

These details, on the whole, appear to tally pretty closely with the metamorphosis of the moth in other latitudes, with the exception that the number of broods per season are not so numerous this far north as they are to the south.

So far as our success of getting rid of the codling-moth on Vancouver Island is concerned, I felt quite safe the other day when I informed a gentleman that, if I gave him \$5 on condition that he find me a codling-moth larva, he would think he had more than earned the money.

(Then followed a general discussion regarding the codling-moth.)

Mr. Day: I will now call on Mr. R. C. Treherne, Field Officer, Dominion Division of Entomology, Agassiz, to give his lecture on "Insects affecting Shade-trees and Ornamentals around Vancouver."

SHADE-TREE AND ORNAMENTAL INSECTS OF BRITISH COLUMBIA.

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

The subject I propose to take up to-day is naturally one that appeals to garden-lovers and those especially interested in the beautification of boulevards and parks. I do not propose to make an exhaustive study of all the insects found on shade-trees and ornamentals, but merely to touch upon certain of the more important and most noticeable, which year in and year out attract attention by their presence.

HEMIPTERA (TRUE BUGS).

SCALE-INSECTS.

Scale-insects are those which cover themselves with a waxy shield or scale, under which they lie protected and hidden from view. It is only necessary to draw your attention to the very familiar oyster-shell scale (*Lepidosaphes ulmi*) to give you an excellent illustration of the type of insect referred to as a "scale-insect." This oyster-shell scale occurs on a great many different species of shrubs and trees in this part of the world (see Bull. 5), and being very plentiful and numerous may readily be taken and studied, in a general way, as a type. Its common name indicates its appearance, and there is no other insect so readily available that has such characteristic markings. Beneath these protecting scales the soft-bodied insects lie immovable, but are able to grow and reproduce. Each one is furnished with a minute "sucker," which is inserted into the plant-tissue, thereby obtaining nourishment for itself.

Other scale-insects of ornamentals may be observed in the vicinity (Vancouver, B.C.), notably the following:—

The rose-scale (*Aulacaspis rosæ*).

The cottony maple-scale (*Pulvinaria innumerabilis* Rathv.).

The European fruit-scale (*Aspidiotus ostryiformis*).

Lecanium spp. on maples, laurels, etc.

Chionaspis palm-scale (*Chrysomphalus dictyospermi*).

The cottony maple-scale, found on stems and twigs of maples and many rosaceous plants, presents a familiar appearance with its white cottony exudation beneath a brown shield or scale. The European fruit-scale, found on the mountain-ash, flowering crabs, etc., may be recognized as minute black specks with orange-coloured centres or "nipples." The Lecaniums, of which it is believed two species occur in Vancouver on maples, laurels, etc.—viz., *hemisphericum* and *hesperidum*—are known as somewhat large, spherical brown scales on the stems and leaves. All these scales may be controlled by the use of kerosene emulsion in the spring, or by caustic-soda applications during winter. The palm-scale is peculiar to plants and ferns in the greenhouse and conservatory, and the rose-scale has been taken in North Vancouver.

APHIDES.

These insects, commonly referred to as "green lice," form colonies on the leaves and twigs of plants they attack. The species frequently found on roses may be taken

as a type. Each species of plant, for the most part, has a different species of aphid attacking it, but despite the varietal differences all are similar in structure, and for the most part in habits also. They are soft-bodied creatures, slow-moving, usually green, brown, or covered with a whitey, woolly excretion. All are sucking-insects and can be controlled by applications of soapy solutions, kerosene emulsion, or caustic spray, the only requisite being necessary that each individual receive attention. Black Leaf 40 has been found particularly efficacious and easy to apply.

THE TARNISHED PLANT-BUG (*Lygus pratensis*).

The malformations of such plants as chrysanthemums, dahlias, and asters, producing often a one-sided flower-development or sometimes a total "blighting" of the flower-bud, are due in a great many cases to the attack on the bud by the above-named insect. The adult is very active, about $\frac{1}{4}$ inch long, and darts away rapidly when approached; brown in general colour, but frequently adopting a yellowish or red tinge. The latest report on this insect (Cornell Bull. 346, June, 1914) records the satisfactory control as "still an unsolved problem." Under garden conditions sprays of nicotine or kerosene emulsion or dry applications of pyrethrum, sulphur, or ashes will give relief.

THE ROSE-LEAF HOPPER.

Frequently on the under-surfaces of rose-leaves a number of small white hopping insects may be observed. If the bush be disturbed these "hoppers" will fly out in great numbers. If careful watch be kept, it will be seen that each insect is methodically absorbing the juices of the leaf with its sucker inserted into the tissues of the plant. A peculiar white mottlish appearance shows on the upper surface of the attacked leaves. When these conditions are observed we are usually dealing with the above insect. Control of this insect, again, is a difficult matter, but careful sprays of nicotine or kerosene emulsion applied in May, preferably early in the morning, and especially directed to the under-surfaces of the leaves, will assist materially in the control.

SPITTLE-INSECTS (Cercopidæ).

These insects produce a peculiar saliva-like excretion on many plants in the herbaceous border and on grass. Within this liquid excretion a small yellow insect will be seen. During the past few years this insect has been the cause of much inquiry. Applications of kerosene emulsion or a strong driving force of water from a hose will destroy a number of these insects.

LEPIDOPTERA (BUTTERFLIES AND MOTHS).

THE OBLIQUE BANDED LEAF-ROLLER (*Archips rosaceana*) (Tortricidæ).

The larval form of butterflies and moths are referred to in general terms as caterpillars or "worms," and it is only in the larval form that they attract attention of the gardener. We have several insects in the vicinity of Vancouver which yearly cause damage by devouring the leaves and flowers of ornamentals. One of the most important in this regard are the caterpillars of the above moth. They are familiar to all amateur rose-gardeners and horticulturists.

They are usually light green in colour, with an evidence of a darker colour of green along the centre of the back; head very dark brown, almost black. They may be seen in the curl of some leaves, doing damage to both leaves and flowers by devouring the tissues. When disturbed they wriggle rapidly backwards and drop to the ground by means of a thread of silk. They quickly make a rose-garden look unsightly and the destruction of the bloom causes great inconvenience. The food-plants of this insect are very numerous, and from the number of egg-masses which may be seen by any one in this city (Vancouver, B.C.) on the trunks of maples, mountain-ashes, apples, and several other boulevard trees, as well as on the veranda woodwork, it is evident that it attacks more plants than actually have been observed

so far in these parts. It has been estimated that a single female moth will lay on the average of 305 eggs, and that a cluster of eggs will contain an average of 117 eggs, thus indicating that a single moth will deposit one or more clusters of eggs. (Sanderson.)

During the past winter I collected a number of these egg-masses and estimated that medium-sized clusters contained on the average of 48.5 eggs, with an average hatching fertility of 56.6 per cent. Parasites play an important part in the control of this insect during the summer, as has and may be shown by breeding tests, otherwise the former figures would indicate a serious outlook for the safety of our shade-trees. The brown moths fly in July and may be collected in thousands around the electric lights in the streets and on verandas.

As a control nicotine sulphate has been proven very efficacious, and infinitely more satisfactory to use on plants growing over verandas, steps, or trellis-work around houses than arsenate of lead, mainly for the reason that it does not mark the paint or woodwork. Arsenate of lead, apart from its unsightly effect in a rose-garden, is an admirable insecticide.

THE ROSE BUD-WORM (*Olethreutes* sp.) (Tortricidæ).

A species resembling the Eastern *nibatana* has been taken here (Vancouver, B.C.), reared from apple. Literature of the species records it under the above common name. Apparently its habits on the rose, as, indeed, the whole "make-up" of the larva itself, closely resembles the former species, *A. rosaccana*, so that the two are hardly distinguishable.

THE FRUIT-TREE LEAF-ROLLER (*Archips argyrospila*) (Tortricidæ).

This is another insect closely related and similar to the two foregoing Tortricidæ. It has been reared on the Pacific Coast from apple, and as it is a very general feeder on all kinds of ornamental shrubs and trees, there is little doubt it can also be incorporated in this article. The full-grown larva is dark green in colour, about $\frac{3}{4}$ inch in length, with the head, thoracic shield, and legs of brown.

THE ALFALFA-LOOPER (*Phylometia (Plusia) californica*) (Noctuidæ).

During the past season (1914) this insect has been prevalent. There was a serious outbreak recorded for the Okanagan during the early part of the summer. (See page 9.) Its attack on rhododendrons, laurels, hollies, roses, and several other shrubs and plants has attracted attention on the Coast. The larvæ are capable of completely defoliating a bush, and are recognized as olive-green caterpillars, with bright-green heads, mouth-parts brown, and black thoracic legs. When disturbed they curl up and drop to the ground, then refusing to move. Fortunately parasites played an important part in the control of these insects. While they were very common this past season, there is little likelihood of damage being caused in the 1915 season.

THE WEST COAST PAINTED-LADY (*Vanessa caryæ*) (Nymphalidæ).

The over-wintering butterflies of this species may often be taken in the first warm days of the spring. While the adult is one of the most beautiful of our Coast butterflies, the larvæ are by no means so prepossessing. During this past summer the caterpillars were plentiful on many malvaceous plants, and hollyhocks in particular suffered severely in Vancouver. Both *V. atlanta* and *V. cardui* occur on the Coast, the former being rare, while the latter may frequently be found on thistles. *Vanessa californica* is mainly confined to interior points of this Province on its natural food-plants of the Ceanothus family.

THE BLUES (Lycenidæ).

The larvæ of one of these butterflies this summer destroyed the appearance of patches of violets in the gardens of the city by riddling the leaves with feeding areas and in some cases by totally destroying the leaf.

THE TUSSOCK-MOTH (*Hemerocampa antiqua*) (Lymantriidae).

During the past two summers the larvæ of this moth has been very destructive to azaleas, laurel hedges, and hollies in the city, and may be found on such trees on the boulevards as elm, birch, willow, poplar, maple, chestnut, ash, mountain-ash, as well as on the varieties of apple. The attack on the last-named trees is likely to pass notice until at a last moment, in a year of special prevalence, when parasites are limited, the attack becomes so marked that great damage results. City life is particularly suited to the growth and reproduction of this insect. The matter of control is a very simple matter, for the reason that the female is wingless, and consequently is forced to remain localized on one tree, provided it is not transported artificially or by contact of branches to another. At this time of year, during the winter, the egg-masses may be seen in a cluster of dead leaves still adhering to the trees on the streets. In the experience of other cities in Canada, notably to my knowledge in Toronto with *Hemerocampa leucostigma*, the attacks by this insect in past years has become so pronounced at times that the city authorities have found it expedient to follow the recommendations of the entomologists. Boys were employed on the bounty principle to collect these egg-masses during winter. Up till the present time Vancouver and other Coast cities have not suffered to any marked extent, but the presence of these caterpillars during the past two seasons would indicate that close watch should be kept for fear of an outbreak in the future.

THE TENT-CATERPILLAR (*Malacosoma crosa*) (Lasiocampidae).

This is another insect which appears as a periodical destructive visitant. When it does occur it causes an extreme amount of damage to shade-trees and shrubs in these parts (Vancouver). It is fully dealt with in Bulletin No. 4 of our series; consequently it does not need to be mentioned to any extent here.

THE FALL WEB-WORM (*Hyphantria cunea*) (Arctiidae).

During the past few years this insect has not been over-plentiful. During the years surrounding 1903 the webs of this Arctiid were "very conspicuous." It is my impression that it is again obtaining an ascendancy over its parasites, for the unsightly webs frequently recur to one's notice.

THE CUTWORMS (*Peridroma saucia*) (Noctuidæ).

Cutworms of all descriptions have proven themselves at times destructive, but the above species, this past summer and in former years in the Province and on the Coast, has been especially injurious to many kinds of plants in the garden. The greasy-looking worms are mostly nocturnal feeders, and only in cases of extreme prevalence do they adopt daylight-feeding habits. Frequently one finds a plant very badly defoliated or suddenly cut off at the ground, and for a time one is at a loss to assign the cause or observe the culprit. By carefully sifting the soil around the plant the cutworm may be found. If it belongs to the above species it will be, when full grown, about $1\frac{3}{4}$ inches in length, dull brown in colour, mottled grey or black, with a row of four to six yellow spots on the back. As a control for this class of insect a mixture of 50 lb. bran, sugar syrup, and 1 lb. Paris green, all mixed together and placed around a plant in the evening, will be effective.

THE DIAMOND-BACKED MOTH (*Plutella maculipennis*).

A small green worm measuring about $\frac{1}{4}$ inch or rather more when full grown has been very destructive this year, more so than in any of the past three years to my knowledge. Stocks and sweet peas suffered greatly, as did the cruciferous garden-truck crops. The larva is very active when disturbed and quickly falls to the ground. The cocoon is formed on the leaves of the plant attacked, and is recognized as a delicate silk gauze-like structure resembling a loose-mesh piece of lace. Within this cocoon the larva forms its pupa. There are at least two broods and probably a third supplementary brood in the Fraser Valley.

THE HEMLOCK-LOOPER (*Therina* sp.).

Two "loopers" occur on the Coast, one attacking hemlocks (Vancouver) and the other oaks (Victoria). The former, I believe, is referred to as *T. fervidaria*, while the latter has been called *T. somniaria*. I am not satisfied that we are entirely correct as to these specific names, and it is advisable to make more certain. The former species on the hemlock is one of the specially injurious in Stanley Park at the present time.

CEDAR-LEAF MINER.

The larva of a small moth is commonly to be found mining the leaves of the cedar. It is very prevalent in certain sections of Stanley Park, and greatly disfigures the trees. It will be recognized by its habits of turning the leaves brown and by producing a swelling on the affected leaf-tissues.

THE SPRUCE-CHERMES.

These and other insects affecting the timber of the Pacific Coast have been the subject of considerable investigation by Mr. J. M. Swaine, who has charge of forest-insect investigations under the Dominion Entomological Branch. It is to be hoped that when Mr. Swaine has completed his work, in which he is being assisted by Mr. R. N. Chrystal, he will be able to give our Society some of the benefits of his researches.

COLEOPTERA (BEETLES).

Otiorynchus sulcatus.

A large white grub may frequently be found in and among the roots of several plants in the herbaceous border, notably in primulas. Frequent reports have been received in the city regarding this insect. It also has been observed affecting strawberries, and growers of this crop in a few cases have lost severely. The larvæ may be found embedded in the roots of the plants, actively devouring the tissues, while those specimens in the soil will devour the roots themselves. The result is that the plants die, the effect becoming most noticeable in the spring. The eggs of the species are laid during August, and the minute larvæ hatch in September, and become quarter-grown during the fall. A partial dormancy is experienced during the winter, but in the spring the attack again progresses. It is at this time that the plants suffer most. Pupæ are formed in the soil during May and June, and the adults appear in June and July.

A close relative, *O. ovatus*, is found to be the more injurious of the two species to the fruit-grower, but *O. sulcatus* has proved more important to the gardener. The life-histories of the two species closely resemble one another, and a report on *O. ovatus* with control measures may be seen in Bulletin No. 2 of our series, page 41.

CLICK-BEETLES (Elateridae).

We have many species of click-beetles recorded in our proceedings; several of them have been shown to be injurious to blossoms of trees while in bloom. The damage, of course, to the fruit-grower is more serious than to the gardener, for the reason that the attack destroys the possibility of the resultant fruit. However, it is interesting to note that the adults of these beetles are also injurious to ornamentals.

CHRYSOMELIDS.

These leaf-feeding beetles at times pay us visits, as they did last summer, and frequently cause considerable harm. The species observed are not yet identified.

THE POPLAR-BORER (*Saperda calcarata*).

This beetle is also recorded for the Province as injurious to willows and poplars.

DIPTERA (FLIES).

There are two flies which are gaining in importance in the garden and green-houses of Vancouver—viz., the chrysanthemum leaf-miner and the narcissus-fly. The former I reported in my paper of last year, and an account may be seen in Bulletin 4 of our series, as affecting white daisies and chrysanthemums. The latter, however, the narcissus-fly (*Merodon equestris*), while also reported on at length in the same Bulletin 4, requires further mention. I again wish to warn those who are interested that this insect is rapidly increasing its sphere of prevalence. During the past spring I observed an extraordinary bad attack from this insect just outside the city limits of Vancouver. Upwards of half an acre of bulbs, buried in the ground and neglected, were severely infested. This instance is only one of many in which careless growers of bulbs neglect their grounds to increase the breeding area of this insect. I understand that when there is no sale for the bulbs it is the practice by commercial gardeners to "heel" in the bulbs, trusting to make money by any chance blooms during the spring. This practice cannot be too strongly condemned, as the unfortunate private residents of the locality suffer as a direct result. I have known cases of individuals in the City of Vancouver who have failed to harvest their bulbs owing to this fly, and I have no doubt, further, that many bulbs suffer which we do not hear about.

Three years ago the Victoria District was suffering severely, and at that time we only had actual references of a few cases of infection in Vancouver. Last year the attack was noticed in private gardens, indicating an increase. This year I feel sure that it has increased to a remarkable extent, more so than we can gauge from exact data. Furthermore, Mr. Tom Wilson, Dominion Inspector of Indian Orchards, informs me that less than 1 per cent. of a large bed of daffodils planted on the All Hallows grounds at Yale, 150 miles inland, matured. The sisters in charge remarked on the condition and produced the insect in question.

To those who are not familiar with this insect will find references in Bulletins 1 and 4 of our series. It may be recognized as a large grub within the bulb of daffodils, causing a rot. Extreme care should be taken to examine the bulbs before planting, and, when, digging, to determine whether or not the bulb is infested. No bulb should be left undisturbed during the winter; all should be pulled up for spring planting.

OTHER ANIMALS.

THE LINDEN-TREE GALL.

The gall produced on the leaves of basswoods and lindens, and recorded mainly from Victoria, but also occurring at points inland, is referred to, in one of the late Dr. Fletcher's reports, as the work of *Eriophyes abnormis* Garman.

THE RED SPIDER (*Tetranychus bimaculatus*).

Early in spring, frequently showing activity in the month of February in the City of Vancouver, these mites may be seen, forming webs of fine silk over the trunks of many of our boulevard trees. Their presence on the trunks of trees is readily discernible, resembling in a way as if the trees were dusted with sawdust. I took active specimens on February 20th this year. To satisfy myself, specimens were forwarded to Dr. Nathan Banks, of the Washington, D.C., Bureau, and he believed them to be the above species.

THE CLOVER-MITE (*Bryobia pratensis*).

This mite also occurs in association with the red spider, causing discoloration of the leaves of ornamentals.

THRIPS.

According to Comstock's classification these insects belong to the Physopoda. If you tease open any flower you will usually find a large number of very minute, active creatures; these are usually Thrips. They may be found on very nearly

every kind of flower—viz., aster, dahlias, chrysanthemums, daisies, roses, and many others. The damage caused by them is often lost sight of, but in the order we have several economic pests, the most important, in our connection, being the greenhouse thrip, which is credited as being one of the most injurious of all greenhouse insects in these parts. As yet we have had no one to study these insects under our local conditions; consequently there is some excellent work ready at hand for those interested.

SLUGS.

Slugs in the soil in this part of the world frequently are met with, and their slimy nature make them very disagreeable. Their presence is largely accounted for by somewhat sour conditions of soil, such as we have in the city. Applications of lime will give relief.

MOLES.

According to Mr. E. M. Anderson, Museum, Victoria, we have two species in the immediate vicinity of Vancouver—viz., Townsend's mole (*Scapanus townsendi* Bach.) and Gibb's mole (*Neurotrichus gibbsi* Baird). The former is 6 inches in length, while the latter is only 3. They are both beneficial, though at times a nuisance.

Mr. Day: I shall now ask Mr. Tom Wilson to read his papers on: (a.) "The Oyster-shell Scale" (published in Bulletin 5). (b.) "The Remarkable Outbreak of Locusts of 1914."

THE OUTBREAK OF LOCUSTS OF 1914.

BY TOM WILSON, F.R.H.S., DOMINION INSPECTOR OF INDIAN ORCHARDS.

This past summer has been remarkable for an outbreak of locusts which occurred. The immense range areas of the Interior and the fruit lands of the Okanagan have suffered equally from the attack, each in its own respective manner.

True locusts, or short-horned grasshoppers, belong to the entomological family Acridiidae. Some of the most numerous and destructive insects belong to this family. They are widely dispersed throughout many different parts of the world, and do periodical damage in those different parts of the world. They are mentioned in many ancient writings; for instance, we read of a plague of locusts in ancient Egypt, a country which still is subject to occasional infestations. They are found in both the Old and New Worlds: Southern Europe, Algeria, India, South Africa, in the Eastern Hemisphere, and in the Argentine, Mexico, and some of the Western United States, as also on the Canadian great plains, and now, owing to several different trains of circumstance, in British Columbia.

The insects of this family have antennæ short, much more so than the body; the ovipositor of the female also short and composed of four separate plates; the tarsi are three-jointed. The hind legs are the longest and usually have stout femora, especially near the base.

Amongst those species of this family that did most damage during the past season, for there were several species involved, were *Melanoplus affinis* and *M. femur-rubrum*, the red-legged locust. The first district in which they came under the writer's notice was in the Similkameen Valley, near Princeton, about the middle of July. They were so numerous that the flight resembled a snow-storm. We found that crops of clover, alfalfa, and the ordinary hay-crops had been much injured, so much so as to bring about an appreciable shortage in weight per acre, while the ranges or cattle-grazing grounds had been rendered bare.

A little later in the season we were in the Okanagan country near Kelowna, and the same conditions were found to exist. In one young orchard which we visited, where that most reprehensible practice "clean cultivation" was being carried on, we found the locusts, after having eaten off the surrounding "range," were tackling