 evidences went to show that parasites and predators had obtained control over the pest, hardly any moths being seen during the summer of 1915. By this time the damage done was irreparable over a considerable area, and in other places the trees were fighting an uphill battle, with sadly thinned foliage, against the effects of the previous year's attack.

The western hemlock bark-beetle is also established in the affected trees and is known to be a destructive species.

Dipterous Maggot in Bark of Hemlock.—The presence of a dipterous maggot of the genus *Cheilosia*, probably the species *C. alaskensis* Coq., family Syrphidæ, was found fairly commonly in the bark of the western hemlock in the park. This insect causes the injury known to the lumberman as "black check," and its presence may be detected by the pitch-tubes of resin which collect at the point of attack. Mr. H. E. Burke, of the United States Bureau of Entomology, in a paper on "Black Check in Western Hemlock," Circular No. 61, United States Department of Agriculture, Bureau of Entomology, 1905, states that the injury is due primarily to the work of the bark-beetle of the western hemlock (*Hylesinus* sp.), which excavates food-tunnels in these places, giving the young maggots a starting-ground for their work. This insect has not yet been exhaustively studied in Stanley Park.

The Western Hemlock Chermes.—In the spring, on isolated trees in the park, the close observer will notice that the foliage has the appearance of being covered with minute flecks of a white woolly material; this marks the presence of the above species. During the first days of spring, the stem mother, an oval-shaped flat louse, 0.5 mm. in length, and dark brown in colour, with the dorsal surface covered with a white woolly secretion, may be found located at the base of the needles, her setæ deeply sunk in the tissues.

Oviposition commences about this time, the young hatching in six or seven days. The complete life-cycle of this species has not yet been established. Although up to the present this species has not proved generally destructive, at least two large hemlock-trees have been killed as a result of its attacks, while others are in a serious condition; the old needles are affected and fall off during the early summer, leaving the tree partially defoliated. The larvæ and pupæ of Syrphus flies and Coccinellid beetles have been found in considerable numbers preying on the young in the spring, and it is possible that these may prove to be an efficient natural means of control.

THE DOUGLAS FIR (*Pseudotsuga mucronata*).

The Douglas fir has on the whole remained healthy; it is considered the healthiest species of conifer in the Province.

THE WESTERN CEDAR (*Thuja plicata*).

The majority of the large cedars in the park are dead-topped, which injury is said to be due to a fungus-disease. So far no discovery of extensive insect-damage to this species has been recorded in the park. The twigs of the cedar are attacked by a leaf-miner belonging to the genus *Argyresthia*; the damage done is not extensive, however.

DAMAGE TO OTHER SPECIES IN THE PARK.

The shrub *Gaultheria shallon* (salal), which is abundant in the park, is rendered unsightly in places by the work of a lepidopterous leaf-miner (*Phyllorhynchus (Lithocolletis) gaultheriella* Wlsm.). The life-history of this species has been partially studied.

Elders (*Sambucus*) growing in the park were found to have been attacked, and in a few cases killed, by a Cerambycid larva belonging to the genus *Leptura*.

CONTROL MEASURES AND IMPROVEMENTS.

It was shown by experiments carried out by Mr. R. C. Treherne in 1914 that the attacks of the spruce gall-cherms could be readily controlled along the driveways and places where the spruce was accessible. By means of a modern power-sprayer equipped with abundant hose, a solid-stream nozzle, and extension ladder the foliage could have been sprayed up to 140 feet in height. Lead arsenate could have been used to control the caterpillars on the hemlock, and a contact spray, such as kerosene emulsion, fish-oil soap, or nicotine extracts, employed in the case of the cherms. Unfortunately the survey of 1914 showed that the condition of the spruce along the driveways would not warrant the expenditure which would be entailed in the purchase of a power-sprayer, and the crisis of the attack on the hemlock having come and gone, the idea of employing spraying as a method of control was for the time abandoned. At the present time attention is being given to the subject of treatment from a silvicultural standpoint; the measures proposed entailing clearing up and cutting out of the dead and sickly trees, and the employment of an artificial system of regeneration such as would be easily carried out in a confined area like Stanley Park. The Douglas fir has been recommended as a suitable tree to plant on the areas which are to be regenerated, and it is to be sincerely hoped that in the near future adequate measures will be taken to restore the beauty of the park, and render it a worthy object of care to the city, of which it is an inseparable part.

SOME ORCHARD INSECTS OF ECONOMIC IMPORTANCE IN BRITISH COLUMBIA.

By R. C. TREHERNE, FIELD OFFICER, ENTOMOLOGICAL BRANCH, DOMINION DEPARTMENT OF AGRICULTURE, AGASSIZ, B.C.

We are approaching very rapidly a condition in the Province of British Columbia, in regard to insects of importance to the agriculturist and fruit-grower, which will very soon demand most serious consideration. We are reaching a point in which the whole system of orchard-management in relation to spraying will have to be reconstructed and viewed from a different light than heretofore. The importance of such pests as the codling-moth, San Jose scale, pear-thrips, woolly aphis, and black currant bud-mite cannot be too lightly dealt with. The fruit-growers of British Columbia, as will become evident in the pages that follow, have since the inception of the fruit-growing industry relied on two main considerations: (1) The youth of their industry and the production of fruit free of serious pests which beset fruit-growers in other sections of Canada; and (2) the wise considerations of the Provincial Government and the Provincial Board of Horticulture, who have dealt with insect pests in most drastic manners, both through an efficient system of quarantine and inspection at the ports of entry, and through careful and pains-