pression of the opinion that I was fully justified in adding to the already long list of varieties of this genus.

I regret that another butterfly to which I applied a tentative name, *Lycene quesnellii,* still remains in my cabinet represented by two worn specimens, but I trust that by the assistance of some of the members of the B. C. Entomological Society I may yet secure a large series of this butterfly from its local habitat, that of Au Bah Lake, Quesnelle. Any of our members taking this Blue in that locality will confer a great favor by submitting them to me for examination.

I extremely regret that I am unable to be present to read these rambling notes, but wish to express my best wishes for the success of the British Columbia Entomological Society.

J. W. COCKLE,
Kaslo, B.C.

INSECTS OF THE YEAR IN BRITISH COLUMBIA.

This is a very comprehensive title and a large order. I hope I shall not be expected to deal with all the insects of the year in British Columbia. I presume that the thought in the mind of the party who arranged the programme was that I would be expected to deal with destructive or noxious insects.

Even if it were contemplated that I would deal with all the destructive insects of the year, the subject would be much too large to be dealt with in the time allotted. I see that there are seven other subjects to be dealt with, and each in turn must receive a fair share of the time at our disposal. I will, therefore, confine myself to a few of the most destructive insects with which we have to deal in this Province.

I may say that we have always had them with us, and mankind has had from the earliest history of civilization to suffer more or less from the destruction of insect pests, which prey on fruit, vegetables and grain. It is the common experience of all mankind since the Creation.

We have evidence of the existence of noxious insects even in geological times. Dr. Dawson, our own Canadian Geologist, has abundantly demonstrated this fact. In the early history of Egypt and Palestine it has been shown that the inhabitants of those countries suffered a great deal more from the depredation of insect pests than we are suffering to-day, although I am bound to admit that it is the experience of economic entomologists the world over that there is rapid increase in the number of insects that afflict the agriculturist, horticulturist and gardener.

British Columbia, being a comparatively newly settled Province, has suffered less than most countries from destructive insect pests, although we are, by our geographical position, and having trade relations with practically every nation on earth, especially the Orient, more exposed to insect invasion than any other section or province of North America.

Early in the history of the Province the pioneer fruit-growers wisely took precaution to protect the country from insect invasion. We profited by the experience of California, and were determined to protect ourselves. In this we were aided by the Government of the day. In 1890 steps were taken to create a Board of Horticulture, with power to make regulations governing the inspection of imported nursery stock, trees, plants and fruit. The Regulations of the Board have, by Act of Parliament, the force of statute law, and it is entirely owing to the provisions of these Regulations that the Province is free from many of the most destructive of insect pests, which inflict such financial loss to our neighbours to the south, and the Eastern Provinces of our own Dominion.

We have, however, a few very destructive pests. I think it is wise to deal with these. I presume that the object of this Society is to study insect life with the view of protecting the country from the depredations of destructive insects. I think we may take this for granted, and therefore I will deal briefly with some of our most injurious insects.

Lepidosaphes ulmi, commonly known as the Oyster Shell Scale, or Mussel Scale. I can well remember when this Scale was not known either in California, Oregon, Washington or British Columbia. I was quite familiar with conditions in these States up to, and including the year 1885, and am clearly of the opinion that this Scale did not exist anywhere on the Pacific Coast prior to the year 1887, and that probably it was imported on nursery stock from Ontario.

I saw it first on some grand old apple trees in the vicinity of London, Ontario, in the year 1888. The owner of the trees was entirely oblivious of the presence of the Scale, and was greatly astonished when I suggested that he should examine it under a pocket lens. I myself was amazed at the number of scales that were sucking the very life out of these beautiful trees, which were in full fruitage.

On the completion of the Transcontinental Railroad we began the importation of large quantities of nursery stock from Ontario. This stock was planted mostly on the Lower Mainland, Vancouver Island and the Islands, and I have no doubt whatever that the Oyster Shell Scale was imported on this stock.

Fortunately for the Province, it is rarely found east of the Cascade Mountains in British Columbia. I did discover a case of infection in the Grand Forks Valley last October. In looking over the fruit that was

being packed for shipment, I detected the Scale, traced the infection to the orchard from which the fruit had been sent for packing, and notified the owner that unless immediate steps were taken to destroy the infection, I would quarantine the orchard, although it is a large commercial concern, consisting of thousands of bearing trees, and in the vicinity of several very promising young orchards.

I have the assurance that the infection will be promptly dealt with. It is by taking such precautions as these that we have been enabled to keep the interior of the Province comparatively free from this pest.

Coming now to the life history of this insect, it completes the round of life once a year. It belongs to the order "Hemiptera," Family Coccidae, sub-family Diaspinae (Armoured Scales). It is owing to the fact of being protected by the covering scale that it is one of our most difficult pests to eradicate.

The winter is passed in the egg, underneath the protecting scale of the female. I have here a sample of the egg clusters, which I will submit for the inspection and information of all who should care to examine it. These eggs hatch out usually the latter part of May on the Lower Mainland, probably from one to two weeks earlier on Vancouver Island.

It is after the insects are hatched, and the tiny youngsters are seeking for a place to settle, that they are most exposed to the effect of our contact sprays. They cannot be poisoned, but must be destroyed by contact sprays.

If our fruit-growers will keep a close watch from the middle to the last of May, and immediately apply contact spraying material, such as the "Black Leaf 40," a compound of Sulphur and Nicotine, and spray the trees thoroughly with this mixture, they will do a great deal to eradicate the pest.

If not destroyed at this time, the young insect establishes itself at a favorable point on the bark of the trunk and branches. A favorite location is on the fruit spurs. It inserts its beak and begins to suck nourishment from the tissues under the bark.

As the female lays from fifty to eighty eggs, the increase is exceedingly rapid, and with all those little suckers extracting the juices of the fruit-tree, we may expect a rapid deterioration both in quantity and quality of the fruit, for the juices that should properly go to the building up of the tissues of the fruit are supporting an encrustation of these Scales.

It takes about three months from the date on which the young are hatched out till the female attains full maturity, and begins its egg-laying process. As soon as the tiny insect establishes itself, white waxy filaments extend from the back of the young. This excretion mats down

and soon forms a protecting covering, which together with the skin of the first molt forms a covering scale. Another molt occurs later, and a second cast-off skin serves to enlarge the covering scale. The last molt occurs in this latitude, probably about the first of August, or sixty to seventy-five days after the eggs hatch out.

As stated above, the female begins to deposit her eggs soon after the second molt. After she lays her eggs, her life work having been completed, she shrivels up and dies. The eggs remain under the scale until the following spring, thus completing the round of life.

In the destruction of this pest, I have pointed out that the most vulnerable period of their existence is after the young have hatched out, but this is generally a busy time with fruit-growers and owners of fruit-trees, and protective measures are usually neglected.

Fortunately we have in the commercial Lime-Sulphur solution, if prepared in the proportion of one to nine or ten, and applied with a spray pump having great force, a fairly good remedy for the destruction of the pest.

Unfortunately this insect is exceedingly omnivorous, one of its favorite food plants being the wild crab-apple, which is found in vast quantities over the entire Lower Mainland and Vancouver Island. I believe it is owing to the existence of this natural plant food that we have not succeeded better in destroying this pest.

I believe the time is not far distant when the Government will be obliged to bring down legislation to compel all owners of land throughout the Province to cut down and destroy all wild crab-apples. If this Society will give this suggestion their favorable consideration, and cooperate with me in making this recommendation, I think it would be one of the most useful things it can do.

Although we have many other minor scale insects, none of them, I believe, are of sufficient economic importance to be dealt with in this paper. My desire is to deal with the most destructive pests, irrespective of the order to which they may belong.

This leads to a consideration of the order "Lepidoptera," Family Lacosmoidae, of which the *"Clisiocampa americana,"* commonly known as the Tent Caterpillar, is the most prominent representative, and which has been very destructive in some sections of the Province during the year, but compared with sections of Washington, we have not suffered nearly as much by the depredations of this insect.

There are several species of the Tent Caterpillar, and curiously enough, most of them belong to the Pacific Coast. The *"Clisiocampa americana"* is quite common in the Eastern States and our Eastern Provinces, but I do not think it is quite as destructive in the East as it is on the Pacific Coast.

The moth is buff color, or dull brownish red, with two transverse whitish, or pale yellowish, lines on the fore wings. This is the distinguishing mark from that of the forest Tent Caterpillar, which belongs to the same family and is closely allied.

The *"Clisiocampa"* Moth appears early in summer and lays its eggs upon the tender shoots and fruit-spurs of the year's growth. The eggs are laid in a ring-like cluster, about the twig, and are glued together by a substance which is practically impervious to our most caustic sprays.

The eggs hatch out early in spring, just at the time when the tender leaves are available for the food of the young caterpillars. Soon after hatching they begin to form a tent in the nearest fork. Here they live in company, moving out from time to time to feed. It is not uncommon to see all the foliage destroyed in the vicinity of these nests. Any season when they are very plentiful an entire orchard may be defoliated. This has happened at several points on the Lower Mainland and on Vancouver Island during the past summer.

Fortunately we have a remedy whereby these leaf-eaters may be speedily destroyed. Arsenate of Lead, in the proportion of three pounds to a barrel of water, if carefully sprayed on the foliage before any serious injury has been done, will speedily destroy them. The Arsenate of Lead is preferable to any other Arsenical sprays, because of its adhesive qualities.

The caterpillars must feed on the foliage. It is their only food, and if the material has been properly prepared and applied, they must inevitably perish.

I would recommend that a close watch be kept on the trees during the pruning season, and the egg clusters destroyed. This is the most economical method of dealing with the infection.

After the caterpillars have obtained their full growth, they abandon the nest and crawl to some convenient shelter in the vicinity. They often seek the eaves of houses and sometimes fences, and weave a rather thin cocoon of yellowish texture, this tinge being caused by a fine powder of the color of sulphur. In these cocoons transformation occurs, the pupal state lasting about three weeks.

After the moth emerges, she seeks the most desirable position for laying her eggs, and she seems to be endowed with sufficient intelligence to place the egg masses where the young may find proper food after hatching.

This completes the life cycle of this insect. Fortunately it is subject to a fungous disease which carries them off very speedily. It is not uncommon to see thousands of them dead on a bush or tree. They are subject also to a parasitical attack, to a slight degree. Entomologists will often notice small white, globular eggs on the heads of the caterpillars.

These hatch in due course, and the larvae penetrate the body of the caterpillar, which is quickly destroyed.

The *"Clisiocampa americana"* attacks various deciduous trees, but the apple and wild crab-apple seem to be preferred, so that taking the two most destructive insects with which we have to contend in British Columbia, it will be seen that the wild-crab, to which reference was made when I was dealing with the Oyster Shell Scale, constitutes a real danger, which seriously interferes with the eradication of this destructive pest.

It would be a relief to not only the fruit-growers, but those who have shade-trees and plants, which are liable to be attacked by the Tent Caterpillars, if the wild crabs throughout the Province were destroyed.

East of the Cascade Range the Tent Caterpillar is not nearly as common as it is on the Coast. I think this is largely owing to the fact that great care has been taken in the inspection of nursery stock, for it is practically impossible for a tree or plant having an egg mass of the Tent Caterpillar to pass the rigid inspection, which has been in force during the last twenty years.

This is also true in regard to the Oyster Shell Scale. No tree or plant infected with either pest is permitted to pass inspection.

The next most destructive pests are the Aphides Family, which include the Woolly Aphis, *"Schizoneura lanigera,"* Plum Aphis, Green Aphis of the apple, and Black Aphis of the peach and cherry.

These are all sucking insects, and more or less in evidence everywhere that fruit is grown. We have also the Hop Aphis, which is very destructive some seasons, but which is easily controlled by using contact sprays. I find by experience that the "Black Leaf 40," to which reference has already been made, has given by far the best results.

I have the most flattering testimonials from various sections of the Province, stating that nothing that has been used hitherto has proved so effective.

I may say it has also proved a very excellent remedy against the aphis which attack cabbage, turnips and other root crops. A test was made with the "Black Leaf 40" at the Government Old Men's Home, in Kamloops, this year, and both superintendents of the Gaol and Old Men's Home have reported that nothing they have ever tried has given such good results, and that their garden crops were saved this year by the use of this very valuable insecticide.

I refer to this for the guidance of those who may be interested in protecting their gardens and bushes.

The *"Pulvineaia occidentalis"* has been more or less in evidence on the Coast during the present year. It is not a very destructive pest, and yet a bush may be greatly injured by its attacks. I have seen several

such during the present year. The Kerosene Emulsion has proved the best remedy for this pest.

During the coming year it is my intention to use the Distillate sprays more extensively. They are comparatively cheap and easily applied, and seem to give excellent results, both in California and Australia. Considering their cheapness, and the ease with which they can be applied, I quite expect that they will become very popular in dealing with scale insects.

I have made provision for supplies of this very popular spray for the coming season. The order has already been sent forward.

In conclusion, I may say it is my intention to keep the public well informed as to the general merits of the various spraying materials, which are being constantly introduced.

THOMAS CUNNINGHAM,
Inspector of Fruit Pests.

Mr. Treherne—In connection with the Oyster Shell Scale, may I inquire if the scale is to any extent controlled naturally by parasites in B. C.? In the southern portion of Ontario where the majority of the nurseries are situated, the scale is usually commonly parasitised by *Aphilinus mytilaspidis.*

Mr. Cunningham—Yes, large numbers are parasitised.

Mr. Wilson—If the scale was introduced into B. C. on nursery stock, as you suppose, how do you account for it being taken miles away from orchard land? I have found it on June berry, Barberry, Vine Maple, as well as on the crab-apple, and also at an altitude between 2-3000 feet.

Mr. Cunningham—The medium of spread is undoubtedly birds, and I have found young scales on the legs of flies.

Mr. Treherne—If the Oyster Scale is so common in the forests, would the destruction of crab-apple trees in the vicinity of orchards effectually control this insect?

Mr. Cunningham—I claim that in addition to the crab-apple trees you mention, all crab-apple trees on the lands of speculators and land companies should, by Government enactment, be destroyed. I ask this Society to assist me in my endeavors to obtain Government control in connection with these trees which undoubtedly represent a serious nuisance to the Province. The acreage of crab-apple trees is so tremendous and the ground they occupy so valuable that it would be a wise measure to destroy them, as they harbor injurious insects and in particular this Oyster Shell Scale.

Mr. Bush—I quite agree that the crab-apple trees are bad and as they grow more or less in clumps, their destruction would not entail so much labor as one would think.

Mr. Wallace—How about the Government lands?

Mr. Cunningham—Let them also be attended to.

Mr. Chairman—I am sure we have to thank Mr. Cunningham for his excellent paper, and I trust he will favour us with another of equal practical importance another year. I wish now to draw your attention to the next paper on the programme, the commercial culture of the Narcissus. A recent importation in the form of the Narcissus Fly from Holland is causing much consternation to the growers of bulbs on Vancouver Island, and we are pleased to welcome Mr. Wallace here today as a practical grower of this class of stock. It has been the special endeavour on the part of our secretary to introduce the practical side into these meetings. I will now call on Mr. Wallace.

Mr. Wallace proceeded to give the members a short extempore account of the trouble the Narcissus Fly has been to him on Vancouver Island, dealing briefly with methods he had himself tried towards eradicating this insect. (His paper will appear at some later time.)

Mr. Chairman—Our secretary has been fortunate enough to obtain an account of the depredations of this Narcissus Fly by Mr. Priestly Norman of Victoria, a gentleman who has been in close touch with the commercial aspect of bulb-growing on the Island. I will now ask our secretary to read Mr. Norman's paper.

"MERODON EQUESTRIS" IN SOUTHERN BRITISH COLUMBIA.

"Merodon Equestris," or Narcissus Fly, is an insect, resembling, roughly speaking, an ordinary bumble-bee, about the size of a large blue-bottle or blow-fly.

A still closer resemblance may be drawn to the horse-fly of the Upper Country, with which many are familiar. The similarity to the latter insect is so striking that the name *"Equestris"* was derived from it, this insect being much better known to the world generally, and having a far greater sphere of action than the Narcissus Fly, whose ravages are principally confined to the Narcissus alone.

In speaking of this insect, let it be understood that I make no assertions. I only give my observations and opinions. Having accepted as theories, several of the popular dogmas connected with this insect (which even at first hand are vague and unscientific), in the first place I was