

Anopheles punctipennis Say. Although not common during 1919, this species may be fairly abundant during wet seasons. The larvæ occur almost everywhere throughout the district in roadside ditches, surface pools, and alder swamps.

Anopheles occidentalis Dyar and Knab. This anopheline is found sparsely throughout the district. The larvæ occur mainly in roadside ditches and alder-swamps.

Several species of **Ædes** were also taken in the Fraser Valley, the identity of which could not be determined with certainty on account of the scantiness and condition of the material obtained. Dr. Dyar kindly examined these and reported on them as follows: **Ædes fletcheri** or **riparius**; **Ædes excrucians** or **fitchii**.

The writer desires to express his thanks to Dr. H. G. Dyar for his kindness in verifying his findings and for determining the identity of **Ædes punctor** and **Culiseta impatiens**.

A FURTHER REVIEW OF APPLIED ENTOMOLOGY IN BRITISH COLUMBIA.

BY R. C. TREHERNE, ENTOMOLOGIST IN CHARGE FOR B.C. DOMINION
DEPARTMENT OF AGRICULTURE.

Notable progress has been made in applied entomology during the past six years. The disastrous war in Europe between 1914 and 1918 undoubtedly checked progress to a marked extent, and many entomologists who assisted so materially in establishing our science during its early years in British Columbia will not return. Some lost their lives in France; others who enlisted for the Empire's service, but who survived, have found their billets in other industries in other parts of the world. The campaign for greater production which was carried on industriously during the middle years of the war undoubtedly proved a leading string to foster the development of economic entomology. The closing of the avenues of loss on the farm proved a great incentive to popularize entomology. Farmers, some for the first time, have learnt to realize the serious inroads insect pests are capable of causing in their financial returns. The improved prices for agricultural commodities of recent years also has acted as an impetus towards providing better equipment for fighting agricultural pests, and this same feature has induced growers to take a wider interest in life-histories and modes of combat of our injurious insects.

During the years 1914 and 1915 the names of those engaged in economic-insect investigations numbered three or four. To-day, or rather during the season of 1920, there were twelve individuals who have been actively engaged in solving economic-insect problems. It is true that the majority of these investigators commenced their work in the last two years or since the termination of the European war, and it is pleasing to note that

fully half the number are men who have seen active service at the Front. If the progress shown during the past two years is continued, the outlook for our science is bright indeed. I propose mentioning briefly the progress of entomology in the Province for the past few years on the supposition that our historical notes may become confused with the wealth of data we expect to appear in the near future.

During 1914 the writer, who had charge of the Dominion Entomological Laboratory and Field Station at Agassiz, published Bulletin No. 8 of the Dominion series on the strawberry-root weevil. This publication was based on studies carried on at Hatzic during 1912 and 1913. It is interesting to note that this bulletin was the last to appear as an Entomological Division bulletin of the Experimental Farm system. The formation of the Dominion Entomological Branch as a separate Department under the Dominion Department of Agriculture took place under the ægis of Dr. C. Gordon Hewitt on February 26th, 1914. During the summers of 1914 and 1915 the writer was engaged in a study of the cabbage-root maggot, the wheat-midge, and other insects of local interest in the Lower Fraser Valley.

All entomological investigation up until the close of 1915 under the auspices of the Dominion entomological service took place in the Lower Mainland and Island. It will be recalled that Mr. W. H. Brittain, who entered the Province in the spring of 1912 as Provincial Entomologist and Plant Pathologist, established his headquarters at Vernon, in the Okanagan Valley. The interior sections of the Province were thus under his care, and it may be stated that Mr. Brittain and the writer agreed to this tentative division of territory so as to avoid all possibility of conflict in the matter of investigating insect problems. Unfortunately, Mr. Brittain left the Province in 1913 to return to Nova Scotia. Mr. J. W. Eastham succeeded him at Vernon in the spring of 1914. Mr. Eastham, being a plant pathologist in leanings, delegated Mr. M. H. Ruhmann, his assistant, to conduct such studies as were necessary in entomology. Mr. W. H. Lyne, operating under Mr. Thomas Cunningham's division of Provincial fruit inspection, conducted certain field-work operations, assisted by his staff of local field inspectors, against the codling-moth. In the New Year of 1915 the new Provincial Court-house at Vernon was completed and the Provincial Entomological Branch took up its quarters in this building under the direction of Mr. J. W. Eastham. During the summer of 1915 Mr. Eastham decided to move to Vancouver, where he established pathological headquarters in the Vancouver Court-house, the Vernon office being maintained under the direction of Mr. M. H. Ruhmann.

The only other publications of note during the years of 1914 and 1915 were those by Dr. Seymour Hadwen, Animal Pathologist at Agassiz, on tick paralysis, anaphylaxis of cattle, sheep and horses, and the warble-flies.

During 1914 no new serious insect pests were recorded, and with the exception of certain outbreaks of codling-moth and a severe infestation of locusts in the Nicola Valley little of interest occurred.

In 1915 two new insects of importance made their appearance, and both on Vancouver Island. In April, through the courtesy of Mr. Glendenning, the writer became aware of the presence of the black-currant bud-mite at Duncan. This mite had evidently been imported by a nurseryman at Somenos some three years previous from England or Scotland on currants, and the record of its appearance on Vancouver Island constituted an original record for the American continent, and, so far as I am aware, no other centre of infestation occurred in Canada or the United States until the close of this year 1920. During 1915 and 1916 steps were taken to eradicate the mite from British Columbia, and while great progress was made it is questionable whether the mite is exterminated.

Towards the latter part of April of 1915 a still more serious insect pest made its appearance, although it doubtless had been present in the locality for a great many years. I refer to the pear-thrips found on the Saanich Peninsula. It was too late in the year to take any material action against this insect, but full plans were laid down for the 1916 season in co-operation with Mr. R. M. Winslow, Provincial Horticulturist, to combat the pest in the orchards.

As a matter of history, not for personal reasons, I would like to point out that, with the exception of the field-work against codling-moth carried on by the Provincial Fruit Inspection and Horticultural Branches, I believe I was the only professional economic entomologist at work in the Province. Mr. M. H. Ruhmann was at Vernon, but he was so busily engaged in correspondence-work and field-control measures that he had little time for investigational work. The bulk of my work had been carried on at Coast points, and it was not until 1916 that the Okanagan Valley received any attention of an investigational nature. In this year the study of the life-history and habits of the codling-moth was commenced at Vernon, the work being undertaken by Mr. Ruhmann and myself. This was in July of 1916, but I have neglected to mention that previous to my visit to the Okanagan in midsummer we had to welcome Dr. A. E. Cameron, who came direct from Manchester University to British Columbia in March, 1916, as an officer of the Dominion Entomological Branch and as an associate of my own in the pear-thrips campaign which opened early in the spring. We were all very glad indeed to welcome Dr. Cameron to British Columbia, as it marked a very important step in the progress of economic entomology in the Province, as is evidenced by the amount of information on British Columbia insects collected and published by him during his stay in the Province. Unfortunately, he found his billet in Saskatchewan in the summer of 1917 after having remained in British Columbia for about eighteen months. In February of 1916 British Columbia lost one of its most active entomological members, a man who really bears the credit for having established British Columbia as a pest-free Province. I think it is safe to say that the Province until this time may be considered pest-free, inasmuch as it was a fact that while we had a number of insect pests of importance there was none that had so great a hold on the agricultural interests as to cause untold loss or worry. I refer to Mr. Thomas

Cunningham, who died in Vancouver in February of this year, and he took with him, in addition to the respect of all his associates, the main credit from an entomological standpoint of having established a world-wide reputation for the Province in the matter of its freedom from the codling-moth. I think there is no question about this and it is right to give honour where honour is due. Mr. Cunningham by his foresight and will-power laid the foundation-stones upon which we as officers of the Department who followed him have built.

In 1916, again several new insect pests not previously recorded for the Province were reported and determined by officers of the Entomological Branch. It may almost appear that the number of insect pests were increasing in due proportion to the increase of the entomological staff, but, of course, these insect pests doubtless had been present for several years and their identity had lain dormant until discovered by entomologists whose duty it was to investigate insect conditions. The pests that I have noted for this year are the chrysanthemum-midge, which was reported to me by Mr. R. M. Winslow and E. W. White, of the Provincial Horticultural Branch from Victoria; the mangel-root or sugar-beet aphid (*Pemphigus betæ*), reported to me by W. T. McDonald, Provincial Live Stock Commissioner from Victoria; and the apple-maggot (*Rhagoletis pomonella*), taken by myself at Penticton on July 26th, 1916, and identified by Dr. J. M. Aldrich, of Washington, D.C. The identity of the sugar-beet aphid was proved by Mr. W. A. Ross, of the Entomological Branch, Ottawa.

During 1916 the Bulletin No. 12 of the Dominion series appeared from Ottawa detailing the habits of the cabbage-root maggot. During 1917 the study of the pear-thrips on the Saanich Peninsula continued, with Dr. A. E. Cameron and the writer in charge. The results of this work were summarized into bulletin form during the winter of 1917 and appeared as Bulletin No. 15 of the Dominion series in January, 1918, in time for the opening of the spring campaign of that year.

Mr. W. Downes was engaged as temporary field assistant in the spring of 1917 to carry on the field data on the pear-thrips in the neighbourhood of Victoria. Mr. J. D. Tothill also visited the Province this year and opened up a field laboratory at Royal Oak, on Vancouver Island, to commence the study of tent-caterpillars, spruce-budworm, and fall web-worm. Mr. Tothill had charge of the natural-control features of Dominion Entomological Branch studies, and it was under the auspices of the Federal Government that he commenced work in this Province. His studies carried him far and wide throughout the Province, but Lillooet, the Lower Fraser Valley, and Vancouver Island claimed his attention to the greatest extent.

The most noteworthy economic insects discovered this year were the pea-weevil at Penticton and Summerland, reported to me by the Provincial Field Inspectors, and the apple-maggot at Victoria, discovered by Mr. Downes. The writer also undertook this year to investigate certain stored-product insects, and heat was used for the first time in the Province to control such insects. *Calandra oryza*, *Læmophleus ferrugineus*, *Tribo-*

lium ferrugineum, *Plodia interpunctella*, *Dermestes vulpinus* and *lardarius*, *Necrobia rufipes*, and *Tenebrioides mauritanicus* were found in cargoes of transpacific vessels. *Plodia interpunctella*, *Ephestia kuehniella*, *Tinea granella*, *Pyralis farinalis*, *Calandra oryza*, and *Tyroglyphus farinæ* were found in local mills and warehouses.

At this point I would like to diverge for a moment to another phase of entomological progress. It has been pointed out at various times that economic entomology in the Province has received its incentive for further action through the medium of the British Columbia Fruit-growers' Association and the Horticultural Branch of the Province. This is as much true to-day as in the years gone by, and in passing I feel it only right that we should mention the excellent work of Mr. R. M. Winslow, who officiated as Provincial Horticulturist between the years of 1909 and 1917. The establishing of known measures of insect-control as regular orchard procedures was very largely due to Mr. Winslow, and his sympathy for the solving of measures improperly known and the force he exerted to obtain results against new and imperfectly known insect pests was very great indeed. British Columbia suffered a very material loss in his resignation in July, 1917.

Mr. M. S. Middleton succeeded Mr. Winslow later in 1917, and through him a new series of horticultural bulletins, of which many were entomological in nature, was inaugurated. Mr. Middleton saw fit to resign his position in 1918, since when the office has been vacant.

During 1918 some changes in the organization of the entomological work took place which are worthy of mention. Agassiz, on the Experimental Farm, had been the headquarters of the Dominion Entomological Branch in the Province since 1912 and up until the close of 1917. It has been pointed out already in this paper that the Provincial headquarters had been maintained at Vernon from 1912 until 1918, at which time Mr. Eastham moved his headquarters to Vancouver. Mr. Ruhmann was left in Vernon, undertaking such entomological work that required attention, but he found that pressure of other duties interfered so materially with his insect-work that he was unable to accomplish very much. Furthermore, the development of the Federal work showed prospects of enlargement to such an extent that the quarters at Agassiz would shortly become too small. Furthermore, again, it happened that the greatest number of inquiries of an entomological nature were emanating from the Okanagan Valley, where it appeared the most serious insect problems were pending. It was decided, therefore, to transfer the Dominion headquarters from Agassiz to Vernon. This was done during the spring of 1918, and although the writer had spent the greater part of the two previous summers in the Okanagan Valley, this spring of 1918 was the first spring spent in the Interior.

It may also be worthy of mention, as a matter of history, that by request of the Provincial Department of Agriculture the direction of the Provincial entomological activities was turned over to the writer. In this way Mr. Ruhmann was relieved of a great deal of his executive work, which enabled him to undertake more insect-investigation studies.

Mr. W. Downes undertook the work necessary under the Dominion Entomological Branch on Vancouver Island, undertaking in particular the studies necessary on the strawberry-root weevil and pear-thrips. He was also able to prove the existence of the apple-maggot and its food-plant, showing that the species in British Columbia was a "biological species" not connected with the apple at all, but with the *Symphoricarpus* or snowberry. It was, however, in all other particulars identical with the typical apple-maggot of the East. Mr. Downes also received this year an impression of the parthenogenetic nature of the strawberry-root weevil adults, an impression which he verified the succeeding year.

The writer was able this year to bring to light in the Upper Country several insect pests which had not been noted previously. Chief among these was the alfalfa-seed chalcid, which was found wherever alfalfa was grown between the Lower Similkameen and Lillooet and causing a loss which varied from 25 to 75 per cent. in the seed-crop; the clover-seed midge at Victoria; the greater wheat-stem maggot (*Meromyza americana*) in the neighbourhood between Salmon Arm and Chase; and the pear-psyllia at Nelson. All of these insects rank in the forefront as economic pests and doubtless will need consideration at some time in the future. *Hemerocampa vetusta form gulosa* (the tussock-moth of the fir) was also reported from Armstrong, Chase, Salmon Arm, and Hedley during this year, and its presence has been noted every year until the present at the same points, with the addition of Vernon and Okanagan Centre. A species of *Lachnosterna* which was believed to be referable to the species (*dubia*) *anxia* was received from Blind Bay in the Shuswap area and Vernon. Mr. Downes also added *Synanthedon rutilans* and *Aristotelia fragariæ* among the injurious small-fruit insects of the Island.

In the spring of 1918 Mr. Tothill, as a result of his preliminary inquiries of the year previous, instructed his assistant, Mr. A. B. Baird, to repair to British Columbia for the purpose of undertaking a systematic study into the parasitism of the tent-caterpillars, the spruce-bud worm, and fall web-worm. Mr. Baird made Agassiz his headquarters and he remained in British Columbia until the close of this present year 1920, when he returned to his headquarters at Fredericton, New Brunswick.

British Columbia was honoured in the autumn of 1918 by a visit from Dr. C. Gordon Hewitt, Dominion Entomologist. Dr. Hewitt, of course, was not a stranger to British Columbia, inasmuch as he had visited the Province on the average of every other year since his appointment in Ottawa in 1909. However, on this occasion his visit was noteworthy because it added just one more milestone to the progress of entomology in the Province. The Lower Fraser Valley has always contended against the mosquito plague, and public opinion was aroused to such a pitch that the writer was enabled to arrange a meeting with the Vancouver Board of Trade, the Reeves of the Fraser Valley municipalities, and Dr. Hewitt this autumn. The meeting was held at Mission, with Mr. C. E. Tisdall in the chair, on September 10th. Dr. Hewitt promised to appoint an officer from his

Branch to investigate and report on the biology and species of the mosquitoes present in the valley and to assist the municipalities by general advice and suggestion. The Vancouver Board of Trade undertook to draft a "Mosquito-control Act" which could be submitted to the Provincial House for discussion and endorsement. Unfortunately, the endeavours came to naught owing, I believe, to lack of co-operation among the municipalities, but Dr. Hewitt fulfilled his part of the bargain, and next spring we welcomed Mr. Eric Hearle to British Columbia with special instructions to investigate the mosquito problem.

In 1917 Mr. R. N. Chrystal, of Dr. Swaine's Federal Division of Forest Insects, left the Province this year to undertake certain work elsewhere in the Dominion. Mr. Chrystal had been engaged in preliminary studies of forest insects in British Columbia for two years and his major inquiries centred in Stanley Park at Vancouver. A laboratory was established in Stanley Park for the purposes of close investigation, but this was abandoned when Mr. Chrystal left for the East.

So far as the Provincial entomological service is concerned, in addition to the services of Mr. M. H. Ruhmann at Vernon, we have to record the entrance of Mr. E. R. Buckell to the field insect-work. Mr. Buckell was attached during 1918 to the Horticultural Branch of the Province and was engaged in codling-moth eradication at Walhachin. In 1919 he joined the entomological service proper and was placed at Penticton to investigate the peach-twig borer and the locust situation in the Lower Okanagan Valley. Mr. Buckell found his special field of investigation in insects affecting the range and cereals, so that during 1920 he made the Chilcotin District his headquarters. It is interesting to note that, so far as I am aware, this was the first time the Chilcotins have been visited to investigate any special insect problem. The sad depletion of the range from overgrazing and from the influence of locusts necessitated some action, and it is hoped that as a result of Mr. Buckell's investigations some measures will be adopted, in co-operation with the Provincial Range Commissioner, to better the conditions. Mr. Buckell intends continuing his investigations in the same area next year, 1921.

A matter of some importance which I have neglected to mention thus far in this paper in reviewing entomological progress in British Columbia is the school educational work under the auspices of the Provincial Department of Education. Mr. J. W. Gibson was appointed as Provincial Director of Agricultural Education during the winter of 1914-15 under the Federal grant used for that purpose. In 1915 he held his first short course for teachers at Victoria, and the writer had the honour of presenting the course in entomology. It is felt that this work may have a very direct bearing on the future of entomology, as the teachers who were thus instructed undoubtedly obtained a wider knowledge on insect-life which they could impart to their students in all parts of the Province. A similar course has been held in Victoria during July of 1916, 1917, 1919, and 1920. The writer has conducted this course each year under Mr. Gibson's direction,

ably assisted in 1917 and 1919 by Mr. E. H. Blackmore, who undertook to give instructions in the determination of the important families of the Lepidoptera.

With the opening of the 1919 season the following officers were actively engaged in economic-insect investigations: Mr. W. Downes, who during 1918 and 1919 had been on temporary employ of the Dominion Entomological Branch, was appointed as permanent officer of the Dominion Branch on September 1st, 1919; Mr. E. P. Venables, who had recently returned from active military service in Palestine, was placed on temporary employ on the Dominion Branch for six months dating from May 15th until November 15th; Messrs. M. H. Ruhmann and E. R. Buckell under the Provincial Service; and the writer, who assumed general direction of the work. It will be seen that the Dominion and Provincial services are now co-ordinated so as to prevent overlapping of industry. The necessary projects are now grouped under crop insects: Mr. Downes, located at Victoria, was placed in charge of small-fruit investigations; Mr. Venables, at Vernon, on tree-fruit studies; Mr. Ruhmann, on vegetables; and Mr. Buckell, on range and cereal insects. In addition, Mr. Hearle, at Mission, is continuing his studies on the mosquitoes, and Mr. Baird, at Agassiz, on natural-control features of certain insect pests. Furthermore, the field officers of the Provincial Horticultural Branch were engaged in collecting data and reporting the existence of insect troubles in their respective districts, and the quarantine and inspection work under the direction of Mr. W. H. Lyne in Vancouver was productive of many notes of entomological interest. Thus the work was planned for 1919.

The year 1919 was productive in the following notes of special entomological interest: The writer received the work of **Marmara pomonella**, a lepidopterous fruit-miner, from Sorrento on October 25th. This same insect was noted by Mr. M. H. Ruhmann in 1917 in apples received from Creston on October 25th. The identification was made by Mr. Quaintance, of the United States Federal Entomological Bureau, Washington, D.C. In midsummer larvæ of **Mineola tricolorella** were taken at Okanagan Landing and bred through to the adult, the determination being made by Dr. J. McDonough, of Ottawa. **Argyroploce consanguiniana** was also reared from apple-foilage at Vernon. This insect had previously been noted from the Province in 1914, when it was bred from larvæ taken on apple at Hatzic, in the Lower Fraser Valley. Mr. Downes, in addition to establishing the identity of many small-fruit insects from Island districts, this year reported **Apateticus crocatus**, a pentatomid bug predaceous on the caterpillars of the tent-caterpillar and oak-looper at Victoria. During May Mr. Buckell, in association with the writer, was able to establish the very interesting and doubtless important note on the existence of **Entomophthora (Tari-chium) megaspermum**, an entomophilous fungous disease on noctuid larvæ attacking the **Chrysothamnus** bushes at Keremeos. The determination was made by Mr. Speare, Mycoentomologist of the United

States Bureau of Entomology, who remarked "that as near as can be determined the fungus is *E. Megaspermum* Cohn, which was described in 1873 and has never been recorded since as far as I am aware."

There is another phase of entomological endeavour which I have not mentioned thus far in this review, for the reason that it constitutes a separate branch of work. I refer to the Indian-orchard work. In 1911 the writer entered upon his duties in British Columbia to relieve our late lamented associate, Mr. Tom Wilson, of his duties as Dominion Inspector of Nursery Stock. Mr. Wilson previous to 1911 combined the duties at the Vancouver Fumigation Station with those essential to the establishment and safe-keeping of Indian orchards. He found the work necessary on the many Indian reserves in the Province so important that in 1911 he was enabled to spend his whole time superintending Indian orchards and agriculture in general. His work in this connection took him to all parts of the Province, and his astonishing knowledge of botany, zoology, and entomology made him an invaluable collector of insects and insect records. Mr. Wilson carried on his duties until March 6th, 1917, when he met an untimely death in a disastrous fire at the Coquihalla Hotel, Hope, B.C. His loss was felt most severely in a personal and professional way. The writer had the honour of writing his obituary notice in our Bulletin No. 10, 1917, but this only half expressed the high regard in which he was held. With Tom Wilson went a great mass of information on insect-life which never now can be published. His death was so sudden and unexpected that it was hard to realize the loss entomology suffered. If a moral could be pointed, it should be impressed upon us all that for the sake of the future we should make an endeavour to cover by writing the important established data which our experience produces. Mr. Wilson was succeeded by Mr. Walter B. Anderson in the spring of 1918, who has carried on similar duties that Mr. Wilson was performing at the time of his death. Mr. Anderson proved an inveterate collector and the National Museum in Ottawa has been enriched to a very considerable extent as a result of his labours.

The year 1919, as may be seen, proved an auspicious year for British Columbia. It remained for this last year, 1920, to show the greatest degree of development yet experienced in the Province. The progress made in British Columbia has been due to the foresight of the late Dominion Entomologist, Dr. C. Gordon Hewitt. I think it should be clearly borne in mind that while the local officials of both Federal and Provincial Departments of Agriculture have done all in their power to further the interests of entomology in the Province, nothing like the progress shown would have been possible without the support and endorsement of Dr. C. Gordon Hewitt. It was with feelings of deep regret that we heard of his untimely death by pneumonia in February of this year. The studies planned for 1920 were planned at a time previous to his death, and so I think we may still give Dr. Hewitt credit for the developments shown during this past year.

The first new face that we welcomed was Mr. Ralph Hopping, who was appointed under Dr. Swaine's Forest Insect Division, and who arrived in December, 1919, to take charge of special forest-insect investigations in this Province. Mr. Hopping came direct from California, and he brought with him not only the best private collection of beetles on the West Coast, but also a standard of knowledge on beetle-life which has been gained as a result of twenty years' experience in this group. He is regarded as one of the leading students on forest-insect life on the West Coast, and his allocation to British Columbia was not only a direct loss to the United States, but a most decided acquisition to Canada and to the Province of British Columbia in particular. The next most important item in this year's history is the advent for the first time into the field of entomology of students from the University of British Columbia. Three were employed this year. Mr. Alphonse Crawford, undergraduate in medicine, was delegated to assist Mr. Eric Hearle in his mosquito studies on the Lower Fraser; Mr. N. L. Cutler, biology student, was posted to the entomological laboratory at Vernon to undertake the collecting of insect specimens for the University collection, the specimens to be collected individually and in bulk for the use of the students at the University during this present winter; Miss A. C. Healey, art student, as laboratory assistant at the Vernon Laboratory. All of these students were on temporary employ for the summer months, terminating their services in time to return to Vancouver to continue their graduate studies.

Mr. A. B. Baird received temporary assistance this year in the person of Mr. R. Glendenning, and on the termination of the special natural-control investigations and the return of Mr. Baird to the East, Mr. Glendenning was enlisted for temporary service as assistant to Mr. Downes at Victoria. Mr. Buckell, as previously mentioned, went north this year to the Chilcotins on special range-work, and Mr. Ruhmann continued his studies of vegetable insects at Vernon, as did Mr. Venables on tree-fruit insects. Another innovation instituted at the Vernon Laboratory this year for the first time in the Province was the employment, under the Provincial Department of Agriculture, of two laboratory boys—boys who by reason of the fact that they showed unmistakable ability in natural-history studies were thought fit to pin, mount, collect, and take simple field-notes on insect-life in the field. It is hoped that if this idea is persevered in we may be able to build up entomologists for the future.

During this year, and commencing with the autumn sessions of the University, Dr. C. McLean Fraser, of the Marine Biological Station at Nanaimo, was appointed as Zoologist. Dr. Fraser lectured to the students during the 1919 sessions at the University, dealing with insects as a phase of the zoological science, and to him and to Dr. A. H. Hutchinson, Biologist, we are indebted for available students for field-work in the Province during the past year. Similar courses are again being held this year, but, I believe, for the first time, will a course be

held in economic entomology in the regular session at the University. The writer has the honour at this time to be giving this course.

During 1920 the following insects have been reported of economic interest: The Hessian fly was sent in to the Vernon Laboratory by the Superintendent of the Sidney Experimental Farm. This is a new record for the Province, although, judging from the present known area of infestation, it has been present for many years. Our information until 1918 was to the effect that while this insect was widely distributed west of the Cascades in both Washington and Oregon States, it was not known to occur north of Seattle. It is probable that this insect will cause very considerable trouble to fall wheat on the Island and measures for its control will have to be figured out. The satin-moth was reported by Dr. J. McDonough, of Ottawa, who determined this insect for Mr. A. B. Baird, who collected it. This moth is now only known to occur in British Columbia in the City of New Westminster, and the only other point at present infested in the North American Continent is Massachusetts. Hence it is believed to be an imported pest of recent standing, as it is common, I believe, both in Europe and Siberia. It is impossible at this time to state how important this insect may become during the next few years, but there is no question but that it will require careful watching. The Colorado potato-beetle, reported last year by Mr. W. H. Lyne for Gateway, in the Lower Kootenay country, was this year noted by Mr. W. B. Anderson at Waldo, a spread of 40 miles in a year. The currant elm-aphis, reported by Mr. Downes from Chilliwack and identified by Mr. W. A. Ross, of the Dominion Entomological Branch, Vineland, Ontario, as *Eriosoma ulmi*, is noted for the first time. *Anisandrus pyri* (the shot-hole borer of the West) was, I believe, introduced to our notice by Mr. J. W. Eastham, who obtained identification through Dr. J. M. Swaine in Ottawa. This insect was taken in the neighbourhood of South Vancouver. *Mineola tricolorella* was again reported from Vernon, while the studies of Mr. Venables have brought to light the following list from the apple: Bruce's measuring-worm, *Rachela bruceata*, *Epicallima dimidiella*, *Peronea maximana*, together with the established identity of other common fruit-infesting larvæ, such as the lesser apple-worm, bud-moth, and the dock false worm. Several other insects attacking fruit have been found, but their identity is not yet disclosed. *Peronea maximana* may be further mentioned for the reason that it is closely related to *Alceris (Teras) minuta*, an insect which is noted by Mr. J. R. Anderson in his Bulletin No. 12 of Provincial Department of Agriculture, and as long as I can remember this insect has been mentioned to me as being present in British Columbia, but no specimens had been received. It is just possible that *T. minuta* may have been confused with *P. maximana*, but of this we have no definite information. Of those insects Mr. Buckell has found infesting the range lands of the Province I cannot make mention at this time. Suffice it to say that he has enriched our locust knowledge by establishing the presence of about

sixty species of locusts and has obtained ecological notes and life-history data on the majority of these. *Diplotaxis tenebrosus* Fall was noted this spring injuring young apricot seedlings at Osoyoos.

This review has taken longer than I intended it should, and on reading it over it appears as though it were a diatribe on the features of professional entomologists and a history of the Branch development. I really do not intend that it should be such and must apologize if it appears so. I have not touched upon the very excellent systematic work that has been accomplished during the past few years by professional and private members of our Society, and the non-inclusion of these records in this paper is no reflection. I had intended only dealing with the economic history, and in order to do this effectively I must of necessity mention personal data. In closing, I merely wish to say that it is my hope that the same progress be shown in the next few years as I am sure you will all agree has been the history of the past few years.

A TALK ON INSECTS IMPORTED FROM THE ORIENT.

By W. H. LYNE, INSPECTOR OF IMPORTED FRUIT AND NURSERY STOCK.

It is not my intention to discuss the point as to whether or not the San Jose scale was first introduced to this continent on nursery stock imported from Japan. The fact that it was discovered on shrubbery imported from Japan to San Jose, Santa Clara County, Cal., and thus established its name, I have no wish to dispute.

What I do know is that on more than one occasion San Jose scale has been found on nursery stock imported from Japan to British Columbia, and that within the last month several apple, pear, and peach trees from Japan were condemned here in Vancouver owing to their being infested with that particular pest.

The San Jose scale (*Aspidiotus perniciosus*) is not the only scale-insect imported from Japan. We occasionally come in contact with other species, such as the cherry-scale (*Aspidiotus forbesi*, *A. nerii*, and *A. hederæ*), infesting ornamental trees and shrubs. There are often other subfamilies of Coccidæ, such as *Chionaspis*, *Mytilaspis*, *Diaspis*, and *Lecanium*, represented by several of their relative species.

On one occasion several egg-masses of the gipsy moth (*Porthetria dispar*) were found on the bark of *Arbor vitæ* trees.

Other interesting species of insects imported are the larvæ of several beetles, boring into the heart-wood or feeding on the roots of trees or plants. The giant borer, a species of the Prioninæ, has occasionally been found in roots or just above the crown of *Wistaria*, walnut, and other trees from Japan.

Probably the beetle attracting the most attention at the present time is the Japanese beetle, *Popillia japonica*, owing to its having become established in certain sections of the Eastern United States. It is supposed to have been imported in iris-roots from Japan. On a few occasions and very recently we have found several larvæ closely resem-