

for the succeeding year is arranged by joint committees uniting all the various societies combined. Prof. W. B. Herms is Secretary-Treasurer of the Entomological Society, and he resides at the University of California, Berkeley, Cal. Should any of our members wish to become members of this Society, I am sure that Professor Herms would be willing to give you assistance and notification regarding the by-laws. It might be quite advisable if a small representation of our members went to Seattle in the spring to attend the meetings, to show our appreciation of the fact that the Pacific Association of Scientific Societies are bringing the results of their labours near to our doors. California is too far for most of us to go every year, but if a good turn-out of North-western entomologists were present at this spring meeting it may impress the authorities of the advisability of invading our territory once every so often.

A REVIEW OF APPLIED ENTOMOLOGY IN BRITISH COLUMBIA.

BY R. C. TREHERNE, EXPERIMENTAL FARM, AGASSIZ.

In an attempt to supplement the paper that our President, Mr. Day, has just presented, representing as it does a review of the systematic side of the science in the Province, I will refer, in as few words as possible, to the history and progress of the economic considerations that have taken place within our boundaries.

As will be noticed through this paper, applied entomology in this Province originated and has its place in the published annals of the British Columbia Fruit-growers' Association. Sundry notes and observations by those interested in fruit-growing in the early days brought forth remarks concerning insects. Consequently we find that the phase of entomology, dealing with insect pests of the agriculturist, and referred to as "economic entomology," began almost conjointly with the formation and foundation of the British Columbia Fruit-growers' Association. This Association began its active career in the year 1889.

In 1897 we find "An Act respecting the Provincial Board of Horticulture," cited as the "Horticultural Board Act" (1894, c. 20, s. 1), in operation. This enactment was the result of two previous Acts regarding the Board of Horticulture, the first coming into operation about 1892. In the wording of the Act, it states that "the Lieutenant-Governor in Council shall appoint . . . a competent person especially qualified by practical experience in horticulture, who shall be known as 'Inspector of Fruit Pests.'"

Mr. Ernest Hutcherson, of Ladner, was first appointed as Inspector of Fruit Pests in about the year 1892 under the authority of the original Board Act. Two years later he was succeeded by Mr. R. M. Palmer, who occupied this position in the neighbourhood of eight years, finally handing the office over to Mr. Thomas Cunningham in 1902, who to-day (1914) is still operating the Act in a most efficient manner. Mr. Cunningham, previous to his appointment, had charge of the fruit-inspection work since 1896.

The "Horticultural Board Act," however, after various changes, insertions, and amendments, finally, in 1911, was combined in the "Act respecting Agricultural Associations," and cited as the "Agricultural Associations Act," Part IV., the former Act and title being repealed.

As I have already said, we look to the Horticultural Board and to the Fruit-growers' Association for our information relative to the economic pests of fruit and agriculture of the time.

Two men compiled and published notes and remedies on insect pests of the agriculturist in the Province from the records of the British Columbia Fruit-growers' Association. Mr. J. R. Anderson, formerly Deputy Minister of Agriculture, and Mr. R. M. Palmer, formerly Inspector of Fruit Pests and later succeeding Mr. Anderson as Deputy Minister of Agriculture for the Province, are responsible for the dissemination of practical knowledge on economic entomology in these early

* Hort., chap. 94, sec. 9.

times. The various members of the Executive of the Horticultural Association, through their interest in the fruit-growing problems of the Province, have added much to our entomological knowledge.

As a result of their labours, in 1895 the Horticultural Society and Fruit-growers' Association of British Columbia published a "Pest and Remedy Supplement" as adopted by a committee appointed at an annual meeting of the Society. This committee consisted of Messrs. G. W. Henry, Hatzic; Thos. Cunningham, New Westminster; Michael Baker, Victoria; R. M. Palmer, Victoria; G. Hadwen, Duncan; E. Hutcherson, Ladner; and T. A. Sharpe, Agassiz; and it was under the direction of these gentlemen that the "Supplement" was issued.

The first officers of the Horticultural Society were J. M. Browning, Thos. Cunningham, G. W. Henry, and A. H. B. McGowan. In the six succeeding years a number of officers were appointed to the Executive of the Society, among them being W. J. Harris, Tom Wilson, John Kirkland, Wm. Knight, T. G. Earle, and J. R. Anderson.

In 1899 and 1901 two reports by Mr. R. M. Palmer, Inspector of Fruit Pests, were issued, containing remedies and suggestions recommended for adoption by farmers, fruit-growers, and gardeners of the Province, prepared for the Provincial Board of Horticulture.

In 1907, and reissued again in 1908, Mr. Thomas Cunningham, as Inspector of Fruit Pests, published a "Spraying Bulletin" on "Orchard Cleansing."

In 1908 Mr. J. R. Anderson, at the time Deputy Minister of Agriculture, published Bulletin No. 24 from the Department of Agriculture of British Columbia, and he titled his bulletin "Farmers' Foes and their Remedies." In presenting this bulletin to the agriculturists of the Province, Mr. Anderson states in the introduction: "The purpose of the present bulletin is to afford a description in a succinct form of those pests which are prevalent, reported, or are likely to be introduced in the Province, and their natural enemies, with the remedies prescribed by competent authorities or which have been found by experience to be the most effective." This bulletin represents careful and painstaking construction and to-day is the most useful issue we have relative to insect pests of the Province.

Touching the subject of artificial control measures and spraying, some interesting records can be gleaned from private journals and diaries. Few published records appear to be available on the number of machines and to what extent spraying for insect pests was practised by the fruit-growers. Consequently, while the following records appear to stand, it is just possible that omissions have occurred to some extent.

In 1885 Mr. Thomas Cunningham bought a 45-gallon spray-pump from the Field Spray Pump Company of New York. Mr. William Clarkson, of New Westminster, also sprayed for aphids and apple-scab with a similar hand-pump of his own purchase in the 80's. In 1888 Mr. W. J. Brandrith, of Ladner, owned a "stirrup" spray-pump. This was of cast iron with a wrought-iron plunger, and was only capable of throwing a spray some 12 feet or so. Mr. Brandrith in 1890 again arranged for the purchase and sale of six 5-gallon bucket Spramotor hand-pumps to various fruit-growers in the Lower Fraser Valley. These pumps cost, laid down, \$30 each. In 1892 he again bought a No. 2 40-gallon Spramotor for his own use.

Bordeaux was in use between the years 1885 and 1890 at the 4-4-50 formula and whale-oil soap, which latter was imported from the Standard Soap Company of San Francisco, Cal., at the time.

In the early 90's Mr. T. A. Sharpe, Superintendent of the Dominion Experimental Farm, Agassiz, had a Spramotor hand-pump sent out from London, Ontario, for use on the Government Farm. As far as can be gathered, at least six more spray-pumps from the same firm came into the Fraser Valley and on to Vancouver Island about the same time. Mr. Tom Wilson, on his farm near Harrison, in the Fraser Valley, bought a Myers spray-pump in 1892 and fitted it to a barrel. He

says: "The only thing we used to spray for was the green aphid, and we used tobacco-stems steeped in water. Previous to that we used a solution of concentrated lye or caustic soda applied with a swab or whitewash-brush to the bodies and larger limbs of the trees. About 1893 woolly aphid used sometimes to be noticed, and it was the practice to apply a little raw coal-oil to the affected parts with a swab. Oyster-shell scale, when treated at all, used to get a lick of lye and water. I remember seeing this scale in the woods in the early 90's."

Records for the Okanagan District are limited. In 1895 one hand-power Bean sprayer was in use on the Coldstream Ranch, Vernon. With the exception of a brass Spramotor No. 2, owned and bought by Mr. Price Ellison, M.L.A., later and at the present time Minister of Agriculture for the Province, it is doubtful whether any other existed in the Upper Country previous to this time, although conjointly in the Lower Mainland spraying fruit-trees for fungi and insects was more or less general. Spraying, however, for insect pests did not become general all over the Province in the fruit-growing areas until about 1900.

As a precautionary measure to the rapidly increasing fruit-growing industry, and to safeguard this industry from the introduction of more insects than those indigenous to the Province, a station was built in Vancouver in 1895, to be used for the inspection of all fruit-trees and vegetation that were passing into the Province from points outside. In 1896 the fumigation of incoming nursery stock, combining tree to tree-inspection with fumigation, was begun by the Provincial authorities. Mr. Thomas Cunningham had charge of this work as a member of the Board of Horticulture. To Mr. Cunningham is due the credit for the erection and manipulation of this detention-shed for incoming vegetation, and to his opinion on the Executive of the Board we are indebted for the foundation of the present efficient system of pest-control.

In 1900 the Dominion Government, directed by Dr. James Fletcher, Dominion Entomologist and Botanist, operated a separate fumigation-station in Vancouver under the "San Jose Scale Act." Mr. Tom Wilson had charge of this work. It was not until several years later that a co-ordination of the Dominion and Provincial work in fumigation and inspection took place.

Occasionally we find records that certain very dangerous insects were evading the system of fumigation and inspection. In 1896 an infestation of what, at first, was thought to be the dreaded San Jose scale was noticed at Popcum, east of Chilliwack. It afterwards proved to be the Putnams scale. In 1902 or 1903 some San Jose scale were discovered on trees which had passed through the detention-sheds. In 1904 an outbreak of codling-moth occurred at Kamloops. Spraying the trees, of which there were, roughly, 3,000 growing in and around Kamloops at the time, was undertaken by the Government, but a certain lack of co-operation on the part of the orchard-owners hindered the work of control, so that the outbreak continued until about 1910, when the infestation was believed to be safely overcome. For the past four years no further evidence of the reappearance of the moth or its larva has been received from the district, which indicates the control-work has been successful.

In the same year (1904), again, another and more serious outbreak of codling-moth took place in the southern portion of Vancouver Island. Deputies of the Department of Horticulture were instructed to locate and destroy all infected fruit and larvæ, and endeavour to induce the growers to co-operate in the matter of control. In 1909 the fight still continued against the moth, as many as 17,582 trees being found infected, and 7,610 fruits from which larvæ were taken. Urgent measures on the part of the growers and the Government were then undertaken, with the result that a few years later the moth infestation was reduced to a very low condition.

The introduction, localization, and spread of these dangerous pests had the double effect of increasing the rigidity of the inspection and fumigation regulations and of stimulating the cause of artificial control measures in the field, for to-day we

find the system of inspection and fumigation is very complete and efficient, the possibility of the introduction of any dangerous insect pests being reduced to a minimum, and spraying in the orchard has become general throughout the Province. Mr. Cunningham, assisted by Mr. W. H. Lyne, Assistant Inspector of Fruit Pests, in close co-operation with the Dominion Division of Entomology, represented up till October, 1911, by Mr. Tom Wilson, acting under the Dominion "Destructive Insect and Pest Act," operate the co-ordinated inspection and fumigation work in Vancouver, whereby every plant product is duly given individual inspection and fumigation within certain regulations. The writer took over the work from Mr. Wilson in the fall of 1911.

The first power-spraying outfit (Bean) was brought to the Province in 1910. To-day there are nine large machines at work in the various sections of the Province operated directly by the representatives of the Provincial Government. Several private individuals and fruit-growing concerns also enlist the aid of these machines to reduce the margin of loss in their orchards. At present between Armstrong and Penticton there are about twenty-five private machines in operation. It is curious that the Lower Fraser Valley, which was the original fruit-growing area of the Province before the Okanagan became famous, forming as it did the advance guard in the use of the spraying-machine, and first illustrating the principles of pest-control in the early days of the Province, has let other sections go ahead and leave them in a not very much better position than the early 90's. From the experience of the writer during the past few years, it would seem apparent that there are no more than fifteen individuals in the valley who own and operate their own spray-machines, hand and power, for the control of orchard pests and diseases.

In May 1912 Dr. C. Gordon Hewitt, Dominion Entomologist, established a field station for investigational research in entomology, the object being to study the life-history and habits of insects in the Province, preferably those of economic importance and their control. The writer has the honour, at the moment, of occupying the position as field officer for British Columbia under the direction of the Dominion Entomologist. Through the courtesy of Mr. Arthur Brealey, fruit-grower, Hatzic, in the Lower Fraser Valley, the Dominion Division of Entomology was permitted to establish temporary field-quarters on his farm for the purpose of investigating the life-history and habits of *Otiorynchus ovatus*, the strawberry-root weevil, an insect which was causing very considerable annoyance to the growers in the locality. These temporary quarters at Hatzic were removed to permanent ones on the Dominion Experimental Farm, Agassiz, also in the Lower Fraser Valley, in the spring of the next year, 1913.

In the spring of 1912, again, the Provincial Department of Agriculture appointed Mr. W. H. Brittain, at the request of the British Columbia Board of Horticulture, to the position of Entomologist and Plant Pathologist for the Province. Mr. Brittain commenced to work collecting data on fungous diseases and insects of the Province in April, 1912. His headquarters were at Vernon. In the fall of 1913 he accepted a position in charge of the Biological Department at the Truro Agricultural College, Nova Scotia, thus leaving British Columbia at this time. The results of his investigations in insects in the Province are for the most part recorded in our proceedings.

Under the date of November 12th, 1912, Seymour Hadwen, D.V.Sc., First Assistant Pathologist, Dominion Veterinary Department, at the branch office on the Experimental Farm, Agassiz, published an account on the "Economic Aspect and Contributions on the Biology of Warble-flies" under the auspices of the Dominion Department of Agriculture, Health of Animals Branch.

The records of entomological work accomplished within the Province since 1911, and the workers who are responsible for the dissemination of knowledge at this time, will be found in the publications of the proceedings of the Society. As the science stands to-day, everything bids fair for the future. The numbers of workers are increasing and the demand for knowledge is being felt. The moment should not pass without one last reference to the splendid foresight shown by the several names

mentioned in this paper in safeguarding the agricultural interests of the Province by their sound judgments and sane measures, embodied in the regulations of the Board of Horticulture, against the introduction of dangerous insect pests—pests which are causing considerable annoyance and expense to fruit-growers and farmers in other portions of the Dominion of Canada, and which might with ease be introduced through the medium of trade into this Province, which in the early 90's was only just beginning to develop its wonderful agricultural and horticultural resources. To-day this Province stands, in comparison to its fruit-growing areas, the cleanest of any fruit-growing country in the world. There is little codling-moth, no San Jose scale, no very serious insect pest in the orchard or on the farm, and we look back to the few men, whose names have been incorporated in this paper, through whose wise judgment and who through the exercise of proper precaution made this condition possible.

If it had not been for the Horticultural Regulations, for it has been on the basis of these regulations that our economic entomology has been built so far, and about which mention has been made, our history of British Columbian entomology up to the present would have been very different. Instead of applying quarantine and preventive measures as have been done and as we are in the main doing now, we should have been studying and controlling insect pests of the farmer, of more serious intent than any we have with us under present conditions. As such the published record of entomology in British Columbia would have been much different.

No praise, therefore, is too great for those whose energies have placed this Province on an independent pedestal in the field of economic or applied entomology, causing her to stand an example to all of the practical and elementary principles of entomology, which other Provinces and States failed to follow until too late.

Our work for the future will be to retain this standard of immunity at all costs of labour and expense, and we will endeavour at the same time to supplement our knowledge on those insects of economic importance in our midst and indigenous to the Province. There are few countries with such an interesting entomological fauna. There are few studies that offer such scope for individual research as a study of this same entomological fauna; consequently the field lies open, in systematic or economic investigation, in popular or scientific research, for those that may wish to place their energies and the products of their brains towards a furtherance of our knowledge on British Columbia insects, their lives and their characteristics.

MITES: THEIR CLASSIFICATION AND HABITS, WITH SOME OBSERVATIONS ON THEIR OCCURRENCE IN THE OKANAGAN.

By J. SYDNEY DASH, B.S.A.

The work of mites has been brought so much before us in this Province throughout the past season (we need only mention here the discovery by Güssow of a species of *Eriophyes* associated with a kind of "silver-leaf," and also by Brittain of a species of the same genus causing apple-blotch on the fruit) that the writer, when asked to make a few remarks at this meeting, thought it would not be out of place to treat briefly on this class of minute animals, so that a more exact idea of the nature, classification, and importance of the class may be obtained.

The animal kingdom, as you are probably aware, is divided into a number of branches or phyla, each phylum having its own peculiar characteristics. The phylum with which we have to deal is the *Arthropoda*, a group of animals having jointed bodies and jointed legs. In this phylum are the following classes:—

1. *Crustacea*.—These are water-breathing animals. They possess many legs and hard outer or exoskeletons; head and thorax are united. Example: Crabs, lobsters, crayfish.

2. *Arachnida*.—These are land forms, possessing eight legs, head and thorax united. Example: Scorpions, spiders, mites, and ticks.