Fortieth Annual Report

OF THE

# Entomological Society

OF ONTARIO

## 1909

Published by the Ontario Department of Agriculture, Toronto.

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PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

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Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO

*To the Honourable* John Morison Gibson, K.C., LL.D., etc., etc., etc.,

*Lieutenant-Governor of the Province of Ontario.*

May it Please Your Honour:

The undersigned begs to present herewith for the consideration of your Honour the Report of the Entomological Society of Ontario for 1909.

Respectfully submitted,

JAMES S. DUFF,

*Minister of Agriculture.*

Toronto, 1910.

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# FORTIETH ANNUAL REPORT

OF THE

# Entomological Society of Ontario

## 1909.

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*To the Honourable James S. Duff, Minister of Agriculture.*

Sir,—I have the honour to present herewith the Fortieth Annual Report of the Entomological Society of Ontario, which contains the proceedings of the forty-sixth annual meeting of the Society, which was held at the Agricultural College, Guelph, on the 4th and 5th November, 1909. The report includes the papers read and the reports submitted by the various officers and branches of the Society.

"The Canadian Entomologist," the monthly organ of the Society, has been regularly issued during the past year, and has now completed its forty-first volume, which has maintained the high scientific standard of its long series of predecessors.

I have the honour to be, Sir,

Your obedient servant,

Charles J. S. Bethune,

*Editor.*

Ontario Agricultural College,
Guelph.

# Entomological Society of Ontario.

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### Life Member.

Saunders, Dr. William......Ottawa.
Director of the Experimental Farms of the Dominion.

# Entomological Society of Ontario.

## ANNUAL MEETING.

The forty-sixth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 4th and 5th. During the day meetings the chair was taken by the President, Mr. Tennyson D. Jarvis, and at the evening session by Dr. Bethune. Amongst those present were Messrs. H. H. Lyman and A. F. Winn, Montreal; Dr. C. G. Hewitt and Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. John D. Evans, Trenton; Mr. F. J. A. Morris, Trinity College School, Port Hope; Dr. E. M. Walker and Messrs. C. W. Nash and J. B. Williams, Toronto; Mr. R. C. Treherne, Grimsby; President Creelman, Profs. C. A. Zavitz, R. Harcourt, S. B. McCready, C. J. S. Bethune, Messrs. Jarvis, Howitt, Caesar, Eastham, Crow, Klinck, of the staff, and a large number of the students of the Ontario Agricultural College and the Macdonald Institute, Guelph.

Letters expressing regret at their inability to attend were received from Prof. C. C. James, Deputy Minister of Agriculture for Ontario; Dr. William Saunders, Director of the Dominion Experimental Farms, Ottawa; Rev. Dr. Fyles, Hull, P.Q.; Messrs. Paul Hahn and A. Cosens, Toronto; G. Chagnon, Montreal; C. E. Grant, Orillia; W. E. Saunders and J F. Calvert, London; R. S. Hamilton, Galt; Prof. W. Lochead and Mr. J. M. Swaine, Macdonald College, P.Q., and others.

A business meeting of the Council was held in the Biological Building, at which their report was drawn up and various matters discussed. On motion it was decided to contribute the sum of fifty dollars to the fund for the erection of a memorial drinking fountain to the late Dr. James Fletcher at the Experimental Farm, Ottawa.

In the afternoon the Society met at 2 o'clock in the Biological Lecture room, where there was a goodly attendance of members and students. The first order of proceedings was the reading of the reports of the Directors on the noteworthy insects of the year in their respective districts. Owing to various circumstances, none were received from Mr. C. E. Grant, of Orillia, representing Division No. 2, nor from Mr. R. S. Hamilton, Galt, of Division No. 6.

## REPORTS ON INSECTS OF THE YEAR.

### Division No. 1.—Ottawa District. By Arthur Gibson, Central Experimental Farm, Ottawa.

The season of 1909 in the Ottawa District, although cool and late in spring, was an excellent one for growth of all kinds. The rainfall during the whole season was rather above normal, and there was, comparatively speaking, but little hot weather, and this not until the middle of August. Injurious insects, as a whole, were not so troublesome as they were in 1908.

The following notes probably cover those insects which were most complained of in the District during the past season.

### Attacking Field Crops.

The Hessian Fly (*Mayetiola destructor,* Say.) which was troublesome near Ottawa in 1908, was not reported as present in 1909. On the Central Experimental Farm, where it occurred last year, no trace of its work could be detected this year.

Grasshoppers were decidedly destructive in many localities near Ottawa, particularly in places where the soil is light. On June 21st I received a report that these insects were causing much anxiety to farmers near Buckingham, Que., about 23 miles from Ottawa. It was stated that they were present in that district in "countless millions." Up the Gatineau River grasshoppers were enormously abundant, and many complaints were made concerning their ravages. On July 29th I drove from Maniwaki to Baskatong, Que., a distance of about 40 miles, and saw the insects in great swarms. Oats, which are largely grown in the Gatineau country, were much damaged, also timothy; the crops in some fields being entirely eaten. At Baskatong I visited a large field of turnips, the tops of many of which had been completely eaten, and what remained was rapidly being devoured by the grasshoppers. At Castor, Que., which is about half way between Baskatong and Maniwaki, one farmer had sown turnips twice and had lost both crops. On July 30, the grasshoppers were working in his oat and wheat fields. I was much amused at a method which was being adopted to save the crop of turnips at Baskatong. A s mall boy was kept walking up and down the rows of turnips with a branch in his hand, with which he endeavoured to drive off the grasshoppers. Of course, almost as soon as he had passed, the insects immediately swarmed back to the plants and continued their work of destruction. The species which was responsible for the damage was the Lesser Migratory Locust, *Melanoplus atlanis,* Riley. I advised them to try the Criddle mixture, which had given such remarkable results in Manitoba. The following quotation is from a letter I recently received from Mr. Criddle, of Treesbank, Man., who devised this mixture: "There has been another rather bad outbreak of locusts here, which has necessitated several applications of the Criddle mixture. The result has been entirely satisfactory, the mixture having undoubtedly prevented much damage. I was beginning to be afraid that I had over-estimated the value of horse droppings as an attraction, but I am glad to find that such is not the case."

The Grain Aphis (*Macrosiphum granaria,* Kirby) was present in large numbers in the Ottawa District. In the Gatineau country I saw many fields, at the end of July, which were infested. Fortunately, the outbreak, as usual, was attended by parasites which greatly reduced the numbers of the plant lice. Some fields of oats, however, at the above date, looked as if they had been much weakened by the attacks of this insect.

The Greater Wheat-stem Maggot (*Meromyza Americana,* Fitch.) was conspicuously present in wheat near Ottawa. Larvæ collected on July 9th were apparently full-grown, being about a quarter of an inch in length. In some experimental wheat plots on the Central Experimental Farm the "silver tops" or "deadheads," as they have been called, were rather abundant, but were not present, however, in sufficient numbers to affect materially the resultant crop. They were especially noticed among wheat of the variety called "Bishop."

The Apple-leaf Hopper (*Empoasca mali,* LeB.) which did so much harm in eastern Ontario in 1908, was again present on potatoes in injurious numbers in the Ottawa district. Its work was supplemented very much this year, however, by the Potato Aphis and the Potato Flea Beetle, particularly the former. On October

6th, I was present in a field when the potatoes were being harvested, and was surprised to see the crop so poor. I was told that the above insects were largely responsible for the small crop. On the 14th of September, when examining some potatoes, I noticed many of the nymphs of the Apple Leaf Hopper, and on the same day in an orchard close by, the adults were flying in thousands around apple trees. On July 14th some of the mature insects were noticed on potatoes on the Experimental Farm. Up to this date I had not heard of any damage in the Ottawa district by this insect.

The Potato Flea Beetle (*Epitrix cucumeris,* Harr.), besides injuring potatoes, as above mentioned, attacked to a very noticeable extent a number of plants of the Wonderberry which were growing a short distance away. The Flea Beetle was not present in the district in such numbers this year as it was in 1908. As a rule it is more numerous in hot dry summers.

Root Maggots were not much complained of in the district during 1909. They were present, of course, as they always are, but as far as I can learn, not much damage has been done by them. On the Experimental Farm, for instance, hardly an onion was destroyed by these larvæ. On September 14th I saw them working to some extent in an experimental row of winter radishes.

Cutworms were present, as usual, in injurious numbers. At Carp, about 20 miles from Ottawa, an outbreak occurred towards the end of June. Mr. Sirett, the resident representative of the Ontario Department of Agriculture, reported the matter to me, but unfortunately specimens of the larvæ were not received. Mr. Sirett thought, however, that the species was the Variegated Cutworm, *Peridroma saucia,* Hbn. Injury was done to field crops, but just what these crops were, I did not hear. About the middle of July the Red-backed Cutworm was present in fair numbers in a large field of mangels on the Experimental Farm. The larvæ on the 15th July were about full-grown. An application of poisoned bran soon stopped any further injury.

The Striped Cucumber Beetle (*Diabrotica vittata,* Fab.) was particularly numerous during the past season. It appeared on some cucumbers in my garden on June 15th, just as the plants were up nicely. On July 3rd I saw many in copulation. At Billings Bridge, near Ottawa, it was particularly reported to be injuring squashes. It also to some extent attacked melons, and was complained of by many of our market gardeners. As this beetle is very active, any application of poison must be frequently renewed. The leaves should be dusted with Paris green mixed with land plaster or lime in the proportion of one pound of the poison to fifty of the diluent, if necessary every second day. Bordeaux mixture is also a useful remedy for this insect as well as for the Cucumber Flea Beetle which often does serious injury.

The Black Blister Beetle (*Epicauta pennsylvanica,* DeG.) appeared suddenly at several places in the district, and did locally noticeable damage, particularly to potatoes and tomatoes. Plants in flower gardens were also attacked, and in some instances the foliage completely eaten. In one garden near Ottawa 100 splendid Clematis plants were defoliated, the beetles appearing on the 23rd June. On June 28, they were present in conspicuous numbers in the Arboretum of the Central Experimental Farm and were attacking plants of the genus Thalictrum, in the perennial border. As is well known, these beetles in their larval form are predaceous on the eggs of grasshoppers, so generally speaking it is not advisable to destroy them with arsenical sprays. They can often be driven from a crop by several boys walking across it and waving from side to side a bough of spruce or other conspicuous branch. As these beetles are easily disturbed they will fly ahead, and on reaching the edge of the crop will disperse and as a rule not return

### ATTACKING FRUIT CROPS.

The fruit crop in the Ottawa district was on the whole a very fair one. Weather conditions have been excellent for the maturing of fruit. Insects have not been especially destructive, and growers who sprayed their trees regularly were not much troubled.

The Codling Moth (*Carpocapsa pomonella,* L.) did a good deal of damage in unsprayed orchards in Eastern Ontario. The intelligent fruit growers of the district, however, were not troubled to any serious extent by this insect. A friend who lives at Aylmer, Que., about 9 miles from Ottawa, told me that every apple in his garden was wormy. He had, of course, neglected to spray his trees.

Plant lice were the insects which were most abundant in orchards in the district during the past year. The season has been a remarkable one for plant lice of all kinds. Apple and plum trees were badly attacked, and where small trees were infected, serious damage resulted. During the early part of June the plant lice were enormously abundant in orchards near Ottawa, but towards the end of the month it was noticed that important parasites were appearing and doing splendid work in reducing their numbers. When orchard trees become badly infested with plant lice, it is a difficult matter to destroy the insects, on account of the curled up condition of the leaves, making it almost impossible to reach the insects with any contact insecticide. In eastern Canada, fortunately, these insects do not, as a rule, seriously injure apple trees, but in British Columbia, the Apple Aphis is in some years decidedly destructive, and frequent treatment is necessary. The Woolly Aphis of the Apple was fairly prevalent in the Ottawa district during the past season. On September 14th, I saw a number of young apple trees which were much infested.

The Pear-tree Slug (*Eriocampa cerasi,* Peck.) was again noticeably present on plum and cherry. The foliage of some trees examined in September was much eaten by the slimy dark coloured slugs of this sawfly. The insect is one which is easily controlled by spraying with any of the arsenical poisons.

The Currant Worm (*Pteronus ribesii,* Scop.) was complained of by growers of currants. The second brood of larvæ were very numerous in a large patch of red and white currants near Ottawa on July 12. They first appeared a few days before this date, and were quickly stripping the bushes of their foliage. The first brood of this insect, which appears when the leaves are attaining full size, are easily controlled by Paris green or arsenate of lead, but for the second brood, which appears just as the fruit is ripening, white hellebore is recommended, either dusted upon the bushes, or applied as a spray, one ounce in two gallons of water. The first brood should be treated thoroughly so as to reduce the numbers of the second brood.

The Currant Aphis (*Myzus ribis,* L.). Almost wherever currants were grown the past season they were attacked by large numbers of this plant louse. In eastern Ontario we received many complaints of the work of this insect. Unfortunately, unless the bushes are sprayed with kerosene emulsion or whale-oil soap, as soon as the aphides appear, and before they cause the leaves to blister and curl, it is difficult to get good results from the work. It is necessary to force the liquid well up beneath the leaves. This can be done by attaching a piece of bent pipe, bearing the nozzle at the end, to the rod of the sprayer.

### Attacking Forest and Shade Trees.

Cankerworm larvæ were more abundant in the spring of 1909 than they were in 1908. On the 4th June they were half grown. At Beechwood, just outside of Ottawa, beech trees were badly attacked, the result of their depredations being easily seen. When ornamental trees are attacked by these caterpillars, it is important to apply the arsenical poison while they are small. They can then be easily killed at the ordinary strength used for leaf-eating insects. When they are more than half an inch long they are a good deal more difficult to kill, and consequently much stronger sprays must be used.

The Spiny Elm Caterpillar (*Euvanessa antiopa*, L.) was abundant on elm trees throughout the district. On June 21, larvæ about one and a quarter inches long were noticed. Specimens which were collected had become full grown and changed to chrysalids by July 10. The species is intermittently abundant at Ottawa, and some years it is not an uncommon sight to see small elm and willow trees entirely stripped of their foliage.

Elm trees seemed to be particularly attacked by insects during the past season. The Woolly Elm-leaf Aphid was very abundant and many enquiries were received concerning it. By the middle of June the conspicuous colonies were much noticed. The Cockscomb Gall was also numerous in the district, the leaves of many elm trees being covered with these galls. Near Maniwaki, Que., on July 29, I saw large numbers of the Plum Gall, *Pemphigus ulmi-fuscus*. The galls were large and on most of the leaves of the infested trees there were at least two and very often three or four galls present.

The Spruce Budworm (*Tortrix fumiferana*, Clemens.) This insect caused much anxiety among the lumbermen of the Ottawa district. Reports were received from the upper Gatineau that some insect was ravaging the spruce and balsam forests, and as a result I was sent up into the infested area to find out the nature of the trouble. The result of this investigation is given in a separate paper which I hope to present shortly. At Ottawa, thousands of the moths were noticed flying around bushes and trees of all kinds on July 20th. They were even abundant all through the city, and on almost any bush or tree being disturbed, many of the moths would fly out from the foliage on which they were resting.

The Larch Sawfly (*Nematus Erichsonii*, Hartgn.) was also very prevalent wherever larches were growing. It was noticed in considerable numbers on some ornamental larches on the Experimental Farm, on July 20, and at this time the larvæ were about full grown. Up the Gatineau River from Ottawa as far north as Baskatong, I noticed all through this area at the end of July the results of the work of this larvæ. Many trees were entirely stripped of their foliage. Along the railway, between Ottawa and Montreal, the defoliation of these handsome trees was also conspicuous.

The work of the Spruce Sawfly was also noticed to some extent north of Maniwaki, and larvæ were found to be full grown on July 30. At this date most of the larvæ had disappeared.

The Bronze Birch Borer (*Agrilus anxius*, Gory.) is seriously injuring birches in the Ottawa district. The result of the work of this insect is easily seen at the Central Experimental Farm, where practically all of the cut-leaved birches are dying. This insect has not been mentioned very much in Canada as yet, but in northern portions of the United States it has done a good deal of damage. The presence of this borer is soon shown by the dying of the tops of the trees. This is owing to the fact that the insect first attacks the tops, which results in the killing of the upper limbs.

The Fall Webworm (*Hyphantria textor,* Harr.) was again present in conspicuous numbers throughout Carleton County. Larvæ were seen to be just emerging from the eggs at Ottawa on July 8, and a small nest on lilac was observed on July 14, the caterpillars in which were only a day or two old. Full grown larvæ were noticed as late as the 6th October.

### Attacking Garden Plants.

The Tarnished Plant Bug (*Lygus pratensis,* L.) was very troublesome in gardens the past season. As is well known, this insect not only does injury by sucking the juices from the leaves, but it also pierces the flowers of many plants, thus destroying them. In September the adults were present in thousands around apple and other trees. As they pass the winter in this state, beneath almost any surface shelter, it is important that all garden rubbish be burned in autumn, so as to reduce the hibernating quarters for this and other kinds of injurious insects.

The Destructive Pea Aphis (*Nectarophora pisi,* Kalt.) was again present in 1909 in the district, on sweet peas in gardens. The first colonies were noticed on July 26. At this date I could not find any winged specimens. The attack, however, was not nearly so severe as the outbreak of 1908. In early September I noticed that the parasitc *Megorismus Fletcheri,* Crawford, which was described in the *Canadian Entomologist* last March, from Ottawa material, was present in goodly numbers. From parasitized plant lice collected on September 2nd, I secured a further series of the parasites, the specimens emerging on September 15.

Many plants in gardens were seriously injured during the past season by Red Spider. At the Central Experimental Farm, towards the end of July, Phloxes particularly were seen to be dying from the work of this mite. Few garden plants are free from its attack, and as these creatures are so small, their work is generally unnoticed until a good deal of harm has been done. Flowers of sulphur are useful in destroying Red Spider and may be applied in the proportion of one ounce to every gallon of water. As the mites occur chiefly on the underside of the leaves, the spray should be forced up from beneath so as to reach them.

The interesting and rare little Tortrix (*Sparganothis flavibasana,* Fern.) was again rather destructive on a few bushes of Lonicera of the Caprifolium group at the Central Experimental Farm. This is the third year in succession that this insect has appeared on the same bushes. This year the larvæ were mature on June 15.

### Division No. 3.—Toronto District. By J. B. Williams.

The Tussock Moth has been, as usual, quite plentiful on many of the shade trees in the city streets.

At the beginning of the summer the Park Commissioner had many of the trees sprayed with arsenate of lead, and later on, towards the fall, several gangs of men were employed to collect the cocoons; but the city appropriation was not sufficient to do the work thoroughly, and as a further grant was refused, the work of collecting the cocoons has come to an end for the present year, just at the time when it might be most successfully pursued.

Early in the summer one of the Park Commissioner's men brought me a sample of Elm bark covered with a scale that was doing much damage to several trees. I sent it to Mr. Gibson at Ottawa, and he determined it as the Woolly Elm-Bark Aphid (*Schizoneura Rileyi*). They have treated some of the infested trees with whale oil, as Mr. Gibson recommended, and found the results satisfactory.

The Aphid seems, at first, to have been confined to small trees; but Mr. Cameron, the Park Commissioner's assistant, says that it has also begun to attack the small branches of the larger Elm trees, and he fears that it will give them a good deal of trouble before it is eradicated.

Prof. Ramsay Wright had during this summer a good many of his dahlias injured by a bug, which pierces the plant just below the flower bud, and so spoils the blossom. He brought a specimen down to the Museum, but it was mislaid somewhere so that I cannot give the name of the species.

I asked another gentleman, who grows dahlias in the west end of Toronto, if his plants had been injured in this way. He replied that he had not seen any bugs on them, but his dahlias had been a failure this year. Perhaps the bugs may have done some of the mischief without being detected in it.

Division No. 4.—East Toronto District. By C. W. Nash, Toronto.

The summer of 1909 was remarkable for the dearth of insect life in this neighborhood. Even such butterflies as the Cabbage White, Clouded Yellow and Monarch were remarkably scarce and little or no damage was done by the larvæ of the Cabbage butterfly in the large market gardens of East York. The Monarch (*Anosia archippus*), which usually appears early in June was not seen until the first week in July. From that time to early September, when the southward flight takes place, only an occasional specimen was visible. No great host of these insects passed from east to west when migrating as in former years, so that if they do not breed in the south this winter it would seem probable that the species would be very rare in Canada next summer.

*Papaipema cataphracta,* the larvæ of which, by boring into the stems of plants, have during the last few years done much mischief in flower and vegetable gardens, were not noticed at all this season nor did I find *P. purpurifascia* in the roots of Aquilegias.

It would be interesting to know the cause of the almost total disappearance of *Cosmopepla carnifex.* For some years this insect increased yearly with astonishing rapidity, reaching its maximum in 1907, when the stems of all the Aquilegias, Penstemons and some few other plants grown near here were literally covered with them. In 1908 their numbers were greatly reduced and this last summer I only saw one specimen. There were no evidences of parasites having attacked them. It seems probable, therefore, that weather conditions of last winter were unfavourable and that they perished while hibernating.

The larvæ of the Tussock Moth though extensively parasitized in 1908 were about as abundant as usual on the shade trees of Toronto.

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Various matters referred to in the Directors' Reports were discussed by Messrs. Caesar, Treherne, Hewitt, Bethune, Jarvis, Tothill, Nash, Gibson and others. The Woolly Aphis was stated to be rarely found on the roots of apple trees in the Niagara district; it hibernates as a stem-mother in the crevices of bark, and early in spring new colonies are produced. It was reported that in many parts of Ontario, where grasshoppers were so abundant this year, the Criddle mixture was found to be entirely effective, though in one or two localities complaint was made that the grasshoppers would not touch it. This failure may have been caused by some defect in making the mixture or in the mode of application. In Manitoba this year it has proved to be an excellent remedy.

The Tussock Moth was said to be on the increase in country districts, though largely kept in check by its parasitic enemies. In Toronto the methods employed for its control were much criticized; spraying was done towards the end of July when a large proportion of the caterpillars had ceased feeding; those in charge of the operation had so little experience that they used nozzles that were too coarse, and allowed the pavement and roadway to receive more of the arsenicals than the trees. Subsequently the gathering of cocoons was begun much too soon and then the appropriation was exhausted and further supplies refused when this part of the work might have been performed most effectively.

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## OBSERVATIONS ON A FEW INSECTS OF THE SEASON.

By Lawson Caesar, Ontario Agricultural College, Guelph.

A year ago last June, when in the vicinity of Niagara-on-the-Lake, I happened to notice a number of white pine trees that seemed to me to have an abnormally large number of dead twigs. On investigation it seemed evident that some sort of borer had been the cause of their death as every twig had a longitudinal hole in the wood and a considerable amount of castings at the entrance. No insects, however, were found in the tunnels or on any of the twigs examined. On the 21st of June of the present year I was in the same district and again examined the same trees. Once more it was clear that borers had been at work. After examining as many twigs as time permitted four specimens of beetles were found in the tunnels. Two of these belonged to one species and the other two to another, but they were all apparently Scolytids. The larger species was not more than about half the size of the Shot-hole Borer (*Scolytus rugulosus*), and the smaller species was only half the size of the larger.

Not having seen this injury elsewhere I thought that it might be the work of some dangerous pest that had just crossed the border and might later on spread through our pine forests. Accordingly I sent specimens of the injured twigs to Dr. Hopkins, of Washington, who has charge of Forest Insect investigations. No beetles were sent with the twigs because I supposed he would be perfectly familiar with their work and could tell me the cause without them. His letter is as follows:

"I have your letter of the 22nd. instant and the specimen of white pine twig that has been injured by a beetle. I examined the specimen and find the work of the beetle, but to my great disappointment no insect could be found. This is a most interesting example of injury, differing from anything I have seen in the East, although I have seen something like it on the Pacific Coast and in the Rocky Mountain region. Therefore I wish you would send a good supply of infested twigs in order that I may be sure to get the beetle. It is evidently a scolytid, but without specimens it cannot be identified. The blighted appearance of the twig is similar to that which was very prevalent throughout northern New England last summer, but in our quite extensive investigations, in which many different causes were found for the dying of the twigs, we did not find evidence of the work of this insect. Therefore the matter is of special interest, and I hope you will send us plenty of specimens without delay, for fear that they may leave the twigs. After we have made a study of the matter we will be very glad to give you further information on the subject."

On receipt of this letter I at once sent all the specimens I had with a request that he keep one of each species and return the other two. A considerable number of twigs were also sent through the kindness of Mr. Alfred Eastham, who happened to be about to visit the infested district. Dr. Hopkins in reply to my note accompanying the specimens said:

"I have your letter of the 1st. inst., and two spcimens of balsam mounts, also two specimens of beetles mounted on card points, and have just now received a bundle of pine twigs collected July 6th, at Niagara-on-the-Lake.

"The beetles in balsam are evidently a species of *Pityophthorus*, but it is impossible to identify them beyond the genus when mounted in this way, and even the genus is uncertain. They are far better for identification mounted dry. The other two specimens on card points represent an undescribed species, evidently of the genus *Conophthorus*, and is allied to a number of species that we have found to be injurious to the living twigs of pine, Douglas fir, etc., in the Western States. I am retaining one of the specimens for further study, and am returning the others to you as requested.

"The specimens of twigs are of unusual interest. A superficial examination seemed to indicate that they represented the common troubles investigated in New England last season, which were found to be due to several causes. A more thorough examination, however, revealed the fact that certain of the twigs with a peculiar grayish appearance were infested with living larvæ, apparently a *Pityophthorus*, and in one dead twig an adult *Pityophthorus* was found. We shall have no trouble in rearing these larvæ to the adult stage, after which we shall be able to identify them and shall write you further.

"One or two forms of the twig blight are also represented by the specimens sent, one associated with a light yellow spot on the twig, which is believed to result from the presence of the nymph of spittle insects, which are often very abundant on pine twigs. Some of the twigs are also thickly infested with *Chermes pinicorticis*, which reduces the vitality of the twigs and trees. These *Chermes* are of special interest, because they have alternate hosts, that is, one or more generations will develop on pine and then migrate to spruce, where they cause galls on the twigs, from which they migrate back to the pine, larch, etc., and there is one form of twig blight which is commonly met with where the white pine and spruce grow together. If, later in the season, you find that twig blight is developing under such conditions, I shall be very glad indeed to have specimens of the twigs."

It is too soon yet to expect any further word from Dr. Hopkins.

I have not had much chance to visit districts where the white pine is found so that I cannot at present say just how far this insect has spread through the province, but since Dr. Hopkin's last letter I have found its work in a pine grove about three miles south of Stoney Creek, and Mr. Jarvis has found it in Peel county near Inglewood.

It is quite clear that if these beetles were to become very abundant they could do enormous damage to our pines. So far they can hardly be said to be very serious, although about five per cent., or possibly more of the twigs have been killed. Trees that were infested last year did not seem any worse infested this year.

It must not be supposed that all the dead twigs seen on pine trees are killed by these insects, because in several districts numerous twigs had died, but on examination there was no evidence of any insect work.

Last year when in Prince Edward County I observed what was to me a new kind of injury on apples. It took the form of small, circular, brown, dead areas about one-quarter of an inch in diameter and one-eighth in depth. The skin over these cavities was always ruptured in the centre. Apples thus damaged were shown last year at our annual meeting, but no one seemed to know the cause. A few weeks after the meeting on looking over Prof. Crandal's excellent bulletin on the Plum Curculio I felt convinced that this insect had done the injury; consequently this autumn I asked Mr. McVannel, the Agricultural Representative at Picton, to see whether he could find any of the Curculios at the work. He discovered two early in September, and on the twenty-fifth of the same month, while in the same county, I found four of the insects at these cavities, two of them having just finished making fresh ones.

The apples worst attacked so far as I could discover by a very limited inspection were Golden Russet, Cranberry Pippin, Ben Davis and Snow. Spy and other varieties with very glossy surfaces seemed to escape. Some of the above mentioned varieties had as many as twenty injuries on a single apple, the majority of them usually being found near the calyx. Orchards that were not cultivated were, as one would naturally expect, much worse damaged than cultivated ones.

This sort of injury is done by the newly emerged beetles before they hide away for the winter and seems to begin about the third week in August and continue to the first week in October or possibly a little later.

It is rather remarkable that there is not considerable loss from this cause in the western counties of Ontario when it is so common in Prince Edward county and, as I have lately been informed, in the counties further east. Prof. Crandal states that in Illinois apples are often severely damaged by these feeding punctures, and Prof. Quaintance says that this sort of injury is especially common in the colder states and districts of North America.

A few interesting cases of parasitism have been observed during the season. For the previous two years the Shot-hole Borer (*Scolytus rugulosus*) has been doing great destruction to cherry, peach and plum trees in the Niagara district. Some fruit-growers lost as high as sixty trees in a single year. Many were afraid that the destruction would increase year by year and endanger the fruit industry. Very fortunately this year the borers have not done nearly so much damage. The reason for this seems to be solely the great increase in parasites. Early in the season, from a small piece of branch only a few inches long, I reared fourteen parasites. In September, while visiting St. Catharines and the surrounding district, numerous parasites could be seen on trees that had been attacked by the borers. A number of these were brought back and proved to be the same as most of those reared in the spring. All the parasites obtained so far are Chalcids, and much the commoner species is, so far as I have been able to determine it, *Chiropachys colon*.

On the trip on which the parasites of the Shot-hole Borer were found in abundance I was also requested to have a look at a maple tree that was said to be covered with some species of scale. On examining it I saw that the insect was the much dreaded Terrapin Scale (*Eulecanium nigrofasciatum*). On first sight I felt sure that the tree would have to be cut down and burned, but on closer evidence it was seen that nearly all the adult scales had been parasitized and there were only a comparatively small number of the living immature scales present. As it was quite clear that the parasites were looking after the scale in a satisfactory manner I informed the owner of the tree that he need not do anything except leave these friends to fight the battle for him.

One regrets to have to report that two of our worst insects have spread to new districts. The San José Scale has been found in one orchard in Prince Edward county and has come safely through the winter on nursery stock planted there last year. Efforts are being made by the provincial authorities to stamp it out before it can become well established and spread.

The other insect is the Railroad Worm. I have received specimens of apples infested by it from Bowmanville and from Cobourg, the latter having arrived only a week ago.

One new pest, the Blackberry Miner (*Scolioneura capitalis*) is becoming very abundant, especially in the Niagara district, and threatens to cause great loss to growers of this fruit unless a remedy can soon be found or parasites come to the rescue.

# NESTS OF THE BROWN-TAIL MOTH IN IMPORTATIONS OF FRENCH NURSERY STOCK, 1909.

By Arthur Gibson, Central Experimental Farm, Ottawa.

The inspection work in Canada which was necessary in view of the finding of nests of the Brown-tail Moth in shipments of nursery stock from France, is treated of fully in the annual report of the Division of Entomology and Botany for 1908-1909, which is now in press.

A short statement, however, of the work which was done in the provinces of Ontario and Quebec may be of interest to the members of the Society attending this meeting.

Nests of the Brown-tail Moth containing living larvæ were discovered early last January in New York State on apple, pear and cherry seedlings and quince stocks imported from France. This fact was at once communicated to the Division of Entomology, and a circular giving this information and asking for advice of shipments coming into Canada was at once prepared by the Director, Dr. W. Saunders, and sent out to nurserymen and others who would be interested, as well as to the press generally. On February 5th, after undoubted nests had been found in Ontario, a second circular, giving further information on this threatened invasion of such an injurious insect, was prepared by the Director and the writer, and sent to nurserymen.

The first nest found in such imported nursery stock in Ontario was on a plum seedling on 27th January. This was in the first shipment of stock examined. From this date until May 20th, every shipment of nursery stock coming into the provinces of Ontario and Quebec was examined carefully, either by me or by Mr. Harry Arnold, the Provincial San José Scale Inspector, of Pelham Centre, who had been instructed by Mr. P. W. Hodgetts to assist me on certain dates in this work. Every nurseryman who imported such stock was visited, as well as a number of seedsmen and florists. Thirty different firms or individuals in all were visited, 26 in the Province of Ontario and 4 in the Province of Quebec. A complete list of these and the nature of the stock examined and the number of nests found will be found in the report of the Division above referred to. Many of the nurserymen had to be visited several times, immediately on the arrival of stock.

The examination of this imported stock had, of course, to be made very carefully. Generally speaking, the whitish nests were easily detected, but occasionally small nests would be found, or some which had become broken. The nests mostly occurred between two or three of the twigs or along the main stem of the seedlings, and in size varied from less than half an inch in length and about the same in width, to about nearly three inches in length and over an inch in width.

In the provinces of Ontario and Quebec, 1,503,129 plants were examined. These consisted largely of apple, pear, plum and cherry seedlings, to be used either for grafting or budding. In the province of Ontario, 188 nests of the Brown-tail Moth were found, and in the province of Quebec, 8, making a total of 196. These were found as follows: 100 on pear, 56 on apple, 28 on plum, 5 on quince, 1 on cherry, 2 on rose, 2 on spiræa, 1 on sugar maple and 1 on Prunus pissardi.

We have reason to expect, owing to the way in which the consignments of nursery stock were examined, that every nest of the Brown-tail Moth present was found. No report has come to the Division since this inspection work, of any larvæ of the Brown-tail Moth having escaped from these shipments and established themselves. Nurserymen and others were strongly advised to burn all packing, etc., in the cases in which the nursery stock was shipped, as well as the cases. After the trimmings from the fruit seedlings had been burned, as an extra precaution the importers were advised to dip the stock in kerosene emulsion, or a standard miscible oil as was being done in New York State. If the packing, etc., from these cases were not destroyed before spring, it can be readily seen how some of these caterpillars might have got out and established themselves.

In the report of the Division now in press there will also be found a statement of some experiments with hydrocyanic acid gas to kill the larvæ of the Browntail Moth. These experiments were conducted in a fumigation box having 128 cubic feet of contents. Varying strengths of gas were tried, from the one used in the federal fumigation houses to destroy the San José Scale, viz., 1 ounce of cyanide of potassium, 1 ounce of sulphuric acid and 3 ounces of water to every 100 cubic feet of air space, exposure 45 minutes, to three times this strength, the exposure being lengthened to 2 hours. In these experiments many of the larvæ had left the nests and were active on the sides of the glass jars, with cheese cloth coverings, in which they had been kept. These experiments, although not very extensive, went to show that fumigation with hydrocyanic acid gas evidently cannot be relied upon as a practical remedy for this insect when in its winter condition. Even when the strength of the gas was three times that used in our federal fumigation houses, and the exposure very much lengthened, only a very small percentage of the larvæ which had left the nests were killed. It would certainly require considerably greater strength and much longer exposure to kill the larvæ when within the nests, and owing to the tough, closely woven nature of these nests the outcome would be very doubtful. In this work of fumigation I was assisted by Mr. Herbert Groh.

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## THE LARGE LARCH SAWFLY.

(*Nematus Erichsonii, Hartig.*)

Dr. C. Gordon Hewitt, Dominion Entomologist, gave a brief description of his work on this insect in England, where it is becoming a serious forest pest. Its distribution in Canada is also increasing and the larches (*Larix americana*) as far west as Winnipeg, are now suffering from the attacks of this sawfly, which destroyed most of the larches in Eastern Canada subsequent to its appearance in 1882.

Only one brood was found to occur—the deposition of the eggs and the emergence of the larvae extended over a considerable period, and might give the impression that the species was double brooded.

The chief parasite was found to be *Mesoleius aulicus,* Grav., and investigation showed that in 1908 the average number of cocoons parasitised was 6 per cent., in the present year it was found to have doubled. Another ichneumon, *Microcryptus labralis,* Grav., was bred out and this insect is probably a hyper-parasite on (*M. aulicus.*)

One of the most potent factors in the natural control of the insect was the Field Vole (*Microtus agrestis,*) which extracted the larvæ from the cocoons during the winter, during which season the larvae form a large portion of their food. In one plantation about 50 per cent. of the cocoons were emptied in 1908 by these rodents.

Certain species of birds, such as the starling, rook, jackdaw and tits were of great importance in destroying the larvæ in large numbers. A scheme of attracting these species of insectivorous birds by means of nest-boxes was initiated and the results of the experiment were very gratifying, 33 per cent. of the boxes being utilized in the first year.

A species of *Cordiceps*, a fungous parasite, was found to be destroying a large number of the pupating larvae, and as the probable method of infection is terrestrial, this fungus may prove to be an important means of natural control.

The eradicative measures which were carried on against the larvae on the young trees were spraying with lead arsenate and crushing the larvae when they are in the "clustering" stage of their life-history, both of which measures were very effective in preserving the foliage of the trees under 8 feet high. Such measures of course cannot be employed in the case of large tracts of young self-sown larches, such as occur in many places in Canada; in such places natural means of control must be relied on.

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## NURSERY WORK IN ONTARIO.

By R. C. Treherne, Grimsby.

It is with a great deal of pleasure that I am enabled to give you a report on the Nursery work in Ontario. This year the Ontario Government, for the first time since 1902, instituted a general summer inspection of the nursery stock of Ontario, with a view to more effectually check the increase, distribution and ravages of the San José Scale and other pernicious insects which are prevalent in the nurseries, and also to gain a more precise idea of the nature of these attacks and the extent of their prevalence. A report, such as I am attempting to present to you at the present time, must necessarily be of a somewhat general character for the reason that the work is not yet finished and the final report is not yet completed. Nevertheless I will endeavour to outline to you the course adopted by the Government, which ultimately led to the formation of this summer inspection. The inspection is principally aimed at the San José Scale, but other insects, fungi and plant diseases are also included.

For the last three years sub-inspectors were appointed in the Niagara Peninsula where the bulk of the nursery stock is grown, and to quote from last year's report, "It was the duty of these men to watch closely to see that all nursery stock was properly fumigated before being shipped out, and also to report any instances of scale being found in the nurseries." Presumably the work of these inspectors was sufficient to show that the scale had become localized in many nurseries, and, in order to effectually combat the insect and prevent its spread it was expedient to discover its breeding places and distributing centres. With that view, then, the course of summer inspection of all nurseries was adopted; the Act which had already been passed prohibiting the sale of scale-infected stock was enforced, and inspectors were authorized to break down, or otherwise prevent from sale, affected stock in the nursery row.

The work was started in the Niagara District early in August of this year with two, and sometimes three, inspectors employed. They commenced at Stoney Creek and worked through to Queenston and at the present time (Nov. 4), are engaged in the Welland and Fonthill Districts.

The work has been delayed somewhat owing to the enormous amount of stock that is being grown and is ready for sale at the present time. According to last year's Fruit Branch Report, there were well over two million fruit trees growing in the nursery rows, to say nothing of grape and small fruit cuttings and the various ornamental shrubs that are being propagated. This year, I believe, the amount is still larger when all saleable stock is computed.

It is the duty of the inspectors to make a tree to tree inspection, locate the scale and dig up and destroy affected plants; and since a single man can only examine 15,000 to 20,000 trees a day, according to the nature of the stock and the care it has received, it can be imagined that the work is assuming great proportions. But it is work along the right line, and the nurserymen realize this.

Here it might be desirable to lay greater stress on the work of the local inspectors, whose duty it is to examine and enforce the law on those orchards found to be infested by scale throughout the country, but specially in the neighborhood of nurseries. For it is only by destroying the root of an evil that we can hope to accomplish results, and so long as infested orchards remain, just so long will the scale be found in the nursery.

From observation this summer it appears that the orchardist in very many cases neglects his duty to the Peninsula, and that the nurseryman in nearly every case is anxious to reduce the scale to a minus quantity.

Speaking generally, the San José Scale has been found in nearly all the nurseries thus far examined, and is found to be present in greater or less quantities, varying from one tree to several hundred, dependent on the locality. But little scale was found in the nurseries of the Stoney Creek District, but a considerable amount was found in the old Niagara District. A varying quantity was found between these two districts with a gradual tendency to increase from the former towards the latter. Scale is also very prevalent in the Fonthill District—greater infestation being to the north and north-west of the village.

Birds, and the procuring of scaly bud-sticks appear to be the principal means of the distribution within the nursery, while shipment after faulty fumigation seems to increase the area of infestation outside. It is peculiar that sometimes a three year old tree literally encrusted from the twigs to the ground, will be the only tree in a row affected, thus proving the necessity of a tree to tree inspection.

Remedial measures most commonly in use in the nursery are the Lime Sulphur Spray, Whale Oil Wash and the Carlson Mixture.

Besides the San José Scale, there is a long list of insects found on nursery stock. The most important, the most frequent and the most evenly distributed being Pear-Tree Slug, Leaf-Hopper, Red Spider, Oyster-shell Bark Louse, Blister Mite, Woolly Aphis, Bucculatrix, and the Trumpet Leaf-Miner.

From the botanical standpoint, the Cherry Mildew, Black Rot of Grape, Fire Blight, Bear Scab, Black Knot, Crown Gall and Hairy Root, are the most frequently observed fungous diseases.

It is hoped that future years will see this scheme of summer inspection continued. A fuller and more complete account of this year's work will probably be published in the Report of the Fruit Branch, Department of Agriculture.

During the discussion that followed, attention was drawn to Clause 2 of the Nursery Inspection Act, which states that:

"The Council of any city, town, township, or incorporated village may, and upon the petition of 15 or more ratepayers shall, by by-law, appoint at least one inspector to enforce the provisions of this Act in the municipality."

It was considered that there is a weakness in the clause which authorizes a Council to appoint an inspector, chiefly because the local man, from the very fact that he is a local man, does not inspire confidence. The fruit-growers and farmers with whom, in the performance of his duty, he comes in contact, ask one another the questions: "What does he know about the scale?" "Does he know the scale better than we do?" And further, the local inspector does not wish to risk disputes and wrangles and loss of his popularity by condemning a neighbor's orchard. On this account it would seem better to appoint as inspectors outside men, and that the Government should assume entire control of the work.

The following resolution was then unanimously adopted:

Moved by Dr. C. Gordon Hewitt, Dominion Entomologist, seconded by Mr. A. F. Winn (Province of Quebec), "that this Society, having heard from Mr. Treherne an account of the methods and work being done by the inspectors, wishes to express its great appreciation of the Ontario Government's arrangements for the inspection of nursery stock this season, and hopes that this important work will be continued with equal, or even greater, zeal in the future."

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## SOME GUESTS AT THE BANQUET OF BLOSSOMS.

By F. J. A. Morris, Trinity College School, Port Hope.

In 1905, my first season of collecting, I went over to England at the end of June on a botany trip. I had already begun to watch for beetles on blossoms before leaving Canada, though my chief hunting ground had been the bark of trees. In England I knew that the latter game-preserve was practically out of the question, as timber is far more scarce, and nearly all the woods are kept too clean for fallen timber to lie or wood to rot. If I meant to do any beetle-hunting, it must be by some other method, and I naturally made up my mind to combine hobbies by carrying a collecting-bottle out with me on my daily botanical rounds.

My first stay was on a small estate in Chislehurst, Kent. Here, in this garden within a garden, while wandering through a wood of hazel and oak, I came on a large clump of tall umbellifers in full bloom. I knew already from Fowler's and other books that such blossoms were a favourite haunt of certain beetles, and I made my way cautiously along a hedge of rhododendrons towards the clump. As I did so, there rose from between my feet a dark brown hawk-like bird, that flew up into my face and hovered for some moments in front of me; it was a nightjar, the famous goat-sucker of popular superstition, menacing, but powerless to fulfil a threat, being, indeed, cousin-german to our night-hawk and whip-poor-will, with all the furtive movements and ghostly silence of the creatures that fly abroad by night and hawk beneath the light of the moon. Like the nighthawk, it builds no nest, but there among the round flint pebbles by an oak lay its pair of eggs.

When first I got to the clump of flowering plants and scanned their broad white discs of blossom, among numerous diptera and hymenoptera, nothing was to be seen except a few butterflies, but presently I saw a large black and yellow Longicorn settle on an umbel some distance off. On approaching I found two of the beetles feeding and succeeded in catching one in my hand. They were very active, as quick as sunflies and almost as wary, so that capture was far from easy. I managed, however, to get a second specimen some time after. They proved to be Strangalia armata; later on in the season I captured in North Wales a pair of Strangalia melanura, one on a composite, the other on a small umbellifer; and in Somerset, on the slopes of the Quantocks, I captured the more rare Strangalia quadrifasciata, sunning itself on a hazel leaf. The genus Strangalia is closely related to Leptura, and, like that genus, with its near allies frequents blossoms. So far I have not found any in Canada, though some species are, I believe, not uncommon. From the wood I passed into the kitchen garden, for I remembered a bed of orpine or livelong (Sedum telephium) where, 25 years ago, 1 could be sure of some Red Admirals (Pyrameis atalanta) and an occasional Peacock (Vanessa io), but alas! King Orpine's days were numbered, and Salpiglossis and Montbretia reigned in his stead. However, I spied a bed of asparagus and went over to review its ranks. I soon found that ladybirds were glutting themselves on a small dark grub about the foliage; it was probably the grub of the asparagus beetle (Crioceris asparagi), for I found a number of the mature insects on the leaves. Though very small, this beetle is extremely beautiful when alive, the vertical lines and cross-bars which appear black in cabinet specimens being of a rich dark green in the living insect. It has a curious habit when alarmed of thrusting its antennæ straight forward in front of the head and remaining motionless like a pointer; this habit is found in not a few of the Chrysomelians, as in some of the Longicorns, notably the Saperdas. I saw no trace of the 12-spotted species (*Crioceris 12-punctata;* indeed, at the time I did not know it occurred in Great Britain; but in September, 1907, I found both species on some asparagus in the late Dr. Brodie's garden in Toronto, and the last two years I have found the latter species abundant in Port Hope. In Dr. Bethune's day, I understand, it had not yet appeared there.

During the rest of my stay in England I did not do much collecting, as the month of August forms a sort of interregnum in insect activity between the early and the late broods. But I returned to Canada fully determined to prosecute my search among flowers and foliage in the coming season. I knew, of course, that I should thereby restrict my captures mostly to two or three families of beetles —the Scarabs, Longicorns and Chrysomelians, but to some such form of amateur specialism I was not at all averse.

Accordingly, from early April in the spring of 1906, I was out and about whenever I got the chance. It was not till May that my efforts met with much reward. A species of Œdemeris that frequents the dogtooth violet was almost the only capture. I had been told that a somewhat rare Longicorn was to be met with on the blossom of the trillium, but my informant could not tell me its name, nor did patient search in trilliums yield me any specimens of this family. About the 20th of May, however, blossomed the early elder, and though I wasted a great deal of time over elder clumps growing far away from woodlands, I did at last, by good luck, direct my steps to some growing on the edge of a wood about four miles north of the school. Here I found a new species of Scarab, leaden-gray in colour, though disguised for the nonce in a light yellow coat of pollen, with which it was thickly dusted over; it had long crooked hind legs that looked too clumsy to be of much use to their owner, and were, indeed, trailed along after it when it crawled. It was the male of *Hoplia trifasciata,* and I found it abundant for two or three weeks on the early elder, the choke-cherry, and the hawthorn; at first only the males were to be found, but about a week later the females became common; these at first I took for a distinct species, as they are very different in colour, yellowish-white, with three irregular bands of brown across the back; on the hawthorn, however, where the female was in preponderance, I more than once found a pair. The same mistake appears to have made its way into print, and the two sexes were at one time assigned to distinct species, the male figuring as *Hoplia tristis,* and the female as *Hoplia trifasciata.* I found also on this clump of elder a few specimens of one of our earliest Lepturas, *L. ruficollis;* and, by way of a new illustration to the old adage that "it never rains but it pours," three specimens of what at first I took to be an ant, till on looking closer I saw the straight line down the back formed by the suture of the wing-covers and the gracefully curving antennæ that mark the Longicorn beetle. It was quite new to me, and my fellow-collector, though several seasons older than I, had nothing like it in his collection. There was nothing specially remarkable about its colour, which was blackish or dark gray, relieved by some transverse pencilled lines of white, and it was only 1-3 of an inch in length, but there was an elegance of form and outline that made it long a favourite in my little collection. This enthusiasm in a grown man doubtless seems absurd to the uninitiated, and I must admit, somewhat ruefully, that I found myself an object of pity rather than envy when I "talked beetles" to a brother of mine who has misspent the last 20 years of his life tiger-hunting in Madras and bagging lions in Rhodesia, in fact, generally making ducks and drakes of all his golden opportunities to collect rare Longicorns from tropical blossoms.

In the identification of this insect occurred an episode that I hope Dr. Bethune will pardon me for introducing here. At the close of this season of 1906 I purchased a copy of LeConte & Horn's key to the genera of N. A. Coleoptera. By a somewhat rough process of elimination I had decided my beetle belonged somewhere in the tribe *Clytini,* whose most familiar representative is probably the famous sugar-maple borer, *Plagionotus speciosus.* LeConte & Horn's book made it probable that in the third group of this tribe, the *Anaglypti,* it would find its place. This group contains four genera, *Microclytus, Cyrtophorus, Tillomorpha,* and *Euderces.* Only one of these genera was at all known to me, and that from a single species (*Euderces picipes*) somewhat resembling the subject of my examination. I found first of all that the beetle I was trying to place had no ivory marks on the elytra, which put *Euderces* out of the question; the eyes were oblique and emarginate instead of round, which excluded *Tillomorpha;* it must be either *Microclytus or Cyrtophorus,* and the book gave one no choice, for in *Microclytus* the second joint of the antennæ was equal to the fourth, while in *Cyrtophorus* the second joint was much shorter, as it obviously was in my specimens. My fellow-collector had already sent a box of unidentified specimens to Guelph to be named, and when they came back I was naturally eager to learn the result. To my chagrin I found my little favourite christened *Microclytus gazellula.* This so mystified me that at last I wrote to Dr. Bethune, explaining the quandary I was in. To my great relief I got an immediate reply, that the beetle sent him had been identified from a cabinet specimen named by an older collector. LeConte & Horn were right, my beetle was *Cyrtophorus verrucosus,* as were those in the Guelph cabinet, though hitherto wrongly named.

I have examined a number of cabinets, and in none of them yet have I found more than an odd specimen of this beetle, nor have I met a Coleopterist who had captured it, except accidentally, as it were. But on the blossoms of the early elder, still more those of hawthorn, sometimes of choke-cherry, dogwood, spiked maple, viburnum and New Jersey tea, from the middle of May till early in July, I have found it abundant. It is then replaced by its near relation, *Euderces picipes,* which frequents blossoms all July, especially those of New Jersey tea and milkweed, though often met with also on certain of the Rosaseæ and composites. It closely resembles *Cyrtophorus,* though considerably smaller and not so elegant in form; on the side of each elytron is a transverse white band, technically termed an ivory vitta; in the first specimens captured I did not recognize a new kind till I took them out of the killing-bottle.

This finding of a new species acts as a great incentive to the collector, not merely through the stimulus and encouragement of filling gaps in his cabinet, but through the interest and education of comparing closely-allied species and genera, and gradually following out the relationship of distinct tribes as the series of intermediate forms grows more and more continuous; thus retracing, as it were, the steps of natural evolution. It was, I know, a great encouragement to me to find the wide gap between, say, the Cyllenes and the Lepturas being gradually filled in and the various stages of the transition emerging, so to say, from the unknown. I believe it was the consequent redoubled efforts made by my fellow-collector and myself the next season, more than mere luck, that brought us an interesting discovery in the middle of June. On a certain Sunday morning I captured on spiked maple a specimen of an ant-like beetle, obviously belonging to the *Anaglypti* group, but neither *Cyrtophorus verrucosus* nor *Euderces picipes,* and in the afternoon of the same day on hawthorn, my friend captured a specimen of an ant-like beetle neither *Cyrtophorus verrucosus* nor *Euderces picipes.* Neither of us noticed his discovery till we came to turn out the contents of our killing-bottles on returning home. Stranger still, the new species we had captured, when we came to compare notes, proved different from one another. By a close examination of my friend's capture, I found he had at last got a genuine specimen of *Microclytus gazellula.* My capture has not yet been identified, but it may be referred almost certainly to the genus *Cyrtophorus.*

I have been led into something of a digression here, and for purposes of this paper I may remind you that we are in the month of May, and searching for beetle guests on the blossoms of the early elder. Through the middle of the wood where I made these first discoveries flows a small stream that has eaten out for itself quite a deep ravine through the limestone, clay and marl. About 100 yards up this glen grows a large shrub of early elder that opens about the end of May; on its blossoms we got several more of the *Leptura ruficollis,* but nothing new that season. In 1907, however, while my fellow-collector was examining the blossoms, he spied a new Longicorn, of which he captured three specimens, and a day or two later, from the same shrub, I managed to get two. Though there were several other elder bushes in the wood, we have found this beetle on none of them, only on this one tree, and it has yielded us from 3 to 5 specimens every season since. As far as our experience goes the beetle is active from the end of May till nearly the end of June. In 1907, from another locality I took two specimens on dogwood blossom; in 1908 I got three or four specimens on dogwood and on the thimble-berry, and in the season just over we both saw specimens feeding on hawthorn blossoms. It is the *Pachyta monticola,* a very pretty insect with pale yellow elytra, boldly marked with black or deep crimson. This genus is closely related to the Lepturas, but broader across the base of the elytra, and thicker through the sternum; its thorax, too, instead of being rounded at the sides, is armed with an excrescence known to Coleopterists as a "process." In 1907 and 1908 I succeeded in capturing a few specimens of two more species of *Pachyta,* smaller than *monticola,* and inconspicuous in colour, black, or black with dark brown streaks on the wing-covers. They were taken late in June, feeding on the blossom of dogwood. And with every fresh discovery I swelled with pride as I found myself getting more and more intimate with this royal family among beetles, the Longicorns.

With the passing of May the early elder came to an end, but before it was over the hawthorns began to bloom all over the neighbourhood. Our first field of investigation *was* a field, an extensive pasture bordered on one side by a wood of pine, beech and maple. At first I went all about the farther end of the field wherever the snowy mass of hawthorn bush in full bloom drew me, but I soon found that it was only near the wood that my search was rewarded; the first captures were a couple of Scarabs called *Trichius piger,* a beetle looking very much like a small bumblebee and extremely active; it is abundant on blossoms from early in June till the middle of July, and may be found on a great variety of flowers. Then I got my first specimen of *Dichelonycha elongata,* another Scarab, which is particularly fond of basswood foliage, and becomes some seasons a veritable plague. Finally I came to hawthorns on the border of the wood, and here I found several Longicorns feeding. Among them three Lepturas that were new to me, *Leptura pubera, L. mutabilis* and *L. vibex,* of the last two only a single specimen. About the same date I paid a visit to the wood four miles away, to see what guests the hawthorns there were entertaining. On one bush at the edge of the wood I found both sexes of *Hoplia trifasciata* plentiful, two or three specimens of *Dichelonycha,* and a lot of *Leptura ruficollis* and *Cyrtophorus verrucosus;* and besides these a new insect that at first I passed over for a fly, till the long antennæ betrayed it; these in the female were about the length of the body, in the male twice as long; it was the more easily mistaken for a fly in that its wing-covers were reduced to a mere pair of epaulets or shoulder pads. It proved to be the Longicorn *Molorchus bimaculatus,* and was very abundant throughout June on several sorts of blossom. On another bush at the edge of the wood I found a regular colony of Chrysomelians busy in the blossoms. I sent three of these to Guelph, where they were identified as varieties of *Orsodacna atra;* in June, 1907, I found the same beetle on hawthorn blossom at Lakefield, and I have taken it also on viburnum; in no case did I find the normal form of *O. atra,* though a few of my specimens approximated very closely to it.

A curious feature about the hawthorn and its guests is that some shrubs apparently as favourably situated as others and in full bloom, were deserted and others crowded. It may prove that some species attract beetles and others do not; Gray's New Manual enumerates 65 species of hawthorn in N. A., while in Sargent's Monograph on the Cratægus in some parts of Ontario alone (as published in last year's Wellington F. N. Bulletin), no less than 95 species are distinguished. The results of closer determination in the species of plant hosts might prove interesting.

An encouraging thing about this sort of collecting is that seasons vary in the maturing of both hosts and guests, so that often you will find species frequenting blossoms that the year before they did not visit, and sometimes you will come across an entirely new insect. Two seasons ago, for instance, early in June, we found a strange beetle abundant on dogwood; it proved to be *Callimoxys,* a first cousin of *Molorchus;* in this genus the wing-covers are not short as in *Molorchus,* but awl shaped, so that the inner margins do not lie together in a straight line. Again this last season I made a new find on hawthorn in the shape of a small oak-pruner (*Elaphidion*). Much, too, may result from search in a new neighbourhood;

in 1906 I found scores of *Lebia furcacta* ( a small Carab of the Bombardier group) feeding on golden-rod about the margin of a swamp at Lanark, and last July I captured two fine specimens of the large blister beetle, *Pomphopœa Saya,* in Muskoka, upon nannyberry (*Viburnum lentago*).

When the hawthorn began to bloom in 1907, I went eagerly back to work my claims, for the bloom of a hawthorn last barely a week, and seems to attract insects for only a day or two. I had already ruled out the shrubs growing in the open; so I went first to the edge of the wood, but this faced west, and was exposed to a chilly wind. There was nothing to be found, and I followed the gleam of hawthorn north across some stump lands to a large wood; skirting its west and north border, I came presently to a stretch of low swampy ground that penetrated the wood in a southerly direction, and was entirely out of the wind. It was thickly grown with dogwood and spiked maple, both of which were in the prime of their bloom, and in full sunshine. The number of insects feeding on the blossoms was astonishing; in an hour or two I must have captured several hundred beetles. Besides *L. ruficollis* (with its variety *sphœricollis*), *L. vibex* was plentiful and so was *L. mutabilis,* whose name now for the first time became clear to me, both forms being abundant, the light brown and the dark gray; I found also a very small *Leptura* that was new to me (*L. subargentata*), and the beetle, *Encyclops cœrulea;* there were also a few specimens of *C. verrucosus,* and it was then that I got my unidentified species of *Cyrtophorus.* There were, of course, other families of beetles; in particular, Elaters, of which I captured four new species, one of which I have never seen except on spiked maple, the head and thorax dark brown, ending in a reddish-brown base, the elytra yellow-green, tipped with dark brown. On the same blossom in another locality I have taken three more Elaters, *Corymbites hieroglyphicus, C. propola,* and a third species not yet identified, prettily marked with dark wavy lines across the wing-covers; besides these, yet another Leptura ( *L. 6-maculata*). *L. vibex* seems fairly to revel in these moist woody hollows, and later on in the same place on black elder I found *L. lineola* abundant. It is evidently addicted to black elder, and partial to moist woodlands.

As June drew to its close we extended our search to the south slope of a long ridge of high land, some 6 miles north of P. H. On this slope grew the New Jersey tea, and as there were many groves of standing timber, as well as berry patches and thickets of small trees and shrubs, we felt confident that we should make some finds. Our first visit to this place (which we dubbed "the Rocky Mountains") found the New Jersey tea still some days short of blossoming, but there was dogwood in bloom on the slopes, and almost the first bush we visited brought us three or four new beetles, among them *Gaurotes cyanipennis,* of the Lepturoid group, a stout, robust beetle, resembling in form *Pachyta monticola,* very handsome and of a brilliant dark green hue, and *L. capitata,* a beetle we at first took for *ruficollis,* but more tapering in outline, and with head crimson as well as thorax.

With the first days of July, along the southern slope of our local Rocky Mountains the New Jersey tea and late elder expanded to the sun, and the whole hillside became a revel of insect life. The delicate fragrance of the New Jersey tea would no doubt at any time attract guests to its dainty white clusters, but coming, as its blossoms do, jump with the height of insect activity, and in the most glorious weather of the year, the sun blazing through a breathless atmosphere, the number and variety of guests swarming to the feast were almost beyond belief. Sometimes an altercation would arise, when some blundering glutton (like *Bombus* or *Trichius*) tried to elbow his way into a blossom where there was no longer standing room. But "with them," as Wordsworth points out, "no strife can last."

> " For why?—because the good old rule
> Sufficeth them—the ancient plan
> That they should get who have the power
> And they should keep who can,"

—and the weakest go to the wall.

Among the many new species we met with in these happy hunting-grounds were several members of the group *Clyti,* between the *Cyllenes* and the *Anaglypti;* of this group we found an occasional specimen of *Xylotrechus colonus,* and a small *Neoclytus,* while *Clytanthus ruricola* was abundant. In the Lepturoid group we took many specimens of a genus we had not found at all before, *Typocerus,* of which we met with three distinct species, one black (*T. lugubris*), one black and yellow, banded like a wasp (*T. sparsus*), and a third mottled with patches of straw-colour and reddish brown (*T. velutinus*).

In midsummer heat, insects seem to grow nervously alert and restless and we found the Typocerus often defied capture; they would hover at a blossom without settling, like miniature humming birds, their tiny wings fanning with marvellous velocity, while their flight from one point to another was of the swiftest. A small beetle in flight is never conspicuous, and some of them when they settle on a blossom seem to have stepped out of the infinite, and when they take to flight again they pass away into a 4th dimension, as though, like Wordsworth's skylark, they too enjoyed a "privacy of glorious light," but one that needed no soaring to gain. More than once we found with birds of this feather that one in the hand was by no means worth two in the bush; there proved many a slip between the cup of one's closed fist and the lip of the cyanide bottle.

To the Lepturas themselves, already a long list, we added *L. subhamata, zebra, vagans, proxima, biforis, vittata, Canadensis,* and three species at least unidentified. Of these, *proxima* and *subhamata* seem to prefer the elder, and *Canadensis* the milkweed. In the same neighbourhood, from the heart of a dogrose I flushed an *Oberea bimaculata,* and from plants of the wild bergamot, with its sweet fragrance and delicate lavender blossoms, a whole covey of some smaller *Oberea* that I have not yet identified. I say "flushed" advisedly, for in the first instance I did not bag my bird; indeed, I chased it for two years before I caught it (the species, that is, not the individual). It is a small insect, of very narrow outline and black in colour; when flying it is almost invisible, only the practised eye can make out a minute and swiftly-moving shadow. You will get some idea of the hunter's difficulties when I say that I found it fatal to wink the eye while marking its flight; the creature simply disappeared like the skylark at the last point of vision. For one thing, it has a dodging flight, like that of a snipe, and to make its assurance of escape doubly sure it never settles on the upper side of a leaf, but always underneath. Even then it is seldom off its guard; if you cast so much as a shadow, it is off like a trout in a pool. I tell you there was rejoicing in the camp, if not feasting, when I came home with the scalp of *Oberea bimaculata* at my belt.

But in so fair a scene as the Port Hope "Rocky Mountains," disappointments cast but a passing shadow. The place was a perfect Paradise of flowers, and as we wandered in sunshine beneath the vaulted blue, over beds of New Jersey tea, through thickets of raspberry and thimbleberry, among brackens and orange lilies, by fences festooned with grapevine and smothered in dogrose, everywhere a riot of blossom and insect life. Nature transfigured with the glory of the July sun, we thought of the wonderful interdependence of all living things on earth, and felt—I hope I may say it without irreverance—that it was good to be there.

> " Such life there, through such lengths of hours,
> Such miracles performed in play,
> Such primal naked forms of flowers,
> Such letting Nature have her way,
> While Heaven looks from its towers!"

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## EVENING SESSION.—THURSDAY, NOVEMBER 4.

At 8 o'clock p.m., a public meeting was held in the Massey Hall auditorium, which was well filled with students, both male and female, and a number of visitors from the town as well as members of the Society. The chair was taken by Dr. Bethune, Professor of Entomology. The proceedings were much enlivened by musical selections excellently rendered by the College Orchestra under the direction of Mr. J. D. Tothill, fourth year student in Biology, and a piano solo by Mr. Roy Fraser, another student in the same department.

After a few remarks by the Chairman on the origin and progress of the Society which was celebrating its forty-sixth anniversary and the near approach of its jubilee, he introduced the speaker of the evening, Dr. C. Gordon Hewitt, the newly appointed Dominion Entomologist, who was taking up the work at the Experimental Farms so long and so ably conducted by their lamented friend, the late Dr. James Fletcher. It was a great pleasure to welcome Dr. Hewitt to Canada, and to have his kindly assistance during the proceedings of the annual meeting of the Entomological Society.

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## HOUSE-FLIES AND THEIR ALLIES.

**Being the major portion of a lecture delivered before the Entomological Society of Ontario, on November 4th, 1909, by C. Gordon Hewitt, D.Sc., F.E.S., Dominion Entomologist, Ottawa.**

It is an especial pleasure to me to have this opportunity which the Entomologists of Canada, in inviting me to give this address, have afforded me, of addressing my first remarks in public in Canada to the Entomological Society and the students of the Ontario Agricultural College and the Macdonald Institute. It is, in a sense, my official introduction to you, and the cordial reception which I have been accorded on all sides, and especially during the meeting, have been most encouraging, and I can only say in reply to it all that while I have the honour to be Dominion Entomologist it will be ever my object to further the science of entomology, especially Canadian entomology, and by the application of the results of scientific research to deal with those varied problems, both great and small, which confront the entomologist when dealing with injurious insects and their control.

The subject of my address this evening is one that is familiar to you all. In Canada I find you know the house-fly only too well. It is man's most constant companion and the most truly "domestic" animal in the world. Wherever man has gone the house-fly has followed in his steps, from the arctic circle to the burning tropics it dances in constant attendance, the uninvited guest. And yet, in spite of all this, notwithstanding the fact that no living creature paid him so much attention, he did not trouble himself about it beyond a most cursory inquiry into its habits and life. This is not infrequently the case in zoological science; we write monographs of inordinate length on species of animals whose chief recommendation is that they are rare, whereas on the other hand, those animals, frequently of great interest and importance, that are waiting on the threshold of our laboratories for inquiry are passed over. The house-fly is one of the greatest examples of this. In 1790, Keller made an excellent study of the "Stubenfliege;" he studied the life-history and anatomy and anyone who has seen the beautiful memoir which he wrote and the charming illustrations will be filled with admiration and wonder that so much could have been done with the scientific apparatus then at the investigator's disposal. Previously and subsequently to that, those great naturalists, Reaumur, DeGeer and Bouche, all included a short description of this insect and its habits in their classic works. Since that time the only investigators who contributed really valuable information have been Packard and Howard, who have studied the life-history and habits in the United States. There is no need for me to call the attention of Canadian entomologists to the great importance of Dr. Howard's work, the value of which lies in the fact that he, above all investigators, showed the people of the United States, and of other countries too, the serious rôle which the house-fly plays in our national life. I need only refer to the excellent work which is being done by the New York Merchants' Association to combat this danger from flies—than which such an association could do no work more worthy—as an illustration of the manner in which a corporation has taken the warnings, has proved them beyond dispute for itself and is applying the results of such knowledge as it has gained to the amelioration of public life.

It has been my good fortune during the past few years to be able to add a little to our knowledge of this insect by a detailed study of its anatomy of which we had no previous account, and its life-history and habits. The result of that work has now been finished, though like most investigations it is not complete and it is my intention to-night to give you briefly and in a popular manner some of the results of my work and of the work of others who have been studying the habits of this insect.

First of all, you must understand that several species of flies inhabit houses, some of these are frequently mistaken for the true house-fly (*Musca domestica*). This species is easily recognizable by having on the dorsal side of the thorax four almost black longitudinal stripes on a dusty grey ground which in certain lights has a golden shimmer; the ground colour of the abdomen is a buff yellow and there is a dark brown median dorsal stripe; the whole of the dorsal side of the abdomen, however, is overspread with a reflecting grey which gives it a blotchy appearance. The average size of this species is 6-7 mm., but unfavourable conditions in the larval life tend to produce dwarf specimens of the adults. The occurrence of these smaller specimens was no doubt partially responsible for the popular idea that they were *young* house-flies and this in turn led to the mistake that many non-etomological people make in believing the other species of fly which occurs in houses, namely, *Homalomyia canicularis,* to be a young *M. domestica.* This lesser house-fly differs on examination very considerably from *M. domestica.* In the venation of the wings the fourth longitudinal vein of the wing of *H. canicularis* goes straight to the margin as in all the members of the group *Anthomyidæ,* whereas in *M. domestica* it is bent up at an angle before reaching the margin which it joins close to the termination of the third longitudinal vein; not only is it smaller, but in form and colouration *H. canicularis* differs from *M. domestica.* The dorsal surface of the thorax of the male is greyish black with three indistinct longitudinal stripes, the male's abdomen is slender and tapering compared with that of *M. domestica;* it is bronze black with three or four pairs of translucent yellow lateral areas. The body of the female is coloured a dark ash-grey and the thoracic stripes are more distinct, the abdomen shorter and more robust.

*Musca domestica* forms by far the major portion of the fly population. Howard's, Hamer's and my own observations show that the percentage is usually 90-98 per cent. of the total fly population.

Another fly that sometimes occurs in houses, especially country houses in the fall, and also in the spring in England, and whose habits have frequently led to the popular erroneous idea as to the ability of the house-flies to bite, is the blood-sucking *Stomoxys calcitrans,* known by various popular names such as Storm-fly, Stable-fly, Fall-fly, all of which names are equally inapplicable to one species. It can readily be distinguished from *M. domestica* by the sharp awl-like piercing proboscis which projects forward horizontally from beneath the head. This type of proboscis enables it to pierce the skin of animals and thereby suck the blood of the same. It is interesting to note in passing that *S. calcitrans* is allied to those tropical blood-sucking Diptera of the different species of Glossinas, which are responsible for the deadly disease of sleeping sickness and Nagana. They carry the Trypanosomes, the organisms which cause the diseases, and by their blood-sucking habits infect man and other animals. The former disease has reduced in a few years the population of Uganda by two-thirds and Nagana has rendered central and sub-tropical Africa practically impassable to horses.

*Musça domestica* possesses a proboscis that is quite incapable of piercing the skin. It is only of use in absorbing fluids and this process of absorption is one of great interest. The proboscis is extended in the following manner. The vacant spaces in the head are filled with capacious air-sacs and blood; by the inflation of these air-sacs of the head the blood is driven into the cavity of the proboscis which is thereby extended and the two lobes which form the oral disc are distended by means of the blood. These oral lobes are traversed on their inner sides by a very large number of channels which are kept open by minute rings open at one side—and owing to their tracheal appearance are called pseudotracheæ. The oral surface is applied to the fluid-moistened surface and by capillary action and the pulsating movement of the oral lobes the fluid runs along the pseudotracheæ into the oval pit and thence into the pumping pharynx—the pumping action of the latter keeping up the constant inward flow of the solution. In the case of such solid food as sugar this is first rendered soluble by the secretion of the lingual or salivary glands. The surface of the oral lobes is kept in a moist condition by the secretion of a small pair of labial glands.

If the abdomen of a mature female fly is opened it will be found that it is almost filled by the enormously distended ovaries; the alimentary tract occupying a small trough-like cavity between them and the dorsal region. In the posterior region of the abdomen the ovipositor will be seen usually in a retracted telescopic condition. When exserted the ovipositor is about equal in length to the abdomen and the female fly is thus enabled to deposit her eggs deep down out of the light in the crevices of whatever substance, decaying vegetable or excremental, it may have chosen as a nidus for the larvæ. About 120 to 150 eggs become mature at the same time and these are deposited in clumps, as many as sixty or seventy may be found packed together in one clump. The eggs are pearly white in colour, marked with very fine sculpturing; they are 1 mm. in size, slender and cylindrically oval, one end being more pointed than the other and along the dorsal side of the egg there are two curved rib-like thickenings of the chorion. The eggs of *M. domestica* have not the appearance of the grooved wheat grain as stated by several writers. It has been found that horse manure is the special breeding place of flies, but they will deposit their eggs and the larvæ are able to feed on almost any kind of excremental products and in decaying vegetable substances such as kitchen refuse, especially if such substances are in a fermenting condition. They will also deposit their eggs in decaying fruit and certain food stuffs such as moistened bread, egg, broth, etc. The most important factor which governs the development of the larvæ is temperature; a high temperature accelerates the development. It is also affected by moisture, diminution in the amount of moisture retards development and by the character of the larval food and fermentation. The shortest time which I was able to obtain for the development of *M. domestica* was eight days. This was obtained by keeping the larvæ at a constant temperature of 35 degrees C., and the times occupied in the different stages were as follows:—egg from deposition to hatching, 8 hours; whole larval or "maggot" stage 5 days: the larvæ moult twice and the times occupied in the three larval stages were 24 hours, 24 hours and three days respectively; the pupal stage lasted three days. These times are probably as short as will be found usually under natural conditions. Under unfavourable conditions, with regard to temperature, moisture, etc., the development has been found to extend over several weeks. In no case, however, was it found possible to keep the insects in the pupal stage during the winter nor do I know of any other observer who was able to do so. They invariably pass the winter as adult flies, and under suitable conditions of temperature and the presence of larval food, are able to breed during the winter months. The newly hatched larva measures 2 mm. in length and the average length of the adult larva is 12 mm. It is a typical, conically cylindrical, muscid larva, or "maggot," consisting of thirteen segments. It progresses by means of seven pairs of locomotary pads on the ventral side of the body and these are covered with small spines. The intestine of the full-grown larva is very complicated as will be seen from the figure thrown on the screen. When the larva is full-grown it retracts the anterior and posterior ends to form a barrel-shaped pupal stage lasted three days. These times are probably as short as will be found from a creamy yellow to a dark chestnut brown. When the fully developed fly emerges from the pupal case it pushes off the front end of the case in two sections by means of an inflated sac in front of the head; this sac is afterwards withdrawn into the head. After emerging from the pupal case the fly crawls about until its wings have attained their permanent form and the body has hardened and dried. In my experiments I found that the flies became sexually mature in ten to fourteen days after their emergence from the pupal state, and four days after coitus with the male they began to lay their eggs which was possible therefore from fourteen days after emergence from the pupæ. It will be seen from actual observations and experiments that in hot weather the progeny of a fly may be laying eggs in about 3 weeks from the time the eggs from which they were hatched were deposited, and as a fly may deposit about six hatches of eggs in a single season, it is not difficult to realize the millions of flies which a few flies may produce in the hot summer months. These observations indicate two important points: first, the necessity of destroying the *first* flies that appear in the season, and secondly, the abolition of their breeding places. In our towns and cities owners of stables should be compelled to either remove collections of manure within seven days or to treat the manure with such a substance as chloride of lime or mineral oil as each lot is thrown on the heap to prevent the breeding of the flies and such manure should be kept in a chamber to which flies cannot obtain access. The first method is the best and most effectual and certain cities have now by-laws enforcing such periodic removal of manure. All cities and towns should enforce such removal or treatment, nor should they allow the accumulation of rubbish and substances on which flies can breed as many local authorities are accustomed to do. It is invariably found in such cases that the maximum number of cases of zymotic diseases such as typhoid and epidemic diarrhœa are located around such places. The change of attitude of people towards house-flies during the last few years has been remarkable. Public opinion on such subjects is slow in changing and although we had known for years from the work of Celli, Nuttall, Hoffman and many others that flies were in the habit of carrying the bacilli which cause certain of our infectious diseases such as typhoid fever, ophthalmia, tuberculosis, etc., it was not until medical men as a whole began to realize the important rôle that house-flies play in the dissemination of these diseases that we really began to move. But now there are fortunately few who do not realize the danger of the house-fly. What could be more probable than the transference of disease-carrying bacilli by flies when they have access to the dejecta of incipient or carrier cases of typhoid on the one hand and food materials on the other. Several observers during recent campaigns and also in military camps in time of peace have observed flies frequenting the food in the mess tents and carrying on their bristle-covered legs the white disinfectant from the camp latrines. Such an observation is sufficient to convince the most obstinate sceptic as the relation that flies may have in the transference of disease germs. Take, for instance, the flies in unsanitary localities; they are accustomed to frequent every kind of filth in the way of kitchen refuse and excremental substances and to spend a portion of their time regaling their palates with the food stuffs in the houses, especially such articles of food as sugar and milk. It has been proved that milk to which flies have had access becomes seriously contaminated with and infected by the bacilli which the flies have obtained from filth of different kinds and milk is an excellent medium for the growth of bacilli, especially during warm and hot weather.

What are the methods, then, which we have of combating this most serious menace, for, to my mind, the fly problem in our cities is far more important than the mosquito problem towards the solution of which thousands of dollars are spent annually—and compared with which the suppression of the fly danger is indeed as simple. They are these. First, the abolition of their breeding places; the removal within seven days in the summer, of collections of horse manure, decaying and fermenting vegetable substances on which the flies can breed. The substitution of the more sanitary system of sewage disposal by water instead of the older and generally insanitary and dangerous methods of conservancy. The protection of collections of manure or kitchen refuse; keep the lid on the refuse chamber. Do not allow flies to have access to food, especially such foods as milk, sugar, etc., but, where flies occur, keep all such food covered with a muslin covering. Farmers and dairymen should not leave milk about exposed and accessible to flies. A man would not be willing that flies should have access to a glass of milk intended for his own consumption, and why should he leave milk exposed in pails in cow-sheds and similar places where the flies have a maximum opportunity of covering their legs and bodies with bacilli of all kinds, especially putrefactive bacilli. "Prevention is better than cure" is almost a truism, but the welfare of the future will depend almost entirely on that one word, Prevention. Nature is yielding up her secrets one by one through the toil of men of science, and it is by the application of the knowledge thus gained that we shall be able to avoid that great rod of chastisement of Nature, disease, which is inflicted on those who disobey or transgress her unwritten laws.

And while we have these insects arrayed against us there are others allied to them which, by assisting in the maintenance of a balance in nature take up their position on our side. These are the Tachinid flies, many of which, to the casual observer, have a superficial resemblance to the house-fly. There are a very large number of species of Tachinidæ and considerable variation in size and structural characters. The larvæ of most of them are parasitic on lepidopterous larvæ, and in certain cases these parasites increase to so great an extent that they may suppress completely an exceptional increase of caterpillars. It is largely owing to these parasites and the Ichneumons that our vegetation is not completely eaten up by lepidopterous larvæ. The Tachinid maggot feeds inside the caterpillar and gradually destroys the tissues of the host. In some cases the maggot leaves the caterpillar before it pupates, in other cases the caterpillar pupates and the Tachinid maggot pupates inside the cocoon or pupal cell. Their life-histories are extremely diverse and this is frequently found to be the case in the life-histories of the members of a group of animals which has assumed parasitic habits, whether it be insects, crustacea or more lowly organisms. Parasitism induces profound changes in the life-history of animals, and we find great variations in so small, comparatively, a group as the Tachinidæ. Whereas some of the insects deposit their eggs upon the skin of the caterpillars, from which position on hatching the larvæ bore into the interior of the host; others deposit their eggs upon the leaves of the plant as, I believe, is the case in *Ugimyia sericaria,* Rond, which is the cause of the most serious "Ugi" disease of the Japanese silkworms. The caterpillars, on feeding on the leaves, take the eggs in biting off the portions of leaf to which they are attached, into their digestive tracts where the maggots emerge and bore through into the tissues of the body. A third class is exemplified by the species *Eupeleteria magnicornis,* Zett, which, as Townsend has shown, deposits living maggots not on the caterpillars, but upon the green shoots, leafribs, etc., on which caterpillars were present and usually on the silken thread spun by the caterpillar on its trail over the plant. It will be recognized that the first method is the one in which the maggot is least sure of success in entering the host, for it not infrequently happens that the caterpillar moults before the eggs of the Tachinid hatch and thus rids itself of the danger. So that although we may find Tachinids depositing their eggs freely upon caterpillars, it is unsafe to predict beneficial results. Howard, for example, mentions a case in which 226 moths and only four Tachinid flies were obtained from 235 caterpillars of the Gipsy Moth, upon each of which 1 to 33 Tachinid eggs had been observed. In another case, 252 caterpillars, all bearing Tachinid eggs, were reared and not a single fly emerged. These cases illustrate well the advantage to an insect larvæ of such a method of growth by the moulting of the old skin. Once inside the caterpillar the maggot bores its way into the body cavity or blood cavity and immediately attaches the breathing pores at the posterior end of its body to one of the breathing pores of spiracles of its host and thus obtains its air direct from the outside. In this position it remains during the whole of its larval life, until it is full grown. It moults twice and the old skins remain attached at the posterior end of the body as the maggot does not leave the spiracle of the caterpillar to which it has once attached itself, until it finally leaves it to pupate.

Allied to these insects are the Anthomyidæ, some of whose larvæ are the destructive root-maggots, which feed on the roots of many vegetables, such as cabbages, radishes, onions, beans, etc. A few years ago I found, when studying the life-history of *Musca domestica,* that the flies of the root-maggot (*Anthomyia radicum,* Meigen), were especially fond of laying their eggs on horse manure in which the larvæ were reared. This fact may account frequently for the presence of root maggots on crops, as it has been found that fields heavily manured suffer more from the attacks of root maggots than those on which there is less manure or which have been manured some length of time. Such facts as these have to be borne in mind in cultivating infested areas.

These few cases of the economy of certain allied insects will illustrate to you the benefits and injuries that are the result of different modes of life of insects somewhat closely allied and show how the knowledge gained from a careful study of the life-histories and habits of life or bionomics can be applied to further the welfare of man.

At the close of Dr. Hewitt's lecture, which was illustrated by a number of beautiful lantern slides of the life stages of various species of flies and of their structural and anatomical details (Plate F, page 141), a hearty vote of thanks was given him. President Creelman, in proposing the vote, and Professor McCready, in seconding it, spoke in high terms of the excellence of the address and the gratification that all felt in the appointment of so well qualified a successor to the late Dr. Fletcher.

The chairman referred to the measures that had been put in operation for reducing the number of disease-bearing flies in the city of New York, and the encouraging diminution in the percentage of cases of sickness and death during the later months of summer, especially amongst children. The meeting was brought to a close with a musical performance by the orchestra and the singing of "God Save the King."

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## SECOND DAY'S SESSION—FRIDAY, NOVEMBER 5TH, 1909.

The President, Mr. Tennyson D. Jarvis, took the chair at 9.30 a.m., in the Biological lecture-room of the Ontario Agricultural College. There was a good attendance both morning and afternoon, including many of the students as well as members of the Society. The first order of the day was the reading of the reports of the Council, the Branches at Montreal and Toronto, and of the different officers of the Society. The Montreal Branch was represented by Mr. A. F. Winn, and Toronto by Mr. J. B. Williams. The report of the Delegate to the Royal Society was read by Mr. A. Gibson, of Ottawa. This was followed by the election of officers for the ensuing year, 1909-1910 (see page 6).

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## REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present the report for the year 1908-09.

The forty-fifth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on the 5th and 6th of November, 1908. There was a very satisfactory attendance of members from a distance as well as those locally resident; a considerable number of the students of the College were also present.

The first afternoon was occupied with the reading of the reports of the Directors on the insects of note in their respective districts, and a conference was held on the chief insect pests of the season, which was participated in by many of those present. In the evening a public meeting was held in Massey Hall, and a popular lecture was delivered by Dr. E. P. Felt, of Albany, State Entomologist of New York, on "The Interpretation of Nature," illustrated by lantern pictures. A paper was also read by Prof. Lochhead, of the Macdonald College, St. Anne de Bellevue, P.Q., on "Entomology in the Graduate School of Agriculture at Cornell University."

The morning and afternoon of the second day were occupied with the reading of the reports of the various branches and officers of the Society. Papers were also read on a variety of subjects, both scientific and practical. All of these have been published in the annual volume. This volume, the "Thirty-ninth Annual Report to the Legislature of Ontario," was published in March last, and contained 152 pages and 18 half-tone plates of gall insects, also a portrait of the late Dr. James Fletcher. The papers were further illustrated by over 40 figures in the text. Besides those already mentioned, it included the following articles: "What Entomology the Farmer and Fruitgrower should know," "The Strawberry Weevil," and "Injurious Insects of Quebec in 1908," by Prof. Lochhead; "A Catalogue of the Gall Insects of Ontario," "Apparatus for Collecting small Arthropods," and "Notes on the Coccidæ of Ontario," by Mr. T. D. Jarvis, President of the Society. Among the popular papers were, "Beetle Haunts," by F. J. A. Morris; "A Farmer's Wood Lot," by Dr. Fyles; "The Importation of Parasites of the Gypsy and Brown-tail Moths," by Dr. L. O. Howard, Chief of the Bureau of Entomology, Washington. The remaining papers were of a more or less scientific character, viz: "Hydrœcia Micacea in Canada," and "The Entomological Record," by Mr. Arthur Gibson; "The Life History of Euchætias Oregonensis," by Mr. H. H. Lyman; "Observations on the Sorghum Midge," by Mr. R. C. Treherne; "Enemies of Ontario Coccidæ," by Mr. A. Eastham; "Two Butterflies added to the Montreal List," by Mr. A. F. Winn; "Collecting with a Lantern Trap," and "Notes on Lachnosternas," by Mr. J. D. Evans; "The Tussock Moth in Toronto," by Mr. P. Hahn; "The Economic Importance and Food Habits of American Gall Midges," by Dr. E. P. Felt; "Injurious Insects of the Year," by Dr. Bethune and Mr. Gibson.

A few days after the close of the meeting the members of the Society and a host of friends all over the continent were shocked and deeply grieved at the sad tidings that our much loved President, Dr. James Fletcher, was no more. His death took place at Montreal, on Sunday, November 8th, 1908, after an operation from which he had not the strength to rally. A great man, a master mind, an enthusiastic student of nature, a most lovable personality has been taken from us. In our last report a full obituary notice was given. It is therefore unnecessary to enter into any further account of the work of our lamented friend.

"The Canadian Entomologist," the monthly magazine of the Society, has been regularly issued at the beginning of each month. The fortieth volume was completed in December last, and eleven numbers of the forty-first volume have already been published. The volume for 1908 consisted of 471 pages, and was illustrated by 11 full-page plates and 20 figures from original drawings. The contributors numbered 69 and included writers from Ontario, Quebec, Manitoba, Alberta, British Columbia, England, the United States, Brazil, Norway, and the Hawaiian Islands. The articles are, as usual, largely of a scientific character, and contain much highly valuable matter. No less than 33 new genera were described, 282 new species and 9 varieties or subspecies of insects belonging to various orders.

The reports from the branches of the Society, at Montreal, Quebec, and Toronto, are highly satisfactory, meetings having been regularly held and many papers read and discussed. Owing to the absence of the Secretary in England no report was received from the British Columbia Branch.

Meetings of the Society were held from October to March at the Ontario Agricultural College, Guelph, on alternate Wednesday evenings. The attendance included a number of the more advanced students and a gratifying amount of interest was shown by all who attended. The following papers were read during the season: "The Sorghum Midge in Louisiana," by R. C. Treherne (4th year student); "A Classification of Muscoidean Flies," by W. R. Thompson (4th year student); "Rearing Pomace Flies," by E. W. Stafford (4th year student); "Suggestions for Field Inspection," by R. C. Treherne (4th year student); "Notes on Eriophydæ," by J. Tothill (3rd year student); "Memoir of the late Dr. Fletcher," by Dr. C. J. S. Bethune (Professor of Entomology); "Some Notes on Mites," by T. D. Jarvis (Lecturer in Entomology); "The Chalcidid Subfamily Encyrtineæ," by Alfred Eastham (4th year student); "Remarks on the External Anatomy of Chalcids," by A. C. Baker (2nd year student); "The Genus Tetranychus," by R. C. Treherne; "The Entomological Department at Macdonald College," by A. G. Cutler (4th year student); "Spiders," by Dr. C. J. S. Bethune; "Injurious Insects of the Season," by L. Caesar (Demonstrator in Entomology).

It is with deep regret that the Council have to record the death of Dr. William Brodie, of Toronto, who died on the 6th of August last, in his seventy-eighth year. He had recently been contributing a series of papers on Gall insects to the pages of the "Canadian Entomologist," and was occupied with the duty of looking after the collections in the Museum of the Department of Education. One of the oldest honorary members of the Society, Mr. William H. Edwards, died in the early part of the year. He had been one of the most regular contributors to the pages of the "Canadian Entomologist" during a long series of years and was known to the scientific world as the author of three most beautifully illustrated volumes on "The Butterflies of North America." We have also to deplore the loss of another contributor in the person of Prof. M. V. Slingerland, of Cornell University. Obituary notices of these gentlemen have already been published in the pages of the "Canadian Entomologist."

Efforts are now being made to hold an International Congress of Entomologists at Brussels, in August of next year. A large Committee has been formed to represent the Dominion of Canada, including members of our Society in all the different provinces. It is much to be hoped that we may be represented by one or more delegates, and that the forthcoming meeting may be a precursor of a long series in years to come.

It is with much regret that the Council has learned that the Rev. Dr. Fyles, for so many years the active President of the Quebec Branch, has resigned his position as Chaplain to the Immigrants and removed to Hull, P.Q. The rest and retirement which he has so well earned by many years of laborious work will, it is hoped, be long enjoyed by this veteran entomologist. Mr. A. R. M. Boulton has been elected President of the Quebec Branch, which will, no doubt, continue as active and enthusiastic as heretofore.

The Council has great pleasure in welcoming Dr. C. Gordon Hewitt, the newly-appointed Dominion Entomologist for the Experimental Farms. It is a great satisfaction to know that we have a successor to the late Dr. Fletcher who has had a thorough scientific training and is evidently quite competent to take up and continue the work of his illustrious predecessor. The country is to be congratulated on the acquisition of so able a man and it is trusted that he will long continue to work out and develop the various phases of economic and systematic entomology which will devolve upon him. We welcome him most cordially also to the ranks of our Society.

Respectfully submitted,

TENNYSON D. JARVIS,
*President.*

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## REPORT OF THE MONTREAL BRANCH.

The 302nd regular, and 36th annual meeting of the Montreal Branch was held at 74 McTavish Street on May 8th, 1909.

The members present were: Messrs. Geo. A. Moore, in the chair; Henry H. Lyman, G. Chagon, G. A. Southee, E. C. Barwick, A. E. Norris, L. Gibb, F. Parkins, Jr., W. G. Gerth, A. M. Delisle, A. F. Winn.

The minutes of the April meeting and last annual meeting were read and confirmed.

St. Hilaire was selected as the locality for Victoria Day outing.

The Secretary read the following

### REPORT OF THE COUNCIL.

During the season eight regular meetings have been held, the average attendance being eight members. Six new names have been added to the roll, and it is hoped that after the collecting season that they will help make our meetings interesting by bringing specimens of their captures as well as notes and queries on certain species.

At the beginning of the present year, the Mount Royal Entomological Club was amalgamated with our Society, their books, pamphlets and funds being handed over to us. To take the place of part of the work of the late club, it was decided to hold informal meetings between the regular dates or during the summer. Two of these meetings have been held; one in January was devoted to examining the collection of lepidoptera of the Secretary; the other in April at Mr. Barwick's, at which he showed his new cabinet and collection, and microscopic slides of insects were exhibited under three of the members' instruments.

The following is a list of the papers read:

Annual Address of President, Geo. A. Moore.
A Supposed Addition to Montreal Lists (Incisalia Henrici), Henry H. Lyman.
More Recollections, H. F. Winn.
Captures of Hemiptera at St. Hilaire, May 24, Geo. A. Moore.
"Go to the Ant, thou Sluggard," Henry H. Lyman.
Two Additions to the List of Montreal Butterflies, A. F. Winn.
Note on Junonia Cœnia in Maine, A. F. Winn.
On Water-Striders, Geo. A. Moore.
Respiration in Caterpillars, Henry H. Lyman.
A Trip to Gardiner, Maine, A. F. Winn.
A Small Collection of Insects from the Yukon, G. Chagnon.
The Genus Triphleps (Hemiptera), G. A. Moore.
Notes on a few Butterflies from the Yukon, Henry H. Lyman.
Notes on Hepialidæ, A. F. Winn.
Unnamed Capsidæ, Geo. A. Moore.

Pseudohazis Shastaensis, A. F. Winn.
The Shores of Ponds and Creeks as Collecting Grounds, G. Chagnon.
Note on Capture of Colias Philodice, var. Luteitincta, A. F. Winn.
A Card-Index Chart for Life Histories of Insects, A. F. Winn.
Butterfly Collecting in Manitoba (selected), Capt. J. G. Boulton, Quebec.
On Spittle-Insects, Geo. A. Moore.
Remarks on Prof. Poulton's Paper on Mimetic Species of Limenitis, Henry H. Lyman.
Structural Characters of Our Species of Agrilus, G. Chagnon.
On Luck, A. F. Winn.

The report of the Treasurer shows a balance on hand of $72.86. The incoming Council are reminded of one or two matters not yet finished, viz., the selection and purchase of a suitable bookplate, the completion of bound sets of the *Canadian Entomologist* for our library, as well as the arrangement of outings for the summer and a programme for winter months.

Respectfully submitted.

(Signed) GEO. A. MOORE, *President.*

The President read the annual address, after which the election of officers was proceeded with, resulting as follows:

President, Henry H. Lyman; Vice-President, G. A. Southee; Secretary-Treasurer, A. F. Winn; Librarian and Curator, L. Gibb; Council, G. Chagnon, G. A. Moore, E. C. Barwick, F. Parkins, Jr.

Mr. Lyman read a paper, entitled, "A Spring Outing," describing a trip to Washington, D.C., and other places, made about April, 1908, illustrating his remarks by specimens of Lepidoptera and pressed plants.

The meeting then adjourned.

(Signed) A. F. WINN, *Secretary.*

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## REPORT OF TORONTO BRANCH OF ENTOMOLOGICAL SOCIETY FOR 1908-1909.

The thirteenth annual meeting of the Society was held on Thursday, June 10th, 1909, in the Provincial Museum, St. James' Square.

The President, Dr. Brodie, was in the chair, and the following members were present: Miss Blackmore, Mr. Smith, Mr. Miller, Mr. Williams, Mr. Cosens, Mr. Laing and Dr. Abbott.

The following officers were elected for 1909-1910:

*President*—Dr. Brodie.
*Vice-President*—Dr. E. M. Walker.
*Secretary-Treasurer*—Mr. J. M. Laing.
*Librarian*—Mr. J. B. Williams.
*Curator*—Mr. J. M. Laing.
*Council*—Mr. S. T. Wood, Mr. A. Cosens, Mr. T. J. Ivey and Dr. A. R. Abbott.

During the past year meetings were held with an average attendance of eight members. The Society held an excursion to Niagara Glen, which proved both profitable and enjoyable

The membership of the Society is now twenty-seven. During the past winter the tussock-moth and galls have received much attention, as the list of papers appended will show.

The Librarian reports that publications have been received from the Entomological Bureau at Washington, from the Ohio and Connecticut Experiment Stations, and from the New York State Museum; and, as in former years, the Society have subscribed for a copy of the *Entomological News*.

The Treasurer's report shows the finances to be in a satisfactory condition with a balance in hand of $1.35.

Respectfully submitted,

J. M. LAING, *Secretary-Treasurer*.

LIST OF PAPERS READ: Galls, Dr. Brodie; The Tussock Moth, Dr. Brodie; Collecting in England, Mr. Williams; Galls, Dr. Brodie; Characteristics of the Order Orthoptera, Dr. Walker; Insect Mimicry and Evolution, Dr. Brodie; Ferns, Mr. Ivey; The Tussock Moth, Dr. Brodie.

## TREASURER'S REPORT.

*Receipts.*

| | |
|---|---|
| Balance from 1907-1908 | $779 74 |
| Late Treasurer to March 16, 1908 | 89 25 |
| Back numbers | 181 50 |
| Annual Reports | 19 25 |
| Refund of salary | 33 00 |
| Advertising | 12 48 |
| Members' fees | 397 62 |
| Interest | 7 40 |
| Printing extras | 26 70 |
| Supplies, pins, etc. | 134 40 |
| Expense: sale of cash-book and case | 7 50 |
| Government grant—10 months | 666 00 |
| | $2,354 84 |

*Expenditures.*

| | |
|---|---|
| Late Treasurer's Exp., Nov. 16, 1909 | $37 68 |
| Printing | 1,328 64 |
| Annual Report | 111 00 |
| Salaries | 200 00 |
| Expenses, Postage, etc. | 62 60 |
| Annual Meeting | 80 81 |
| Exchange on checks | 5 10 |
| Library books and binding | 41 51 |
| Supplies, pins, etc. | 114 44 |
| Balance | 373 06 |
| | $2,354 84 |

J. E. HOWITT, *Treasurer*.

Examined and found correct.

S. B. MCCREADY,
J. W. CROW,
*Auditors*.

## REPORT OF THE CURATOR.

The Society's collection during the last year has been increased by the addition of one hundred and eighteen new specimens. Of these, ninety were contributed by Mr. Charles T. Ramsden, Guantanamo, Cuba; twenty-two by Mr. T. Baird, High River, Alberta, and the rest by friends who do not wish their names published. Mr. Ramsden's contribution consisted of eighty-five specimens of Lepidoptera, chiefly butterflies and Spinx moths, one Orthopteron, three Diptera, and one Hymenopteron. These insects being almost solely exotic species have been placed in a case by themselves. All of Mr. Baird's specimens were moths, principally belonging to the Noctuidae. These have been distributed among the different cases according to families and genera. The other insects presented consisted of four rare species of moths and two specimens of a rather rare scale insect.

The Society is greatly indebted to the contributors, especially to Messrs. Ramsden and Baird, for their generosity.

While gifts of Lepidoptera and Coleoptera are always welcome, there is great need of properly named species of Orthoptera, Odonata, Hemiptera, Diptera and Hymenoptera, and specimens of these orders are specially solicited from members or other collectors.

The collection has been thoroughly inspected from time to time and precautions taken to prevent loss from museum pests or from other causes. They are all in good condition and show no signs of deterioration.

Respectfully submitted,

L. CAESAR, *Curator.*

## REPORT OF THE LIBRARIAN.

During the year closing September 30, 1909, twenty-nine bound volumes have been added to the library, making the total number on the register exactly two thousand. There are also a very large number of periodicals, pamphlets and bulletins added to the shelves, many of which, it is hoped, will be bound during the next few months. No new book of any very great importance has appeared during the past year. Several parts of Wytsman's "Genera Insectorum" have been purchased and others will be added from time to time. Forty-three volumes have been taken out by members during the year, and the books have been largely used for consultation by students and members of the Society almost daily during the College terms. Recently the work of making a card catalogue has been resumed and will be carried on steadily throughout the winter. It is expected that a complete catalogue both of subjects and authors will be accomplished by the annual meeting next year. This will render the books in the library much more accessible and useful to the members.

Respectfully submitted,

CHARLES J. S. BETHUNE, *Librarian.*

## REPORT TO THE ROYAL SOCIETY OF CANADA.

BY ARTHUR GIBSON, DELEGATE, OTTAWA.

I have the honour to report that the Entomological Society of Ontario has had a most successful year during 1908. It was with very great regret, however, that we had to record the death of our beloved friend and president, Dr. James Fletcher, which occurred at the Royal Victoria Hospital, on Sunday morning, November 8th, 1908.

The forty-fifth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 5th and 6th last. An interesting discussion took place at the first session on the chief insect pests of the season. The annual report of the Society which recently appeared contains a full account of the proceedings, with the papers presented at the meeting published in full. This is a report of 152 pages and is one of the most valuable ever published by the Society. Among the papers which are here printed, the following may be mentioned:

The Interpretation of Nature. By E. P. Felt, Albany, N.Y.

The Economic Importance and Food Habits of American Gall Midges. By E. P. Felt, Albany, N.Y.

Observations on the Sorghum Midge. By R. C. Treherne, Ontario Agricultural College, Guelph.

Hydroecia Micacea, Esp. in Canada. By Arthur Gibson, Central Experimental Farm, Ottawa.

Further Notes on the Coccidae of Ontario. By Tennyson D. Jarvis, O. A. College, Guelph.

Some Enemies of Ontario Coccidæ, By J. W. Eastham, Ontario Agricultural College, Guelph.

" Some Beetle Haunts," by an Amateur Botanist. By F. J. A. Morris, Trinity College School, Port Hope.

A Catalogue of the Gall Insects of Ontario. By Tennyson D. Jarvis, O. A. C., Guelph.

Entomological Record, 1908. By James Fletcher and Arthur Gibson.

Insects of the Year 1908 at Ottawa. By Arthur Gibson, C. E. F., Ottawa.

Present Condition of the Work Connected with the Importation of the Foreign Parasites of the Gipsy Moth and Brown-tail Moth. By L. O. Howard, Washington, D.C.

What Entomology the Farmer and Fruit Grower should know. By Wm. Lochhead, Macdonald College, Que.

Injurious Insects in Ontario in 1908. By C. J. S. Bethune, Ontario Agricultural College, Guelph.

Injurious Insects of uebec in 1908. By William Lochhead, Macdonald College, Que.

The Farmer's Wood Lot. By Rev. Thos. W. Fyles, Levis, Que.

Life History of Euchætias Oregonensis, Stretch. By Henry H. Lyman, Montreal.

The Society's branches at Quebec, Montreal, Toronto, Guelph and Vancouver all report a most active year. They have all held regular meetings at which papers have been read and specimens exhibited for discussion. The British Columbian Branch publishes a Quarterly Bulletin, which gives concisely the work of the local members. Valuable notes on captures are included from time to time.

The library of the Society, at its headquarters in Guelph, is continuously growing. During the year ending August 31st, 1908, 49 bound volumes were added to the Library, making the total now on the register 1,971. The books of the Society are consulted almost daily by members and also to a considerable extent by the students of the Ontario Agricultural Society.

Some interesting donations have been made during the year to the Society's collections of insects. These collections are now being gone over and many old specimens have been replaced by fresher examples, bearing fuller particulars as to locality, date of collection, etc.

The *Canadian Entomologist,* under the continued able editorship of the Rev. Prof. C. J. S. Bethune, completed last December its fortieth volume. This is a much larger volume than usual, containing 471 pages. Its articles are of the greatest value to entomologists, in fact it is absolutely necessary for anyone who studies insects to any extent, to subscribe to it. Sixty-nine different entomologists contributed to its pages last year, and a number of full page plates appeared as well as numerous figures in the text. It is impossible here to give a list of the papers published, but the following are some of the more important:

British Columbia Syrphidæ, New Species and Additions to the List. By Raymond C. Osborn, Columbia University, New York.

New Histories and Species in Papaipema (Hydrœcia). By Henry Bird, Rye, N.Y.

Studies in the Genus Incisalia. By John H. Cook, Albany, N.Y.

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## ADDRESS OF THE PRESIDENT.

By Tennyson D. Jarvis, Ontario Agricultural College, Guelph.

It is my happy privilege to preside over the present meeting and very thankfully do I accept the position which you have so kindly imposed upon me. I have the peculiar privilege of succeeding the late lamented Dr. Fletcher, whose labours and abilities need no words of praise or encomium from me, as they are so well known and so thoroughly familiar to you all.

Besides the late Dr. Fletcher, who so eminently strove to advance the interests and welfare of this Society, we also most sincerely deplore the loss of the activities in our behalf of the late Dr. Brodie, of Toronto. In the neighbouring States William Ashmead, Prof. Slingerland and W. H. Edwards have departed since our last meeting, and the entomological world suffers an immeasurable loss. The results of their untiring zeal and labours to discover what we might know, and what we should know, of the science of entomology have impressed their effects deeply and indelibly upon the minds and in the hearts of all students of this extensive and intricate science.

In the interests of entomology I must congratulate this Society and the country at large on the arrival of Dr. C. Gordon Hewitt, of England, now active at the Central Experimental Farm at Ottawa, and one whose reputation for good work in scientific and economic Entomology had preceded him to this country. Since the decease of the late Dr. Fletcher the department over which he presided has been divided, the Entomological division being taken charge of by Dr. Hewitt, ably assisted by Mr. Gibson, and the Botanical division by Mr. H. T. Gussow, assisted by Mr. Groh.

I regard with pleasure the many new and effective methods which have arisen and have been adopted during the past few years for the diffusion of the knowledge of the science of Entomology. The work of the agricultural experts attached to High Schools in several counties of Ontario, will give a great stimulus to the study of Entomology. The office of the experts includes the teaching of the science in the high school, the conducting of experiments in farmers' orchards and elsewhere, giving advice on agricultural matters and establishing libraries in each county which will contain work largely devoted to Nature Study. Teachers of high and public schools have taken up the subject with more or less success and their work has been very prolific of good results. Another method, and one which may in course of time be a most powerful one to increase the study of entomology, is the three months' course at the Ontario Agricultural College for Normal School students. Nearly two hundred students have during the past year availed themselves of this opportunity, and the number promises to be largely increased in future years.

There is also the nursery and orchard inspection conducted through the horticultural branch of the Department of Agriculture by which an intimate knowledge of injurious forms of insects is obtained and remedies are applied to prevent their increase and spread through infected fruit or stock. The Natural History Societies, with their publications on Nature Study, their excursions, their periodical meetings where eminent scientists are frequently invited to address the members, and in many other ways, have made great strides forward in obtaining and diffusing the knowledge of insects. Another attractive method for the enlightenment of the farmer, nurseryman and others upon this subject of insects, is found in the bulletins issued from time to time by experimental stations and agricultural colleges, by which the quintessence, as it were, of the subject is brought to easy view within a few pages of reading matter. I must also acknowledge the good work of the *Farmer's Advocate, Canadian Horticulturist,* and the *Weekly Fruitgrower* for their assistance in the diffusion of knowledge and the instruction of their readers. These periodicals merit highly the splendid patronage accorded to them.

From the position which I at present occupy I feel impelled to acknowledge that a large share of the means of disseminating a knowledge of the workings of our Society throughout the world is due to the *Canadian Entomologist,* our monthly magazine edited by Dr. Bethune. This publication has long since attained a position of celebrity in literary and scientific circles for the thorough information it imparts and the high standard of excellence it has attained and achieved.

The graduates from this College in the Department of Biology also deserve to be mentioned as a potent factor in the gathering of facts and diffusing knowledge in this science. Their studious and untiring researches and investigations, the zeal and energy with which they enter into their task, and the interchange of ideas resulting from them have greatly assisted in attaining a thorough knowledge of certain families of insects under all kinds of climatic conditions.

We should not overlook the work of this College and of kindred institutions in the diffusing of the knowledge of Entomology and the stimulus they impart to research. Hundreds of students therein, undergraduates, are during the most favourable season of the year engaged in the gathering of insects and in the study of their life histories, their habits and their workings.

A great deal is done for the spread of information regarding insects by the professors at the Colleges where the science of Entomology forms part of the curriculum, by correspondence with people of various pursuits making inquiries. There have been many hundreds of such enquiries answered during the past year by Dr. Bethune of this College, and his colleagues, and no doubt the same may be said respecting the correspondence in other Colleges of a similar character.

The lectures given by professors and graduates of Agricultural Colleges, and by others who have given the matter thought and study, upon all branches of Nature Study at meetings and gatherings of various kinds, also greatly assist in disseminating in a more or less successful way, the knowledge of this science and the useful application of what we know about insects.

Among some of the latest and best works upon the subject of insects published during the past year may be mentioned "Our Insect Friends and Enemies," by Dr. J. B. Smith; "Insects and other Allied Pests, etc.," by Fred V. Theobald; and "Fruit Trees and Their Enemies," by Spencer W. Pickering.

It is to be regretted that in the cause of research the methods employed are not always calculated to bring about the best possible results. Persons engaged in this work are often too easily contented with the discovery of individual insects and fail to profit by the study of a family group of them. In this regard the pursuit of research should be continued with more and better system and it would be well to inculcate into the minds of all entomologists that this science must be studied, not from individual insects alone, but also from observing the life history, the habits, the qualities and working of whole families. However, the proper methods have been adopted by a number of eminent scientists in this country and the United States as we learn from the reports of their successful researches.

It is to be hoped that the governments of the day will be as generous, or even more so, in giving aid for the benefit of the science of entomology as they have been in the past, so that the work or research and the diffusion of information may not suffer from want of the means to carry them on. When able men, aided by the necessary means, are active, great results may be expected, and with the stimulus of new discoveries constantly before them, there is no fear that we should suffer disappointment; the benefits to our country and its people derived therefrom, will in all probability be equal to, if they do not surpass, any investment of energy and means in other causes.

In closing my remarks I desire to thank you very heartily for your attendance here, for the excellence of your addresses, and the patience and close attention you have exercised during this meeting. If the enthusiasm for the science of entomology which you have displayed during this session is a true exponent of the spirit within you, it augurs well for profitable and successful years to come for the Entomological Society of Ontario.

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## THE ORIGIN AND DIFFUSION OF ENTOMOLOGICAL ERRORS.

By Henry H. Lyman, Montreal, Que.

Though using the word entomological, I shall confine my remarks to the Lepidoptera as the only order which I have studied, but doubtless similar conditions have given rise to similar errors in the other orders.

Anyone who has looked over many collections of North American Lepidoptera must have been struck by the number of mis-identifications of species, or transpositions of names to be found in them, and an interesting study could be made of the numerous popular errors which have become current in time past, and which in many cases still persist. Indeed, their universality and persistence is quite remarkable and it seems almost hopeless to try to eradicate them.

Their origin can in most cases only be surmised, but their diffusion and persistence can be easily accounted for. In Europe they have always been much better supplied with illustrated works on Entomology than we have been on this continent, and this is easily accounted for. In the first place the science was studied there long before it was here and many North American insects were described by European authors. Then there has always been a much larger number of collectors in Europe than in America, and if many of them have done nothing else to advance the science, their subscriptions have at least rendered possible the issue of well illustrated works, which was also assisted by the much cheaper rate at which such works could be produced in Europe than in America.

The earliest important work devoted to the Lepidoptera of North America was the magnificent work by Abbot and Smith, in two large folio volumes on "The Natural History of the Rarer Lepidopterous Insects of Georgia," which was published in London in 1797, but this was a costly work and only found its way into the more important libraries and to a few wealthy collectors.

Thomas Say, who has been called the Father of American Entomology, wrote between 1818 and his death in 1834, but it was only in 1859 that his complete writings on Entomology were collected by Dr. John L. Leconte, and issued in two volumes. Of the 54 coloured plates, only 12 were devoted to the Lepidoptera, most of the others being given to the Coleoptera. In 1841 appeared the first edition of Dr. Harris' classic work on the "Insects of Massachusetts Injurious to Vegetation," and other editions were issued in 1842 and 1852, and the revised edition by Flint in 1861. But from none of these works could the names of more than a very few of the moths of this continent be learned, and, therefore, collectors were dependent upon the leading authorities in the various branches for the determination of their captures.

As Mr. Grote was the leading authority upon the Noctuidæ, he was probably the one most frequently appealed to for determinations, indeed, he once advertised that as his time was so much taken up with this work he would for the future make a charge for naming specimens, which probably had the effect of materially reducing the applications.

Another who did a great deal of this work was Dr. Herman Strecker, who advertised his readiness to determine material sent him.

Under such conditions it can be easily understood that mistakes would be sure to arise. In many cases duplicate specimens would be numbered and sent for name, corresponding numbers being placed on other specimens, which were retained by the collector. Unless specimens were rare, their return would often not be asked, in order to avoid the return express charges, but a list with numbers and the names would be returned.

Mistakes might happen in many ways. As has been said, "no one is infallible, not even the youngest of us," and these high authorities would certainly have some errors in their collections, and so name these species wrongly for others. Again, in handling the specimens, the numbers of a couple might drop off and then be accidentally transposed in replacing them, and this might occur either in the hands of the one who named, or the collector who sent them. Or the collector might make a mistake and think two closely allied forms the same and send one for name, while retaining the other as his numbered specimen.

Given an initial error, its spread would be inevitable. John Brown, who had had his specimens determined by so high an authority as the celebrated Dr. Blank, would at once become an authority among those of his acquaintance whose specimens have not been so authoritatively determined, and these collectors would be only too willing to have him name their specimens for them, and these in turn corresponding and exchanging with others would still more widely diffuse the error.

One error which has become very widely diffused is the transposition of the names "Gortyna nitela Guen." "Gortyna nebris Guen."

The author of those names described *nebris* first mentioning the white spots and then in the description of *nitela* wrote: "Taille et couleur de la *Nebris,* dont elle ne diffère que par l'absence complète des taches blanches," and yet in most collections the white marked one is called *nitela* and the one without white spots *nebris*.

Another common error is the transposition of the names *petulca* and *ferrealis* in the genus Xylina, which was current in all our Montreal collections from the time that Grote and Strecker were naming material for the late Mr. Caulfield, until I discovered the transposition when studying the genus a few years ago.

That that error must also have been widespread may be inferred from the fact, pointed out by Dr. J. B. Smith, that Dr. Holland figured *ferrealis* under the name *petulca.*

Of course, an error could not become almost universal unless some prominent authority were himself in error, and that has undoubtedly frequently been the case.

Dr. Scudder's writings afford several curious instances of this. In 1863 he published in the Proceedings of the Essex Institute of Salem, Mass., "A list of the Butterflies of New England," in which he describes as new *Melitæa Œnone* and *Melitæa Harrisii,* the latter being the species which Harris had placed hesitatingly under the name Melitæa Ismeria, Boisd. and Lec. Subsequently he ascertained by comparison of his *Œnone* with types of M. Nycteis, Doubl, and he had redescribed the latter species, so in his "Supplement to A List of the Butterflies of New England," published in Proc. Bos. Soc. Nat. Hist. XI., 1868, he corrected his error in regard to it, but in some way which he was never able to explain, made another error in saying that *M. Ismeria?* Harris was a synonym of Nycteis and not of M. Harrisii Scudder. In his magnificent work on the Butterflies of New England he made three transpositions. On plate 3, he transposed the numbers of the figures of *Grapta Interrogationis* var. Umbrosa and var. Fabricii, this he corrected in the appendix. On plate 10, he transposed the numbers of what he called Atrytone Zabulon male and female, but which is really Hobomok, and to this I called his attention, and in his third volume, in the part devoted to butterflies not found in New England, he transposed the descriptions of Brenthis Freija and Chariclea.

More recent examples of curious transpositions are well known to most of us occurring in Holland's beautiful "Moth Book," and these, unfortunately, will have a wider effect on account of the thousands who will use the book, not one in ten of whom will ever see the corrections which have been published.

Another class of errors is composed of those which have a purely typographical origin. A curious one of this kind, which, however, has no importance, occurs in a paper by C. E. Worthington, formerly of Chicago, Ill., entitled "Notes on Argynnis Alcestis." (Can. Ent. X. 38.) After saying that both Alcestis and Aphrodite were found in the neighbourhood of Chicago, but generally at different localities, he says: "I have been greatly surprised at the readiness with which a strong *aphrodite* upon the prairie can be distinguished, while on the wing from the surrounding *alcestis,* etc.," and I feel sure he wrote "stray," but that it was misprinted "strong," and this error was reproduced by Edwards in his magnificent work on the "Butterflies of North America."

More serious errors of typographical origin, or perhaps merely through careless transcription, are those in connection with names.

CORRECTIONS OF ERRORS IN HOLLAND'S MOTH BOOK.

| Plate. | Fig. | Name Given. | Should Be. | Correction By. | Publication. |
|---|---|---|---|---|---|
| vi. | 1 | *Cocytius antæus, Dru* | *C. cluentius Cr.* ♂ | E. A. Smyth, Jr. | *Ent. News*, xv., 105. |
| xvi. | 9 | *Hyphantria cunca* | *H. textor*, as in text | H. H. Lyman. | |
| xvii. | 23 | *Euthisanotia grata* | *E. unio* | E. J. Smith. | *Ent. News*, xvi., 88. |
| | 24 | " *unio* | *E. grata* | " | " |
| | 16 | *Alypia Langtoni* ♂ | *A. octomaculata*, as in text | H. H. Lyman. | |
| xviii. | 14 | *A. lepusculina* | *A. populi*, as in text | " | |
| | 16 | *A. Radcliffei* | *A. albarufa*, as in text | " | |
| | 24 | *A. xyliniformis* | *A. lithospila*, as in text | " | |
| xxiv. | 34 | *Heliophila albilinea* | *H. diffusa* | E. J. Smith. | *Ent. News*, xv., 221. |
| xxv. | 9 | *Xylina petulca* | *X. ferrealis* | J. B. Smith. | *Ent. News*, xv., 104. |
| xxvi. | 5 | *Papaipema inquæsita* | *P. impecuniosa* | E. J. Smith. | *Ent. News*, xv., 221. |
| | 8 | " *nebris* | " *nitela* | " | " |
| | 9 | " *nitela* | " *nebris* | " | " |
| xxix. | 66 | *Cydosia majuscula* | *Tricostibas calligera* | H. G. Dyar. | *Can. Ent.*, xxxvi., 26. |
| xxx. | 15 | *Drasteria crassiuscula* | *D. erechtea* | E. J. Smith. | *Ent. News*, xv., 221. |
| xxxi. | 4 | *Catocala subviridis* | *C. Agrippina* | Wm. Beutenmuller | *Can. Ent.*, xxxvii., 292. |
| | 8 | " *retecta* | *C. luctuosa* | " | " |
| | 11 | " *flebilis* | *C. Angusi var. lucetta* | " | " |
| | 14 | " *obscura* | *C. residua* | G. H. French. | *Can. Ent.*, xxxvi., 54. |
| xxxii. | 5 | *C. dejecta var. Carolina Holl.* | *C. flebilis* | Wm. Beutenmuller | *Can. Ent.*, xxxvii., 292. |
| | 6 | *Catocala relicta* | *C. relicta var. clara* | " | " |
| | 7 | " " *var. bianca* | *C. relicta* | " | " |
| xxxiii. | 1 | " *Californica* | "Looks like a pale C. Irene" | " | " |
| | 4 | " *Ultronia var. Celia* | *C. Ultronia var. Adriana* | " | " |
| xxxiii. | 7 | *Catocala Ultronia var. mopsa* | "Not *mopsa*, but another var." | " | " |
| | 8 | " *Augusta* | "Looks like *C. Californica*" | " | " |
| xxxiv. | 7 | " *ilia var. osculata* | "Looks like *C. ilia*" | " | " |
| xxxv. | 1 | " *amasia* | *C. sancta* | " | " |
| | 2 | " *similis* | *C. similis var. aholah* | " | " |
| | 3 | " " *var. aholah* | *C. similis* | " | " |
| | 5 | " *fratercula var. jaquenetta* | "Looks like *C. blandula*" | " | " |
| | 7 | " *præclara* | *C. gracilis var. sordida* | " | " |
| | 13 | " *Stretchii* | *C. Mariana* | G. H. French. | *Can. Ent.*, xxxvi., 54. |
| | 14 | " *Californica var. Cleopatra* | "Looks like *C. Californica*" | Wm. Beutenmuller | *Can Ent.*, xxxvii., 292 |
| | 15 | " *Rosalinda* | Looks like *C. Californicc var. Cleopatra* | " | " |
| xlii. | 32 | *Tephroclystis absinthiata* | *Macaria infimata* | H. G. Dyar. | *Can. Ent.*, xxxvi., 26 |
| | 25 | *Palæacrita vernata* | *Alsophila pometaria* | G. W. Taylor. | *Can. Ent.* xxxvi., 245. |
| | 49 | *Mesoleuca intermediata* | *Petrophora fluctuata* | " | " |

## CORRECTION OF ERRORS IN HOLLAND'S MOTH BOOK.

| Plate. | Fig. | Name Given. | Should Be. | Correction By | Publication. |
|---|---|---|---|---|---|
| xliii. | 10-11 | *Hydriomena custodiata* | *Hydriomena excurvata* | H. G. Dyar | *Can. Ent.*, xxxvi., 26. |
| | 36 | *Deilinia variolaria* | *Deilinia erythremaria* | G. W. Taylor | *Can. Ent.*, xxxvi., 245. |
| | 39 | *Philobia enotata* | *Philobia notata* (of Europe) | " | " |
| xliv. | 2 | *Caripeta angustiorata* | *Caripeta seductaria* | " | " |
| | 32 | *Plagodis emargataria* | " I think *P. alcoolaria* " | " | " |
| xlvii. | 15 | *Euclea chloris* | *E. indeterminata* | H. G. Dyar | *Can. Ent.*, xxxvi., 26. |
| | 21 | *Cochlidion y-inversa* | *Tortricidia flexuosa* | " | " |
| | 27 | " *rectilinea* | *C. latomia* | " | " |
| xlviii. | 22 | *Tortrix albicomana* | " Is very unlike the type " | W. D. Kearfott | *Ent. News*, xv., 105. |
| xlviii. | 24 | *Platynota flavedana* | *Olethreutes nimbatana* | " | " |
| | 40 | *Epagoge tunicana* | " Probably *Sparganothis senecionana* " | " | " |

Corrections to the "Key to the Families," supplied by Dr. H. G. Dyar.

Page 24: Under 3, for 15 read 14. Under 14, for 17 read 16.

Page 25: Under 25 add a line, "Fore wing with vein 5 nearer to 4 than to 6 26." Under 26, for 26 read 27.

On page 62 the reference after Hæmorrhagia thysbe should be to Plate II., not I.

On page 337 Epelis faxoni Minot is referred as a synonym of Epelis truncataria Walk. E. J. Smith, *Ent. News*, xv., 221, says erroneously.

| Page. | Text. Fig. Named. | Should Be. | Correction By. | Publication. |
|---|---|---|---|---|
| 378 | *Inguromorpha basalis* | *Cossula magnifica* | H. G. Dyar | *Can. Ent.*, xxxvi., 26. |
| 379 | *Cossula magnifica* | ? | " | " |

In *Ent. News*, xv., 105, W. D. Kearfott says, "Several of the generic names used by Dr. Holland differ from those used in Prof Fernald's latest published list of Pyralids, Zinckenia Zell. for Hymenia Hbn., Glyphodes Gn. for Diaphania Hbn., Phlyctænodes Gn. for Loxostege Hbn., and he has repeated the error which occurs in both Dyar's Catalogue and Smith's 1903 List, Alceris in place of Acleris."

Most collectors know the pretty moth named *Plusia Ærea,* Hubn, and the one so much like it that it was named *Æreoides* by Grote. The name of the latter was correctly printed up to the issue of Dr. Smith's Catalogue of Noctuidæ in 1893, in which it appeared cut down to Æroides, but whether through the error of author or printer, I am unable to determine, and since then I have hardly ever seen it correctly spelled anywhere. Dr. Dyar fell into the same error in his catalogue of 1902, though he gave the correct spelling in his index, and Dr. Smith, in his check list of 1903, repeated the error, and everywhere the same erroneous spelling is copied, including publications issued by Dr. E. P. Felt, State Entomologist of New York, and in the lists of British Columbian Lepidoptera recently issued.

In order to render my copy of Dr. Holland's Moth Book as correct as possible, I have tabulated the corrections which have been made from time to time in different publications by different writers, and have myself discovered five discrepancies between names on plates and in the text. If any corrections have been made which I have not noticed, or if any of the corrections have been proved erroneous, I would greatly appreciate being informed of the facts.

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## CONFLICTS BETWEEN ANTS.

By G. E. Sanders.

Following are notes on a series of conflicts between two species of ants—*Myrmica scabrinodes sabuleti, Meinert.* and *Lasius niger Americanus*:

While making night observations on the Corn-root ant, *Lasius niger Americanus,* in August, 1909, Mr. W. P. Flint and myself accidentally caused a very curious conflict between the workers of a Lasius nest, and those of a nest of Myrmica. For the three nights following we were fortunate enough to have it repeated and to get several variations in the original procedure of Myrmica. It is on these variations in the actions of Myrmica that I intend to dwell particularly, and I will leave it to the reader to decide as to whether we had an unusual series of accidental happenings, or if Myrmica is endowed with a certain amount of reason.

To describe the situation:—The Lasius nest, containing about 250 workers, was situated under the edge of a wide furrow which we had plowed through a corn field; the furrow was 6 inches deep, and the bottom of it cleaned out with shovels, leaving a smooth surface, one foot in width. The Myrmica nest, containing about 60 workers, was situated in the bottom of this furrow, about 8 inches away from the opening of the Lasius nest; 6 inches beyond this, and in the bank opposite the first Lasius nest, was a second Lasius nest, containing about 150 workers.

Both species of ants are for the most part nocturnal, at least in their movements on the surface. During warm nights throughout the summer one will find from 1-10 to 1-4 of the workers of a Lasius colony on the surface, foraging within two feet of the entrance to the nest; a few individuals forage at greater distances, but the majority forage near the nest. This enables them to attack and kill, by force of numbers, almost any small insect, up to the size of the common Carabid, *Agonoderus pallipes,* which is unfortunate enough to fall among them. They exhibit great courage and skill in attacking these insects, which are often 12 to 15 times as heavy as a Lasius worker. Myrmicas seldom forage near their nest; they forage singly at great distances, often 10 feet from the nest, and seldom attack living insects. It often happens that a Myrmica, in foraging, will wander into a migrating line or band of Lasius foragers. Several Lasii will immediately attack it, one holding to each leg or *antenna,* and will drag it from the vicinity of the nest or line, as it happens to be, and there leave it to go as it will, making no attempt to kill it. The Myrmica, in such cases, offers no resistance whatever, and will remain almost motionless while being dragged away. Occasionally a solitary Myrmica and a solitary Lasius will meet, and while the Lasius will usually avoid the Myrmica, it will sometimes attack the larger ant. In such cases the Myrmica will stand higher in the air than usual, moving about slowly, keeping the Lasius, which is attempting to get a hold on its legs or antennæ, a little to one side and slightly in front of its head. They will often fence in this manner for a minute or more until the Lasius gets in the proper position, when the Myrmica, with a spring, swifter than one would imagine such an ungainly ant capable of, will seize the Lasius, usually by the petiole from the upper side, and lifting it in the air, will carry it to the nest, possibly for food.

Myrmica, while a very sluggish and awkward ant, shows itself in cases such as the two mentioned (and probably 100 of each were observed during the summer), to be a very cool, deliberate, and, if such a term may be used, calculating ant. Lasius moves more quickly, and apparently more blindly than Myrmica.

On the night of August 18th and 19th, while feeding the foragers about the larger Lasius nest, some of the food insects dragged themselves near the opening of the Myrmica nest before they were overpowered. In the excitement of capturing the insects, 75 to 100 Lasius had come out from their nest and were busily engaged near the Myrmica entrance in dragging the dead insects back to their own nest. At this moment a single Myrmica appeared at the opening of its nest, and in a second disappeared. In less than a minute three more Myrmicæ appeared and after running about on the surface for a few seconds in an excited manner, disappeared into their entrance. A few seconds later the whole colony of Myrmicæ, with the queen, came pouring from their nests, many of them carrying young, and very evidently prepared to migrate. A few of the Myrmicæ attacked the Lasii nearest them, while the rest ran about aimlessly for a few seconds, and then returned the young to the nest. The majority of the Myrmica workers now began an earnest attack on the Lasii, driving them slowly away from the insects which they had captured, and in the course of 15 minutes had them all driven back into their nest, leaving the insects near the Myrmica nest where they had abandoned them. The queen Myrmica remained on the surface only a few moments after the young were returned to the nest; she did not go more than three inches from the entrance and took no part in the battle.

After the Lasii had all been driven in, most of the Myrmicæ returned to their nest, leaving about 20 of their number, apparently standing guard, about the Lasius entrance, where they remained for some time, the last ones leaving and returning to their own nest about twenty minutes after the last Lasius had disappeared. The Myrmicæ in returning to their nest scarcely noticed the dead insects, two of them dragged a dead back-swimmer about for a moment and abandoned it. The remains of the insects were found at their entrance the next morning, showing that during the night they had dragged them in and devoured them.

On the night of August 19th-20th, the Lasii were brought near the Myrmica nest by feeding with living insects, this time purposely. The Myrmicae in appearing on this night were somewhat less excited than on the previous night, most of them attacking the Lasii as soon as they emerged from the nest. A few young, less than ten, were brought to the surface, as they emerged, and immediately returned to the nest. The queen remained in the nest throughout this battle. The time occupied in driving the Lasii into their nest was about fifteen minutes. After they were driven in, a number of the Myrmicæ—about 20—remained at the entrance as before, the last of them leaving the entrance fourteen minutes after the battle proper closed.

On the night of August 20th-21st, the Lasii were enticed out near to the Myrmica nest in the same manner as before. Their presence was discovered by two Myrmica workers which alarmed the nest. The Myrmicæ, in appearing on this occasion, did not bring their young with them, but among the last of the ants which came pouring from the entrance, the queen appeared. The Lasii were at once attacked and driven away from their captures and in about fifteen minutes were all driven into their entrance. The queen Myrmica remained on the surface not more than two minutes; her presence there was probably accidental. It is possible that she was caught in the swarm of workers emerging and carried along with them. She took no part in the battle, not going more than an inch from the entrance to her nest. The Myrmicæ on this night did not remain at the Lasius entrance more than two minutes after the last Lasius had disappeared.

On the night of Aug. 22nd-23rd, the drawing out of the Lasii and the emergence of the Myrmica workers was exactly the same as on the previous nights, excepting that the queen did not appear. No young were brought to the surface by the Myrmicæ on this occasion. The Lasii were driven from their food and into their nest in approximately the same time as on the two previous nights. After the Lasii had all disappeared the Myrmicae scarcely remained at their entrance at all, returning to their own nest almost immediately.

On the night of Aug. 23-24th we had an exact duplicate of the proceedings of the previous night, until the battle was well under way, when we drew out the second and smaller nest of Lasius. By using insects which they were particularly fond of we drew them up to the rear of the line of fighting Myrmicae, about as near the Myrmica nest as the first nest of Lasius had been when the Myrmicae attacked them. When this second nest of Lasius came near so that the Myrmicae began to notice them the last of the large nest of Lasii were disappearing. The appearance of this second nest seemed to demoralize the Myrmicæ, which were already in some disorder, and instead of attacking, as we expected they would, most of them ran around the cluster of Lasii and disappeared into their nest; a few of them attacked the Lasii, but not being supported, fell off and returned to the nest, leaving the second nest of Lasius in full possession of their insects, which they dragged to their nest.

On account of the nights becoming suddenly colder, we could not get Lasius to come out, and so had to discontinue the observations. One of the most curious things was the apparently regular battle formation of Myrmica. In every case, soon after the conflict began the Myrmicæ would form in a somewhat irregular line, with only a few workers behind, and a few in front of this line, those behind fighting with the straggling Lasii, and those in front being attacked by several Lasii and seldom moving, simply allowing the Lasii to pull at them. The line was always thickest at the centre, and thinnest at the ends where the Lasii were least numerous. The ends in all cases advanced faster than the centre, so that towards the end of the battle the line would assume the shape of a horseshoe. On the night of the 23-24th when we brought up the second nest of Lasii behind this apparent formation, which was already partially broken up in driving the first nest of Lasius into its entrance, the Myrmicæ apparently did not know what to do. A few put up a weak fight and in a few moments all retreated, leaving the Lasii in possession of their insects right at the Myrmica entrance. There were plenty of Myrmica workers out to drive off the Lasii, for there were not nearly as many of the second nest out as there had been of the first. Does this indicate that the Myrmicæ fight in a more or less regular formation, and being surprised when this formation was broken up, they retreated rather than fight?

Another thing: On the night of August 18-19th, when the Myrmicæ were first disturbed they brought all of their young to the surface with them. From having seen dozens of Myrmica migrations, we can say positively that they were fully prepared to migrate. On the second night we find only a few young brought to the surface and immediately returned, showing them to be less excited over the presence of Lasius than on the previous night. On the third, fourth and fifth nights no young were brought to the surface at all. It was fear that induced them to bring their young to the surface the first night; on the second night we find that fear greatly abated, as fewer young were brought to the surface and kept there for a much shorter time. On the third, fourth and fifth nights we find no young brought to the surface; so, evidently, they had no fear of their nest being raided by Lasius. Can we conclude that this nest of Myrmica was profiting by experience? It certainly was showing a degree less of alarm over the appearance of Lasius after each successive conflict.

Again, on the first night of the battle, the Myrmicæ stood about the entrance of the Lasius nest for 20 minutes after the last Lasius had disappeared. Whether they were simply wondering where they had gone, or, whether they expected them back, and so were picketing the entrance to prevent their reappearance, we cannot say. On the second night we find them waiting about this entrance for less than 15 minutes. On the third night we find them waiting less than two minutes, and on the fourth night, scarcely waiting to drive the last Lasius in. Does this indicate that they slowly proved to themselves the futility of waiting; that they remembered their earlier experiences, and so did not wait at all on the night of the 22-23rd?

The notes on these conflicts were taken at the same time, separately by Mr. Flint and myself, and later compared. The notes on the behaviour of Myrmicæ, when in ordinary conflicts with the Lasius, are from hundreds of observations, and go to show the cunning of the Myrmica in battle.

The questions which I am not attempting to answer, are those which suggested themselves to Mr. Flint and myself when taking the notes.

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## THE SPRUCE BUD-WORM, TORTRIX FUMIFERANA, CLEMENS.

By Arthur Gibson, Chief Assistant Entomologist, Experimental Farm, Ottawa.

During the early part of the past summer the Spruce Bud-worm was especially abundant in Canada. Towards the end of July the Deputy Minister of the Department of Agriculture was informed by the Hon. Senator Edwards that some kind of an insect was doing much damage to spruce and balsam trees in the above district, and as a consequence I was instructed to proceed at once to the infested locality, to investigate the outbreak.

Early on the morning of July 29th, therefore, I left Maniwaki, Que., in company with Mr. M. Boyle, of the W. C. Edwards Company, and drove to Baskatong, about 40 miles due north, which place we reached about 5.30 in the afternoon. Around Baskatong the injury to spruce and balsam was very apparent, owing to the conspicuous reddening of the tops of the trees. Early the following morning we left Baskatong and spent the whole day examining trees at different points. As soon as the first tree was cut down I saw at once that a lepidopterous insect had been at work. Thousands of the empty pupal cases of the moths were present on the trees, and these, with the partly eaten and discoloured dead foliage, together with the excrement from the caterpillars, gave the conspicuous reddish appearance to the tops of the trees. The injury for this year, of course, had stopped before the time of my visit. The caterpillars had evidently become full-grown during the first and second weeks of July. Moths which had issued some days before the end of July were present in large numbers on the trees, and from fairly good examples collected, I saw that the species was *Tortrix fumiferana,* Clemens, which is known popularly as the Spruce Bud-worm. The caterpillars had fed chiefly at the tops of the trees, although some injury was done towards the ends of many of the lower branches. The foliage for about four or five feet from the tops of the infested trees was almost wholly destroyed, being either partly or completely eaten by the caterpillars. This, with the exposed pupal cases above referred to, gave the trees the conspicuous reddish appearance, and caused the rather widespread report among lumbermen that the trees were dying. In looking over a valley on the opposite hillside, the trees appeared as if fire had swept through the region. Other than loss of foliage and the consequent setback thus caused, the trees did not seem to be seriously injured. The tops were perfectly green under the bark.

The outbreak of the Spruce Bud-worm this year has been most remarkable and very widespread. Not only has this insect done much damage all through the Upper Gatineau country and other adjacent districts, where there are large tracts of spruce and balsam trees, but even in British Columbia reports have been received of much injury by the Tortrix. Dr. C. Gordon Hewitt, Dominion Entomologist, when in British Columbia, in October last, saw the conspicuous work of the insect and received reports from local entomologists concerning its ravages.

The Spruce Bud-worm, when mature, is nearly an inch in length, tapering slightly from the middle to the end. In colour it is dark brown and bears conspicuous whitish-yellow piliferous tubercles, and along the side of the body there is a yellowish stripe. The eggs of the insect are scale-like and are deposited in clusters overlapping each other. The partly grown caterpillars pass the winter among the terminal shoots of the trees, completing their growth the following year. The moth expands about 7-8 of an inch when the wings are spread. In colour it is dull gray, the fore wings overlaid with bands, streaks and spots of brown. In the middle of the upper margin of the front wings there is a rather large conspicuous whitish spot. In British Columbia, this year, the moths were of a distinct reddish colour, but all the eastern specimens noticed were of the gray form.

When an insect attacks forest trees, such as has been the case with the Spruce Bud-worm the past summer, it is, of course, impossible to do anything in the way of applying remedial treatment, such as is done for leaf-eating insects when attacking orchard or ornamental trees. Fortunately an outbreak of such a nature, however, is generally attended by natural parasites, which sooner or later restore the balance of nature. From observations made, and from parasites reared in the Division of Entomology from material collected in the Baskatong District, we have reason to hope that the Spruce Bud-worm will not next year continue to any serious extent its work of destruction. Undoubtedly, too, birds will help materially to reduce the numbers of the hibernating caterpillars.

In the forthcoming annual report of the Division of Entomology of the Dominion Experimental Farms, covering the injurious insects of the year 1909, it is purposed to give a much fuller account of the injury done to spruce and balsam trees by the above insects not only in the Upper Gatineau country of the Province of Quebec, but also in British Columbia.

## THE SNOW-WHITE LINDEN MOTH.

(*Ennomos Subsignarius, Hubn.*)

By A. F. Winn, Westmount, Que.

Poor as the summer of 1909 has been for most species of butterflies and moths in the neighborhood of Montreal, conditions must have been favourable for this White Geometrid Moth, for during August swarms of them about the electric lamps in our streets attracted the attention of many persons who do not usually take much heed of insects that do not sting them.

For at least twenty years, prior to 1908, the moth might well be considered a rarity and my captures of it in that period did not exceed an average of one specimen per annum, and these were all taken in the woods flying among linden, beech and maple trees. In 1908 there were great numbers of larvæ in June, in the woods at the eastern end of Montreal Island, feeding on the leaves of the trees above mentioned, as well as birch, completely stripping the lower branches of their leaves, the dropping of the frass on the leaves and ground sounding like the patter of a smart shower of rain.

I was out of town the last two weeks of July, during which time the principal part of the flight of the moths occurred, but scores of dead moths in store windows and spider webs, and broken-off wings in little heaps at base of electric light poles and in gutters, showed plainly that the flight must have been one of myriads. The Entomological Record for 1908 tells of the occurrence at Ottawa, July 23rd.: Dr. Felt's 24th Report records its abundance through New York State and Massachusetts, with figures of larvæ and pupæ and plate of eggs and imago; and Mr. W. H. Broadwell in the *Canadian Entomologist* (XL. 327) gives, under title of "A July Blizzard," an interesting account of the flight of swarms of moths at Newark, N.J. The last writer has again an article in the November number of our magazine mentioning that the 1909 crop of moths was even greater than that of the previous year. The same thing has occurred here and doubtless in many other places, and as Mr. Broadwell aptly remarks, it is "very unusual for an insect ordinarily rare to appear in great numbers for two succeeding seasons." If this insect's periods of visit in swarms are always separated by such a long term of years it cannot have many parasites peculiar to itself, or they would surely starve during all the lean years. Toads, bats, cats and sparrows undoubtedly had a sumptuous repast in the cities, but they have quite a choice of diet. It will be interesting to note whether there are any of the moths next year; if not, we may have to leave future observations to our successors, as the astronomers do with the comets.

On the morning of August 2nd, on my return from a vacation, large numbers of the moths were seen clinging, with their wings closed over their backs, to the office buildings down town, particularly at, or near, the street corners where the arc lamps had evidently attracted them the previous night. The following day there were still some moths about town, and all taken and seen on both days were males.

On August 9th they were again plentiful at the lights during the evening—every lamp passed by in a three-mile walk had its swarm of white moths about it. An incandescent lamp on my gallery attracted many of them, the numbers increasing as it became later, and about 11 p.m. there were often between 20 and 30 flying around and the brick wall of the house was spotted all over with white.

On the 14th, the moths were again noticed down town, in good condition, on walls and windows of buildings and all were males so far as noticed.

On August 24th, after 10 days apparent freedom from them, they were again plentiful and in equally good condition. Evidently there had been a large flight to the lamps the previous evening. Dr. Bethune happened to be in Montreal in the evening of the 23rd and in crossing the city from the Windsor to the Place Viger Railway Station, observed and wondered at the great quantities of white moths around nearly every lamp, capturing some to make sure what they were and was surprised to find E. subsignarius swarming at so late a date—a full month later than in 1908. Among my captures on 24th August, was one female, the only one seen attracted to light among several thousands observed of the male sex.

On September 4th, a couple of females were found on tree trunks in Mt. Royal Park, but they were worn and nearly dead—too weak to lay any eggs. These were the last that I noticed alive. Wings and dead moths still adorn many corners and basement window sills that are not swept out so carefully as they might be.

The simultaneous appearance of unusual numbers of any insect always makes one suspect migration from distant warmer parts, where they have been drawn up into the upper air and carried along by the wind, certain numbers dropping off here and there, as is the case with such moths as the Cotton Moth (*Alabama argillacea*), Erebus odoratus and many of the Southern Sphingidæ. I am inclined to think that in this case all the insects were bred in the neighborhood, but it is difficult to account for their excessive abundance on certain nights and absence on others over such a long period unless certain weather conditions are necessary for the final transformation from pupa to moth, or that only under favourable conditions are the male moths inclined to visit the lights. A study of the McGill College Observatory report of the local weather for the month throws no light on the subject, neither temperature, humidity, direction, or velocity of the wind, nor rainfall appearing to show any relation to the flights; but of course, a west wind might bring the moths from a tract of woods lying west of the city on one evening, while an east or a north wind might have the same effect on other evenings on those bred in the respective directions. It is quite certain the swarms of moths seen in St. James Street did not breed within a mile radius of Montreal General Postoffice. It is a curious coincidence that our other species of Ennomos, E. magnarius, usually so plentiful in September, has been scarcely seen at all either in 1908 or 1909.

## NOTES ON FRUIT TREE SCOLYTIDS.

By J. M. Swaine, Macdonald College, Que.

There are three species of scolytid beetles occasionally injurious in parts of this country to orchard trees. Two of them, *Eccoptogaster rugulosus*, Ratz., and *Phlœotribus liminaris*, Harris, have recently caused considerable uneasiness in certain fruit districts of Ontario, and the third, *Xyleborus dispar*, Fabr., has been a well-known pest of Nova Scotian apple orchards for some years.

Apparently these insects are not serious pests in Quebec Province. *X. dispar* is found here commonly in *Betula lutea* and other forest trees, but I have not yet taken it in Quebec from orchard trees. The first two species are at least rare in the Montreal district.

Inquiries have come to this Department recently for an easy method of separating these three forms, and the following notes are to that end.

The Shot-hole Borer, *Xyleborus dispar*, cuts round, black tunnels deep into the wood; in small branches or stems one division of the tunnels partially girdles

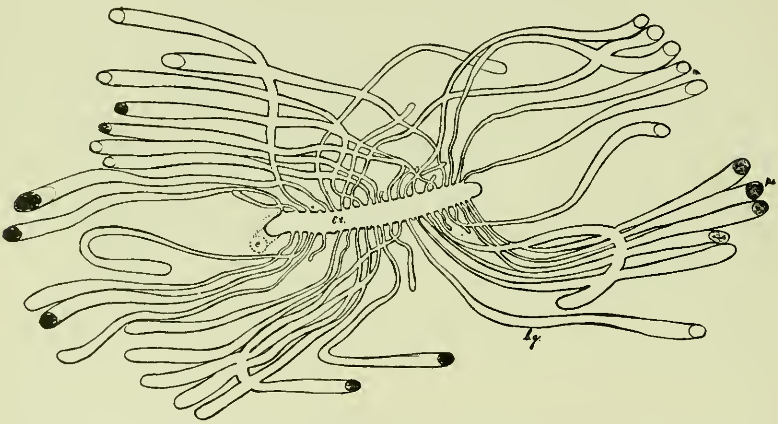

FIG. 1. Tunnels of E. rugulosus in peach: (*e*) entrance hole; (*e.t.*) egg tunnel cut by adult; (*l.g.*) larval gallery ending in *p.c.*—the pupal cell.

the wood. The eggs are laid free in the galleries early in June, and the larvæ feed upon the fungus which grows upon the tunnel walls, and gives the dark stain just referred to. The larvæ do not enlarge the tunnels, and emerge when matured, through the entrance hole cut by the mother insect. In the other two species each individual beetle, when ready to emerge, cuts a separate hole through the bark.

This species breeds in various forest trees and in fruit trees. Of the latter it apparently prefers the apple, and does harm chiefly to the young stock. The remedies aim to repel the tunnel-cutting females, which do the entire damage, or to destroy the food-fungus and the brood within the tunnels. Good results have been obtained in Nova Scotia from the use of a wash made of 3 gallons of water, 1 gallon of soft soap, and half a pint of crude carbolic acid. This wash is applied several times while the beetles are prevalent, the first application being made about the first of June. Badly infested trees should be burned, and those still of value may be treated with carbolic wash, and should receive good cultivation and plenty of fertilizer. Trees in good health are less liable to attack. Diseased

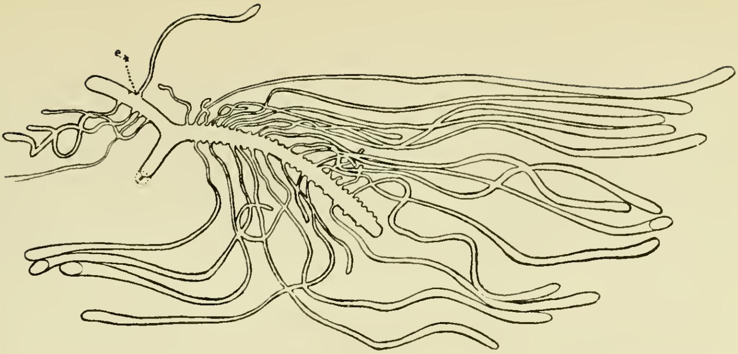



FIG. 2. Tunnels of P. liminaris: (*e.n.*) egg-niche.

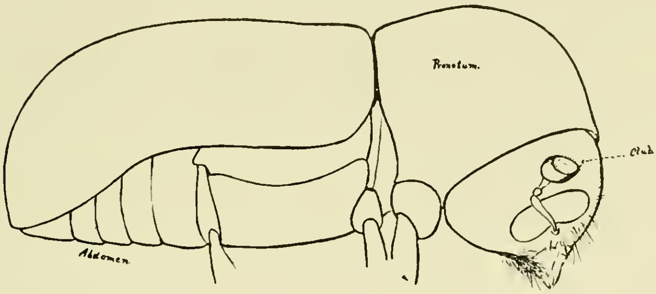



FIG. 3. Xyleboru s dispar from the side, legs removed.

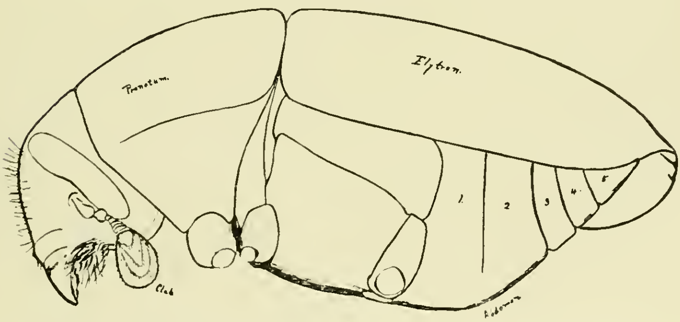



FIG. 4. Eccoptogaster rugulosus from the side, legs removed.

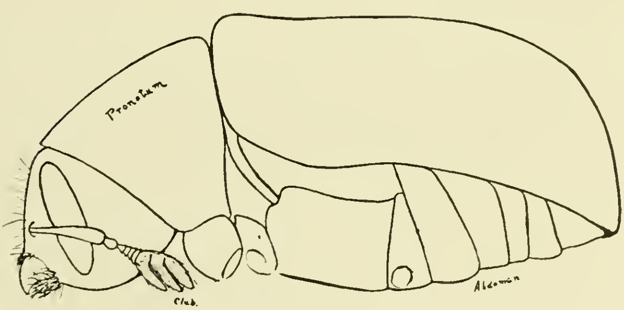



FIG. 5. Phloeotribus liminaris from the side, legs removed.

and dying branches should be removed and burned before the first of June. When fresh holes of this beetle are found in small trees, it is an easy matter to inject into the holes a little kerosene or other oil. The oil kills the insects which it wets, and destroys the food-fungus, with fatal results to the beetles and larvæ.

The adult female is black, cylindric, and about one-eighth of an inch in length. The pronotum is bent very strongly ventrad in front, so that the anterior opening is nearly horizontal. The head is globular and deeply sunk in the pronotum. The antennal club is sub-globular and truncate distally. The venter of the abdo-

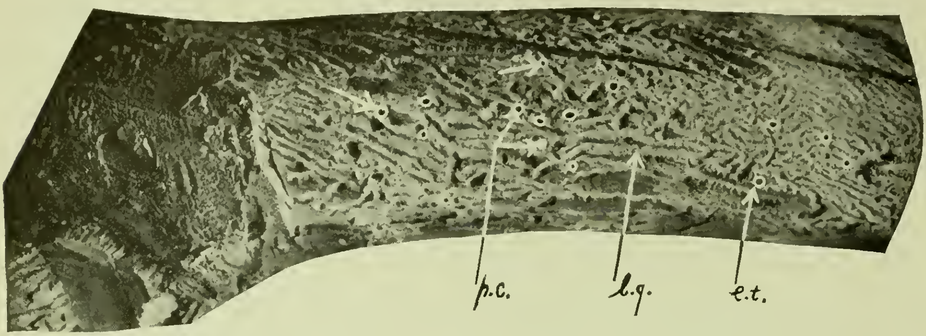


FIG. 6.

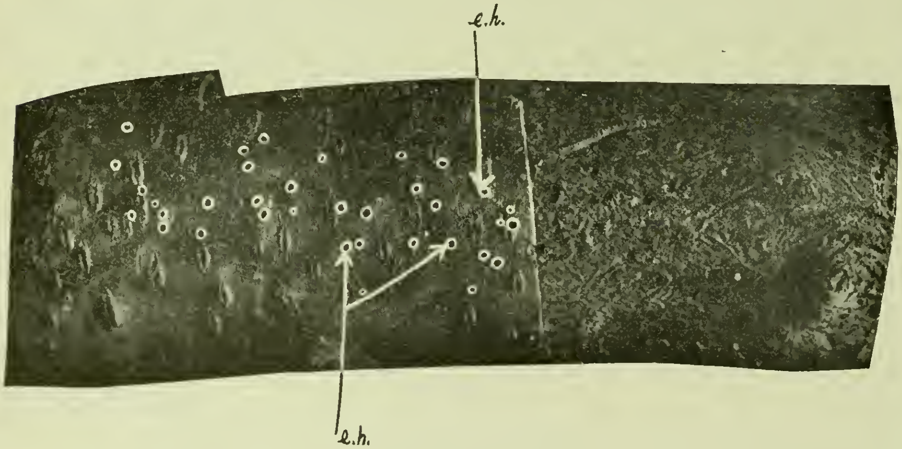


FIG. 7.

FIGS. 6 and 7. Work of E. rugulosus in apple; (*p.c.*) pupal cells sunk into the wood; (*e.h.*) exit holes of matured beetles. These holes lie usually immediately over the pupal cells. The smaller holes in figure 7 were cut by parasites.

men is evenly rounded. The truncate club and the strongly bent pronotum, as well as its larger size, distinguish it instantly from the other two. The males are much smaller than the females, wingless, and of a curious hump-backed shape.

The Peach-tree Bark-beetle, *Phloeotribus liminaris,* cuts all its tunnels between the bark and the wood. An egg-tunnel is cut by the adult and the eggs laid in niches along the sides. The larvæ bore away from the egg-tunnel, keeping between the bark and the wood, eventually following the grain of the wood, and pupate in the enlarged end of the larval galleries thus formed. Later they appear through holes cut in the bark above the pupal cells. The egg-tunnels of this species

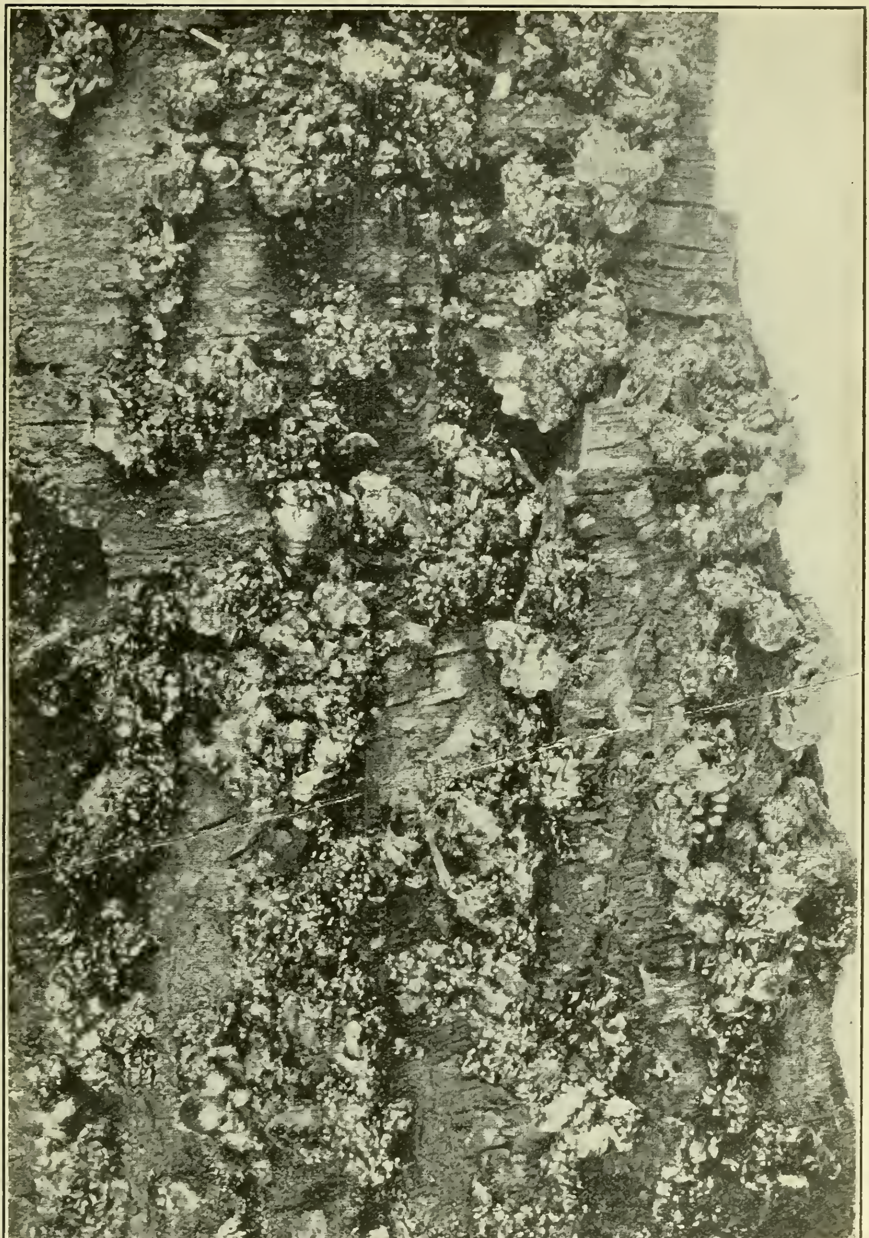

FIG. 8. Exuded Peach Sap from punctures of Fruit Bark-Beetle, (after Lowe, N.Y. Agr. Exp. Sta., Bull. 180).

are distinguished from those of *rugulosus* by a short side-branch which forms, with the short tunnel leading to the opening in the bark, a Y-shaped end to the main division, (See Fig. 2). The adults are brownish-black, about one-tenth of an inch in length. The pronotum is not bent strongly ventrad in front, so that the anterior opening is oblique. The head is large and visible from above. The antennal club is lamellate, divided into three separated, laterally produced segments. The venter of the abdomen is not bent strongly dorsad behind.

The damage inflicted by this beetle is mainly to the cherry and peach. Trees in apparent good health are attacked in the fall by the hibernating adults, and from the short tunnels then cut much sap exudes during the following season. Healthy trees are also attacked by the adults during the egg-laying season, but the vigorous flow of sap invariably drives them away. The brood can be reared only in weakened and dying trees. Successive attacks, however, will so weaken a tree that eventually the egg-tunnels can be cut and the brood reared, the result of which is the utter destruction of the inner bark. Slightly injured trees from which the beetles have been driven by the flow of sap should be well fertilized and protected from further injury, by a repellant wash. All dead and dying limbs and trees should be removed and burned before the emergence of the contained brood. Seriously injured trees are improved by a severe pruning. Mr. H. F. Wilson recommends the use of thick whitewash as a repellant, to be applied before the attack of the borers (Bull. 68, part IX., U.S. Bureau of Entomology). Good results seem to have been obtained in Ontario with lime-sulphur wash and with "Sanders' Wash" applied to the trunk and bases of the branches early in spring, about the first week in March, and again in July before the second attack.

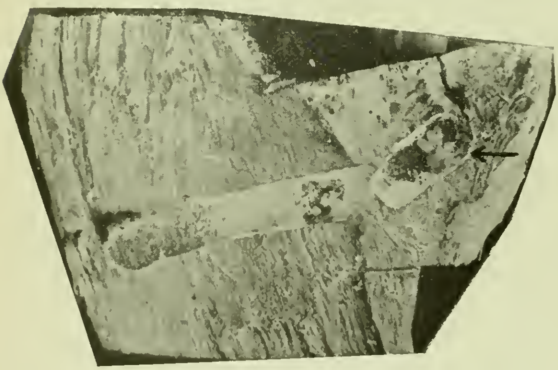

FIG. 9. Tunnels of Xyleborus in beech, arrow points to eggs.

FIG. 10. Tunnels of Xyleborus in beech, arrow points to female in characteristic position guarding the entrance.

The Fruit-tree Bark-beetle, *Eccoptogaster rugulosus*, Ratz., is of the size and general appearance of *P. liminaris;* but the venter of the abdomen is bent sharply dorsad beyond the first segment, and the antennal club is solid, flat and marked by strongly angulated sutures. The galleries of this species are entirely between the bark and the wood; the ends of the larval galleries, which form the pupal cells, are often sunk a few millimeters into the wood. This species agrees with *P. liminaris* in general habits. It breeds in dying limbs and trunks, but like *liminaris,* injures living trees by driving short tunnels into the bark through which the sap flows copiously, later to harden and form the gummy masses which characterize the work of *P. liminaris* and *E. rugulosus* in healthy bark. This species attacks the apple, cherry and peach, and is often found working with *P. liminaris* in the same limb. The three washes mentioned above are also useful against this species

Clean culture is absolutely essential if these borers are to be controlled. Diseased and dying fruit trees furnish breeding grounds for these beetles and for numerous other insect pests, and should be burnt to prevent the spread of the insects beneath the bark and in the wood.

The following key will enable anyone to separate quite easily the three forms discussed. A hand-lens is needed for examining the antennæ, but the other characters are visible to the naked eye. The beetles are easily distinguished by their tunnels, as indicated by the diagrams.

A. Venter of the abdomen with the caudal portion bent abruptly dorsad. Antennal club flat and marked by angulated sutures. (Bark-borers) Eccoptogaster rugulosus (The Fruit-tree Bark-beetle).

AA. Venter of the abdomen normal, regularly curved.

B. Antennal club lamellate, of three separate, laterally produced segments. Head visible from above. (Bark-borers) Phloeotribus liminaris, Harris. (The Peach-tree Bark-beetle).

BB. Antennal club globular, truncate at the tip. Head deeply imbedded in the prothorax, the anterior margin of which is nearly horizontal, invisible from above. (Wood-borers, tunnels stained deep black). Xyleborus dispar, Fabr. (The Shot-hole Borer).

## OBSERVATIONS ON ONTARIO INSECTS IN 1909.

By C. J. S. Bethune, Ontario Agricultural College, Guelph.

As Mr. Gibson and Mr. Caesar have already presented reports upon the insects of the season, it only remains for me to refer to some that have especially come under my observation, or that have been a source of trouble to many correspondents.

The weather during spring and early summer seemed peculiarly favourable to the multiplication of Plant-lice (Aphids). They were to be found in more than usual abundance swarming upon a great variety of trees, shrubs, and plants, and causing a great deal of injury by checking the growth and impairing the vitality of everything they attacked. Cabbage and turnip plants were affected by them early in the season, but they ceased in most cases to be much trouble later on, in marked contrast to last year when they were a very serious plague till the frost came and destroyed them. In the vegetable garden peas, potatoes and lettuce were especially attacked and in the flower borders roses, asters, hollyhocks, etc., and even ferns; currant bushes had their leaves covered with wart-like swellings beneath which swarms of aphids were huddled; plum and cherry trees showed signs of the intruders by the crinkled and twisted leaves at the ends of the branches enclosing multitudes of black lice; on the leaves of apple trees green aphids were abundant, while twigs were soft and foliage tender, but later on they migrated to more succulent plants, probably to the wheat fields. Many elm trees looked sadly out of sorts from shrivelled and distorted leaves covered with disgusting woolly lice, which were to be seen also wherever a scar was to be found on trunk or limb; great colonies of open feeding woolly aphids were also frequent on hawthorns. A clump of European lindens on the College lawn were so beset with lice that the leaves looked as if varnished owing to the incessant dripping of tiny drops of "honey dew," the sweet excretion from the hosts above; happily a couple of days of heavy rain washed the foliage clean and checked the increase of the aphis army. A handsome copper-beech on a friend's lawn in Hamilton was alarmingly attacked by another woolly form (the so-called wool is really wax), and its owner feared that permanent injury would result. In other places, maples, birches and various shade and ornamental trees were beset with these minute foes, while on firs and spruce were to be found the giants of the race, great black aphids, a hundred times bigger than the familiar green plant lice, belonging to the genus Lachnus. Widespread and varied indeed were the enemy, but their own foes speedily came to the rescue; Lady-bird beetles, yellow and orange and black, were to be seen in great numbers, and their larvae also were busily engaged in devouring the sweet morsels. The quaint, spiny chrysalids, sticking by their tails to the bark of trees, and occurring in masses, even fifty or more huddled together, were often sent in by observers fearing that they might be a new foe, and well pleased to learn that the formidable creatures were veritable friends. Syrphus fly larvæ and those of Lace-winged flies, aided by various other aphid eaters, combined to reduce the swarms, and these with a change of weather conditions, stayed or entirely removed the plague; during the latter part of the summer complaints almost ceased to be made. The standard remedies for these insects that live by sucking the juices of plants are kerosene emulsion, tobacco wash or strong soap-suds, preferably that made with whale or fish-oil soap.

Besides the scale insects referred to by others, there has been a widespread attack made upon trees in northern parts of the city of Toronto by the elm-tree scale (*Gossyparia spuria*). Last year it only came under my observation from its occurrence on the elms in a single garden, but it must also have been established unnoticed upon many others to have become so abundant this year. It would probably yield to treatment with the lime-sulphur wash applied at the usual time in early spring, but city dwellers with small gardens and few trees have no spraying outfit nor would they like to make use of a remedy so disagreeable to those who handle it. In their case much may be done by clearing off the scales with a scrubbing brush dipped from time to time in strong soap-suds. Where the elm-trees in parks, on boulevards and the sides of streets are attacked it is certainly the duty of those employed by the city to have the affected trees properly and thoroughly treated. Any neglect now may result in a widespread loss of these beautiful trees which grow so luxuriantly and are so attractive in and around Toronto.

The Cottony Maple Scale (*Pulvinaria innumerabilis*) which is essentially a town insect, attacking many other shade trees beside the maple, and when at its height spreading to plants of almost all kinds in parks and gardens, has been noticeable in several places this year. Like several other injurious insects it has its cycles of abundance and scarcity; increasing in numbers for some years and becoming a veritable plague, and then rapidly diminishing till it ceases to be noticed. This change is due, no doubt, to the attack of parasites combined with unfavorable climatic conditions. Repeated sprayings with kerosene emulsion when the lice are hatching out from the eggs contained in a waxy, cotton-like mass would keep the insect in check, and should be resorted to as soon as the scale is observed on the trees.

The oak trees in the neighborhood of the town of Galt have been stripped of their foliage both this year and last by the caterpillars of the Senatorial Moth (*Anisota senatoria*); the attack has been going on for four years and must result in serious injury to the trees if nature's checks do not soon come to the rescue. The caterpillars, when full-grown—which they were after the middle of September—are black with four ochre-yellow stripes along the back and two on each side. On each segment of the body there are six black spines or prickles, and behind the head two long slender horns projecting out on either side. The caterpillars feed together in great swarms, several hundred on a branch, and devour the foliage, beginning at the end of the twigs and moving downwards till they have completely stripped off all the leaves; then they move on to another limb. When at rest they huddle together in masses and if disturbed raise the fore part of the body and shake their heads in a threatening manner. They make no webs or cocoons, but descend into the ground to pupate and remain buried in the soil till the following June; the chrysalids then work their way to the surface and the moths emerge to lay their eggs and provide for a new generation. The eggs are laid in large clusters on the underside of oak leaves near the tips of the branches and the young caterpillars are hatched during the month of August. The moths are handsome creatures, ochre-yellow in colour with a shading of reddish-purple on the front and hind margins of the wings; an oblique narrow purple-brown band crosses the wings, and near the middle of each there is a conspicuous round white spot. The male moth is much smaller than the female and more tinged with purple, the expanded wings measuring about an inch and three-quarters; the female moth is fully two and a half inches in expanse, and often is entirely yellowish with no tinge of red or purple.

During the height of summer and throughout the autumn season numerous complaints have come in from many parts of the Province respecting White-grubs and Wireworms. The former have been more than usually abundant this year and have caused a great deal of loss by their attacks upon the roots of corn, grain of various kinds, strawberries, etc. The most remarkable and uncommon attack has been upon the tubers of potatoes, in which they have bored great holes and rendered them unfit for marketing or table use. Generally they feed upon the fibrous roots, but this year their numbers were so great that after consuming these the only food for them was the potato itself. As I have stated in the *Ontario Crop Bulletin* for November: "White grubs are the larvæ of what are familiarly known as May beetles or June bugs. They breed for the most part in old pastures and require three years to attain to maturity. Crops that are planted when an infested field has been broken up are usually attacked by these grubs. During the first year they feed to some extent upon the remains of the sod that has been turned under, but during the second year, there being nothing else, they attack the roots of whatever crop there may be. The best remedy for them is a short rotation of crops, so that there will be no time allowed for their attaining maturity. An infested field may be fairly cleared of them by permitting hogs to roam about; they will root the grubs up and eagerly devour them. Late plowing is desirable in order to break up their winter quarters and expose them to the weather and their various enemies. Working underground as they do, it is not practicable to apply any poisonous remedies. Dependence must be placed upon the methods referred to."

WIREWORMS, the larvæ of Click-beetles (Elateridæ), have a somewhat similar life-history to that of the White Grubs, except that the beetles pass the winter under the shelter of rubbish, tufts of grass, etc., and appear during the first warm days of spring, whereas the May-beetles, the adult form of White Grubs, remain buried in the ground during the winter and come out in May or June. Complaints of injury to the roots of many plants by the attacks of Wireworms have been received from various quarters, in fact never a year goes by without much loss from their depredations. The methods referred to above for the control of White Grubs seem to be the only effective remedies for Wireworms also.

GRASSHOPPERS, which have already been referred to by Mr. Gibson, were extremely abundant and destructive this year, attacking oats and other cereals, and injuring vegetation of almost all kinds. In this case, also, old pasture fields, where the soil is dry and sandy, are the favorite breeding grounds, and hot, dry weather the most suitable for their growth and increase. The worst attacks were reported from the counties around the Georgian Bay. At the beginning of August Mr. Cecil Swale, Secretary of the North Bruce Farmers' Institute, Wiarton, wrote as follows respecting the Grasshopper plague:

"We have had these pests for four years in succession, each year worse than the preceding one. This year, I can go to farmers who off, say, 30 acres, have only got a load of fodder, counting hay, grain and everything. Many cut their oats three weeks ago to save what was left. I know fields to-day that are just standing oat stubs, the grain all on the ground. Nobody can quite credit the destruction they can do and are doing; you have to see for yourself. These pests breed in old pastures, roadsides and old meadows. Lots of these pastures cannot be plowed for rock, while being well adapted to this particular use. Then, again, you may have a first-class farm, and your neighbour has fifty acres of pasture alongside; the hoppers cross over and eat you out. You have no remedy. I have a pasture farm divided from the main farm by 100-acre swamp. I have not many hoppers, as all the home farm is pretty much under cultivation; but my neighbour on the other side of the pasture farm has been cleaned out by the hoppers off my pasture. My cattle have been starved off the fifty acres of pasture, and I have taken them up into my hardwood bush. My neighbour has not two loads of anything off a forty-acre clearance. Oats and barley and grass are their chief food. Peas they seldom touch.

"We have been thinking a few experiments might be tried to destroy the eggs of the grasshoppers in the fall, such as lime, salt, or a mixture of both, used as a top dressing on pastures. Possibly a spraying of formalin and water might destroy those now living. The eggs are laid in September by the grasshoppers depositing them in small bunches of twenty or thirty eggs stuck together just below the surface. Skunks dig up great quantities of them in October. I opened a number of grasshoppers yesterday that seemed very large. Nine out of ten were filled with thread-worms, white, six inches long, which would seem to point out a possibility of the brutes dying soon. They are also infested with a bright red parasite. There are thousands of dead ones all over the meadows, but there would be no room for the living if some of them did not die. Naturally dry weather favours their increase, and as the last three summers have been dry we have had an extra hard crack from them. Matters are so serious with the farmers of the townships of Albemarle, Amabel and Keppel (in Grey) that I know many farmers will leave their farms, and many more would go if they could. We all thought last year would be the last of them, but the contrary was the case. Nobody cares to venture an opinion about next year now.

"As the grasshopper dies in the fall, the remedy appears to lie in getting after the eggs. The Criddle mixture, as recommended by one of the bulletins, does not work here; they won't eat it. They don't seem to eat anything which has been dosed with Paris green. I am sure the careful consideration of this matter will be most acceptable to all of us who are unfortunate enough to live in this district."

The Criddle mixture has been so often tried and found effective on a large scale in Manitoba and in many places in Ontario, that we are surprised to learn of its failure in this case. Mr. Criddle himself states that many applications of the mixture have been made this year and that it has proved entirely effective. It may be that some error was made in its preparation or mode of distribution.

The white worms found inside the bodies of some Grasshoppers are commonly called "Hair-snakes" (Gordius) and are well-known parasites of both crickets and grasshoppers. They evidently destroy large numbers, but amongst such hosts as above described, it would require an enormous army of the worms to appreciably reduce the swarms. Scarlet mites, the red parasites referred to, are also commonly to be found clinging to their hosts and helping to destroy them. The destruction of the egg masses by breaking up the soil in which they are laid is by far the best method of getting permanently rid of the pests.

## INJURIOUS INSECTS OF QUEBEC, 1909.

By William Lochhead, Macdonald College, Que.

The season of 1909 was in many respects abnormal. Spring was tardy throughout the Province and the crops were sown later than usual, on account of the cold rains. Summer weather conditions also differed in different parts. On the Island of Montreal there were timely showers throughout the summer, so that the crops at no time suffered from drought. Over a large part of the Eastern Townships, however, little or no rain fell during June, July and August, and the late sown crops suffered from lack of water. In the latter part of August rains fell which interfered with and delayed the harvesting of the crops. The autumn has been unusually free from frost. Very few of the outside flowers were nipped by the frost until the 20th of October.

### Orchard Pests.

Orchards in Quebec are not well looked after as a rule. The majority of them are not pruned regularly, and as a result, the trees have too many twigs and branches, and the excessive foliage does not allow of the proper access of sunlight. Such conditions are congenial for the development of Apple Scab and the Brown Rot of Plums. Spraying is a practice indulged in by but few, and these are the up-to-date fruit growers, usually active members of the Quebec Pomological Society, who make money out of their Fameuse and St. Lawrence apples.

Cultivation of the orchard is sadly neglected, consequently there is ample opportunity for the safe hibernation of the more injurious insects, such as the curculio and the codling moth.

The Codling Moth.—This is undoubtedly the worst insect pest of the apple. It causes an enormous loss in orchards over the entire Province, and one sees no hope of abatement until the people learn to take better care of their orchards; by pruning, spraying, cultivation and destruction of the rubbish. Much good could be done if practical demonstrations were carried on by the Government to show how and when to spray and the value of spraying. I believe the time is fast approaching when the people will be ready to profit greatly by such demonstrations, for Quebec is well adapted climatically for the growing of apples of superior quality. Its Fameuse apple is known most favourably in all the great markets.

In spite of all that has been written, the life-history of the codling moth is not well enough known to the average farmer and fruit-grower. We entomologists must keep hammering away year after year until the fruit-grower can fight this enemy successfully by taking advantage of the weak spots in its life-history.

In Southern Quebec, including the border counties, there is in all probability a partial second brood; and it is the worms of this second brood that produce the wormy apples late in the season. The fruit may be entered at any point, and often an ugly scar is made on the surface, by the larvæ. A thorough spraying with lead arsenate just as the petals have fallen, and another application ten days or two weeks later should kill the great majority of the first brood. To intercept the larvæ that escape these two treatments it would be advisable to apply a burlap bandage about the trunk in late June. The worms in escaping from the fruit find the burlap a convenient place to hide and to spin cocoons. To prevent the small portions that pass through a partial brood from doing injury the burlaps should be removed every ten days, and replaced after all larvæ and cocoons have been destroyed.

The Bud Moth. This enemy of the apple was quite prevalent about Abbotsford, and perhaps in other localities.

The Oyster-shell Scale or Bark Louse. As one would naturally expect, Oyster-shell Scale is quite prevalent in the apple orchards of Quebec. This insect may be looked upon as the enemy of half-tended and neglected orchards. It is not a difficult insect to control, yet it does annually a great amount of damage. Many owners of orchards when asked if the Oyster-shell Scale is present in their orchard will state that they are not acquainted with it. They have not yet come to recognize it as an insect and as a serious enemy. The insect passes the winter in the egg state under the gray-brown, oyster-shaped scales on the bark of the twigs and branches. The eggs hatch early in June; the yellowish lice crawl about for a few days and then settle and secrete a scale over themselves. There is but one brood each season.

An application of whitewash to the trunk and large branches during the winter will remove the scales and leave the branches clean in the spring.

The Apple Aphis. This insect was reported as abundant about Abbotsford, and in the Montmagny and Kamouraska districts below Quebec. It was observed on some of the trees in the young orchard at Macdonald College.

The American Tent Caterpillar. This insect, which was so abundant and injurious a few years ago, was again in evidence in many localities. It would be advisable for farmers to be on the look-out for the ring-like clusters of egg masses which encircle the twigs of apple and other trees during the fall and winter months, and to destroy them.

The Plum Curculio. Curculios were very prevalent in Quebec orchards in 1909. In some orchards a large percentage of the apples were deformed by the numerous curculio punctures, and were rendered practically useless. This widespread injury to the apple crop demands attention; this note is written with this purpose in view, and at the same time to outline concisely our knowledge of the habits of this most destructive insect enemy of plums and apples, and the best remedies that are being used elsewhere to control it.

At the outset it may be said that this pest is no new enemy. For many years it has given more or less trouble to orchardists, making itself more conspicuous by its injuries some years than others.

There are probably two species of curculios that are responsible for the injury in our orchards. The *Plum Curculio* (Conotrachelus nenuphar, Herbst) and the *Apple Curculio* (Anthonomus quadrigibbus, Say). It is believed, however, that the former does the greater amount of injury, although no careful observations have been made in Quebec to determine their relative abundance.

The Plum Curculio is a native of America, and fed originally upon the wild plum, wild crab-apple, and the hawthorn. With the advent of the cultivated apple it took readily to the new fruit, which it continues to infest.

*Life History.* The adult curculio beetles winter over in rubbish on the ground, under bark and elsewhere, and emerge from their hiding places about the time the plums and apples are in blossom. The eggs are deposited within punctures partially surrounded by a crescent-shaped slit in the newly-formed apples and plums. The eggs hatch in less than a week and the larvæ proceed to make channels in the fruit. Infested fruit soon falls, and in about three weeks the mature larvæ emerge and enter the ground. There they pupate, and in about four weeks emerge as beetles. These soon fly to the fruit and continue feeding upon it, until the fruit is picked from the trees, marking it with the characteristic cylindrical punctures. As winter advances they hide themselves under rubbish and bark to hibernate until spring.

The adults that emerge in summer deposit no eggs, *all* the eggs being laid by the over-wintering beetles. The injury to apples is done mostly by the beetles that mature in summer, as they make deep punctures when they feed upon the fruit.

It is rather a strange thing that curculio larvæ develop only in small apples, and will not reach their development unless the apple has fallen.

A single mother curculio may deposit between 200 and 300 eggs, extending over a period of three months, hence is capable of doing a great deal of injury. This great egg-laying and puncturing power of the beetles explain the greatly distorted condition of many of the apples observed this year at Brome, Abbotsford, and elsewhere. In the great majority of apples examined there were as many feeding-punctures as egg-punctures. Not in every case did the eggs develop when deposited within the crescent-shaped mark, for we found many apples that showed the crescent slit but had no trace of larvæ.

*Treatment.* Observations made in Illinois and elsewhere show that uncultivated orchards suffer most from curculios, and our Quebec orchard conditions would favor drawing the same conclusion. And such is what we might naturally expect, for the conditions of the uncultivated orchard, with the excessive amount of grass and weeds and rubbish, and the absence of pruning, furnish ideal conditions for the development of the curculio. Besides, the proximity of neglected orchards is a menace to clean orchards.

There are four ways of treating the curculio:

1. *The destruction of fallen fruit,* so as to kill the larvæ before they make their escape into the ground. The *early small* apples should be specially looked after in June and July, for these contain a large percentage of the larvæ. The later and larger fallen fruit do not, as a rule, contain many larvæ.

The presence of hogs in an orchard is strongly recommended, if no other means can be found to clean up and destroy the fallen fruit.

2. *Suitable cultivation,* so as to destroy many of the larvæ and pupæ in the soil. It has been found that the larvæ and pupæ are extremely sensitive to physical disturbances of any kind, as well as to light and air. Cultivation permits their exposure, for a short time at least, to sunlight and to the attacks of their enemies, birds, ants, and predaceous insects. As a rule, orchardists prefer to cultivate up to the middle of July, but where curculios are doing much harm this cultivation should be continued for a month longer, in order to do effective work to the larvæ and pupæ in the soil.

3. *Spraying with Paris Green or Arsenate of Lead,* to destroy the adult beetles. This treatment has not given good results, and it is doubtful if the practice warrants the trouble and expense.

4. *Jarring the trees,* to collect the beetles that fall on sheets under the trees. This method also is slow, and it is doubtful if the practice warrants the trouble and expense, save with young apple trees and with plums and cherries.

### Farm Crop Insects.

*Grasshoppers and Blister Beetles.* Grasshoppers and Blister Beetles appeared in alarming numbers in August and September in many districts of the Eastern Townships. The former swarmed in oat fields and the latter in clover and mangel fields, and considerable loss was incurred.

The increasing amount of permanent pasture land in Quebec furnishes undisturbed breeding grounds for grasshoppers. The eggs are laid in masses below the surface of the sod in late summer and early fall, and hatch the following spring. As a rule, the young grasshoppers are not numerous, and confine their attention to the pasture lands, but should conditions at any time favor their multiplication they spread to the adjacent grain fields where food is more plentiful. It has often been observed that grasshoppers are seldom abundant two years in succession. The reason for this is that their very great abundance allows their numerous enemies to multiply very rapidly. Among those enemies are:

(1) *Parasitic mites,* bright red creatures often seen at the bases of the wings, which not only suck the blood of their hosts, but also later destroy the egg masses.

(2) *Hair-worms,* which live within the bodies of the grasshoppers and destroy large numbers.

(3) *Tachina flies,* whose maggots live within the bodies of the grasshoppers.

(4) The young of *Blister beetles,* which devour the egg-masses in the ground.

(5) *Fungous diseases* that often spread with great rapidity.

It is quite probable, therefore, that grasshoppers will not be much in evidence next year, and that there will be a rest from their ravages for a few years.

It is possible to guard against such losses as have occurred this year, by watching the pasture lands, and if grasshoppers are very numerous, it would be advisable to make applications of poisoned bait in the pastures, if it is safe to do so, along the edges of adjacent grain fields. This poisoned bait may be made by mixing 1 pound of Paris green in 50 pounds of bran, made into a mash with water and sweetened with cheap molasses. This is distributed in handfuls to infested areas. In Manitoba a bait known as the Criddle Mixture is used with great success. It is made by mixing 1 part Paris green, 2 parts salt, and 100 parts of horse manure. Enough water is added to make a soft, not sloppy, mash. The mash is scattered over the field where the grasshoppers are thickest.

*Black Blister Beetles,* called by the farmers "Blue Beetles," were quite destructive this year on clover, mangels and beets.

They are often found feeding on other plants, such as the golden-rod, aster, pigweed, corn, beans and potatoes, and in the days before the arrival of the Colorado Beetle, this and allied species were the main insect enemies of the potato crop.

The adults are soft-bodied, with long, slender legs. They occur from August to October. The females deposit their eggs in the ground, and from these hatch out active, long-legged larvæ called "triungulius," that feed on the eggs of the grasshopper.

It will be observed, therefore, that while the adult Blister Beetles are injurious to some of our crops the young of these are decidedly beneficial. It is a difficult matter to decide sometimes whether it is advantageous to poison the adults, for if this is done there will be no larvæ to devour grasshopper eggs.

Should the adults become sufficiently injurious to warrant action, applications of Paris Green or arsenate of lead will readily kill them. On account of the abundance of grasshoppers this year, we may expect a large number of blister beetles next year.

*Wireworms and White Grubs.*

Among the list of injurious insects of farm crops, none perhaps surpass Wireworms and White Grubs, in the amount of damage inflicted. They work away unseen underneath the soil, and on this account are unknown to the casual observer. They are peculiarly the enemies of the careless farmer, and their presence indicates that something has not been done properly and at the right time. It may be that the pastures and meadows have been allowed to remain down too long; that a suitable rotation of crops is not practised; or that there is little or no fall plowing done.

Wireworms are the grubs of click-beetles or "skipjacks," and White Grubs are the grubs of June beetles, with which most persons are quite familiar.

*Wireworms.* The adult beetles appear frequently in the spring and the females deposit their eggs close to the roots of grasses or weeds. The Wireworms, however, do not confine their attacks to the roots of grasses and cereals, but often devour the roots of other crops and even the seeds of corn, wheat and other grains. In fact there is no plant that is immune from their attacks, so far as we know, although many farmers in England claim that buckwheat, mustard and rape escape. The Wireworms, of which there are many species, are hard, smooth, shining, yellowish-brown, wire-like grubs, and possess three pairs of short legs, hence they are readily identified.

Many attempts have been made to devise some reliable method of destroying them. Some years ago Professors Comstock and Slingerland, of the Cornell Agricultural Experiment Station, and Professor Forbes, of the Illinois Station, conducted a very complete series of experiments extending over a number of years, and found that insecticides were practically of no value. They ascertained, however, that certain cultural operations were valuable in destroying large numbers of the transforming pupæ and adults before they emerged from the cells in the ground. Wireworms spend from three to five years in the ground and transform to pupæ and adults in the late summer and autumn. But the adults remain in the pupal cells, and do not emerge until the following spring. It was determined that these pupæ and adults wintering in the pupal cells were very sensitive to distributions such as late plowing produces. Plowing infested or suspected sod-land twice—once in August, with a good harrowing a week later, and again in late September or October—will break up many of the pupal cells and expose the beetles during the winter to conditions which they cannot survive.

This cultural process will not interfere with the Wireworms or those in the grub stage. When a sod-land is broken there will naturally be Wireworms in different stages of development, some in the first year larval stage, some in the second year, and some in the third year, and others ready to pupate. Only those ready to pupate will in all likelihood be killed by the fall plowing. In the following season, however, the young grubs are growing rapidly; and if the dying roots of the sod furnish sufficient plant food, they will not do much feeding on the roots of the new crop, but will be more injurious the year following. Now certain crops, such as clover, barley, wheat and rye, are not so liable to attack as are corn, potatoes, mangels, oats; hence, they are better adapted to follow sod. Clover can be sown with barley and rye and plowed down after a cutting has been taken. This may be followed by corn or roots. Such a rotation will gradually exterminate the Wireworms, and furnish crops that give a good yield.

Short crop rotations will never allow Wireworms or White Grubs to make headway and develop, for there is too much disturbance of the soil and change of food plant. The best method of breeding these insects is to allow pastures to go unbroken for a series of years, for then conditions are particularly favourable for their development.

Sometimes it is possible to force the crops through an attack of Wireworms, by the application of mineral fertilizers to stimulate the plants.

*White Grubs.* White Grubs, as already stated, are the larvæ of June beetles, and are large, soft, whitish or yellowish grubs, with brown heads and three pairs of legs. The bodies are larger towards the hind end, and usually appear half-coiled. Like the Wireworms they require about three years to complete their development from egg to beetle. The adults appear in May and June, often in large numbers, to feed on the foliage of certain trees, such as plums, willows, etc., and to deposit eggs below the surface of the ground, usually on the roots of grasses and many other kinds of plants. The grubs on hatching begin to feed on the roots, and often do considerable damage. Dr. Forbes, of Illinois, who has given a great deal of study to White Grubs, is of the opinion that the grubs do not change to pupæ until June or July of the third season; that they change to beetles a few weeks later, but that these do not emerge from the pupal cells until the following spring. He is also able to identify several distinct species of Lachnosterna, of which *fusca* is the most common.

As with Wireworms, remedial measures are difficult. Special rotations are advisable. Fletcher says: "A short rotation in which clover follows grass or is grown at short intervals, will prevent the increase of these insects. In this special rotation the small grains should follow clover before corn or potatoes." When a field becomes infested with White Grubs a portion of the clover field, for example, might be broken and planted to corn instead of planting corn after timothy or grass. To make up for the deficiency of clover, that portion of the sod field which would have been devoted to corn could be sown with oats, vetches, etc., for green feed and hay. It is perfectly safe to put mangels, turnips and rape after old sod, although one will have to be on the guard against cutworms nipping off the young plants.

*Cutworms and Flea-beetles.* Considerable damage was done in June by cutworms on turnips, carrots and mangels, before they were detected, but the application of poisoned bait prevented further action.

In the Experimental Plots at Macdonald College the Wheat Aphis and the Wheat-Stem Maggot again made their appearance, but not in such numbers as in 1908. Flea-beetles were observed on some plots but they did no serious damage.

*Root Maggots.* These were numerous on many kinds of plants, viz., radish, cow-peas, soy beans, cabbage, onions and turnips, and caused considerable loss.

*Cucumber Beetles.* These appeared about June 10th at Macdonald College, and did more harm to squash than to cucumber, pumpkin or melon. Mr. Swaine reports that Bordeaux Mixture seemed effective, but they return to the new leaves and flowers.

*Leaf Miners.* Beets and spinach at Macdonald College were injured by leaf-miners. They attacked small leaves, and had practically disappeared by July 4th.

*Currant Borer.* (*Sesia tipuliformis, L.*). Mr. Swaine reported considerable injury to stems of both black and red currants. In some cases the stems were dying, and the leaves dried and discoloured. The larva bores in the pith sometimes for over six inches; it remains in the wood all winter, and in the following summer, in June, the bluish-black fly-like moth emerges to lay her eggs at the buds on the young wood.

*Gooseberry Span-worm.* (*Cymatophora ribearia,* Fitch). The moths were observed July 24th, not only on the gooseberries, but also on the currants, in the Macdonald College plantation. They fly readily in day-time when disturbed, and are attracted to light at night.

The larvæ or caterpillars are to be found in June; they are white, dotted with black, with yellow stripes about an inch in length when full grown. There is but one brood in a year; the eggs are deposited in July on the twigs, where they remain all winter.

This insect is capable of doing considerable injury to the leaves of gooseberry and currant. Arsenate of lead will control it.

*Currant Aphis.* (*Myzus ribis, L.*). The reddish blisters on the leaves of currants—the work of the currant aphis—were much in evidence in many Quebec plantations this past season. Inasmuch as the deformations interfered with the proper functioning of the leaves, considerable injury was undoubtedly done. Careful examination for the presence of aphids on the young leaves should be made, for it is much easier to kill the insects when they are few in number and before the leaves have become deformed, by applications of whale oil soap or kerosene emulsion solutions.

*The Carrot Rust Fly.* (*Psila rosæ*). This insect did considerable damage in some of the truck gardens about Montreal. Mr. Swaine received on July 14th, from McKinnon & Son, a package of small carrots which were riddled by the maggots of this insect.

*The Fall Web-worm.* The unsightly webs of the Fall Web-worm were very abundant both on forest, shade and fruit trees throughout the Province. Mr. J. M. Fisk, of Abbotsford, reports it as prevalent in his district, and Rev. Brother Liguori states that it was abundant at La Trappe.

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## ANISOTA VIRGINIENSIS, DRURY.

By Thomas W. Fyles, D.C.L.

*Anisota virginiensis* is one of the insects injurious to the oak. In some years its ravages are very apparent. I have succeeded this year (1909) in bringing its larvæ through their successive stages.

I had tried, on several previous occasions, to raise the species, but had failed. I attribute the failures to the fact that oak-spray, severed from the tree, dries very rapidly; and, as there were no oaks growing near my former residence, I could not keep the larvæ supplied with sufficiently tender food.

In my present place of abode I am better situated, as the White Oak, *Quercus alba,* is common in the neighbourhood. I have taken the precaution too, of placing every fresh supply of food for the Anisota under the water-tap, and drenching it thoroughly, before placing it in my insect breeding-cage. This plan has proved very successful.

*A. virginiensis* is widely distributed in the Province of Quebec. Mr. A. R. M. Boulton, President of the Quebec Branch of the Entomological Society has two specimens ( ♂ & ♀ )that were taken, I believe, at Cape Tourment in Montmorency County. I have frequently met with larvæ of the kind on the Island of Orleans, and, on the 16th of last June, I found a beautiful male moth of the species, lying under an arc-light, near some oak trees, on Front Street, Hull. On the 29th of the same month, Miss M. G. Johnson, a member of the Entomological Society, sent me from Miranda, Missisquoi County, some oak-leaves laden with the eggs of the species, and also one of the moths that she had found laying the eggs, and a male of the same species.

The eggs lay close together, in broad patches which in several instances covered the under-side of the leaf—none were laid on the upper side. They were of a roseate light brown tint, but here and there was a pale green egg seemingly unfertilized.

The egg of *A. virginiensis* is globular in shape; but as the larva within advances in growth it becomes depressed, and loses its roseate tinge, till at length the little black-headed larva, snugly coiled, is plainly visible within the shell. The egg is one-twenty-fourth of an inch in diameter.

Doubtless the eggs sent me were deposited by several females of the same kind, and at slightly different intervals, for they hatched irregularly. The first of the young larvæ to appear left the shell the day after the eggs reached me—*i.e.,* on June 30th, and the others appeared at intervals for the next fortnight—consequently, some of them had reached the third stage while others were only in the first. In these notes I have followed the larvæ first hatched.

The newly-hatched larva was one-eighth of an inch in length. Its head was large in proportion to its body, and jet black. The mouth-organs were yellow. The body was yellow, and set with short spines. The legs were pale yellow and semi-translucent.

The larvæ are gregarious. They eat away the substance of the leaf, leaving only the mid-rib and some of the larger veins. When they have finished with one leaf, they proceed to another on the same twig, and, having stript it, they advance to a third, and so on—moving from leaf to leaf and from twig to twig.

The first moult took place on the 6th of July. After it the larva was a quarter of an inch long. Its head and fore-legs were black; its body was pale yellow; it had on the third segment two seven-jointed black horns. Along the middle of each of the following segments on the upper side was a row of small warts—each wart bearing a short bristle. A few white hairs extended from the black head. Towards the end of this stage in the larva's existence the segments of the body became more distinct and assumed a bluish green tint, with slightly darker longitudinal stripes.

The larva moulted again on the 14th of July. The old skin broke at the head to allow the larva to escape from it. When it made its fresh appearance the head, horns, anal segment and fore-legs of the larva were green, but they soon changed to black.

The body colour in this stage was sage green, with yellow sub-dorsal, side, and spiracular lines. There were several black, pointed tubercles along the middle of each segment, on the upper side. The spiracles were black. The black, glossy horns on the third segment extended beyond the head. There was a black granulated plate on the second segment, and before the horns on the third.

The larvæ again moulted on the 23rd of July. Their vacated skins were left in rows adhering to the mid-ribs of the leaves which they had skeletonized. Their body colour was now black. As in the previous moult the head, etc., were green at first, but soon changed to black. The whole body was firm and glossy. There was a double line of yellow along the back; and the sub-dorsal, side, and spiracular lines were yellow. There was a row of spike-like protuberances around the segments on the upper side—on the anal segment there was a cluster of such protuberances. In this stage the larvæ attained a length of one and one-sixth inches.

They moulted again on August the 4th. Their length after the moult was one inch and five-twelfths of an inch.

The larvæ reached their full growth by the second week in August. They were then two and a quarter inches long, cylindrical, glossy black with very conspicuous yellow lines. The spiracles were black. There was an oblong yellow spot over each of the prop-legs and a similar spot on either side of following segments. The thorny protuberances on the segments were well developed, and at the end of the body there was a cluster of such protuberances.

The larvæ began to enter the soil on the 10th of August; and before the end of it, all in my keeping had buried themselves; but, so late as the 13th of September, I found in the woods a solitary straggler of the species.

The pupa is finely sculptured. Its abdominal segments are boldly outlined; and from the last of them projects a stout spine forked at the end. This probably serves as a lever, to enable the chrysalis to work its way to the surface of the earth, when the imago within it is nearing perfection.

In rearing the larvæ of *A. virginiensis* two particulars drew my attention specially. One was that, in the later stages of their growth, some of the caterpillars were *much smaller* than the others. In the final stage the smaller ones were only two-thirds the size of the larger. I should say that these were the undeveloped males, for the male moths of the species *are much smaller* than the females.

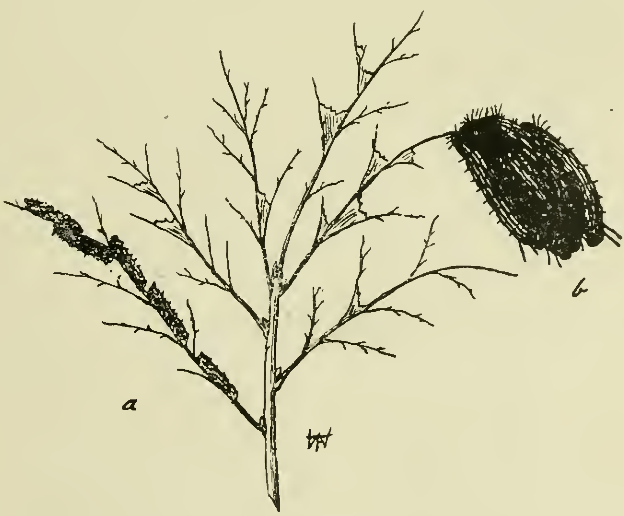


FIG. 11. Oak leaves skeletonized by *Anisota virginiensis*: (*a*) vacated skins of larvæ; (*b*) Larvæ bunched together for mutual protection.

The other particular was, that the larvæ in their later stages, had the habit of grouping themselves into clusters at the ends of the mid-ribs of the leaves which they had skeletonized. In these positions they somewhat resembled the small webs, that, in August, are so frequently to be seen on forest trees. (Fig. 11).

## ADAPTATIONS IN THE STRUCTURE OF INSECTS.

By Rev. Thomas W. Fyles, D.C.L.

On a certain occasion last summer, a friend of mine was standing on a bridge, which spanned a shallow creek that had a muddy bottom. His attention was taken by the proceedings of a large dragon-fly that was hovering close to the surface of the sluggish stream, at the shallowest part of it. The insect repeatedly thrust its abdomen down through the water, and into the mud. My friend could see the slight disturbance in the mud as the point of the insect's abdomen entered it and was again withdrawn. The fly was depositing its eggs. Here then was revealed one reason why the dragon-fly has so lengthy a tail.

It is interesting to see one of the "Demoiselles"—Agrionidae—alight on a floating leaf of a Pond Lily, and bend its long abdomen round the edge of the leaf to affix its eggs on the under side—the side in contact with the water.

The perfect fitness of every part of an insect for the functions it has to serve will always be admired by the inquiring and thoughtful observer.

In our early lessons in Entomology certain facts were impressed upon our mind, viz.—that an insect is a creature that is cut into or notched; that the notches mark out the head, the thorax, and the abdomen; that the insect passes through four stages of existence—the *Egg*, the *Larval*, the *Pupal* and the *Imago* stages.

In this short article I purpose to offer a few desultory remarks on the several features of the insect form, and on the several stages of insect life—endeavouring to show the admirable fitness of the insect to meet, at all times, the exigencies and requirements of its existence.

The Head. In the head of an insect the striking and important features are the eyes, the mouth organs, and the antennæ.

In the larger dragon-flies (Fig. 12), such as those in the genera Æshna and Anax—insects of extremely rapid flight—the eyes occupy the main portion of the head space. The huge compound eyes of *Anax junius* are contiguous; yet they allow room for three ocelli. Nothing seems to escape the glance of these splendid insects; and in the bright sunshine, when they are most active, the ease with which they evade the sweep of the net of the entomologist, though it may be provoking to the sportsman, must nevertheless awaken his admiration.

Fig. 12. Dragon Fly.

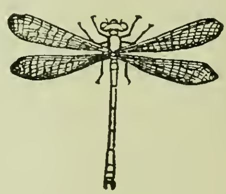

Fig. 13. Damsel Fly.

In the Agrionidoe or Damsel-flies (Fig. 13),—insects of less rapid flight—which can take a more leisurely view of things—the head, as Wood remarks,*

* "Insects at Home," page 275.

FIG. 14. Giant Water Bug.

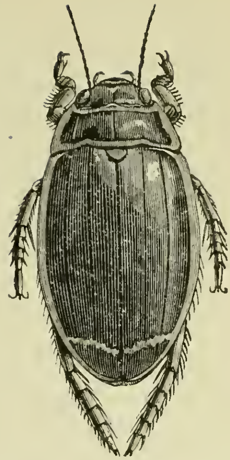

FIG. 15. Diving Beetle.

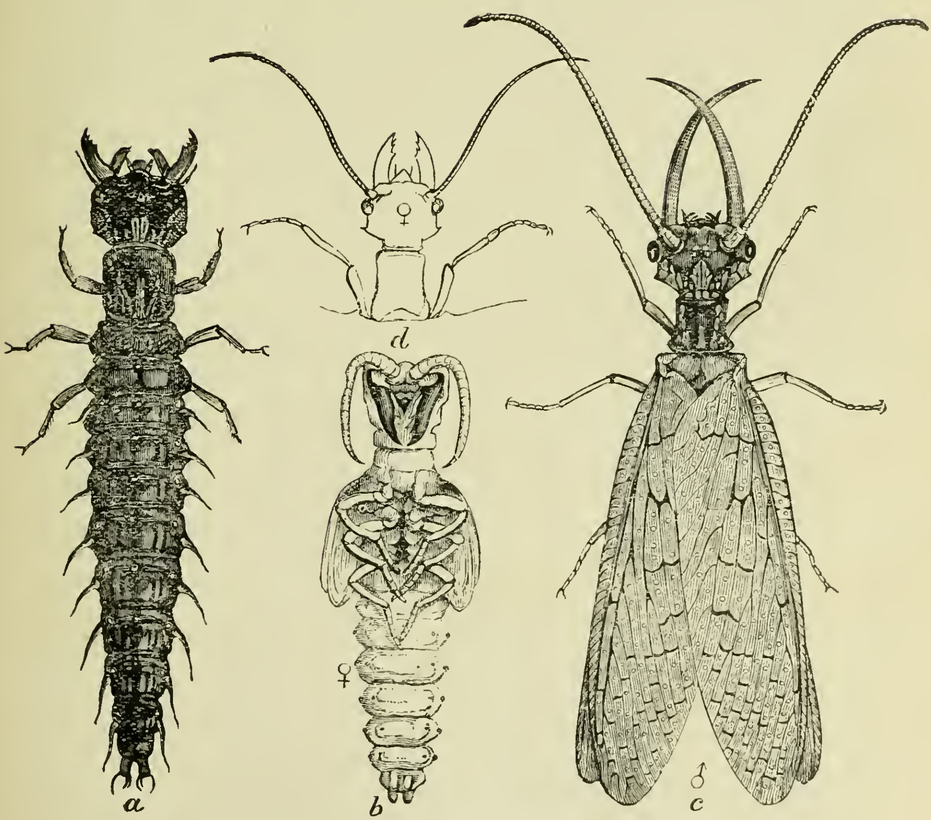


FIG. 16. Giant Water Fly (Corydalis cornutus), (*a*) larva; (*b*) pupa; (*c*) male fly; (*d*) head of female fly.

reminds one of that of the Hammer-headed Shark; and the eyes project from the sides of it. These dragon-flies, like others of the Odonata, can turn their heads half round on the neck, and so look over their shoulders.

Another insect with large and protruding eyes is the Giant Water Bug, *Belostoma Americana* (Fig. 14). So far do the eyes of this insect protrude one might almost expect that, in the wild dashes of the insect through the upper air, and into and under the water, they would be swept from their position. But a remarkable provision prevents the danger; from the centre of the saucer-like eye-socket arises a stout support, flattened out a little at the top—somewhat spool-shaped—and around this the eyelets of the compound eye are compressed. (Fig. 15).

In the Diving Beetle, *Dytiscus Harrisii* (Fig. 15), an insect of very similar habits to *B. Americana*, the eye is so placed in the side of the head that the creature can see both above and below; and the organ is protected by a curved extension of the pro-thoracic shield.

The like protection is afforded to the eye in water-beetles of other genera—Hydrocharis, Colymbetes, Acilius, etc., while in Dineutes the eye appears to pass through the substance of the head, so that the insect seems to have four eyes—two above and two below.

That widely different and very minute insect the White Fly of the greenhouse appears to have eyes similarly arranged to those of Dineutes. In the fly the eyes appear as two black dots above, and two black dots beneath the head.

The mouth organs of insects vary considerably to suit their different habits. There is a striking difference in the mandibles of the male and female imagos of the Giant Water Fly, *Corydalis cornutus* (Fig. 16). This is the more remarkable because in the larval and pupal stages of the sexes the organs apparently are alike. Some years ago I traced the life-history of this species through its metamorphoses. I saw the nymph draw itself about in its cyst, by means of its formidable mandibles; and I expected that, when the change to the imago came, the insect would prove to be a female; but lo, when it came, and the imago burst from the nymphal case, the mandibles were extended (I presume by inflation) into the preposterous organs we see in the male. Why is this difference between the male and the female mandibles? It is that the male may be able to give a loving embrace to the well-defended neck of its mate.

How strangely the lips and jaws of the dragon-fly work, in masticating its food, as if they were at cross purposes, the lips perpendicularly, the jaws horizontally—they are two pairs of very effective cutting knives.

*Belostoma Americana* lives by sucking the life-fluids of its prey, and is furnished with a stout beak-like proboscis, about a quarter of an inch long. This proboscis consists of an outer pointed case, having a longitudinal slit in front, and of an awl-shaped sucking instrument enclosed in a divided sheath barbed at the extremity. It is a formidable weapon.

The bug clings, by means of its powerful front legs, which are terminated with sharp claws, to the fish or other creature that it assails, and thrusts its proboscis into its victim.

The Reduviidæ, or "Assassin Bugs," are furnished with beaks of like construction. The stories told us of the "Kissing Bug" have led us to understand how dangerous, under some circumstances, these weapons may become.

The proboscis of the House Fly is terminated by two ridged valves with which the insect scrapes up its food. Those who have volumes bound in sheep-skin, and exposed in open cases, will soon find, from the roughness and loss of gloss in the binding, that the flies have been at work upon the dressing of the leather.

How different, and how wonderful, are the trunks of the nectar-sipping moths and butterflies! They lie curled up so compactly within the sheltering palpi, and can be extended so far when occasion requires. The length of the proboscis in these cases enables the insect to take its food, as it hovers over the blossoms, without injury to its wings.

Of the purposes served by the antennæ of insects we know but little; but it is obvious that they are fitted to the requirements of the species they adorn; the bee, which enters blossoms in search of pollen and nectar would find antennæ like those of *Paniscus geminatus* unmanageable and entangling; and *Geotrupes Blackburnii,* would have difficulty in delving in the earth, if it were burdened with antennæ like those of *Monohammus titillator.*

THE THORAX. To the thorax of insects are attached the legs and wings.

Passing amongst the Golden Rod, this Fall, I came across three species of insects that secure their prey by means of their fore-legs, viz.—*Mantispa brunnea* (Fig. 17), *Acholla multispinosa,* and *Phymata erosa.*

Like the Praying Mantis of which Hood speaks, in his "Ode to Rae Wilson, Esq.," as—

"An insect, of what clime I can't detérmine,
That lifts its paws most parson-like, and thence,
By simple savages—through sheer pretence—
Is reckoned quite a saint amongst the vermin,"

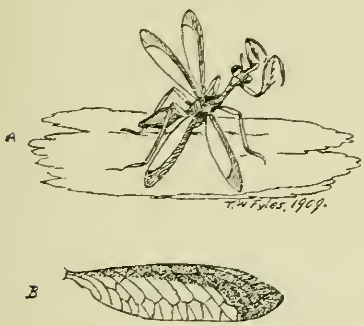


FIG. 17. (*a*) Mantispa brunnea; (*b*) Wing of M. brunnea much enlarged to show the venation.

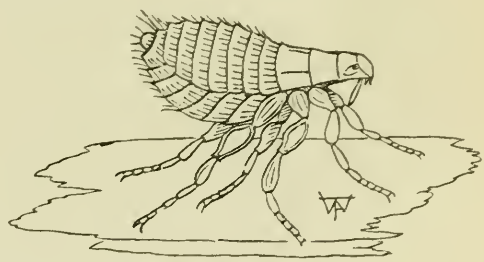

FIG. 18. Bat Flea.

so, *Mantispa brunnea* lifts its paws, with sweet "petitionary grace," lying in wait amongst the flowers. When *Argynnis myrina,* or some other incautious innocent butterfly comes within its reach, *M. brunnea* secures it with its outstretched arms—which are truly arms of offence.

*Acholla multispinosa* is a creature of like habits to *M. brunnea;* and its fore limbs are set thickly with sharp spines (hence the name), which enable it the more readily to secure its prey.

But the most remarkable of the three species is, I think, *Phymata erosa.* This insect in its colours closely resembles the flowers of the Golden Rod in which it lies in wait. On occasion, the tarsi of its extended fore-legs spring back into a toothed groove in the large and powerful tibiæ, and hold a captive as in a vice.

In *Dytiscus Harrisii* the upper portion of the foot in each of the fore-legs is expanded into a disk or pad, supplied on the under surface, with suckers which exhaust the air, so that the insect can attach itself firmly where it is inclined.

These appendages are not found in the female. Moreover, while the male Dytiscus is remarkably smooth and slippery, the female is roughened with striæ.

In *Acilius fraternus* a like provision is found in the foot of the male, to that in the foot of the male Dytiscus; and in this species also the female has roughened elytra.

The powerful hind limbs of the insects that have been named SALTATORES, such as the crickets and locusts, are worthy of observation. But other insects beside these Orthoptera have great powers of leaping:—

On the 24th of May of this year I was sitting on the veranda of Mr. Garrioch's house, on Front Street, Hull, when I saw a bat fall from a tree on the lawn. The little animal was in a very weak condition. While I was examining it I saw a flea creep from the fur, and then bound upwards one hundred times its own height. (If an acrobat could leap 600 feet into the air, he would draw multitudes to witness the feat.) (Fig. 18.)

I put the bat in a box, and obtained from it *thirteen* other specimens of the same kind of flea. No wonder the little animal was in a weak condition.

This *Pulex vespertilionis* was different from *P. irritans* and *P. serraticeps.* It was about two millimetres long. Its dorsal parts were of a light chestnut colour, and its ventral parts of a pale amber. The legs were translucent. The trocanters were grooved. The femur in each of the middle and hindmost legs was large, flat, and cleaver-shaped. Around it, near the edges, was a slight indentation. The tibia was striated and bristly. The tarsus had five joints with two bristles at each joint. The abdomen was hairy.

Of the wings of insects, fine examples of venation are afforded by the water-flies *Pteronarcys proteus* and *Polystoechotes punctata;* of elegance of form by *Actias luna and Hyloicus chersis*—and of splendour of colouring by *Philampelus achemon* and *Plusia balluca.*

THE ABDOMEN. How great a difference there is between the telescopic ovipositor of the house-fly which is concealed in the abdomen of the insect, but can be extruded by pressure, and which is fitted to penetrate the manure from the stable in which the larvæ of the fly luxuriate—and that of *Thalessa lunata*, which in some instances extends for four inches beyond the extremity of the abdomen, and is fitted to be passed along the tunnel, choked with frass, at the end of which the larva of *Tremex columba* is working. The young larva of Thalessa follows up and preys upon the larva of the Tremex.

The ovipositor of the last named insect proceeds from the middle of its abdomen, and not from the end. It is shorter and stouter than that of Thalessa, and is adapted to penetrate the bark and white wood of the trees suitable for the sustenance of the larvæ of its species.

THE EGG. Some years ago I found a huge boulder in a swampy wilderness. In a slight hollow, in the top of this, some vegetable mould had accumulated; and a thick pad of moss covered it. On lifting the moss, I found some hundreds of eggs of the Red-legged Locusts packed together in the soil. The locusts had found in the position a suitable nursery for their young.

The life of the Day-fly is very brief—as its name implies. It does not allow much time for oviposition. One act of extrusion consigns its eggs, in a boat-shaped mass, to the surface of the water.

The Cockroach frequents the house, but is highly objectionable to the house-keeper. Its eggs are laid in brown packages—oöthecœ—in the crevices about the kitchen-ranges and the cellar-furnaces. In these they escape notice.

The ovipositor of the Domestic Cricket has a divided sheath—each half of it having a spoon-shaped termination. When closed these terminals hold the egg, as in a casket, till a fitting nook for its deposit is reached; and then, they open and discharge it.

The cat shakes the eggs of the fleas that infest it into the lap of its mistress, or upon the rug on which it sleeps. The larvæ of *Pulex serraticeps* feed upon the particles of food that they find in the cracks of the flooring of the dwelling-place—but if the sheep-tick were to lay eggs that could be shaken from the wool of the sheep, her progeny would perish. Against such a contingency she retains her young till it reaches the pupal stage. The abdomen of the tick is unsegmented, and vellumy, and therefore very strong.

THE LARVA. The resemblance by which some species of Lepidopterous larvæ deceive their foes, and the threatening attitudes assumed by others, to drive their enemies away, are very familiar to all of us. But the very remarkable provision for the safety of the larvæ of *Harrisimemna trisignata* is not so well known.

And here we must call to mind that many caterpillars—those of *H. trisignata* among them—when undergoing the usual moult, withdraw the head from its old case, at its junction with the second segment—at the neck-opening—as a knight of old withdrew his head from the helmet. I raised a brood of larvæ of *Anisota virginiensis* last season. With them the head case was hard and black; but the head when it was withdrawn was soft and green. However, it speedily became rigid and dark as before.

FIG. 19. Harrisimemna trisignata. (Walker).

Now in the case of the grotesque larva of *H. trisignata* (Fig. 19)) on the thoracic segments there are some long stiff hairs which seem to have lain under the skin before the previous moult, and to have been attached, by their tips, to the inner side of the head cover. When the change of skin took place the hairs were erected, retaining their hold upon the head-case. At the slightest disturbance the larva agitated the bristles and the attached case is swung backwards and forwards with great rapidity.

I raised this insect some years ago, and subsequent observation has convinced me that we may see in this a natural provision, to protect the larva from troublesome ichneumons.

*Cassida viridis* appeared in this country a few years ago. It feeds on the Burdock and lies exposed on the plant. A curious provision is made to preserve the larva from the heat of the sun, and to render it unattractive to predacious insects and birds. By a fork-like appendage to the anal segment, the *fœces* are retained and supported over the dorsal parts of the larva, and form a protective wad, or shield.

THE PUPA. In the month of September, larvæ of the Saw-fly, *Cimbex Americana,* may sometimes be seen curled up, helix-fashion, on the ground, under the trees on which they fed. It will generally be found that they are parasitized—victims of *Opheltes glaucopterus.* They may have strength remaining to enable them to creep into some retreat; they may even attempt to spin the cocoon in which under normal conditions, they would spend the winter months; but they fail. Within them is the foe that is exhausting their vitality. This creature undergoes the pupal change within the frame of its host, and, at length, bursts from it as a perfect fly.

The fine ichneumon *Trogus fulvipes* undergoes the pupal stage within the pupa of the beautiful butterfly *Papilio troilus.*

I may cite the following as a remarkable instance of the instinct of a larva about to undergo the pupal change:—There was a needle-book, formed of alternate leaves of white and golden flannel, lying open on a shelf in my study. One night a larva of *Samia cecropia* escaped from the box in which it had been brought to me, and disappeared. Sometime afterwards I found that it had spun a cocoon in the needle-book, and had fastened a white fold on one side of its cocoon, and a yellow fold on the other. To disguise its work more effectually it had secured in the meshes of the cocoon, frayings of the white flannel on the one side, and frayings of the yellow on the other.

Volumes might be written upon the adaptations in structure which fit the insect for its environment, which enable it to supply its wants, and which ensure the perpetuation of its species. The Naturalist delights to look into these things. Considering them he feels, as David felt, that the Divine Designer of the Universe "hath so done His marvellous works that they ought to be had in remembrance."

"The melancholy days" have now come—"the saddest of the year;" but we still can find pupæ of insects in their snug retreats; and we know that, when "Heaven shall repair her rural seat," objects of beauty will burst from cocoon and chrysalis, to gladden the hearts of the beholders.

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## THE ACARINA, WITH A HOST INDEX TO THE SPECIES FOUND IN ONTARIO.

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There is probably no more widely distributed order of Arthropods than the Acarina; in economic importance there is none of greater value; and within the range of the whole animal kingdom there is no study so varied and fascinating as that of the Acarids, commonly termed Mites. The relation of these to other Arthropods has never been clearly defined, but in many respects they bear a close resemblance to Spiders and Scorpions in the Arachnida, and by the best authorities have been put in one order of this class.

However, in structure they are so unlike and in habits they are so varied that one never loses interest in his researches. Perhaps one of the most interesting features in the study of mites is shown in the manner in which they protect themselves against their enemies by special adaptations. The species belonging to the genus Nothrus are found on the bark of spruce and pine and appear in colour and shape like tiny bits of bark and lichen. A species of Analgesid, found on the wings of the Baltimore Oriole, presents precisely the same shade as the feathers of the wing. *Tetranychus spinosa*, which feeds in the upper surface of the leaf of the basswood, is identically the same colour as the leaf, and the writer found it impossible to detect the difference except by use of the microscope.

In the Gall Mite family the young mites are almost as translucent as are the trichomes, but when with age these trichomes turn brown and then black, the mites also assume the same colours in the same manner. Any number of similar examples might be mentioned if space permitted, but sufficient has been said to indicate the adaptation of these animals to their colour environment. Another species of Nothrus may be mentioned as demonstrating protection from dryness and heat. In this case the mite accumulates a covering of dust upon its back. Similarly at the approach of cold, the mite surrounds itself with particles of any substance within reach. Further illustrations of adaptation to environment are seen in a species of mite found upon the roots of Yarrow, with legs broadened, mole-like, fitting it for digging and burrowing in the earth. In the genus Cheyletus, the palpi are large and branched, fitted for grasping, and the mouth parts are long and piercing, providing the mite with suitable weapons for a predaceous life. Aquatic species are greatly modified forms of land mites, with flat and hairy legs, enabling the mite to propel himself quite freely in the water. The parasitic mites attacking all kind of animals have many special devices for attaching themselves to their host and adequate provision for obtaining nourishment from the body of the victim.

The curious shapes and odd looking appendages found in many of these creatures appear to the observer to be more ornamental than useful. The bird mites with their angular construction and long tail-like appendages afford the best examples of this class. The sugar mite *Glyciphagus* with its fan-like attachments is another instance of apparently useless equipment.

In richness of colour and beauty of marking, the Tetranychids and Analgesids are most noticeable. Indeed, some of these handsome species are worthy of the attention of any one interested in the field of Nature. Among the most remarkable phases of animal architecture are the abnormal constructions of vegetable tissues produced by species belonging to the family Eriophyidæ. About seventy different species of these worm-like creatures inhabit trees, shrubs and herbs of Ontario flora.

Not the least wonderful of the habits exhibited by the Acarids are their modes of distribution. As will be shown in our discussion of the dung beetles, many species of the scavenger mites make use of dung beetles and flies to bear them to new feeding grounds. A few species are specially provided with a cord, secreted by glands in the body, by means of which they fasten themselves to their carriers.

Another interesting feature in this connection is their friendship to other animals, a few species sharing the home of many of the common species of ants. Here we find the ants repaid for their hospitality to the homeless mites by having their quarters kept in cleanly condition by getting rid of the cast-off skins which are largely devoured by these active little scavengers.

Because of their relation to disease, their parasitic habits upon man, animals and plants, and their beneficial effects as scavengers, it is hard to over-estimate their importance. There are at least eight well-defined diseases of man and domestic animals, all isolated within the brief period of five years, which are transmitted from host to host by means of these mites. Numerous species spread the spores of bacterial and fungous diseases from affected organisms to healthy plants. As animal parasites they are found upon insects, crustaceans, mollusks, fishes, amphibians, reptiles, turtles, birds and mammals. As plant parasites, almost every known plant is attacked by one or more of these hungry mites; and as scavengers they are found on all decaying matter. In spite of their vast importance, not much has hitherto been done in Canada in working out the different species and determining their habits. This is in part due to their very minute size and also to the difficulty in locating them. For the little we do know, we are indebted to Mr. J. B. Tyrrell, of Ottawa, for his investigations on Analgesids, and to the late Dr. Fletcher for his contributions on the habits of some of our common species of vegetable pests. In the United States much has been done in a systematic way by Mr. Nathan Banks, Bureau of Entomology, Washington.

The species in the list outlined in this report were in almost every case collected in the vicinity of Guelph. This study was first taken up in 1904 and since that time the writer has collected, examined and studied to some extent the habits and characteristics of upwards of three hundred species, one hundred or more of which are new and many of them belonging to genera new to North America.

Mites are known to exist and to cause trouble in every part of the world, but in the temperate zones the largest numbers of species abound. Usually they are found in semi-dark localities, but a few species seem to enjoy full sunlight, being found upon the upper surface of leaves. On account of their minute size, certain species can be obtained only by use of special devices, such as mite traps; others again, such as bird mites, which are nocturnal in habits, must be gathered at night; still others, as the Eriophyes, which closely resemble their surroundings, require several days of constant search. Special emphasis should be laid upon the construction and operation of the mite traps. The trap consists of a copper cone-shaped vessel lined with tin, affording a smooth surface, to prevent the mites from attaching themselves to the sides of the cones. Within the body of the outer cone are four smaller cones, to the ends of which are attached small bottles, and in these the material under examination is placed. The outer vessel is then filled with water at a temperature much higher than the normal habitat of the mites. The discomfort thus produced causes the mites to leave their host or habitat, and as almost without exception, Arthropods when disturbed travel downwards, they slide down the smooth inner surface of the cone into the bottle below, where they are readily available for examination. Sometimes they are preserved in alcohol, sometimes mounted in glycerine jelly or balsam, and if intended for life history study they are transferred to artificial media.

The aquatic apparatus is made of the same materials as the terrestrial one, viz., tin and copper. It works upon much the same principle as the one just described, *i.e.*, when an Acarid becomes uncomfortable the tendency is to go downwards. But instead of applying heat as in the case of the land trap, a few drops of formalin or alcohol is added to the aquatic material. The trap with the proper fittings may be taken to a pond or stream where various kinds of material are available, and in the course of a single day's work many species may be captured.

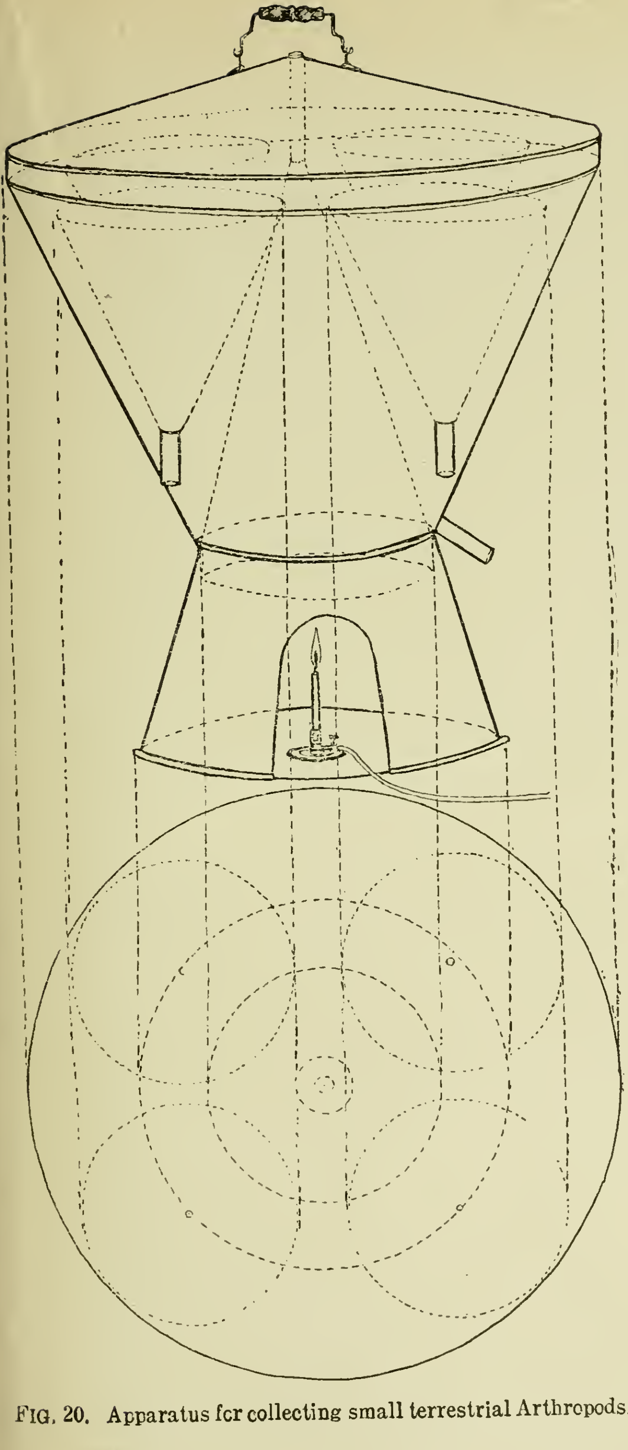

FIG. 20. Apparatus for collecting small terrestrial Arthropods.

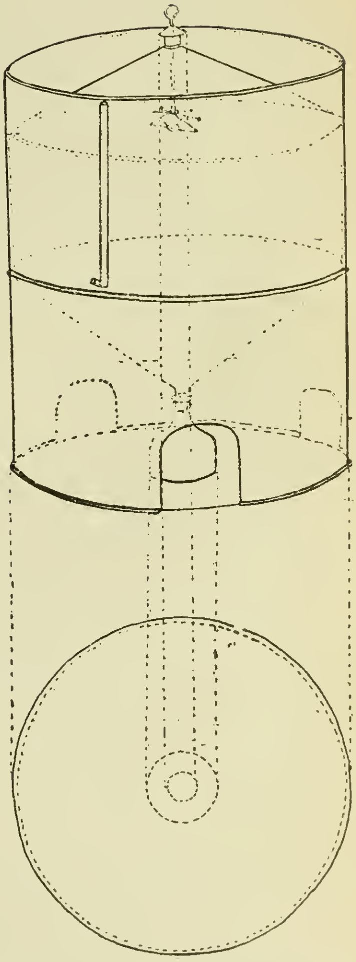

FIG. 21. Apparatus for collecting small aquatic Arthropods.

At the College over one thousand kinds of material were examined and almost all were found to contain one or more species of mite, in some cases as many as twelve different species were procured from a single substance. To give some idea of the kinds of materials tested, we might mention the following: manure, moss, decaying vegetables and leaves, dead and living animals, herbaceous plants, bark and leaves of trees, tubers, bulbs and roots, bone, stone, nests of birds and mammals, soil, pine and spruce cones, ensilage, fleshy fungi, all kinds of grocery commodities, clothing, fruits of all kinds, and sawdust.

Some of the living mites obtained from the mite machines were transferred to pure cultures in order to study their habits and life history. It was found that on proper media it was possible to keep them alive through several generations. Some of the media used are as follows:—First, for living animals—mosquito pupa extract and beef peptone. For living plants—extract of the same plant and on the living host plant. The extract of the plant was made by using two parts by weight of water to one of plant material, and the two heated one hour in a sterilizer and filtered. For mites living on dead matter, the cultures were made in three ways, first, for mites living in nitrogenous substances the culture consisted of whey-peptone, whey 80 per cent., agar 10 per cent., and gelatin 10 per cent. Two other cultures for the nitrogenous feeders were cheese extract and beef extract. On saccharine and acid fruits the media consisted of apple juice. On vegetable matter a culture of potatoes and potato extract gave best results.

The gratitude of the writer cannot be too strongly expressed to Mr. Nathan Banks, Acarologist of the Bureau of Entomology, Washington, for his able and ready assistance in identifying a large number of species sent to him, and to Messrs. W. R. Thompson, B. Barlow, George Chadwick, Geological Hall, Albany, N.Y., and Dr. Bethune, for assistance rendered in various ways.

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## I.—HABITS OF THE CLASS ACARINA AS AGENTS IN THE TRANSMISSION OF DISEASE.

### Spread of Bacterial and Fungous Diseases.

In pathological and bacteriological laboratories, mites are a great nuisance by inoculating pure cultures. Four species were found at the Ontario Agricultural College,—*Tyroglyphus Americanus* and *T. longior* feeding upon non-nitrogenous media, and *Cheyletes clavispinus* and *C. longipes* feeding on nitrogenous cultures. They make their home in the incubators, and gain entrance to the pure cultures through the cotton wool in the test tubes and between the fittings of the Petri dishes. The spores of bacteria and moulds attached to the appendages of the mites are left behind in the pure cultures, where they multiply rapidly and cause no end of trouble.

The spread of bacteria and moulds in root houses is not duly appreciated. More than a dozen species have been found at Guelph inhabiting turnips, beets, carrots, mangels, parsnips, potatoes, spreading spores of affected roots to healthy ones. Especially noticed in cellars of this kind are *Galumna moesta, Rhizoglphus phylloxerae* and *G. depressa* on turnips; *Oribatta depressa* and *T longior* on mangels and turnips, and *Gamasus* species on sugar beets and on parsnips, potatoes, celery, etc. On fruit trees the spread of brown rot, cankers, pear blight, etc., are carried to a large extent by such species as *Tetranychus telarius, T. bicolor, Bryobia pratensis, Oribatella pallida,* and *O. formosa.*

Here it might be mentioned that the fruit grower may do much in the way of avoiding diseases of the kind mentioned by frequent applications of the common insecticides.

*In Grocery stores* cleanliness cannot be too strongly emphasized, as this is one of the favourite resorts of mites. A few examples of the spread of bacteria and fungi will give an idea of their destructive habits to the groceryman. They crawl underneath the lids of manufactured jams and jellies, carrying with them spores which multiply and bring about putrefaction. In dried fruits, sugar, and other sweets, flour, bread, cheese, etc., they carry a number of species of moulds and often cause tremendous loss, which might easily be avoided if the proper care were practised. *T. longior, T. Americanus, Aleurobus forinae, Carpoglyphus sp.* are examples of Grocery pests.

In horse stables and other buildings, mites are found abundantly, especially where imperfect lighting and cracks and crevices of concealment are features of the buildings. *T. longior* might be mentioned as the commonest house mite. It is found from cellar to attic and practically on every object, thus we see the probability of its spreading spores of bacteria and fungi. The ensilage mite which makes its home in the silo is a good example of a stable mite. It, no doubt, spreads spores of some of the numerous bacteria and fungi found in ensilage. Another example of how mites may spread disease from stable to house is the case of the house-fly mite which travels on the backs of flies and may be transported from the manure of the stable to the food in the pantry, *e.g., Histiostoma Muscarum.*

Spread of Protozoan Diseases. Nearly all of the diseases belonging to the genus Piroplasma are transmitted from animal to animal by means of these ticks or mites. In the United States there are two very well known pathogenic diseases which belong to this group. The Texas Fever (*Piroplasma bigeminum*) and Spotted Rocky Mountain Fever (*Piroplasma sp.*) In Asia and Africa six other well known diseases, *Piroplasma ovis* of sheep, *P. canis* known as Piroplasmosis of dogs, *P. equi,* Piroplasmosis of the horse, *Piroplasma Sp.*—Rhodesia fever, and *Haemoglobinurina* of Finland. Space will not permit of discussion of this important phase of the subject. At present we have no record of any diseases spread in this manner in Canada, but since we have here numerous species of ticks associated with animals it is not unlikely that in time we shall find examples of diseases carried in this way.

### As Parasites of Animals.

Man.—Among the mites that are injurious to man might be mentioned, first, those that are parasitic and spend the whole of their existence in the host; second, those like the ticks that are casual visitors; and, third, those that inhabit his house and clothing and cause annoyance by their presence. The first is exemplified in the follicle mite which lives on the secretions of the follicles of the skin, such as *Demodex follicularum* and the "Jigger" of the Southern States. Examples of the second class are the numerous species of ticks. These are found in the tropics, and are abundant in fields, woods and pastures. They leave the herbage to attach themselves to man and other animals, where they burrow into the skin and create considerable irritation. In Ontario ticks are not so abundant, but in some parts the wood tick leaves its common habitat to attack man in the way just described. The harvest mites, found in grass, hay and cereal crops, when found in large numbers also cause much irritation. The species known as *Carpoglyphus passularum* found in sugar in grocery stores often leaves the sugar to attack man, causing what is known as grocer's itch. The most common species found in houses are the Clover Mite (*Bryobia pratensis*) and the Cheese Mite (*Tyroglyphus longior*). The Clover Mites often swarm in houses in the fall of the year, where they frequently hibernate through the winter. They get into the cracks and crevices of chairs, windows, doors, etc., and cause great annoyance to the occupants of the house. The Cheese Mite is even a more serious pest, intruding itself into all the darker parts of the house. It is found in the cellar, on fruits, tubers and other food products; in the pantry on cheese, butter, flour, meat, pastry, etc.; in the wardrobe, particularly on worn and stained clothing; in the library on the paste of the book bindings; in upholstered furniture in all the niches and hollows where they can conceal themselves. Still more annoying is their habit of crawling from the clothing to the body, and in many cases, while not actually on the person, the imaginary discomfort is just as effective. The species is not parasitic. Fumigation with hydrocyanic acid has given fairly satisfactory results as a remedy for this mite.

Domestic Animals. Most of the injurious parasites of domestic animals, such as sheep scab, mange, ticks, follicle mites, belong to the Acarina. The sheep scab caused by the mite known as *Psoroptes communis*, var. *ovis*, is a serious disease of the sheep throughout the world. In Ontario it has occurred in Manitoulin Island and a few other parts, but by proper precautions it has either been exterminated or kept in check. They live in the skin, and obtain blood or lymph as food from the host, and in this manner give rise to considerable irritation, resulting in inflammation, scab formation, and finally in loss of wool and hair. The best treatment consists in using some external applications, such as dipping, which will kill the parasites.

The disease known as mange is caused by species belonging to two different genera, Sarcoptes and Chorioptes. The Sarcoptes when young burrow in the tissue, where they feed and develop. The species of Chorioptes do not burrow in the skin, but produce a scab similar to sheep scab, but it is restricted to certain parts of the animal, as the feet, the ears and the neck. A species of Sarcoptes causes eruptions and inflammation of the skin of horses, which becomes intensely itchy, the animal at this stage refusing food and becoming much emaciated. A species of Chorioptes is found on the horse, cattle and goat, the one attacking the horse being the most common.

Scarcely any of the domestic animals escape the attacks of the mites known as ticks. The ticks are large mites with tough, leathery skin, and possessing mouth parts fitted for sucking and legs fitted for holding on to the host. They are true external parasites and cause much annoyance by getting into the ears, around the eyes, and other places where they can avoid the efforts of the animals to dislodge them. They are most abundant in the tropics, but a few species are native to Ontario, and others again, such as the Southern cattle tick (*Boophilus bovis*), are imported to this country along with the stock.

The follicle mite of swine (*Demodex phyloides*) is the chief member of the mite class attacking swine. They live in the follicle and cause white tubercles on the skin from the size of a pin-head to that of a pea.

Wild Animals.—These, of course, are not of so great economic importance, but when further studied they may be found to play a part in the transmission of disease from wild to domestic animals or man. It is astonishing to find on some animals such vast numbers of these pests. The ground hog is especially a victim to a number of species. The muskrat, the squirrel, the bat, the mole, the mouse, the moose and deer all must suffer considerable annoyance from the presence of these pests. In the study of this group several new genera were established for North America.

Only a few amphibians were examined, and on one, the Leopard frog, a species of Gamasid was found in abundance attached to the skin, apparently doing no harm, but perhaps considerably annoying its host.

Several Ontario reptiles were examined, but the writer found no indication of parasites at work. However, in the United States an interesting species of tick has been known to attack snakes.

Practically all the domestic birds suffer from the attacks of one or more species of mite. The chicken mite, *Dermanyssus gallinae,* is the commonest and most destructive pest of poultry. It is noctural and rests during the day in the crevices of roosts and nest boxes and other places of concealment. It multiplies rapidly and, unless checked by insecticides such as kerosene, will soon ruin a flock of poultry. An interesting species is found in the nasal chambers of domestic and wild birds. The injury they do has not yet been fully ascertained, but in many cases where they are very numerous they cause suffocation by choking the nasal passages. In Rhode Island a species of mite has been found in the air sacs of turkeys in every part of the State. It is again doubtful in this case as to just how much damage they cause. On the pigeon several species are found, some attacking the feathers, some the skin and others the legs and feet. These are only a few examples of the many species found on domestic fowl. It might also be mentioned here that through the agency of large shows, as the International held in Canada and the States, the tendency will be to exchange and distribute the various species of North America.

Our native birds are among the most favoured by the mite pests. In our study so far, we have found over fifty species in Ontario. Their habits vary, some living parasitically, such as Liponissus sp.; others symbiotically as in case of Analgesids; and still others merely as guests. Since many of our common birds associate and feed with our domestic birds, they may easily pass from one to the other. These again are of little economic importance so we need not discuss them further.

Fanciers of caged birds are not exempt from troubles arising from the attacks of these parasites. A species known as *Dermanyssus avium* is very common everywhere caged song birds are kept. Their habits are similar to those of the chicken mite, hiding in crevices of the roosts by day and sucking the blood from their victims at night.

### As Parasites and Guests of Insects and Other Mites.

A striking example of the manner in which mites assist in maintaining the balance of nature is afforded by these parasitic and predaceous creatures. It is a well known fact that many of our most injurious insect pests of fruit, garden and farm crops are controlled more effectively by the Acarids than in any other way. A notable example of this kind is found in the Locust Mite, *Trombidium locustarum.* The mite is generally found attached to the base of the second pair of wings, although it is also found on the wing itself and on any other part of the body, where it cannot be easily detached by the locust. A favourite position upon the body is between the segments of the thorax and abdomen, and also behind the upper joints of the legs, in such position their only means of attachment to their host is apparently by their mandibles. As many as a dozen or more of these mites may be found upon a single insect. These little mites render good service in checking the spread of locusts, as almost every locust upon which one is found appears to be feeble and sickly. Another species, *Celaenopsis latus,* attacks the larva of *Passalus cornutus,* and still others, attacking garden pests are found on the larva of Lachnosterna. Attacking fruit tree pests may be mentioned *Hemisarcoptes malus* on San José Scale and Oyster Shell Bark Louse; *Rhyncholophus sp.* feeding on San José and New York Plum scale; *Cheyletes pyriformis* on the larva of the Codling Moth. On forest tree insects we have a species destroying the Cottony Maple Scale and another species attacking the Maple Plant Louse. On household pests we have *Histiostoma muscarum* parasitic on the house-fly and other species on mosquitoes. The mites themselves are largely kept in check by predaceous and parasitic species belonging to this group. *Sejus macrophylus,* found in the Aspen *Eriophyes* gall, and *Gamasid* species attacking Pear Leaf Blister mite. Here we might also mention that a large number of the aquatic insects are parasitized by Hydrachnids (water mites). Besides the species found preying upon insects there are a large number which attach themselves to the body of the insect without causing any apparent harm or annoyance. Examples of these are the following:

*Uropoda sp.* on Rough Osmoderma, Cerambycids, Skin Beetles, Tumble Bugs, Darkling Beetles, etc.; and *Macrocheles sp.* on Carrion beetles, Silpha, and Horned Passalus.

### As Parasites of Water Insects.

The water beetles and bugs are mostly parasitized by a species *Hydrachna belostomae* which attaches itself to the ventral surface of the Electric Light bug.

### As Parasites and Guests of Mollusks.

A number of species of water mites have been collected from the gills and attached to the bodies of bivalves but the identification of these have not yet been completed.

### As Scavengers.

As a means of elimination of waste materials, there is probably no more effective agent than the mites. There is no kind of filth or decaying matter which is not relished by some species or other of the Acarids. In manure, sewerage, decaying vegetable matter, decaying animal matter and all forms of dirt, mites are to be found actively engaged.

Of Manure. Samples of nearly all kinds of manure were used in the mite machine, and in almost every case mites were obtained. *Histiostoma valida* is a common example in horse manure.

Of Decaying Vegetable Matter. Decaying potatoes, mangels, turnips, parsnips, carrots, kohl rabi, corn stubble, cabbage, lettuce, decaying leaves, humus in the soil, sawdust, rotten stumps, fleshy fungi were all found to be hastened through the stages of decomposition by these busy creatures.

Of Decaying Animal Matter. Almost every particle of thrown-off material from the animal body such as epidermal scales of birds and mammals, moulted skins of insects, are readily consumed by some species of these scavengers. Bone, horn, flesh and hair are also their foods, and it is next to impossible to find a single bit of any of these substances without finding along with it certain kinds of mites.

Of Mineral Matter. Mites were found upon rock and stone in all cases of weathering, in every little crevice where the wearings from the rock had lodged.

Again, specimens were found even in the solid rock, where, without any apparent means of sustenance, these active little creatures seemed to thrive. An example of this species is *Scutovertex petrophagus,* found at Trahanic Falls near Ithaca, N.Y.

### Bush and Fruit Tree Pests.

In Canada and other countries mites that attack bush and fruit trees are among the more serious pests of the fruit growers. In Canada they are found on the apple, plum, pear, etc., and in tropical countries they are very destructive to citrous fruit trees. Examples attacking the apple tree are the Pear Leaf Blister mite, *Eriophyes pyri,* which is widely distributed throughout most of the apple growing region. They form red blister-like spots about one-fourth of an inch in diameter, which turn brown in late summer, the tissues becoming hard and corky. Three or four other species belonging to the genus Eriophyes have not such economic importance. The same species found on the apple are found attacking the pear and other trees belonging to the genus Pyrus. Another injurious species attacking the plum tree in the Niagara district is the Plum Twig Gall mite, *Eriophyes phlœocoptes.* It is an European species which has been imported into this country within recent years. The mites form small sub-spherical galls in clusters at the base of the buds. Pocket-like galls belonging to the genus Eriophyes are found on the leaves of the cherry, plum, and grape. Two species of red spider, *Tetranychus telarius* and *Bryobia pratensis,* are found on the under side of the leaves of the plum, pear and apple, and when in large numbers, as they usually are in dry seasons, they do a considerable amount of injury to the common fruit trees. One species confines its ravages to the secretions on the surface of the apple. The red spider is also found on the raspberry. On currant bushes in England a species known as the Black Currant Gall mite, *Eriophyes ribis,* has long been known to horticulturists in that country, and as it is spreading rapidly in England and other countries, its presence here may be expected any day. In shape this particular species is easily recognized by the distinct globular or swollen-like appearance of the buds. When the buds are badly attacked they never open into leaf, but for a time they retain their green colour, later becoming brownish, dry, gall-like bodies, more or less open at the apex. Another species of considerable economic importance in the tropics is *Eriophyes oleivorus,* the rust mite of the orange and the silver mite of the lemon. It occurs in California and lives on both leaves and fruit. On the foliage the mite causes the leaves to become curled and to lose their gloss. On the fruit of the orange the mite produces a hardening of the rind, which becomes brownish in colour. The infested orange, although injured in appearance, is better able to stand long shipment and is more juicy than the clean fruit. Upon the lemon the mites cause the rind to become silvered, the fruit is better for shipment but the rind is injured for commercial purposes.

### As Pests of Farm and Garden Crops.

As enemies to the growing grain and also to stacked roots such as turnips, carrots, mangels, potatoes, and even ensilage, mites are considerably destructive. Yet they are not responsible for so much damage as they are often credited with. In the field the Clover mite, *Bryobia pratensis,* is of most importance, attacking clover and other leguminous crops. Another species is found on Timothy and causes distortion of the inflorescence. In the root cellars there are hosts of species too numerous to mention, some parasitic, some saprophytic, and a few finding it a favourite place to live, but doing no harm.

### As Pests of Vegetable Crops.

Only a few species have been found, but the enormous numbers of individuals make up for the fewness of the species. Myriads of Tetranychids are found feeding on the leaves, and the Tyroglyphids are everywhere present on the stored roots. *Tetranychus telarius* is the most common species on the outside crop, and *Tyroglyphus longior* and *Gamasids* are most troublesome inside.

### As Pests of Shade Trees and Ornamental Shrubs and Herbs.

Scarcely a tree or shrub escapes the attacks of one or more of these species. Some indeed, such as the maples, have as many as twenty-five or more species, feeding and absorbing nourishment from the leaves, twigs, bark, stem and roots. Most of the injuries of the trees are due to species of the Eriophyidæ, but in case of the shrubs and herbs the Tetranychids do most damage. The type of injury on the trees takes the form of galls. These are beautiful structures and at certain seasons of the year where they are not too abundant, appear more ornamental than destructive. As examples of these might be mentioned the Top Gall of the Soft Maple, the Pocket Gall of the Basswood, the Frost Gall (Erineum) of the Maple and Beech. On the shrubs we find the Tetranychus species again in evidence—the Privet, Garden Bell, Lilac, Spirea, Roses and Dogwoods. Among the ornamental herbs that suffer most from the attacks of Tetranychids are the perennial Phlox, Petunias, Nasturtium and Malva.

### As Pests of Forest Trees.

The Ontario forest flora affords suitable hosts for over fifty species of gall-making mites. A few of the more important ones have been discussed under Shade Tree Pests, but a large number of the species are not met with except on forest trees. These variously shaped galls are found on the flowers, fruits, leaves, twigs, and stems of such trees as the Elms, Poplars, Willows, Oaks, Chestnuts, Hawthorns, Maples, Lindens, etc. They not only do injury to the development of the tree but cause unsightly vegetable deformities sometimes literally covering the tree. The Witches Broom of the Hackberry, Willow, etc., is also the result of the work of these mites. Much difficulty is experienced in treating the trees for these pests as they are protected by the tissue of the gall which forms around them. The lime-sulphur wash which is found most effective for the Pear-Leaf Blister mite is about the best remedy where it is practicable to spray. Red Spiders of the Tetranychus genus almost equal the Eriophyes in abundance on forest trees. Only a few species have been determined but the excessive numbers of these species which are found make up for the fewness of the species. When closer study is made of this genus, it is altogether likely that a far larger number of species will be discovered. *Tetranychus spinosa,* which is found on the Linden on the upper side of the leaves is often sufficiently abundant to consume the whole of the chlorophyll, changing the appearance of the tree from green to yellow in midsummer. *Tetranychus bicolor* produces the same effect on leaves of Oaks and Hawthorns as *T. spinosa* does to the Linden. *T. telarius* is also found on the leaves of many forest trees.

### As Greenhouse Pests.

The florist is only too familiar with the work of the Red Spider and the Bulb mite, which are invariably present in large numbers attacking most of his flowering plants. Two species of Red Spider, *Tetranychus bimaculatus* and *T. telarius*. are the common species of the greenhouse of Ontario. They are found on such plants as primulas, chrysanthemums, carnations, cinerarias, tomatoes, etc. The bulb mite, *Rhizoglyphus hyacinthi,* is responsible for an enormous amount of damage in hothouses. They burrow into the healthy tissue, thereby giving a chance to the destructive soil bacteria to bring about decay. It is found on hyacinths, narcissus, orchids, and other bulbous plants. Affected bulbs should be burned as soon as the mite is discovered. *T. pallidus* is sometimes found on leaves of Chrysanthemum and *Rhizoglyphus heteromorphus,* which cause injury to the stems of carnations, are found in New York state. Other species are found on the pistil of Banana flowers in the tropical greenhouses, and on the leaves of Latania palm.

### As Pests of Flour Mills, Stores, Etc.

Flour mills, grocery stores, drug stores, butcher shops, libraries, laundries, restaurants, confectioneries, seed stores, furriers and furniture stores all afford hospitality to a species or more of Acarid. The flour mites, *Aleurobius farinae* and *Tyroglyphus longior* are the chief pests of the flour mill, the grocery store, the seed store and confectionery store. The sugar mite, *Carpoglyphus passularum* is chiefly found on raw sugar.

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## II.—CLASSIFICATION.

The mites belong to the Phylum Arthropoda, to the class Arachnida and to the order Acarina. In a general way mites are readily identified by their one-piece or sac-like bodies, but a much greater difficulty is encountered when it comes to differentiate them from their allies, the spiders and scorpions. Scorpions have segmented bodies and spiders have a marked constriction between the cephalothorax and the abdomen, and when these characteristics are present they can be easily separated from the Acarids. They are mostly very small and some are even microscopic. It has been found that in the embryo eight legs are present, but at birth and during larval development they have only six, and after moulting a few times develop a fourth pair. Exceptions are found in the large family, Eriophyidæ—the worm-like mites—where they have but two pairs throughout life. The legs are provided with hairs and spines, sometimes much modified, fitting them for special adaptations in life. In some groups organs are found on the anterior legs which are supposed to be sensory. The last joint of the leg is commonly terminated by from one to three claws. The mouth parts take the form of a truncate cone or beak, and in some families it is partially or completely reversible. The mandibles and palpi are of various types and peculiarly modified according to the habits of the mite. In some families there is a lingula or tongue which is usually not visible except by careful examination, but in the Ixodidae it is large and roughened with sharp teeth. On the cephalothorax there are usually one or more pairs of simple eyes which are sometimes elevated on short pedicels. The reproductive organs open on the ventral surface of the abdomen, and in this respect they are like their relatives, the Arachnids.

### Family Eupodidae.

Only three species have been found in Ontario. In chopped grain, under bark of wood and under boards are the principal habitats of this family. They are predaceous, soft-bodied, small mites with very long legs, and mandibles cheylate like their relatives, the Cheyletidæ. In many respects they are primitive in that they possess characters similar to those of the spiders.

*Eupodes variabilis.* Found abundant on barley seed in experimental grain cellar. T. D. J., Guelph.

*Eupodes* sp. Found under bark of Ironwood associated with other sp. of mites. T. D. J., Guelph.

*Linopodes attenuipes* Bks. Found under boards on College campus. T. D. J., Guelph.

### Family Bdellidæ.

There are also three species of this family found in Ontario. Under bark of balsam, crabapple, soft maple, apple, hard maple, in mangel seed, cavities of stone and in ground spelt in Experimental grain cellar, are some of the places inhabited by this family. They are closely related to the Eupodidæ and Cheyletidæ in that they are predaceous with cheylate mouth parts and cephalothorax partially distinct from the abdomen. They are red in colour with long, slender legs and a well developed beak or rostrum.

*Bdella cardinalis, Banks.* Under bark of Balsam, Abies balsamæ, Crabapple, Soft Maple, Pyrus sp. In cavities in stone. T. D. J., Guelph.

*Bdella tenella,* Banks. Under bark of Hard Maple. In Mangel seed in the Experimental grain cellar. T. D. J., Guelph.

*Bdella* sp. Found in ground Spelt in Experimental grain cellar. T. D. J., Guelph.

### Family Cheyletidæ.

This family is more or less largely represented in the Ontario fauna, containing eight species, some parasitic and predaceous upon birds, rodents, and insects. Other predaceous species may be found almost anywhere in search of mites and other insects. They are characterized by having very large palpi and are distinguished from the previous families by the absence of the demarcation between the cephalothorax and the abdomen.

*Myobia caudata,* Banks. Abundant on little brown bat. T. D. J., Guelph.

*Myobia musculi,* Derges. Found in abundance very closely attached to the hairs of the house mouse. T. D. J., Guelph.

*Cheyletes pyriformis,* Banks. Found on larvæ of Codling Moth in winter nest. T. D. J., Guelph.

*Cheyletes longipes,* Banks. Several specimens found in gelatin culture in Bacteriological laboratory. T. D. J., Guelph.

*Cheyletes clavispinus,* Banks. Several specimens were taken under bark of lilac. T. D. J., Guelph.

*Cheyletes ferox.* In hay, Ontario Agricultural College Barns. Mangel seed, Experimental office. Grain in grain cellar. Barley seed, O. A. C. barn. Ground Spelt, Experimental Department.

*Cheyleticlle Canadensis,* Banks. Found on Bluebird, Sialia sialis. T. D. J., Guelph.

*Sorergates* sp. Parasite on house and field mouse in cavities or little cells just beneath the skin. J. B. T., Ottawa.

## Family Tetranychidae.

Five species of this family have been found in Ontario up to the present time. These are distinguished from the three preceding families by being fitted for existence entirely on vegetable matter. Trees, shrubs, and herbs are usually infested with one or more species of this family. Both sides of the leaves are attacked by mites of this family, probably the under side being their most favourite resort. Greenhouse plants as well as outdoor plants are subject to their attacks. Several species are capable of spinning a silken thread and weaving a home, and from this habit are called spinning mites. The commoner species are red in colour and from this they get the name of "red spiders." Other species are found in green, brown, and mottled colours. They all have one or two conspicuous ocelli on the cephalothorax and the body and legs usually have a few long scattered hairs.

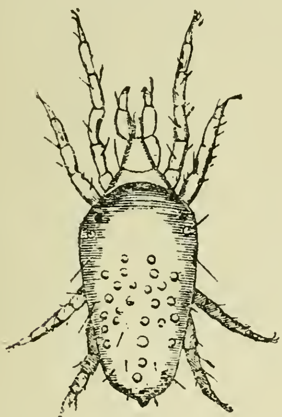

Fig. 22. Tetranychus telarius—"Red Spider."

Fig. 23. Trombidium irritaus—Harvest-mite.

*Tetranychus telarius,* L. (Fig. 22). Found under bark of Buckthorn (Rhamnus catharticus), Crabapple (Pyrus sp.). Cultivated Alder (Alnus glutinosa). T. D. J., Guelph.

*Tetranychus bicolor.* Feeding on upper side of leaf of Hawthorn (Cratægus) and Burr Oak (Quercus macrocarpæ). T. D. J., Guelph.

*Tetranychus spinosa.* On leaves of Basswood (Tilia americana). T. D. J., Guelph.

*Bryobia pratensis.* In houses. On window pane of Experimental basement, Ontario Agricultural College. On clover and plum. T. D. J., Guelph.

*Tetranychus bimaculatus.* In greenhouse. T. D. J., Guelph.

## Family Rhyncholophidæ.

Four species occur in Ontario, all belonging to the genus Rhyncholophus. They are of much economic importance since most of our species are predaceous on scale insects. Most of our species are red in colour and possess very long legs.

*Rhyncholophus pilosus.* Feeding on eggs of Ichneumon; a parasite on Cecropia moth; found at base of old stump in woods; on apple tree feeding on Canker worm; on large black willow and other trees running over leaves in search of insects. T. D. J., Guelph.

*Rhyncholophus parvus,* Banks. Under leaves in woods. T. D. J., Guelph.

*Rhyncholophus* sp. Feeding on San José Scale. T. D. J., Guelph.

*Rhyncholophus* sp. Feeding on New York Plum scale. T. D. J., Guelph.

## Family Trombidiidae.

Although only three species have been studied, one of them, *Microtrombidum locustarum,* is of great importance, as it is parasitic upon the eggs and adults of locusts. The "Harvest mites," as they are popularly called, are recognized by

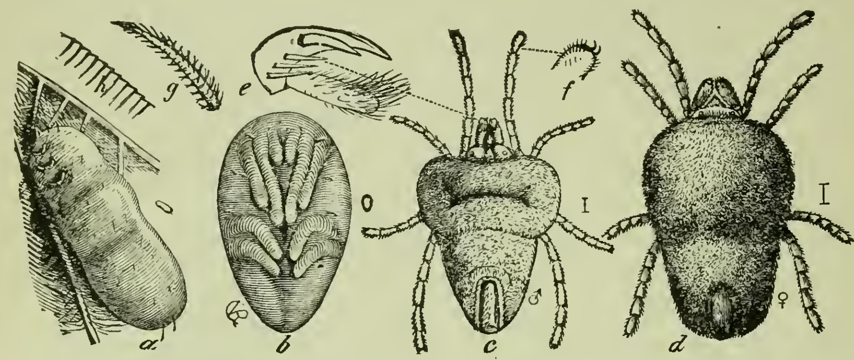


FIG. 24. Trombidium locustarum.—(*a*) mature larva, when about to leave the wing of a locust; (*b*) pupa; (*c*) male adult fresh from the pupa; (*d*) female—the natural sizes are indicated by the short lines on the right; (*e*) palpal claw and thumb; (*f*) pedal claws; (*g*) a barbed hair; (*h*) the striations on larval skin (after Riley).

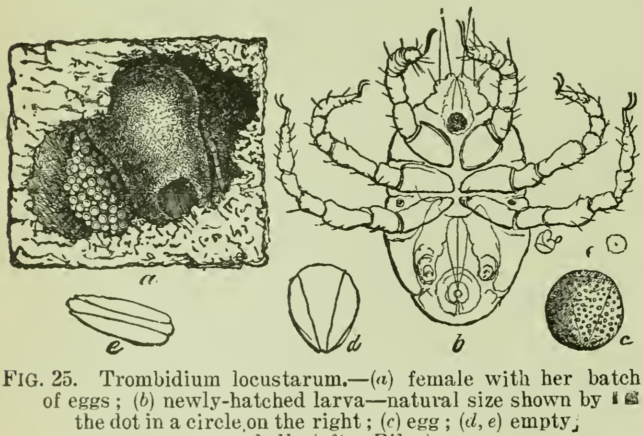


FIG. 25. Trombidium locustarum.—(*a*) female with her batch of eggs; (*b*) newly-hatched larva—natural size shown by the dot in a circle on the right; (*c*) egg; (*d, e*) empty egg-shells (after Riley).

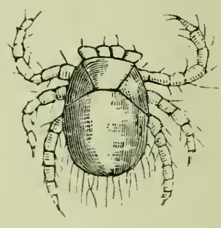

FIG. 26. Dermanysus avium.

the body being divided into two parts, the anterior the smaller and the posterior the larger. (Fig. 23). They are always red in colour and most of them quite large. The body is covered with a compact mass of bristles or branched hairs which gives them a velvet-like appearance.

*Trombidium sericeum,* Say. On decayed log; cedar moss. T. D. J., Guelph.

*Microtrombidium locustarum,* Say. (Figs. 24 and 25). Parasitic on several species of locust in all parts of Ontario. T. D. J., Guelph.

*Trombidium* sp. On eggs of Forest Tent Caterpillar.

### Family Hydrachnidae.

Many species belonging to this family have been obtained by means of the aquatic mite trap, but so far only two species have been identified. They are closely related to the Trombidiidæ, but are distinguished from them by means of their flattened and hairy legs and other adaptations for their aquatic existence. The young of this family are usually parasitic on water bugs and beetles, but the adults, as a rule, live free in the water.

*Hydrachna belostomae*, Rie. Attached to ventral surface of electric light bug. T. D. J., Guelph.

*Hydrachna* sp. Gills of Fresh Water Mussel. T. D. J., Guelph.

### Family Ixodidæ.

Five species of this family have been found in Ontario. They are the largest of the mites and most familiar to ordinary people. The body is covered by a tough leathery skin, which in the female when filled with eggs is shown to be quite elastic by its great distension. They are usually known as ticks and are frequently parasitic upon birds, reptiles, turtles and mammals. Their chief importance is that they are transmitters of disease of man and domestic animals.

*Ixodes Marxi*, Banks. On Red Squirrel. T. D. J., Guelph.

*Ixodes Cooki*, Pack. On Groundhog. T. D. J., Guelph.

*Boophilus bovis*, Riley. On imported cattle. T. D. J., Guelph.

*Dermacentor variabilis*, Say. Dog tick. T. D. J., Guelph.

*Dermacentor albipictus*, Pack. Taken from moose. T. D. J., Northern Ont.

### Family Gamasoidæ.

Over thirty species are included in the Ontario fauna. Their habitat is of the most varied character of all the Acarids, some parasitic, some predaceous, some vegetarians, and some scavengers. The anatomy of this family is also very much varied. Some have a hard cariaceous integument, others again are quite soft bodied. Their legs are short and usually flat and broad.

*Gamasus attenuipes*, Banks. Feeding on turnip in Ontario Agricultural College root cellar. T. D. J., Guelph.

*Gamasus posticatus*, Banks. Under decaying maple leaves in College wood lot. T. D. J., Guelph.

*Gamasus* sp. Abundant in Ontario Agricultural College herbarium on pressed specimens of Pear-leaf Blister-mite. T. D. J., Guelph.

*Gamasus* sp. On decaying squash in Ontario Agricultural College garden. T. D. J., Guelph.

*Gamasus* sp. Under decaying tree in Ontario Agricultural College wood lot. T. D. J., Guelph.

*Gamasus* sp. Abundant on fruiting bodies of Brown Rot of Cherry (Sclerotinia fructigena). T. D. J., Grimsby, Ont.

*Gamasus* sp. Under decaying hard maple leaves in Ontario Agricultural College wood lot. T. D. J., Guelph.

*Gamasus* sp. In gall of Eriophyes on Aspen. T. D. J., Guelph.

*Gamasus* sp. In horse manure at Ontario Agricultural College. T. D. J., Guelph.

*Gamasus* sp. On sugar beet in Ontario Agricultural College root cellar. T. D. J., Guelph.

*Gemasus* sp. Common or Red Squirrel, Ontario Agricultural College. T. D. J., Guelph.

*Gamasus* sp. Under New York Plum Lecanium on Elm, Ontario Agricultural College. T. D. J., Guelph.

*Gamasus* sp. In Pine cone. T. D. J., Guelph.

*Gamasus* sp. Abundant on body of Leopard Frog. T. D. J., Guelph.

*Gamasus* sp. On stored celery in College cellar. T. D. J., Guelph.

*Lælaps pedalis,* Banks. On Chipmunk, Ontario Agricultural College. T. D. J., Guelph.

*Lælaps multispinosus,* Banks. Very abundant on Muskrat, Ontario Agricultural College. T. D. J., Guelph.

*Liponyssus Canadensis,* Banks. On English sparrow; Meadow Lark; Kingbird; Wood Pewee; White Bellied Nuthatch; Red-eyed Vireo. T. D. J., Guelph.

*Lælaps longisita,* Banks. Carrion beetle, Ontario Agricultural College. T. D. J., Guelph.

*Lælaps propheticus,* Banks. Groundhog, Ontario Agricultural College. T. D. J., Guelph.

*Sejus macrophilus,* Banks. Predaceous; found in gall of genus Eriophyes of Large-toothed Aspen. T. D. J., Guelph.

*Dermanyssus gallinae,* Redi. Abundant on domestic fowl. Guelph and all through the province. T. D. J., Guelph.

*Dermanyssus avium* (Fig. 26). Domesticated caged birds. T. D. J., Guelph.

*Cœlænopsis latus.* Attached to beetle (Passalus cornutus). T. D. J., Guelph.

*Liponyssus* sp. On Star-nosed Mole. T. D. J., Guelph.

*Caelaenopsis pedalis,* Banks. Attached to larvæ of Spotted Pelidnota. T. D. J., Guelph.

*Uropoda* sp. On mangel seed in Experimental basement. T. D. J., Guelph.

*Uropoda* sp. On leaves of Rananculus acris. T. D. J., Guelph.

*Uropoda* sp. On Rough Osmoderma; Long-horned Borer; Skin Beetle; Horned passalus; Tumble Bug; Tenebrio. T. D. J., Guelph.

*Macrocheles* sp. On Horned passalus; Carrion beetle; Large Silpha. T. D. J., Guelph.

*Lælaps* sp. On Mangel in Ontario Agricultural College root cellar. T. D. J., Guelph.

*Liponyssus* sp. Attacking dipterous larva feeding on samara of Silver Maple. T. D. J., Ontario Agricultural College, Guelph.

*Lælaps* sp. On White-bellied Nuthatch. T. D. J., O.A.C., Guelph.

*Dermanyssus* sp. Abundant on Screech Owl. T. D. J., Guelph.

### Family Oribatidæ.

This family is also well represented in our fauna, containing about twenty-four species. They are often called Beetle mites on account of their horny-like integument which in appearance is like the elytra of the Coleoptera. The food of the Oribatidæ is mostly of a vegetable nature, but some species are found on decaying matter and others again on the eggs of scale insects. Their habitat varies very considerably. Some are found under the bark of trees, others on stacked roots, in cavities of stones, on gall tissue, under boards, on decaying leaves, in moss and various other places. They can easily be recognized by a bristle arising from a small indentation on the posterior corners of the cephalothorax, and abdomen is well marked. The mouth parts are obscure and the palpi very small. An interesting thing about this family is the manner in which some of the nymphs collect and carry moulted skins, dirt, moss, etc., on their backs. The shapes and appendages of this family are strikingly peculiar in many species.

*Galumna emarginata,* Banks. In cavities in stone. T. D. J., Guelph.

*Galumna moesta,* Banks. Cavities in stone. On mangels in root cellar, O.A.C. Turnip in root cellar, O.A.C. T. D. J., Guelph.

*Nothrus excisus* Banks. Under bark of Austria Pine and Norway Spruce T. D. J., O.A.C., Guelph.

*Oribatella pallida,* Banks. Under bark of Hard Maple, Norway Spruce, Apple, Crab Apple. T. D. J., Guelph.

*Hoploderma granulata,* Banks. Harrington, Ottawa.

*Oribatella formosa,* Banks. Under bark of Catalpa, Norway Spruce, Lombardy Poplar, Mountain Ash. T. D. J., Guelph.

*Eremaeus pilosus,* Banks. Under bark of Catalpa, Buckthorn, Balsam, Cut-leaved Alder, Austria Pine, Mountain Ash. T. D. J., Guelph.

*Galumna affinis,* Banks. Under board on College campus. T. D. J., Guelph.

*Galumna depressa,* Banks. On turnip and mangel, in O.A.C. root cellar. T. D. J., Guelph.

*Oribata depressa,* Banks. On mangel in O.A.C. root cellar. T. D. J., Guelph.

*Galumna hirsuta,* Banks. Under bark of walnut. T. D. J., Guelph.

*Galumna* sp. Under Lecanium scale. T. D. J., Guelph.

*Oribata* sp. In cavities in stone. T. D. J., Guelph.

*Nothrus* sp. Under bark of Soft Maple. T. D. J., Guelph.

*Oribata* sp. On large fungus gall of grape. T. D. J., Niagara Falls.

*Pelops terminalis.* Under bark of Ironwood. T. D. J., Guelph.

*Notaspis Burrowski,* Nuch. Western Ontario. T. D. J.

*Notaspis Canadensis,* Banks. W. H. Harrington, Ottawa.

*Galumna sylvicola.* Among fallen leaves in the forest. T. D. J., Guelph.

*Liacarus panulus.* From moss on a stump. T. D. J., Guelph.

*Oribata Canadensis.* Under bark of Ironwood. T. D. J., Guelph.

*Oribata perolota.* In corn stubble. T. D. J., Guelph.

*Oribata neosota.* From decayed leaves. T. D. J., Guelph.

*Cymberemaeus parvula.* Under bark of Ironwood. T. D. J., Guelph.

### Family Tyroglyphidæ.

We have found ten species in our fauna. They are great destroyers of property, for, although very minute in size, their enormous numbers make up for their minuteness. The list of species tabulated below will give some idea of the varied habits and habitat of this family. The hypopol stage is a resting one, and at this period in their life history they often attach themselves to other animals, but as the mites do no feeding at this time they cannot be called true parasites. In this stage their chief object is to migrate to new feeding grounds. They are usually pale coloured or slightly tinted with pink, with soft bodies and prominent cheylate mandibles. There are no eyes and no special breathing organs.

*Tyroglyphus longior,* Germans. In all parts of houses. On cheese in cheese factories, barley seed, whole wheat, turnip and mangel in O.A.C. root cellar; bulb of Gladiolus; under Oyster-shell scale. T. D. J., Guelph.

*Tyroglyphus siro, Linnaeus.* (Fig. 27.) On cheese in cheese factories in various parts of the Province. Smoked hams. T. D. J.

*Tyroglyphus Americanus,* Banks. In test tube of Bacteriological laboratory. In jar of raspberry jam. T. D. J., Guelph.

*Rhizoglyphus hyacinthi,* Bos. Bulb of Gladiolus, common Daffodil. T. D. J., Guelph.

*Rhizoglyphus rhizoglyphus,* Banks. On hay, O.A.C. barn; decaying potatoes and parsnips, decaying heart of celery. T. D. J., Guelph.

*Rhizoglyphus phylloxeræ,* Riley. (Fig. 28.) On turnip in root cellar, Guelph; on decaying heart of celery, Guelph; on roots of grape, London. T. D. J., Guelph.

*Carpoglyphus passularum,* Hr. On raw sugar from store in Guelph; on smoked ham in pork packing house. T. D. J., Guelph.

*Histiostoma muscarum.* Attached to housefly. T. D. J., Guelph.

*Histiostoma valida,* Banks. In horse manure, Guelph. T. D. J., Guelph.

*Aleurobius farinae.* Fairly common in flour in flour mills. T. D. J., Guelph.

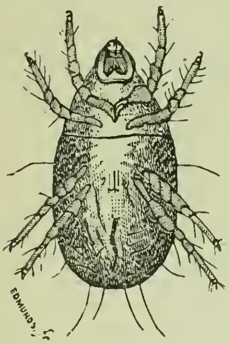

FIG. 27. Tyroglyphus siro—Cheese mite.

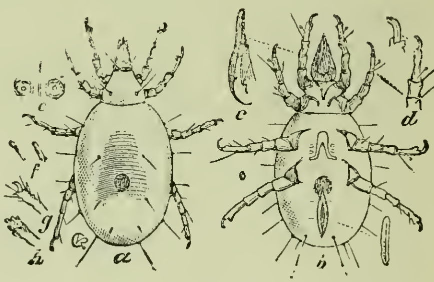

FIG. 28. Rhizoglyphus phylloxeræ.

### FAMILY CANESTRINIDÆ.

Only one species so far found in Ontario. It, however, is of much economic importance, as it is predaceous upon the San José Scale. They are small, short-legged mites, closely related to the Sarcoptidæ and also apparently to the Tyroglyphidæ.

*Hemisarcoptes malus,* Sch. San José Scale, St. Catharines. T. D. J.

### FAMILY ANALGESIDÆ.

Forty-three species have been taken in this Province. They inhabit the feathers of birds and apparently do little or no injury to the host. They are extremely small and found in great abundance on the feathers of the wings and other parts of the bird. W. R. Thompson, B.S.A., of the Gypsy Moth Laboratory of Boston, has made a special study of the anatomy and characteristics of this family in Ontario, using the collection of the writer. In this connection I wish to emphasize the patient and painstaking work of Mr. Thompson on this family, while a pupil of the Zoological Department of this College. A full list of these species will be published in the annual report of this Society for 1910.

### Family Listrophoridae.

These are closely related to the bird mites and live upon mammals. Our species was found on the muskrat. They also are small, soft-bodied mites, with short legs terminating in a sucker. Similar to the bird mites they feed upon the hairs of the small mammals.

*Listrophorus validus,* Banks. Taken from muskrat. T. D. J., Guelph.

### Family Sarcoptidae.

These are the itch mites of man and domestic animals, birds, etc. They, in some cases, burrow within the skin and thereby produce intense itching, and in many cases a diseased condition of the host, commonly known as scabies or mange. The mites are very small, white and semi-globular in shape. Several species of this family have been found in Ontario.

*Sarcoptes scabies,* Itch mite. (Figs. 29 and 30.) Host, horses. Ontario. T. D. J., Guelph.

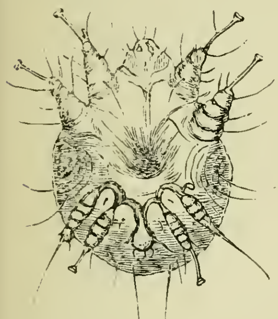

Fig. 29. Male Itch Mite.

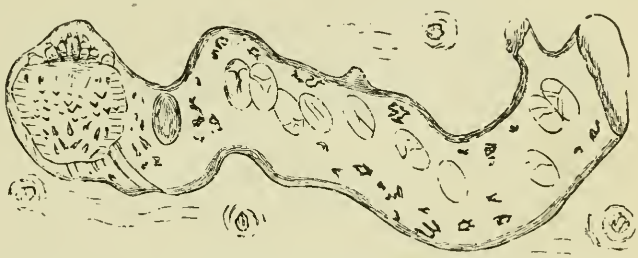

Fig. 30. Tunnel of Female Itch Mite beneath the skin—adult at left end, eggs throughout the tunnel.

*Chorioptes symbiotes,* var. equi, Verheyen. On legs of horses. T. D. J., Guelph.

*Chorioptes symbiotes,* var. *bovis.* On cattle. T. D. J., Guelph.

*Psoroptes communis,* Furst. On sheep. Manitoulin Island. T. D. J.

### Family Eriophyidae.

This is a family of microscopic mites, which are quite curious and unusual in structure. They have only two pairs of legs and the abdomen is long and striated. These striations, which differ in the different species and differ in number on the dorsal and ventral surfaces, are of considerable importance in the classification. The galls produced vary in form, but are always open or provided with an opening through which the mites pass in and out. They are generally lined with minute hairs (trichomes), which may be simple or branched. The different types of Eriophyid galls are shown in figures 31 to 39. Sixty-six species occur in Ontario.


FIG. 31. Erineum on leaf of beech; natural size and highly magnified.

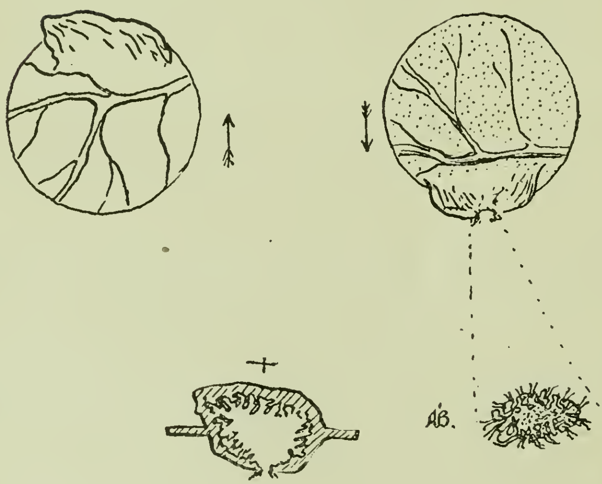


FIG. 32. Capsule Gall: Upper and lower surfaces; interior and opening of capsule, highly magnified.

### Host—Alder.

*Eriophyes* sp. A white, frost-like erineum on under side of leaf in the axils of the veins. Trichomes dense, pellucid. (Fig. 31.) Alnus incana. T. D. J., Guelph.

*Eriophyes* sp. A small, red or green pubescent pocket gall on leaf. Alder Pocket Gall. (Fig. 34.) Alnus incana. T. D. J., Guelph.

### Host—Ash.

*Eriophyes fraxini* (Garman). Small, irregular, smooth, more or less spherical capsule gall, protruding on both sides of the leaf. Ash Mite Gall. (Fig. 32.) Fraxinus americana. T. D. J., Guelph.

*Eriophyes* sp. Pinkish-white, elongated capsule galls on the veins of the leaf. Ventrally the galls appear as white, hairy projections following the veins. Ash Vein Gall. T. D. J., Guelph.

*Eriophyes* sp. A deformation of the terminal buds, their development arrested, producing a mass of small twisted leaf ends. Fraxinus americana. (Fig. 37.) T. D. J., Guelph.

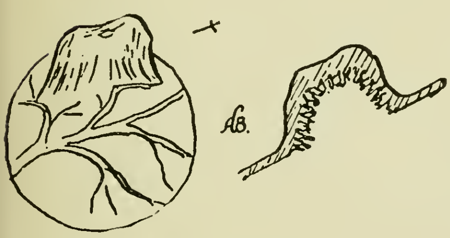

Fig. 33. Dimple Gall and section of interior greatly magnified.

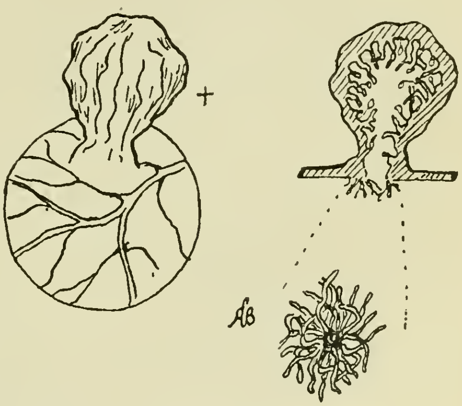

Fig. 34. Pocket Gall: Upper surface of leaf; interior of gall, much magnified.

*Eriophyes* sp. Leaves dwarfed and distorted in a bundle. Resembles somewhat Cecidomyia solidaginis. Ash Bunch Gall. Fraxinus americana. T. D. J., Guelph.

*Eriophyes* sp. Small, irregular, more or less spherical capsule gall, protruding on both sides of leaf. Galls hairy. Fraxinus pubescens. T. D. J., Guelph.

### Host—Basswood.

*Eriophyes abnormis,* Garman. Balloon-shaped galls on the upper surface of the leaf. Apex of gall usually serrated. Basswood Balloon Gall. Tilia americana. T. D. J., Guelph.

*Eriophyes* sp. Irregular, circular, dark reddish-brown spots 4-5 mm. in diameter, having in their centre very characteristic tufts of whitish hairs. Basswood Tufted Gall. Tilia americana. T. D. J., Guelph.

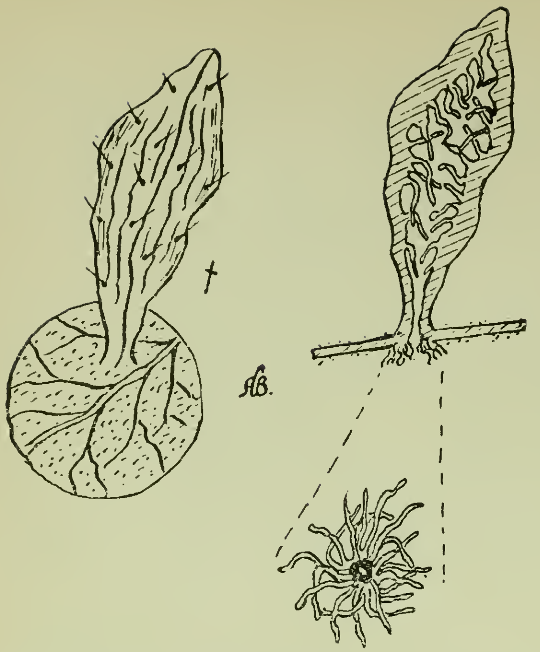

FIG. 35. Pouch Gall on upper surface of leaf; interior of gall, much magnified.

FIG. 36. Leaf-margin Gall.

FIG. 37. Leaf-distortion Gall, different stages.

*Eriophyes* sp. A white erineum or shallow dimple on underside of leaf, much like the Erineum on Acer negundo. Tilia europea. T. D. J., Guelph.

### Host—Beech.

*Eriophyes* sp. A frosty, white erineum in large patches on the under side of the leaf. Trichomes spherically capitate. Fagus americanus. T. D. J., Guelph.

### Host—Birch.

*Eriophyes* sp. A bud deformation, crowded and irregular, often in bunches of large size. Birch Bud Gall. (Fig. 38.) Betula lutea. T. D. J., Guelph.

*Eriophyes* sp. A rosy-pink erineum in large patches on the upper side of the leaf. Betula lenta. T. D. J., Guelph.

Fig. 38. Bud-like Galls.

Fig. 39. Serpentine Gall.

*Eriophyes* sp. A yellowish-white to brownish erineum forming large patches between the ribs on the under side of the leaf. Betula papyrifera. T. D. J., Guelph.

*Eriophyes* sp. A transparently white, granular erineum on the surface of the leaves. Betula pumila. T. D. J., Guelph.

*Eriophyes* sp. A capsule gall, very small, yellow to brown. Paper Birch Capsule Gall. (Fig. 32.) Betula papyrifera. T. D. J., Guelph.

*Eriophyes* sp. A nodular pocket gall, occurring upon both faces of the leaf; yellowish, or reddish to purplish. Paper Birch Pocket Gall. Betula papyrifera. (Fig. 34.) T. D. J., Guelph.

### Host—Buttonbush.

*Eriophyes cephalanthe* (Cook). Clusters of small dimples on the upper side of the leaf, 1 to 3 mm. high. Buttonwood Dimple Gall. Cephalanthus occidentalis. T. D. J., Guelph.

### Host—Chestnut.

*Eriophyes* sp. A small, capsule gall on the leaf, more or less spherical and 2-3 mm. in diameter. Chestnut Capsule Gall. Castanea sativa, var. americana. T. D. J., Guelph.

### Host—Elm.

*Eriophyes ulmi* (Garman). Small green to yellowish pocket-galls, more or less spherical, usually on the upper side of the leaves. Elm Pocket Gall. (Fig. 34.) Ulmus americana and U. racemosa. T. D. J., Guelph.

*Eriophyes* sp. An crineum on the under side of the leaf; white at first, changing to brown. Trichomes simple, tangled. Rock Elm Erineum Gall. Ulmus racemosa. T. D. J., Guelph.

*Eriophyes* sp. A very large pouch-gall on the leaves, commencing as a cone or deep dimple. (Fig. 35.) Ulmus pubescens. T. D. J., Guelph.

### Host—Grape.

*Eriophyes* sp. A white erineum on the underside of the leaf. Trichomes simple. Wild Grape. T. D. J., Guelph.

*Eriophyes* sp. Small, semi-circular or nearly circular capsules along the veins, about 2 mm. in diameter, and but slightly elevated on either surface. On upper surface paler than the leaf; below, with a white nipple surrounded by a furrow. Vitis cordifolia. T. D. J., Guelph.

### Host—Hawthorn.

*Acarus crataegi vermiculus.* A fold of the leaf making long, irregular, wavy projections on the upper surface of the leaf. From the midrib to the edge of the leaf in the general direction of the gall. Serpentine Gall. Cratægus sp. T. D. J., Guelph.

*Eriophyes* sp. Small, round swellings (capsules) protruding very slightly on both sides of the leaf. About .5-1 mm. in diameter. Galls very numerous where they occur—sometimes more than 100 on a single leaf. Speck Gall. Cratægus sp. T. D. J., Guelph.

*Eriophyes* sp. Very small, monothalmous, conical structures, 1 to 2 mm. high and 1-1.5 mm. wide at the base; formed anywhere on either surface of the leaf and sometimes on the stem of young twigs. Cone Gall. Cratægus sp. T. D. J., Guelph.

### Host—Hazel.

*Eriophyes* sp. This gall is found only along the main veins of the leaf. The part of the leaf around the affected portion of the vein becomes crimped, the crimps all radiating towards the vein as a common centre. Hazel Leaf Crimp Gall. Corylus americana. T. D. J., Guelph.

*Eriophyes avellanae.* A bud deformation, which attacks bud as soon as it expands, and checks its subsequent development. Hazelnut Bud Gall. Corylus americana. T. D. J., Guelph.

### Host—Genus Juglans.

*Eriophyes* sp. A brown, velvety erineum surrounding the leaf stalks, or on the main veins, causing a swelling or bending of the stalk or vein. Walnut Cushion Gall. Juglans nigra and probably J. cinerea. T. D. J., Guelph.

*Eriophyes* sp. A green pocket-gall on the upper side (usually) of the leaf. Walnut "Wart" Gall. Juglans nigra and probably J. cinerea. T. D. J., Guelph.

### Host—Juneberry.

*Eriophyes* sp. Small, nearly globular, dark brown, pocket galls, averaging 2 mm. in diameter, singly or in clusters on the upper side of the leaf. Juneberry Ball Gall. Amelanchier rotundifolia. T. D. J., Guelph.

### Host—Maple.

*Eriophyes* sp. A whitish frost-like erineum with scattered spots of rosy-pink, on the upper surface of the leaf, sometimes nearly covering it. Acer rubrum. T. D. J., Guelph.

*Eriophyes* sp. A pale yellow or white erineum on the under side of the leaf. Trichomes capitate. Acer saccharinum. T. D. J., Guelph.

*Phlœoptes quadripes.* A nearly spherical pocket gall on the upper surface of the leaf, varying from light green through red or purple to black. Acer saccharinum. T. D. J., Guelph.

*Eriophyes* sp. A white or whitish erineum in patches on the under side of the leaf, often limited by the veins. Trichomes capitate. When old, the trichomes assume a brown colour. Acer saccharum. T. D. J., Guelph.

*Phlœcoptes aceris.* A green, reddish or purplish, slender, pouch-gall projecting from the upper surface of the leaf. Acer saccharum. T. D. J., Guelph.

*Eriophyes* sp. A white or whitish erineum on the under side of the leaf. Acer nigrum. T. D. J., Guelph.

*Eriophyes* sp. Irregular wart-like swellings (Dimple) on the upper surface of the leaf. The swellings are green at first and turn gray when mature. The average diameter is about 3 mm. Manitoba Maple Wart Gall. Acer negundo. T. D. J., Guelph.

*Eriophyes* sp. A white, whitish, or pale yellow erineum on the under side of the leaf, in patches often in the axils of the veins. Trichomes long, tangled and distorted. Acer spicatum. T. D. J., Guelph.

### Host—Oak.

*Eriophyes querci.* An irregular dimple upon the blade of the leaf. From beneath it appears as an irregular cavity, lined with a tangled mass of white vegetable hairs. Oak Dimple Gall. Quercus macrocarpa. T. D. J., Guelph.

*Eriophyes* sp. A dense mat of brown hairs growing in large patches upon the under side of the leaves. Oak Hair Gall. Quercus sp. T. D. J., Guelph.

### Host—Poplar.

*Eriophyes* sp. Circular, flat or slightly convex, frost-like patches varying from 2-3 mm. in diameter, on the upper side of the leaf. Large-toothed Aspen Frost Gall. Populus grandidentata. T. D. J., Guelph.

*Eriophyes* sp. Circular depressions dimple always on the lower side of the leaf. On the upper side it appears as a reddish circular elevation. Large-toothed Aspen Convex Gall. Populus grandidentata. T. D. J., Guelph.

*Eriophyes* sp. Dimple-like galls on the upper side of the leaf of the Aspen. Aspen Dimple Gall. Populus tremuloides. T. D. J., Guelph.

*Eriophyes* sp. Irregular tubercular masses of closely-packed small reddish-green protuberances on the stem. Unsightly Poplar Gall. Populus tremuloides.

*Eriophyes* sp. A depression on the lower surface of the leaf, 4-12 mm. in diameter and 2-5 mm. in depth. Under surface of gall is orange-yellow. Populus italica. T. D. J., Guelph.

*Eriophyes* sp. Margin of leaf distorted and curled. Populus tremuloides. T. D. J., Guelph.

### Host—Genus Prunus.

*Eriophyes* sp. Reddish, slender pouch-galls, somewhat irregular and pubescent, ¾ mm. long and .5-1 mm. in diameter. Pin Cherry Pouch Gall. Prunus pennsylvanica. T. D. J., Guelph.

*Eriophyes* sp. Green on rosy-red pouch-gall on the upper side of the leaf .5-6 cm. in length. The gall is constricted about half way to the leaf. Black Cherry Pouch Gall. Prunus serrotina. T. D. J., Guelph.

*Eriophyes* sp. Green or reddish pouch gall on the upper side of the leaf, differing from the Black Cherry Pouch Gall in that the aperture is not funnel-shaped. Choke Cherry Pouch Gall. Prunus virginiana. T. D. J., Guelph.

*Eriophyes* sp. A very long, slender, pouch-gall, green or whitish on either side of the leaf. Wild Plum Pouch Gall. Prunus americana. T. D. J., Guelph.

*Eriophyes phlœocoptes.* A tubular growth, encircling base of buds and shoots. Plum Bud Gall. Prunus domestica. T. D. J., Guelph.

### Host—Genus Pyrus.

Apple, Crab Apple. Pear and Chokecherry.

*Eriophyes* sp. Dimple galls, with the concavity on the upper surface of the leaf. Internal surface corrugated. Apple Dimple Gall. Pyrus malus. T. D. J., Guelph.

*Eriophyes pyri.* Capsule Galls on the upper side of the leaf. Apple and Pear "Leaf-blister" Gall. Pyrus malus, P. coronaria and P. communis. T. D. J., Guelph.

*Eriophyes* sp. Capsule Galls, very small. When mature, brown in color. Chokecherry Speck Gall. Pyrus arbutifolia. T. D. J., Guelph.

### Host—Sumac.

*Eriophyes* sp. The leaf margin rolled tightly upward and inward on both sides. Sumac Leaf-margin Gall. Rhus typhina. T. D. J., Guelph.

*Eriophyes* sp. Irregular, rounded, dimple gall, convex on the upper or under side of the leaf. Green to red or purple in color; inside clothed with white trichomes. Poison Ivy Dimple Gall. Rhus radicans. T. D. J., Guelph.

### Host—Willow.

*Eriophyes* sp. A pale green or purple capsule gall, projecting either above or below the leaf, or both; 1½ to 2 mm. in diameter. Salix cordata. T. D. J., Guelph.

*Eriophyes* sp. Small, irregular, serrate and roughened pocket-galls or semi-capsules, green or red, strongly pilose above and thickly pubescent beneath. Usually on the upper side of the leaf. Salix discolor. T. D. J., Guelph.

*Eriophyes* sp. Small, crimson pocket-galls or semi-capsules on the upper side of the leaf. 1½ to 2½ mm. in diameter. Salix amygdaloides. T. D. J., Guelph.

*Eriophyes* sp. A small capsule gall, irregularly hemispherical, greenish yellow, with a projecting aperture usually on the lower surface of the leaf, 1 to 2½ mm. in diameter. Salix nigra. T. D. J., Guelph.

*Eriophyes* sp. Small, irregular, serrate capsule gall, green or red, usually on the upper side of the leaf; beneath sometimes impressed, more often projecting. 1 to 2 mm. in diameter. Salix bebbiana. T. D. J., Guelph

*Eriophyes* sp. Small, irregular, serrate capsule gall, projecting on both sides of the leaf, 1 to 2 mm. in diameter. Salix petiolaris. T. D. J., Guelph.

*Eriophyes* sp. A bud deformation of the flower catkins and leaf buds or parts of leaves, producing a large, irregular, crumpled mass. Salix nigra. T. D. J., Guelph.

*Eriophyes* sp. Rosette-like structures on the leaves and stems. Unsightly Willow Gall. Salix sp. T. D. J., Guelph.

### Family Demodecidæ.

This again is a small family, only two species being found in the Province, one parasitic upon man and the other on swine. They are small and worm-like and resemble the gall mites.

*Demodex folliculorum,* Simon. Parasitic on man. T. D. J., Guelph.
*Demodex phylloides,* Croker. On hog. T. D. J., Guelph.

### Bibliography of Canadian Literature.

Banks, Nathan. New Canadian Mites. Proceedings Entomological Society of Washington. Vol. XI., 1909.

Brodie, W. Mites on Grasses in the Counties around Toronto. Report of Entomologist and Botanist, Central Experimental Farm, Ottawa, p. 10, 1887.

Chadwick, Geo. A Catalogue of the Phytoptid Galls of North America. 23rd Report of the State Entomologist on Injurious and Other Insects of the State of New York, Oct. 15th, 1909.

Dearness, John. A parasite of the San José Scale. Thirty-first Annual Report of the Entomological Society of Ontario, 1900.

Fletcher, James. The Locust Mite. Report of Entomologist and Botanist, Central Experimental Farm, Ottawa, p. 240, 1896.

Jarvis, Tennyson D. The Phlox Mite, Tetranychus bimaculatus. Thirty-sixth Annual Report of the Entomological Society of Ontario, 1905. Mites affecting Farm Homesteads. The Canadian Entomologist, Vol. XXXVIII., No. 7, 1906. The Locust Mite. The Canadian Entomologist, Vol. XXXVIII., No. 10, 1906. Apparatus for trapping small Arthropods. Thirty-ninth Annual Report of the Entomological Society of Ontario, 1908. Gall Insects of Ontario. Thirty-seventh, thirty-eight and thirty-ninth Annual Reports of the Entomological Society of Ontario.

Saunders, William. Destroying eggs of Clisiocampa sylvatica and C. Americana on Nursery Stock in Ontario. Ninth Annual Report of the Entomological Society of Ontario.

# THE ENTOMOLOGICAL RECORD, 1909.

By Arthur Gibson, Ottawa.

The weather conditions of 1909, on the whole, in Canada, were particularly well suited for the growth of vegetation of all kinds. In eastern Ontario, comparatively speaking, there were few really hot days, and these not until about the middle of August. Injurious insects were not complained of to such an extent as they were in 1908. Many collectors have commented on the scarcity of insects, even of many of the commoner forms. As is always the case, however, desirable species have been collected by those who have worked assiduously throughout the season. In Manitoba, Mr. Norman Criddle reported that the season was a most peculiar one, the evenings being particularly bright, for which reason it was almost impossible to attract any moths to lights. In the early part of the season, too, there was an exceptional outbreak of plant lice of all kinds, and it was noticed that night-flying moths frequented trees, mostly Manitoba maples and oaks, which were infested by the aphides, to feed upon their honey dew. The past season was certainly a most remarkable one for plant lice all over Canada.

During 1909 a good deal of material, collected in previous years, has been worked up by specialists, and notes on some of these are included in this year's Record. Unfortunately, a number of our Canadian collectors have not been as active in 1909 as they were in other years. Undoubtedly the great loss sustained by entomologists generally throughout Canada in the death of Dr. James Fletcher, has had some effect on systematic work. We should, however, now even strive all the more to continue the work he so ardently encouraged.

Since the appearance of the Entomological Record for 1908, the writer has received letters from many collectors, all of whom expressed the hope that the Record would be continued from year to year. He begs to thank his correspondents for their continued interest and help.

During 1909 few important expeditions have been made in Canada, as far as the writer knows, for the purpose of collecting and studying insects. Mr. J. B. Wallis, of Winnipeg, Man., spent most of the summer in the Okanagan Valley of British Columbia, and while there collected several thousand specimens which will be gradually worked up. Mr. C. H. Young, of the Geological Survey, Ottawa, while at Ucluelet, B.C., from May to August, collected a good many insects of interest. His work there, however, with Prof. John Macoun, of the same institution, was chiefly connected with the collection and preservation of star fish, crabs and other salt water objects. Mr. Geo. A. Moore, of Montreal, collected hemiptera almost exclusively at North Hatley, Que., in July, and secured much interesting material. The writer spent the whole of August in New Brunswick and Prince Edward Island and brought back collections in all orders.

In 1907 Messrs. Ernest Thompson Seton and E. A. Preble brought back with them from the Great Slave region a small collection of lepidoptera, among which were some interesting species. Mr. Wm. Beutenmuller, of the American Museum of Natural History, New York, has very kindly sent me a list of the species, and mention is made of several of them in this Record.

As in previous years, Canadian students have again to acknowledge the great help which they have received during the year from specialists in the United States and elsewhere. Those who have specially helped, in 1909, are: Dr. L. O. Howard, with his assistants, at Washington, D.C.; Dr. J. B. Smith, of New Brunswick, N.J.; Sir George Hampson, of the British Museum; Prof. H. F.

Wickham, of Iowa City, Iowa; Mr. W. D. Kearfott, of Montclair, N.J.; Mr. E. P. Van Duzee, of Buffalo, N.Y.; Mr. Wm. Beutenmuller, of New York, N.Y.; Dr. Henry Skinner, of Philadelphia, Pa.; Dr. E. M. Walker, of Toronto, Ont.; Col. Thos. L. Casey, of Washington, D.C.; Mr. Charles Leibeck, of Philadelphia, Pa., and Rev. G. W. Taylor, of Departure Bay, B.C.

### Literature.

Among the publications which have been received during the year, and which are of interest to Canadian students, mention may be made of the following:—

Back, Ernest A. The Robber-flies of America, North of Mexico, belonging to the subfamilies, Leptogastrinæ and Dasypogoninæ. Trans. Amer. Ent. Soc., Numbers 2 and 3, April-September, 1909, pp. 137-400. In this splendid paper 194 species, and 36 genera are described; 20 species and 1 genus are new. Eleven plates, illustrating a number of the species, appear at the end of the paper. Only 12 species are recorded from Canada. Many others have doubtless been taken in the Dominion, but these were not available for study by the author. The paper is a welcome one and will be of much value to dipterists.

Banks, Nathan. Directions for Collecting and Preserving Insects. Washington; Smithsonian Institution, Bulletin No. 67. This valuable bulletin was received on Oct. 14, 1909. It takes the place of the work prepared in 1892, under the direction of the late Dr. C. V. Riley. Many new features occur in this bulletin, and a large number of notes are included which have been furnished by specialists in the different Orders. 188 figures in the text appear, as against 139 in Riley's publication. The Bulletin will be most useful as a means of reference.

Beutenmuller, William. The Species of Holcaspis and their Galls (issued 17th Feb., 1909); The Species of Amphibolips and their Galls, (issued March 9, 1909); The North American Species of Diastrophus and their Galls, (issued March 19, 1909): American Museum of Natural History, New York. These papers on gall insects are most useful. The illustrations accompanying each are beautifully drawn, and with the descriptions of the galls and the makers, afford an easy means of identification. We hope to see more of these articles by this well-known author. Many of the species included in the above papers occur in Canada.

Blaisdell, Frank E., Sr. A Monographic Revision of the Coleoptera belonging to the Tenebrionid Tribe Eleodiini, inhabiting the United States, Lower California and adjacent Islands. United States National Museum, Bulletin 63, Washington, issued June 24, 1909. This important monograph of 524 pp. and 13 plates, represents an enormous amount of work for which coleopterists generally will be very grateful. 124 species and varieties are treated of, each at considerable length. It is to be hoped that this bulletin will be freely used by Canadian coleopterists, so that we may soon know more about the beetles of this tribe occurring in the Dominion.

Hampson, Sir George F. (*Bart*). Catalogue of the Lepidoptera Phalænæ in the British Museum; Vol. VII., pp. 709, plates cviii. to cxxii., received Feb. 8th, 1909; Vol. VIII., pp. 583, plates cxxiii. to cxxxvi., received Sept. 1st. 1909. These two volumes which appeared during the year are of great interest to students of the lepidoptera. Vol. VII. is the first part of "the classification of the very large sub-family *Acronyctinæ*, which comprises some 3,000 species belonging to over 300 genera. ........ The sub-family is characterised by the trifid neuration of the hind wing combined with spineless tibiæ and smooth eyes not surrounded by bristle-like hair, and it is the least specialised of the subfamilies of the *Noctuidæ Trifinæ*." Vol. VIII. is the second part of the *Acronyctinæ;* 104 genera are treated of, comprising 720 species. In Vol. VII., 843 species belonging to 96 genera are dealt with. The third and final part of the subfamily is prepared and it is expected will be issued very soon. The beautiful coloured plates which accompany each volume of the Catalogue, are of immense service to students. Those which refer to Vols. VII. and VIII., are of the same degree of excellence. Many of the species figured occur in Canada, and are at once recognized. We are glad to see the names of several Canadian collectors in the text, all of whom have sent material for the collection of the British Museum. Sir George Hampson is very grateful for noctuids from Canada, and all who can should assist him as far as possible in his valuable work.

Hopkins, A. D. The Genus Dendroctonus. (Contributions toward a monograph of the Scolytid beetles). United States Department of Agriculture, Bureau of Entomology; Technical Series No. 17, Part 1, issued June 30, 1909. The results of Dr. Hopkins' studies in this important genus will be of much use to coleopterists generally, and of particular interest to the economic entomologist. This first part of the bulletin is one of the best of the many valuable publications of the U. S. Bureau of Entomology. In the introductory chapter it is stated that, "It is the purpose of this paper to revise and bring up to date the available information on the described species, to describe those that appear to be new to science, and to record the results of original investigations relating to the more technical details that can not well be included in the paper which is to follow as a part of a bulletin in the regular series and which will give full information on the bionomic features." Twenty-four species are treated of, seven of which are new to science.

Smith, John B. Our Insect Friends and Enemies—The Relation of Insects to man, to other animals, to one another, and to plants, with a chapter on the War Against Insects. Philadelphia and London, J. B. Lippincott Company, 1909. This splendid work of 314 pp., by the above recognized authority, is a very welcome addition to the literature of Entomology. Dr. Smith has divided the book into 12 chapters, viz.: (I) Insects in their Relation to the Animal Kingdom; (II.) Insects in their Relation to Plants as Benefactors; (III.) Insects in their Relation to Plants as Destroyers; (IV.) Insects in their Relation to each other; (V.) Insects in Relation to the Animals that feed on them; (VI.) Insects in their Relation to Weather and Diseases that affect them; (VII.) Insects in their Relation to other Animals; (VIII.) Insects in their Relation to Man as Benefactors; (IX.) Insects in their Relation to Man as Carriers of Diseases; (X.) Insects in their Relation to the Household; (XI.) Insects in their Relation to the Farmer and Fruit Grower; (XII.) The War on Insects.

The book is full of information and will doubtless have a very wide sale. It is illustrated by many figures in the text, and at the beginning there is a full-paged coloured plate of some of the commoner insects which are troublesome in houses. The work is well printed, and we congratulate the author on this latest of his many publications.

Snodgrass, R. E. The Thorax of Insects and the Articulation of the Wings: Proc. U. S. Nat. Museum, Vol. XXXVI., pp. 511-595; separates published June 18, 1909. This paper will be found of much interest to entomologists generally. It represents a good deal of careful work and will no doubt be of much use to students. The author states that the paper is an attempt to show the unity of thoracic structure that prevails throughout all the orders of insects. Thirty plates appear at the end of the paper and there are, besides, some figures in the text.

SWAINE, J. M. Catalogue of the Described Scolytidæ of America, North of Mexico. Appendix B., 24th Report of the State Entomologist on Injurious and other Insects of the State of New York, 1908, received Sept. 30, 1909. This catalogue covering 84 pages practically includes, the author states, all the literature published on the North American species of the family. 191 species are listed. It will be of much value to entomologists, especially those engaged in economic work. The author is to be congratulated on the result of his labour, and students generally will be grateful to Dr. Felt for publishing the catalogue.

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The following is a list of the names and addresses of collectors heard from during 1909:—

Anderson, E. M., Provincial Museum, Victoria, B.C.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., care King Brothers, Quebec, Que.
Bush, A. H., 1105 Ninth Ave., Vancouver, B.C.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kalso, B.C.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Dent, W. A., Sarnia, Ont.
Dod, F. H., Wolley, Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fyles, Rev. T. W., Hull, Que.
Gibson, Arthur, Experimental Farm, Ottawa.
Groh, H., Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harms, J. F., Treesbank, Man.
Harrington, W. H., P.O. Department, Ottawa.
Harvey, R. V., Victoria, B.C.
Heath, E. F., Cartwright, Man.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph.
Keele, Jos., Geological Survey, Ottawa.
Keen, Rev. J. H., Metlakatla, B.C.
Letourneau, Jos. A., Experimental Farm, Ottawa
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancouver, B.C.
McIntosh, W., St. John, N.B.
Metcalfe, W., 288 Bank Street, Ottawa.
Moore, W. H., Scotch Lake, N.B.
Moore, G. A., 850 St. Hubert Street, Montreal.
Morris, Frank, Port Hope, Ont.
Nelles, Douglas H., Dept. Interior, Ottawa.
Perrin, Jos., McNab's Island, Halifax, N.S.
Rowland, Alton, Windsor Mills, Que.

Russell, John, Bon Accord, New Westminster, B.C.
Sanson, N. B., Banff, Alta.
Saunders, Henry, 21 Harbord Street, Toronto.
Sherman, R. S., 2285 Sixth Avenue, Vancouver, B.C.
Simpson, W., Dominion Observatory, Ottawa.
Southee, G. R., Sherbrooke, Que.
Swaine, J. M., Macdonald College, Que.
Taylor, Rev. G. W., Departure Bay, B.C.
Tipping, E. Dalton, Bluff Centre, Alta.
Venables, E. P., Vernon, B.C.
Walker, Dr. E. M., Harbord St., Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Willing, T. N., Regina, Sask.
Wilmot, E. S., Vernon, B.C.
Wilson, W. J., Geological Survey, Ottawa.
Winn, A. F., 32 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O. A. C., Quelph, Ont.

## NOTES OF CAPTURES.

### Lepidoptera.

(Arranged according to Dyar's List of North American Lepidoptera, U.S. N.M. Bull. No. 52).

(Dyar's number).

5. *Iphidicles ajax* L. Pt. Pelee, Ont., 1 specimen, Sept. 6, (P. T. Taverner). On August 18, 1904, Dr. W. W. Newcomb, of Detroit, Mich., found this butterfly common at a patch of Papaw near Windsor, Ont. 15 eggs, 64 larvæ and chrysalids were found and 7 imagoes seen.

34. *Pintia* sisymbri Bdv. Fort Smith, Mackenzie, June 15, (Thompson and Preble).

63. *Eurymus hecla* Lefbr. On Island, north shore of Great Slave Lake, July 23, Long. 110°, (Thompson and Preble).

73. *Eurymus pelidne* Bdv. East end of Clinton-Golden Lake, Aug. 10; Artillery Lake, Aug. 13, (Thompson and Preble).

104. *Argynnis cornelia* Edw. Golden, B.C., June 24, (Wallis).

139. *Brenthis polaris* Bdv. On Island, near north shore of Great Slave Lake, July 23, (Thompson and Preble).

248. *Chlorippe clyton.* B. & LeC. Pt. Pelee, Ont., common, Aug. 14, 6 specimens taken, (P. A. Taverner).

289. *Œneis macounii* Edw. On Island, north shore of Great Slave Lake, July 23, (Thompson and Preble). A new locality for this interesting butterfly.

290. *Œneis nevadensis* Felder. Vernon, B.C., one specimen in the valley; the first I have seen, (Venables).

295f. *Œneis taygete* Hbn. East end of Clinton-Golden Lake, Aug. 10; on Island, north shore of Great Slave Lake, July 23, (Thompson and Preble).

362. *Mitoura damon* Cramer. Pt. Pelee, Ont., May 31, (Dr. W. W. Newcomb). Writing of this species, Dr. Newcomb says: "In walking along and dis-

turbing low vegetation, mostly *Juniperus communis,* I discovered this handsome little butterfly. In about an hour in the middle of the day I secured 12 specimens, and my friend, Taverner, also caught several. One male was very dark above with just a suggestion of the brownish-yellow scales on the disk of the four wings and a trace of the same above and between the tails. I should class this as Brehme's *patersonia,* or at least as coming very close to it."

469. *Pamphila palæmon* Pallas. Sherbrooke, Que., July 1, (Southee).

644. *Hesperia centaureæ* Ramb. Fort Smith, Mackenzie, July 2, (Thompson and Preble).

683. *Ampelophaga versicolor* Harris. Britannia, near Ottawa, July 26, (Baldwin).

699. *Phlegethontius convolvuli* L., a *cingulata* Fab. Trenton, Ont. (Evans).

702. *Sphinx perelegans* Hy. Edw. Wellington, B.C., June 6, 7, (Taylor); Peachland, July 6, (Wallis).

704. *Sphinx luscitiosa* Clemens. Britannia, near Ottawa, July 9, 22; 2 specimens, (Baldwin).

728. *Marumba modesta* Harr. Artillery Lake, Aug. 13. (Thompson and Preble). A very northern record.

778. *Basilona imperialis* Dru. Go-Home-Bay, Ont., one specimen found in water, July 12, (Williams); Trenton, Ont., 1 sp. June 27, (Evans).

869. *Neoarctia yarrowi* Stretch. One female at rest on a rock in the hot sun on Mt. Huber, B.C., Aug. 9, about 8,000 feet above sea level, (Lyman).

960. *Panthea acronyctoides* Walk. Montmorency Falls, Que., June 23, (Lyman).

981. *Apatela cretata* Smith. Millarville, Alta., June 22 to July 16th, about 20 specimens at treacle, (Dod).

1,008. *Apatela funeralis* Grt. McNab's Island, Halifax, N.S., emerged June 20, (Perrin).

1,029. *Apatela sperata* Grt. Regina, Sask., June 15, (Willing).

1,042. *Apatela lanceolaria* Grt. Larva found on cherry at Saskatoon, Sask.; green with yellowish bristles from tubercles, one and three-quarter inches long; fed it on some rose leaves; pupated Aug. 1, moth emerged April 28, (Willing).

1,050. *Merolonche lupini* Grt. Duncans, B.C., one at light, (Hanham).

1,053. *Harrisimemna trisignata* Walk. Windsor Mills, Que. (Rowland); Hull, Que., full grown larva on ash, Aug. 28, (Groh).

1,075. *Baileya doubledayi* Gn. Windsor Mills, Que., (Rowland).

1,141. *Oligia grata* Hbn. Trenton, Ont., Oct. 18, (Evans).

1,147. *Hillia discinigra* Walk. Cartwright, Man., Aug. 24, (Heath).

1,211. *Hadena stipata* Morr. McNab's Island, Halifax, N.S., Sept. 13, (Perrin).

1,220. *Hadena vultuosa* Grt. Millarville, Alta., June 28, (Dod).

1,223. *Hadena morna* Strk. High River, Alta., (Baird).

*Hadena commoda* Walk, = *alberta* Smith. Millarville, Alta., June 22 to July 24, about 20 specimens at treacle. I have seen the type of *commoda* in the British Museum, and agree with Sir George Hampson in referring Prof. Smith's species here, (Dod).

1281. *Hyppa brunneicrista* Sm. Millarville, Alta., June 21 to 30, about 20 specimens at treacle, being more than I had ever seen altogether; mostly worn; I saw fewer *xylinoides*, (Dod).

1,286. *Momophana comstocki* Grt. McNab's Island, Halifax, N.S., June 11, (Perrin).

*Oncocnemis poliochroa* Hamp. Penticton, B.C., Aug. 10; Peachland, B.C., Aug. 7, (Wallis). A record for B.C., (Dod).

1,401. *Rhynchagrotis vittifrons* Grt. Penticton, B.C. (L. A. De Wolfe).

1,409. *Rhynchagrotis crenulata* Sm. Penticton, B.C. (L. A. De Wolfe).

1,413. *Adelphagrotis indeterminata* Walk. Duncans, B.C., August, at sugar, rare, (Hanham).

1,480. *Noctua conchis* Grt. Regina, Sask., July 11, (Willing).

*Noctua patefacta* Sm. Millarville, Alta., July 8 to Aug. 9, a few at treacle. The type of *juncta* Grt., which Sir George Hampson treats as distinct, came from Nova Scotia, and has a pale head and thorax, with dark, pale tipped collar. *Patefacta* has these parts dark, and nearly unicolorous. The variation, however, is towards *juncta,* and I doubt their distinctness, (Dod).

1,507. *Noctua flavotincta* Sm. Ucluelet, B.C., (Young).

1,514. *Noctua lubricans* Gn. Mt. St. Hilaire, Que., June 30, (Chagnon).

*Noctua dislocata* Sm. Millarville, Alta., July 10 to 24, a few at treacle, (Dod).

1,530. *Rhizagrotis albicosta* Sm. The specimen recorded from High River, in 1906, is the red costal form of *flavicollis* Sm., recorded in the next line from the same place. Specimens named *albicosta,* by Prof. Smith. in the British Museum, are an entirely dissimilar species, which I have not yet seen from Canada, (Dod).

1,682. *Paragrotis fuscigera* Grt. The specimen so recorded in the Record for 1908, from Olds, Alta., is the species listed as *pleuritica,* from Calgary. Both names are wrong for the species, which Sir George Hampson will shortly describe as new, (Dod).

1,724. *Paragrotis obeliscoides* Gn. Trenton, Ont., 2 sp., July 5, 1 sp. July 10, (Evans).

*Mamestra artesta* Sm. Winnipeg, Man., June 26, (Wallis).

1,782. *Mamestra lustralis* Grt. Sudbury, Ont., (Evans).

1,789. *Mamestra capsularis* Gn. Aweme, Man., June 18, 28, two specimens, (Criddle).

1,806. *Mamestra rubefacta* Morr. Millarville, Alta., one at treacle, June 25, (Dod).

1,827. *Mamestra obscura* Sm. Trenton, Ont., June 2, (Evans).

1,874. *Mamestra tacoma* Strk. Ottawa, June 6, (Gibson); Trenton, Ont., (Evans).

1,877. *Mamestra circumvadis* Sm. Millarville, Alta., one male at light, July 10 (Dod).

1,951. *Nephelodes pectinatus* Sm. Millarville, Alta., Aug. 17, at light, (Dod).

1,983. *Leucania calgariana* Sm. Millarville, Alta., a few at treacle, July 5 to 20, (Dod).

2,012. *Graphiphora culea* Gn. Trenton, June 14, (Evans).

2,072. *Aporophila yosemitae* Grt. Hymers, Ont., Sept. 12, (Dawson).

2,111. *Xylina thaxteri* Grt. Hymers, Ont., Sept. 2, (Dawson); McNab's Island, Halifax, N.S., June 12, (Perrin).

*Cucullia indicta* Sm. Millarville, Alta., one male, at Burgamot, Aug. 1, rare; this will probably prove to be synonymous with *obscurior* of Smith, (Dod).

*Gortyna pallescens* Sm. Millarville, Alta., one about Sept. 8, disturbed from a bunch of hay, a frequent method of capture in some previous years. My note in the Record for 1906 should have referred to this species and not *medialis* Sm., of which I have seen typical specimens from Colorado which look distinct, (Dod).

*Gortyna thalictri* Lyman. Aweme, Man., Oct. 1, (Criddle); a poor specimen of what I think is this species was taken this year at Winnipeg by Mr. Wallis. The variety *perobsoleta*, Lyman, was collected the past season at Hymers, Ont., by Mr. Dawson.

*Gortyna nepheleptena* Dyar. Ottawa, Sept. 23, (Fletcher); Oct. 17, (Gibson). The first Canadian records.

2,200. *Xanthia pulchella* Sm. Duncans, B.C., Sept., over 20 specimens taken at sugar. During previous residence of six years on Vancouver Island, had only taken two specimens, (Hanham).

2,214. *Tapinostola variana* Morr. Britannia, near Ottawa, July 28, (Baldwin); Trenton, Ont., another specimen taken July 31, (Evans).

2,221. *Orthosia ralla* G. & R. Trenton, Ont., Aug. 20, (Evans).

2,301. *Heliothis phlogophagus* G. & R. Winnipeg, Man., Oct. 2, (Wallis).

*Polychrysia trabea* Sm. Millarville, Alta., July 23 to Aug. 9, about thirty specimens, principally at flowers of Larkspur, on which the larva in all probability feeds. I have clusters of these flowers in my garden, but those growing wild attracted by far the greater number. These captures are an interesting discovery, as the food plant of *moneta* in Europe is Monkshood, which belongs to the same family. The only constant difference between the European and North American forms appears to be that the latter is slightly paler in colour. I have not seen typical Siberian *esmeralda*, (Dod).

2,481. *Eosphoropteryx thyatiroides* Gn. Duncans, B.C., a single specimen at bloom in my garden in 1908 and another in 1909; a rare visitant on Vancouver Island, (Hanham).

2,494. *Autographa rubidus* Ottol. Millarville, Alta., June 23 to July 5, six specimens, five of them at treacle. It is unusual for this genus to come to treacle in this district, and the capture of five specimens by this means suggests that I might have found the species common had I discovered its favourite flower, as I did *trabea*, (Dod).

2,528. *Autographa sackeni* Grt. Millarville, Alta., one worn specimen flying in sunshine, Aug. 1, (Dod).

2,529. *Autographa snowi* Hy. Edw. "Head of Pine Creek, Calgary" (the locality usually cited in this Record, with equal correctness, as "Millarville"), July 23, 1905, (Dod), and Mt. Athabasca, Alberta Rockies, July 31, 1907, (Mrs. Nicholl). Both specimens are in the British Museum and agree fully with the description and with Ottolengui's figure. So far as I know these are the first correct records from Canada. The resemblance to *sackeni* is very close, (Dod).

*Syngrapha microgramma* Hbn. Millarville, Alta., July 1 to 12, 1903 and 1904. This is the species erroneously recorded by me as *snowi* in Can. Ent., xxxvii, 45. I took a specimen to the British Museum and found that it fully agreed with European specimens, so that the name must now be added to our lists, (Dod).

2,540. *Ogdoconta cinereola* Gn. Cartwright, Man., 1 sp. Sept. 24, very rare here, (Heath); Winnipeg, Man., Sept. 20, (Wallis).

2,682. *Tarache cretata* G. & R. Trenton, Ont., June 14, 25, (Evans).

2,724. *Phalaenostola larentioides* Grt. Trenton, Ont., July 3, (Evans).

2,728. *Hyamia perditalis* Walk. Trenton, Ont., 2 sp. July 2, Aug. 3, (Evans)

2,769. *Meliopotis limbolaris* Geyer. McNab's Island, Halifax, July 16, (Perrin).

2,777. *Cirrhobolina deducta* Morr. Millarville Alta., one worn female at treacle, July 5; new to Alberta, and, I believe, a great rarity in Canada, (Dod).

2,825. *Catocala elda* Behr. Duncans, B.C., (Hanham).

2,836. *Catocala luciana* Hy. Edw. Cartwright, Man., Aug. 22, very rare, (Heath).

2,868. *Catocala piatrix* Grt. Pt. Pelee, Ont., Aug. 14, (P. A. Taverner).

2,990. *Homoptera minerea* Gn. Trenton, Ont., June 7, (Evans).

*Pheocyma largera* Sm. Penticton, B.C., (L. A. De Wolfe).

3,006. *Erebus odora* L. Pt. Pelee, Ont., Sept. 8, (P. A. Taverner); Quebec, Que., July 28, (Fyles); Brandon, Man., record sent by Mr. Willing.

3,038. *Philometra hanhami* Sm. Trenton, Ont., July 11, 29, (Evans). This is only the second time this species has been taken in the East.

3,136. *Heterocampa umbrata* Walk. Winnipeg, June 24, (Wallis).

3,159. *Cerura scitiscripta* Walk., a. *multiscripta* Riley. Winnipeg, June 22, (Wallis); Aweme, Man., (Criddle).

3,193. *Olene achatina* S. & A. Trenton, Ont., July 19, (Evans).

3,238. *Opheroptera boreata* Hbn. Trenton, Ont., Oct. 28, 29, two specimens, (Evans).

3,240. *Rachela bruceata* Hulst. Kaslo, B.C., (Cockle). New to British Columbia, (G. W. T.).

*Rachela pulchraria* Taylor. Kaslo, B.C., (Cockle).

3,272. *Eupithecia luteata* Pack. Trenton, Ont., 2 sp., July 22, Aug. 6, (Evans).

3,282. *Eupithecia albicapitata* Pack. One specimen labelled "E. Ontario," (Evans).

*Eupithecia packardata* Taylor. Trenton, Ont., Aug. 16, (Evans).

*Eupithecia placidata* Taylor. Kaslo, B.C., (Cockle).

*Eupithecia agnesata* Taylor. Kaslo, B.C., (Cockle).

*Eupithecia terminata* Taylor. Kaslo, B.C., (Cockle).

*Eupithecia slocanata* Taylor. Kaslo, B.C., (Cockle).

*Eupithecia minorata* Taylor. Kaslo, B.C., (Cockle).

*Eupithecia adornata* Taylor. Kaslo, B.C., (Cockle).

*Eupithecia hanhami* Taylor. Ucluelet, B.C., (Young).

*Eupithecia harveyata* Taylor. Ucluelet, B.C., (Young).

*Eupithecia casloata* Dyar. Ucluelet, B.C., (Young).

*Eupithecia compactata* Taylor, MS. Ucluelet, B.C., (Young).

*Eupithecia albipunctata* Haw. Ucluelet, B.C., (Young). This species is recorded in *Canadian Entomologist*, Dec., 1909, p. 428. I had not seen it from Vancouver Island before, (G. W. T.).

*Eucymatoge togata* Hbn. Departure Bay, B.C., (Taylor).

3,328. *Eucymatoge vitalbata* D. & S. Kaslo, B.C., (Cockle). New to British Columbia, (G. W. T.).

*Eutephria lagganata* Taylor. Laggan, B.C., (Dod).

*Eutephria takirata* Taylor. Takir R., B.C., (T. Bryant).

*Aplodes unilineraria* Taylor. Kaslo, B.C., (Cockle); Victoria, B.C., (Harvey).

*Sciagraphia purcellata* Taylor. Kaslo, B.C., (Cockle).

3,706. *Cymatophora bitactata* Walk. Kaslo, B.C., (Cockle). New to British Columbia, (G. W. T.).

3,734. *Cymatophora denticulodes* Hulst. Kaslo, B.C., (Cockle); Similkameen, B.C., (Harvey).

3,767. *Caripeta aequaliaria* Grt. Departure Bay, B.C., (Taylor).

3,835. *Selidosema separataria* Grt. Kaslo, B.C., (Cockle). New to British Columbia, (G. W. T.).

3,922. *Ennomos subsignarius* Hbn. Another visitation of these moths appeared at Ottawa on Aug. 5 and 6. Although great swarms were seen, the numbers did not seem so large as last year, (Groh). Mr. Winn, also, reports that the moths were abundant at Montreal, at intervals, in August.

4,040. *Leucobrephos brephoides* Walk. Winnipeg, Man., April 17, (Wallis).

4,043. *Callizzia amorata* Pack. Trenton, Ont., 2 sp., June 18, Aug. 1, (Evans).

4,274. *Lipocosma fuliginosalis* Fern. Trenton, Ont., 6 sp., July 2, 5, 11, 18, 29, (Evans).

*Blepharomastix nymphulalis* Haimback. St. Johns, Que., July 24, (Chagnon).

4,400. *Perispasta caeculalis* Zell. Trenton, Ont., 2 sp., June 14, 25, (Evans).

4,484. *Lineodes integra* Zell. Trenton, Ont., Sept. 13, (Evans).

*Paralipsa terrenella* Zell. Trenton, Ont., June 24, (Evans).

4,514. *Pyralis cuprina* Zell. Trenton, Ont., July 11, (Evans).

4,519. *Pyralis cohortalis* Grt. Trenton, Ont., June 27, July 29, (Evans).

4,546. *Schoenobius clemensellus* Rob. Trenton, Ont., July 1-29, (Evans).

4,560. *Crambus hamellus* Thunb. Kamouraska, Que., Aug. 19, (Winn).

4,566. *Crambus unistriatellus* Pack. Trenton, Ont., 2 sp., July 9, 26, (Evans).

4,574. *Crambus alboclavellus* Zell. Trenton, Ont., July 2-25, (Evans).

4,587. *Crambus ruricolellus* Zell. Trenton, Ont., 1 sp., July 3, (Evans).

*Thaumatopsis gibsonella* Kearf. Trenton, Ont., 1 sp., Sept. 5, (Evans). Second Ontario record.

4,599. *Crambus oregonicus* Grt. Departure Bay, B.C., (Young).

4,622. *Argyria auratella* Clem. Trenton, Ont., 3 sp. July 6, 9, (Evans).

4,632. *Chilo forbesellus* Fern. Trenton, Ont., 4 sp. July 11, 14, 27, 29, (Evans).

4,633. *Chalcoela aurifera* Zell. Trenton, Ont., 1 sp. July 22, (Evans).

4,698. *Mineola tricolorella* Grt. Trenton, Ont., 2 sp., July 2, 11, (Evans).

4,734. *Nephopteryx ovalis* Pack. Trenton, Ont., July 2-17, (Evans).

4,748. *Meroptera unicolorella* Hulst. Trenton, Ont., June 18, July 11, Aug. 17, (Evans).

4,835. *Euzophera ochrifrontella* Zell. Trenton, Ont., July 9, (Evans).

4,871. *Homœosoma mucidellum* Rag. Trenton, Ont., June 13, 20, July 25, Aug. 2, 23, (Evans).

4,886. *Moodna ostrinella* Clem. Trenton, Ont., June 17, (Evans).

4,888. *Moodna pelviculella* Hulst. Trenton, Ont., July 24-30, Aug. 14, (Evans).

4,973. *Pterophorus paleaceus* Zell. Trenton, Ont., 2 sp., June 20, 21, (Evans).
5,033. *Olethreutes capreana* Hbn. Trenton, Ont., 1 sp., July 2, (Evans).
5,057. *Olethreutes constellatana* Zell. Trenton, Ont., 2 sp., June 18, 22, (Evans).
*Olethreutes removana* Kearf. Trenton, Ont., 2 sp., July 3, 4, (Evans).
5,121. *Eucosma juncticiliana* Wlsm. Trenton, Ont., 3 sp., July 17, 23, Aug. 1, (Evans).
5,134. *Eucosma trigeminana* Steph. Trenton, Ont., 1 sp., June 20, (Evans).
5,140-1. *Eucosma obfuscana* Riley. Isle of Montreal, Que., June 13, (Chagnon). Closely allied to *E. scudderiana* Clem., and, like this species, the larvæ will be found making galls in the stems of aster, or goldenrod, (W. D. K.).
*Eucosma landana* Kearf. Redvers, Sask., (A. J. Crocker).
5,142. *Eucosma otiosana* Clem. Trenton, Ont., 7 sp., June 25, Aug. 30, (Evans).
5,167. *Thiodia aspidiscana* Hbn. Trenton, Ont., 5 sp., June 7, 13, 14, 22, (Evans).
*Thiodia essexana* Kearf. Trenton, Ont., 1 sp., June 12, (Evans).
*Epinotia plumbolineana* Kearf. Departure Bay, B.C., (Young).
5,248. *Ancylis burgessiana* Zell. Trenton, Ont., 2 sp., June 18, Aug. 6, (Evans).
5,253. *Ancylis angulifasciana* Zell. Trenton, Ont., 1 sp., July 11, (Evans).
*Enarmonia vancouverana* Kearf. Redvers, Sask., (A. J. Crocker).
5,295. *Melissopus latiferreanus* Walsm. Mt. St. Hilaire, Que., June 25, (Chagnon). The larvæ may be found during the winter in fallen acorns, usually in company with a Buprestid larva, also an Holocera larva. Sometimes all three may be found in the same acorn, (W. D. K.).
5,353. *Sparganothis flavibasana* Fern. Ottawa, larvæ again abundant on a few cultivated Loniceras, mature June 15, (Gibson).
5,387. *Platynota sentana* Clem. Trenton, Ont., 1 sp., June 27, (Evans).
5,396. *Tortrix pallorana* Rob. Trenton, Ont., 2 sp., Aug. 29, Sept. 5, (Evans).
5,406. *Tortrix fumiferana* Clem. Ottawa, thousands of the moths flying around trees and shrubs in the district, July 20, (Gibson).
5,435. *Phalonia smeathmanniana* Fab. Trenton, Ont., 7 sp., June 22, July 17, (Evans).
*Histerosia cartwrightiana* Kearf. Trenton, Ont., 1 sp., June 27, (Evans).
5,496. *Cerostoma cervella* Wlsm. Departure Bay, B.C., (Young).
5,661. *Trichotaphe nonstrigella* Cham. Trenton, Ont., 6 dates, June 21-Sept. 23, (Evans).
*Gelechia viduella* Fab. Banff, Alta., 1 sp. (Sanson). An arctic species, very rarely found, described as *labradoriella* by Clemens, from specimens collected by Packard. There seems to be no other record of its capture since 1863, (W. D. K.).
5,818. *Gelechia ornatifimbriella* Clem. Trenton, Ont., 9 dates, June 14—July 2. (Evans).
*Psilocorsis fletcherella* Gibson. Ottawa, 2 sp. emerged from larvæ found on *Populus tremuloides* June 10, (Gibson).
6,110. *Scythris impositella* Zell. Ottawa, Mer Bleue, (Young).
6,495. *Tinea biflavimaculella* Clem. Trenton, Ont., 2 sp., July 3, Sept. 5, (Evans).
6,606. *Sthenopis thule* Strk. Macdonald College, Que., larvæ and pupæ found near here in bases of the stems of *Salix petiolaris,* June 29, (Swaine and Chagnon).

## Coleoptera.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico).

28. *Cicindela fulgida* Say. Peachland, B.C., (Wallis).
30*a*. *Cicindela limbata* Say. Radisson, Sask., July 27, (Fletcher).
34*a*. *Cicindela terricola* Say. Westbourne, Man., Aug. 24, (Wallis). New to Manitoba.
167. *Loricera caerulescens* L. Aweme, Man., (Criddle).
305. *Bembidium carinula* Chd. Winnipeg Beach, Man., July 9, (Wallis).
351. *Bembidium lucidum* Lec. Winnipeg, Man., May 6, (Wallis).
569. *Pterostichus caudicalis* Say. Winnipeg, May 8, (Wallis).
623. *Amara avida* Say. Winnipeg, Sept. 9, (Wallis).
626. *Amara rufimanus* Kirby. Westbourne, Man., Aug. 5, (Wallis).
629. *Amara laticollis* Lec. Winnipeg, Aug. 8, (Wallis).
650. *Amara apricarius* Payk. Trenton, Ont., 4 specimens, July 4, 11, 23, Aug. 5, (Evans).
742. *Calathus gregarius* Say. Westbourne, Man., Aug. 14, (Wallis).
777. *Platynus anchomenoides* Rand. Aweme, Man., (Criddle).
804. *Platynus basalis* Lec. Aweme, Man., (Criddle).
836. *Platynus nigriceps* Lec. Radisson Sask., July 29, (Willing).
871. *Lebia divisa* Lec. Last Mountain Lake, Sask., June 5, (G. C. McBean).
898. *Lebia depicta* Horn. Makinak, Man. Record sent by Mr. Chagnon, of Montreal.
*Colymbetes rugipennis* Sharp. Winnipeg, Sept. 19, (Wallis). Mr. Roberts, of New York, who identified the species, writes: "You will find this placed as a synonym of *sculptilis;* this is an error. I can prove it to be a good species."
925. *Callida purpurea* Say. Wilkie, Sask., July 16, (Willing).
947. *Cymindis borealis* Lec. Aweme, Man., (Criddle).
1,450. *Agabus clavatus* Lec. Vernon, B.C., (Venables).
1,484. *Dytiscus marginicollis* Lec. Winnipeg, April 24, (Wallis).
1,500. *Graphoderes occidentalis* Horn. Winnipeg, (Wallis).
1,505. *Gyrinus minutus* Fab. Winnipeg, Sept. 11, (Wallis).
1,551. *Helophorus inquinatus* Mann. Winnipeg, May 5, (Wallis).
1,597. *Hydrocharis obtusatus* Say. Winnipeg, June 3, (Wallis).
1,679. *Cercyon unipunctatum* L. Regina, Sask., in house, Nov., (Willing).
1,729. *Choleva basillaris* Say. Aweme, Man., (Criddle).
1,735. *Ptomaphagus consobrinus* Lec. Aweme, Man., (Criddle).
1,743. *Ptomaphagus brachyderus* Lec. Aweme, Man., (Criddle).
1,866. *Ceophyllus monilis* Lec. Aweme, Man., (Criddle).
*Coccidula occidentalis* Horn. Aweme, Man., (Criddle).
2,098. *Quedius explanatus* Lec. Olds, Alta., in a turnip, Sept. 12, (Willing).
2,234. *Philonthus aurulentus* Horn. Vernon, B.C., (Venables).
3,037. *Megilla vittiger* Mann. Saskatoon, Sask., June 1; Olds, Alta., Sept. 12, (Willing).
3,072. *Harmonia 12-maculata* Gebl. Last Mountain Lake, Sask., 3 specimens, each a different colour, June 5, (G. A. McBean).

3,095*d*. *Brachyacantha albifrons* Say. Meota, north of Battleford, Sask., Aug. 8, (Willing).
3,122. *Hyperaspis 4-vittata* Lec. Last Mountain Lake, Sask., June 5, (G. A. McBean).
*Hyperaspis inflexa* Casey. Last Mountain Lake, Sask., June 5, (G. A. McBean).
3,189. *Mycetina testacea* Ziegl. Regina, Sask., Aug. 28, (Willing).
3,238. *Tritoma californica* Lec. Olds, Alta., (Willing).
3,355. *Telmatophilus americana* Lec. Aweme, Man., (Criddle).
3,421. *Dermestes talpinus* Mann. Olds, Alta., (Willing).
3,425*a*. *Dermestes signatus* Lec. Olds, Alta., (Willing).
3,477. *Hister harrisii* Kirby. Aweme, Man., June, July, (Criddle); Westbourne, Man., Aug., (Wallis).
3,505. *Hister sedecimstriatus* Say. Aweme, June, (Criddle).
3,508. *Hister perplexus* Lec. Aweme, Man., June, (Criddle).
3,615. *Saprinus seminitens* Lec. Aweme, Man., July, (Criddle).
3,617. *Saprinus fraternus* Say. Aweme, Man., July, (Criddle).
3,895. *Byrrhus murinus* Fab. Aweme, Man., (Criddle).
4,282. *Agriotes fucosus* Lec. Winnipeg, July 7, (Wallis).
4,322. *Melanotus fissilis* Say. Westbourne, Man., Aug. 14, Wallis).
4,382. *Pityobius anguinus* Lec. Winnipeg Beach, Man., July 9, (Wallis).
4,607*a*. *Buprestis langii* Mann. Banff, Alta., July 16, (Sanson).
4,810. *Lucidota atra* Fab. Norman, Ont., July 19, (Wallis).
5,235. *Gibbium scotias* Scop. Montreal, June, (Chagnon).
5,296. *Xyletinus lugubris* Lec. Aweme, Man., (Criddle).
5,337. *Endecatomus rugosus* Rand. Aweme, Man., (Criddle).
5,356. *Amphicerus bicaudatus* Say. Regina, Sask., Sept. 17, Oct. 6, (Willing).
5,428. *Canthon praticola* Lec. Mortlach, Sask., in dead gophers, May 31, (Willing).
5,705. *Diplotaxis obscura* Lec. Vernon, B.C., (Venables).
5,960. *Prionus pocularis* Dalm. Trenton, Ont., July 13, (Evans).
6,007. *Merium proteus* Kirby. Vernon, B.C., (Venables).
6,184. *Xylotrechus annosus* Say. Regina, Sask., June 12; Strathcona, Alta., May 20, (Willing).
6,253. *Anthophylax malachiticus* Hald. Mt. St. Hilaire, Que., May 24, (Chagnon).
6,266. *Acmœops subpilosa* Lec. High River, Alta, June 27, (Willing).
6,278. *Gaurotes cressoni* Bland. Vernon, B.C., on wild rose flowers, Aug., (Venables).
6,358. *Leptura scripta* Lec. Vernon, on wild rose, (Venables).
6,385. *Monohammus titillator* Fab. Trenton, Ont., Aug. 9, (Evans).
6,488. *Saperda moesta* Lec. Garden Hill, near Port Hope, Ont. Middle July, on poplar, (Morris).
6,489. *Saperda concolor* Lec. Bethel, near Port Hope, Ont. Middle June, on willow, (Morris).
6,659. *Pachybrachys litigiosus* Suffr. Aweme, Man., July 9, (Criddle).
6,684. *Pachybrachys nigricornis* Say. Aweme, Man., July 19, only one specimen taken, (Criddle).
6,707. *Diachus auratus* Fab. Aweme, Man., Aug. 18, 25, (Criddle).
6,742. *Chrysochus cobaltinus* Lec. Enderby, B.C., Aug. Several on heads of timothy grass, (Venables).

6,796. *Chrysomela conjuncta* Rog. Last Mountain Lake, Sask., June 5, (G. A. McBean).
6,968. *Haltica evicta* Lec. Aweme, Man., (Criddle).
7,032. *Mantura floridana* Cr. Aweme, Man., May 28, on *Rumex venosus,* (E. Criddle).
7,096. *Physonota unipunctata* Say. Qu'Appelle Valley, July, (Halkett).
7,402. *Haplandrus femoratus* Fab. Montreal, (Chagnon).
*Vanonus wickhami* Casey. Trenton, Ont., July 18, (Evans).
7,464. *Tribolium madens* Charp. Vernon, B.C., (Venables).
8,224. *Attelabus analis* Ill. Aweme, Man., (Criddle).
8,228. *Attelabus rhois* Boh. Aweme, Man., (Criddle).
8,334. *Scythropus elegans* Coup. Vernon, B.C., beaten from pine trees, (Venables).
8,430. *Phytonomus comptus* Say. Aweme, Man., on *Rumex venosus,* (Criddle); pupa on head of grass, Indian Head, emerged Regina, Sask., Aug. 1, (Willing).
8,540. *Grypidius equiseti* Fab. Winnipeg, Man., May 23, (Wallis).
8,641. *Anthonomus sycophanta* Walsh. Regina, Sask., June 10; reared from gall on willow leaf, Olds, Alta., Sept. 5, (Willing).
8,688. *Encalus decipiens* Lec. Aweme, Man., May 28, (Criddle).
8,943. *Limnobaris prolixa* Lec. Aweme, Man., (Criddle).
8,948. *Limnobaris prolexus* Lec. Aweme, Man., (Criddle).
9,199. *Hylurgops pinifex* Fitch. Winnipeg, May 9, (Wallis).
9,207. *Allandrus bifasciatus* Lec. Aweme, Man., (Criddle).
9,315. *Philhydrus hamiltoni* Horn. Norman, Ont., July 19, (Wallis).
*Actium retractum* Casey. Queen Charlotte Island, B. C., (Keen).
*Oropus keeni* Casey. Metlakatla, B.C., (Keen).
*Oropus brevipennis* Casey. Metlakatla, B.C., (Keen).
*Batrisodes albionicus* Aubé. Metlakatla, B.C., (Keen).
*Baryodma rotundicollis* Casey. Queen Charlotte Island, B.C., (Keen).
*Baryodma insulana* Casey. Queen Charlotte Island, B.C., (Keen).
*Eucharina sulcicollis* Mann. Queen Charlotte Island, and Metlakatla, B.C., (Keen).
*Megista granulata* Mann. Queen Charlotte Island, B.C., (Keen).
*Thinusa fletcheri* Casey. Queen Charlotte Island, B.C., (Keen).
*Amblopusa borealis* Casey. Queen Charlotte Island, (Keen).

## DIPTERA.

(Arranged according to a Catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI., No. 1,144. The numbers refer to the pages of the catalogue.)

Collectors who other years devoted a good deal of time to these insects have omitted to send in records. It is hoped, however, when the past season's collections are worked up, that notes relating to the rarer species will be sent for inclusion in next year's Record.

87. *Chionea nivicola* Doane. Banff, Alta., on snow, March 29, (Sanson).
105. *Dixa centralis* Loew. Banff, Alta., June 22, (Sanson).
*Anopheles occidentalis* D. & K. Valley of Mayo River, Y.T., Lat. 63° 45′, Long. 136°, 1904, (Keele). Probably the most northerly record for an *Anopheles* (H. G. D.); Aweme, Man., April 23, 24, (Criddle).

127. *Aedes canadensis* Th. Youghall, N.B., July, (Gibson).
129. *Culiseta impatiens* Walk. Valley of Mayo River, Y.T., Lat. 63° 45′, Long. 136°, 1904, (Keele).
129. *Culiseta inornatus* Will. Aweme, Man., May 17, 21, Sept. 27, Oct. 12, 14, (Criddle).
131. *Aedes provacans* Walk. Youghall, N.B., July, (Gibson).
*Aedes sansoni* D. & K. Banff, Alta., June 22, (Sanson).
*Aedes punctor* Kirby. Banff, Alta., June 22, (Sanson).
*Aedes pagetonotum* D. & K. Ottawa, May 20, 1905, (Fletcher); Chelsea, Que., May 17, (Gibson); Aweme, June 3, (Criddle).
*Aedes riparius* D. & K. Aweme, Man., June 1, 2, 24, (Criddle).
131. *Aedes sylvestris* Th. Aweme, Man., June 25, July 19, (Criddle); Youghall, N.B., July, (Gibson).
133. *Aedes spenceri* Th. Aweme, Man., May 17, June 10, (Criddle).
*Mansonia perturbans* Walk. Aweme, Man., June 30, (Criddle).
182. *Stratiomyia badia* Walk. Beaver Lake, Alta., July, (Halkett).
185. *Odontomyia binotata* Loew. Aweme, Man., Aug. 25, (Fletcher).
359. *Platychirus chætopodus* Will. Metlakatla, B.C., (Keen).
360. *Melanostoma angustatum* Will. Kaslo, B.C., Aug. 16, (Fletcher).
363. *Didea laxa* O.S. Fort Simpson, B.C., Aug. 18, (Keen).
365. *Syrphus diversipes* Macq. Hampton, P.E.I., Aug. 20, (Gibson).
*Syrphus perplexus* Osburn. Millie Lake, Hudson Bay Slope, July 27, (Wilson).
367. *Syrphus protritus* O.S. Metlakatla, B.C., (Keen).
368. *Syrphus xanthostoma* Will. Hampton, P.E.I., Aug. 20, (Gibson); Ottawa, Sept. 4, (Groh).
382. *Sericomyia chrysotoxoides* Macq. Youghall, N.B., July 6, (Gibson).
393. *Helophilus hamatus* Loew. Ottawa, May 13, (Fletcher).
568. *Scatophaga furcata* Say. Banff, Alta., on Sulphur Mountain, May, (Sanson).

### Hemiptera.

In this order some good work has been done during the year by Mr. Geo. A. Moore, of Montreal. Other collectors who previously have devoted considerable time to collecting hemiptera have either omitted to send in records, or have not as yet been able to work up their season's catch. Mr. Moore spent the latter half of July at North Hatley, Que., and among the material which he collected the following, although most of the species may not be particularly uncommon, are of interest, as few definite records from that part of the Province of Quebec are available. All the specimens were collected between the 17th and 31st July, at North Hatley, and were not of common occurrence:

*Entilia sinuata,* Fab.
*Lamenia vulgaris,* Fitch.
*Laccocera vittipennis,* Van D.
*Pissonotus marginatus,* Van D.
*Aphrophora quadrinotata,* Say.
*Agallia 4-punctata* Prov.
*Oncometopia lateralis* Fab.
*Gypona quebecensis* Prov.
*Corimelaena unicolor,* P. B.
*Perillus circumcinctus,* Stal.
*Homoemus aeneifrons,* Say.
*Podisus modestus,* Dall.
*Mormidea lugens,* Fabr.
*Peribalus limbolaris,* Stal.
*Elasmostethus cruciata,* Say.
*Corizus nigrosternum,* Sign.
*Corizus novae-boracensis,* Sign.
*Nysius angustatus,* Uhl.
*Oedancala dorsalis,* Say.
*Lopidea media,* Say.
*Resthenia insignis,* Say.
*Lygus pabulinus,* L.

*Neurocolpus nubilis*, Say.
*Poeciloscytus basalis*, Reut.
*Capsus ater*, L.
*Dicyphus famelicus*, Uhl.
*Diaphnidia pellucida*, Uhl.
*Pilophorus amoenus*, Uhl.
*Rhinocapsus vanduzei*, Uhl.
*Coriscus subcoleoptratus*, Kirby.
*Gerris rufoscutellatus*, Latr.
*Rhagovelia obesa*, Uhl.
*Salda ligata*, Say.
*Salda pallipes*, Fabr.

Besides the above, the following records are of interest, those species taken by Mr. Metcalfe, being new to the Ottawa list:

*Livia maculipennis* Fitch. Ottawa, on pine, April 30, (Metcalfe).

*Livia vernalis* Fitch. Ottawa, on pine, April 30, (Metcalfe).

*Aphalara calthae* Linn. Hull, Que., May 10, (Metcalfe).

*Aphalara marginata* Harris. Hull, Que., June 7, (Metcalfe).

*Psylla carpini* Fitch. Hull, Que., on ironwood, Aug. 25, (Metcalfe).

(The above species of Psyllidae were named by Mr. E. A. Schwarz, of Washington. A number of other species besides these were collected, but Mr. Schwarz reported them to be undescribed.)

*Gypona albosignata* Uhl. Trenton, Ont., Sept. 5, 1 sp., rare, (Evans).

*Athysanus striola* Fall. Trenton, Ont., June 18, 2 sp., rare, (Evans).

*Athysanus instabilis* Van D. Trenton, Ont., 5 sp., June 23, July 21, 23, 28, Aug. 1, (Evans).

*Sehirus cinctus* P. B. Large numbers of this insect were seen by Miss A. M. Rand, at Canaan, N.S., in early April, chiefly being clustered on old leaves under, and near, apple trees. Its occurrence in such large numbers seems to me should be recorded, as it is not a common habit among the Pentatomidæ. Mr. Van Duzee says this is the second instance known to him of this insect appearing in large numbers.

*Corynocoris distinctus* Dall. Sudbury, Ont.; Eldorado, Ont., Sept. 1, (Evans).

*Alydrus pluto* Uhler. Crow's Nest Pass, B.C., (W. S. Drury).

*Alydrus conspersus* Mont. Trenton, Ont., (Evans).

*Alydrus scutellatus* Van D. Crow's Nest Pass, B.C., (W. S. Drury).

*Protenor belfragei* Hagl. Sudbury, Ont.; Eldorado, Ont., Sept. 1, (Evans).

*Phlegyas abbreviatus* Uhler. Belleville, Ont., (Evans).

*Corizus crassicornis* L. Sudbury, Ont., June 23; Hastings Co., Ont., June 26, (Evans).

*Cymus luridus* Stal. Trenton, Ont., Aug. 17, (Evans).

*Ligyrocoris diffussus* Uhler. Trenton, Ont., Sept. 1, (Evans).

*Ligyrocoris contracta* Say. Crow's Nest Pass, B.C., (W. S. Drury).

*Geocoris bullatus* Say. Belleville, Ont., (Evans); N.W.T., (J. Macoun); Crow's Nest Pass, B.C., (W. S. Drury).

*Resthenia insitiva* Say. Belleville, Ont., (Evans).

*Diaphnidia debilis* Uhler. Trenton, Ont., Sept. 3, (Evans).

*Labops burmeisteri* Stal. Sudbury, Ont., 1 sp., (Evans). Mr. Van Duzee remarks, "is new to the Canadian list, and, in fact, new to this continent, so far as published records are concerned. I have seen one more specimen, which was taken in the Adirondacks last summer. It was described from specimens taken in Siberia and Kamschatka."

*Reduviolus roseipennis* Reut. Trenton, Ont., June 7, Sept. 16, (Evans).

*Pygolampis pectoralis* Say. Trenton, Ont., (Evans).

## Orthoptera.

During 1909, Dr. E. M. Walker has examined several small collections of Orthoptera for Canadians. Among these are some species which he considers should be recorded here, and of which he has sent me data. These are as follows:

*Labia minor* Burm. Aweme, Man., June 18, 28, 29, 3 males, 2 females; Sept. 11, 5 males, 2 females, (Criddle).

*Chloealtis abdominalis* Thomas. Regina, Sask., Sept. 5, 1 female, macropterous, (Willing).

*Arphia xanthoptera* Burm. There is a specimen of this insect in the collection of the late Dr. Wm. Brodie, labelled Toronto, 1880. It does not appear to be found about Toronto at the present time, but will doubtless be found on the southern strip along Lake Erie. New to Canada, (E. M. W.).

*Spharagemon bolli* Scudd. Aweme, Man., July 27, 1904, 1 female, (Criddle).

*Spharagemon collare* Scudd. Aweme, Man., Aug. 2, 1904, 1 male, (Criddle). This specimen is remarkably uniform in coloration, closely resembling *S. bolli* in appearance, (E. M. W.).

*Ceuthophilus latens* Scudd. There is a male of this species in the collection of the Ontario Agricultural College, Guelph, labelled, London, Ont. New to Canada, (E. M. W.).

*Oecanthus quadripunctatus* Beut. Aweme, Man., Aug. 21, 26, (Criddle).

## Odonata.

Dr. E. M. Walker, of Toronto, has been good enough to send the following notes, all of which he thinks are worthy of recording in the Record:

*Calopteryx aequabilis* Say. Kenogami River, Hudson Bay Slope, Ont., July 7, 8, Aug. 7, 8, 1904, 4 males (Wilson). These specimens are somewhat stouter than those from more southern localities. They belong to the form described by Hagen as *C. hudsonica.*

*Agrion resolutum* Selys. Regina, Sask., June 20, (Willing).

*Ischnura cervula* Selys. Peachland, B.C., Aug. 20, (Wallis).

*Ophiogomphus occidentis* Hagen. Peachland, B.C., Aug. 6, 2 males, Aug. 17, 1 female, July 8, 1 male, (Wallis). New to Canada, (E. M. W.).

*Gomphus descriptus* Banks. Guelph, Ont., May 27, 1908, 1 male, (A. W. Baker). New to Canada, (E. M. W.).

*Gomphus externus* Selys. Aweme, Man., June 22, 1 male, (Criddle); Winnipeg, Man., (Wallis). New to Canada, (E. M. W.).

*Aeshna umbrosa* Walker. Winnipeg, Man., Sept. 6, (Wallis).

*Aeshna eremita* Scudder. Peachland, B.C., Aug. 3, 2,500 ft., 1 female; Aug. 7, 1 female, (Wallis).

*Aeshna sitchensis* Hagen. Winnipeg, Man., Sept. 6, 1 male, (Wallis).

*Macromia magnifica* Selys. Peachland, B.C., July 24, 31, 2 males (Wallis). Determined by Mr. E. B. Williamson. New to Canada, (E. M. W.).

*Tetragoneuria canis* McLachlan. Sudbury, June 26, 1892; June 11, 1893, 2 males, (Evans).

*Somatochlora albicincta* Burm. Aweme, Man., June 22, 1 female, (Criddle).

*Cordulia shurtleffi* Scudder. Sudbury, Ont., June 11, 1893, 2 males, (Evans).

*Leucorhinia frigida* Hagen. Sudbury, Ont., June 26, 1892, 1 male, 1 female, (Evans).

*Leucorhinia hudsonica* Selys. Winnipeg, June 19, 1 male, 2 females, (Wallis).

*Leucorhinia proxima* Calvert. Winnipeg, June 19, 1 male, (Wallis).

*Leucorhinia borealis* Hagen. Banff, Alta., (Sanson); again taken at Aweme, Man., June 4, 9, 2 females, (Criddle).

*Leucorhinia intacta* Hagen. Winnipeg, June 19, 2 males, (Wallis).

In addition to the above, Dr. Walker has written that he has several undetermined species received from Mr. J. B. Wallis, of Winnipeg, Man. Most of these have been examined, also, by Mr. E. B. Williamson, but seem for the most part to be undescribed. They include an *Argia* from Peachland, B.C., (several specimens), a single female of a peculiar *Gomphus*, from the same locality, and 3 females of a *Somatochlora*, related to *franklini* and *macrotona*, but probably distinct. Dr. Walker also adds: "Among a number of Odonata used for class purposes, in the collection of the Ontario Agricultural College, Guelph, are a single *Perithemis domitia* Drury, and several specimens each of *Libellula vibrans* Fab., and *L. auripennis* Burm. These specimens are unlabelled, but Mr. Caesar, of the Entomological Department, thinks that they were certainly taken in the vicinity of Guelph. They cannot be recorded as undoubted inhabitants of Ontario, but should be looked for by collectors in the southern part of the province.

### Neuropteroid Insects. (Except Odonata.)

With the publication of the list of some Canadian neuropteroid insects, exclusive of Odonata, in the Record for 1908, it was hoped that more work would be done in these groups in 1909. Mr. J. B. Wallis, of Winnipeg, has made another small collection, but all of these have not, as yet, been worked up. During the past year a miscellaneous lot of specimens has been determined by Dr. Banks, and it has been thought advisable, owing to the few authentic records of these insects in Canada, to include the entire list. There is much work to be done yet before we will have even a fair idea of the range of species which occur in Canada. The numbers below refer to the pages in Banks' Catalogue, published in 1907, by the American Entomological Society.

#### Archiptera.

15. *Polymitarcys albus* Say. Winnipeg, Man., Sept. 6, (Wallis).

15. *Hexagenia bilineata* Say. Norman, Ont., July 19, (Wallis).

16. *Hexagenia limbata* Pict. Winnipeg, July 3, (Wallis); Norman, Ont., subimagoes, July 19, (Wallis).

16. *Ephemera simulans* Walk. Ottawa, June 5, (Groh); Norman, Ont., July 19, (Wallis).

20. *Heptagenia interpunctata* Say. Norman, Ont., July 19, (Wallis).

21. *Heptagenia terminata* Walsh. Norman, Ont., July 19, (Wallis).

27. *Chrysopa chlorophana* Burm. Winnipeg, Man., Sept. 8, (Wallis).

27. *Chrysopa coloradensis* Banks. Peachland, B.C., Aug. 8, (Wallis).

*Meleoma verticalis* Banks. Penticton, B.C., Aug. 11, (Wallis).

29. *Myrmeleon immaculatus* De G. Penticton, B.C., Aug. 11, (Wallis).

30. *Brachynemurus abdominalis* Say. Okanagan Falls, B.C., Aug. 13, (Wallis).

31. *Brachynemurus brunneus* Currie. Peachland, B.C., Aug., (Wallis).

#### Neuroptera.

33. *Panorpa rufescens* Ramb. Ottawa, July 14, (Gibson).

#### Trichoptera.

35. *Phryganea cinerea* Walk. Rostrevor, Ont., Sept. 11, (Gibson); Regina, Sask., July 15, (Fletcher); Winnipeg, Man., June 25, (Wallis).

35. *Phryganea vestita* Walk. Sable Island, Aug. 16, (collector unknown).

35. *Neuronia angustipennis* Hagen. McLeod, Alta., June 30, (Fletcher).

35. *Neuronia postica* Walk. London, Ont., July 7, (A. P. Saunders).

36. *Limnephilus luteolus* Banks. Peachland, B.C., Aug. 8, (Wallis).

37. *Limnephilus submonilifer* Walk. Ottawa, Sept. 19, (Gibson), Sept. 26, (Letourneau); Rostrevor, Ont., Sept. 5, (Gibson).

38. *Pycnopsyche scabripennis* Ramb. Rostrevor, Ont., Sept. 4, (Gibson).
39. *Stenophylax pacificus* Banks. Peachland, B.C., Aug. 21, (Wallis).
39. *Platyphylax subfasciata* Say. Ottawa, Sept. 21, (Letourneau).

*Platyphylax alaskensis* Banks. Bartlett Bay, off Glacier Bay, Alaska, June 1, (Nelles).

41. *Apatania pallida* Hagen. Winnipeg, Man., Oct. 1, (Wallis).
42. *Brachycentrus nigrisoma* Banks. Winnipeg, Man., May 28, (Wallis).
45. *Molanna cinerea* Hagen. Rostrevor, Ont., Sept. 2, (Gibson).
45. *Triaenodes flavescens* Banks. Ottawa, June 25, (Gibson).
46. *Mystacides sepulchralis* Walk. Ottawa, Aug. 8, (Fletcher); Norman, Ont., July 19, (Wallis).
47. *Macronema zebrata* Hagen. St. Anne de Bellevue, Que., July 23, (Fletcher).
47. *Hydropsyche scalaris* Hagen. Norman, Ont., July 19, (Wallis).
47. *Hydropsyche sordida* Hagen. Ottawa, July 15, (Gibson).

## Araneida.

The Rev. J. H. Keen, of Metlakatla, British Columbia, made a small collection of spiders, which were submitted to Dr. Nathan Banks. The list of determinations is of interest, owing to the locality, and to the fact that it adds considerably to the known range of some of the species. Dr. Banks considers the records all worth publishing. Unfortunately, no dates are given on which the specimens were collected. There is a good deal of work to be done yet in Canada in finding out what species of spiders we have, and many of our collectors, particularly those living in little worked localities, could help very much in adding to the known distribution of these creatures. The following, all of which were found at Metlakatla, constitute the list:

*Epeira patagiata,* Clerck.
*Epeira displicata,* Htz.
*Epeira californiensis,* Keys.
*Zilla californica,* Bks.
*Labulla altioculata* Keys. Not common, (N. B.).
*Linyphia phrygiana,* Koch.
*Linyphia marginata,* Koch.
*Pedanostethus laticeps* Keys. Previously known to me by a few specimens only, (N. B.).
*Lophocarenum florens,* Cambr.
*Tetragnatha extensa,* Linn.
*Tetragnatha laboriosa,* Hentz.
*Apostenus cinctipes,* Banks. Previously known to me by a few specimens only, (N. B.).
*Clubiona pacifica,* Banks.
*Thanatus rubicundus,* Keys.
*Cybaeus reticulatus,* Simon.
*Amaurobius pictus,* Simon.
*Lycosa brunneiventris,* Banks.
*Pardosa glacialis,* Thorell.
*Dendryphantes bifida,* Banks.
*Sclerobunus brunneus,* Banks.
*Ideobisium threveneti,* Simon.

## IN MEMORIAM—DR. WILLIAM BRODIE.

We regret to have to record the death of another veteran entomologist, in the person of the late Dr. William Brodie, who has recently been contributing a series of articles on galls found in the neighborhood of Toronto. On Saturday, July 31st, he complained of feeling unwell on his return to his home, and a few days later became seriously ill. On Friday, August 6th, he expired. He was born in Peterhead, Aberdeen, Scotland, and came out to Canada with his parents when a child. His father settled on a farm in the County of York about thirty miles from Toronto, and there hewed out of the forest a home for his family. From his earliest years Dr. Brodie exhibited an ardent love of nature in all its aspects, and became an omnivorous reader. This habit formed in childhood continued with him throughout his life. While fitting himself for the profession of dentistry he taught school for a time and became one of the first graduates of the Dental College in Toronto. There he practised his profession very successfully for a long series of years. In 1903, he gave up his work and took charge of the Biological Department of the Provincial Museum. While fully occupied during most of his time with the work of his profession, he most industriously devoted every spare moment to his much-loved study of Entomology. Galls and their inmates had a special fascination for him, and he made large collections of these and many other forms of insect life. His enthusiasm was infectious and inspired many of his younger friends with a love for nature, and especially for the collection and observation of insects. He died at the good old age of seventy-eight years and will be very much missed, not only by the members of his family, but by a large circle of friends. His work at the Museum was most congenial to him, and gave him a happy occupation when his age prohibited him from carrying on his ordinary work. Of his family of six children, three daughters alone survive. To them we extend our deepest sympathy.

I.

Ah! you who own the sovereign sway
  Of commerce and the busy mart,
  You knew him not, he lived apart,
The king who passed in state to-day.

A king who recked not worldly gear,
  A pauper—you who rate by gold,
  But rich in knowledge manifold,
In Nature's lore without a peer.

He lived his threescore years and ten;
  He had his court of liegemen true;
  They loved him, like that chosen few
Who served the Master scorned of men.

"He is no king of ours," you say,
  "We know him not"; yet bare the head,
  Pay you your tribute, he is dead,
I saw him pass in state to-day.

II.

To bow the knee he was not planned
  With willowy grace and pliant form;
  Like stalwart oak he faced the storm
And bore the brunt—a monarch grand.

A shock of rebel locks upreared
  Above the forehead bold and high;
  'Neath shaggy brow the deep-set eye
Challenged enquiry; grizzled beard

Part hid his lip; a man endued
  With power of thought, you read the face;
  The Maker moulds in some for grace,
For strength those rugged features hewed.

In mind and will maturest man,
  A boy at heart; his eager quest
  Of Nature's ways the boy confessed,
But through it all endurance ran.

Bend as they might the sturdy frame
  And quell the lustre of the eye,
  Not years could daunt the purpose high
Or quench the ardent spirit's flame.

III.

Greybeard and youth, a thoughtful throng,
  Would gather round their Scottish sage,
  Right gladly youth give place to age,
Listen and learn and ponder long.

Was life's dark riddle hard to read?
  His vibrant tones would cheer. Were there
  Who questioned truth? who fought despair?
He welcomed all, nor asked their creed.

Did they in earnest seek? He sought
  In earnest too. From bounteous store
  He loved with lavish hand to pour
Jewels of knowledge and of thought.

Responsive hearts, unwavering eyes
  His steadfast gaze compelled again;
  He loved the truth, his speech was plain,
He could not stoop to compromise.

IV.

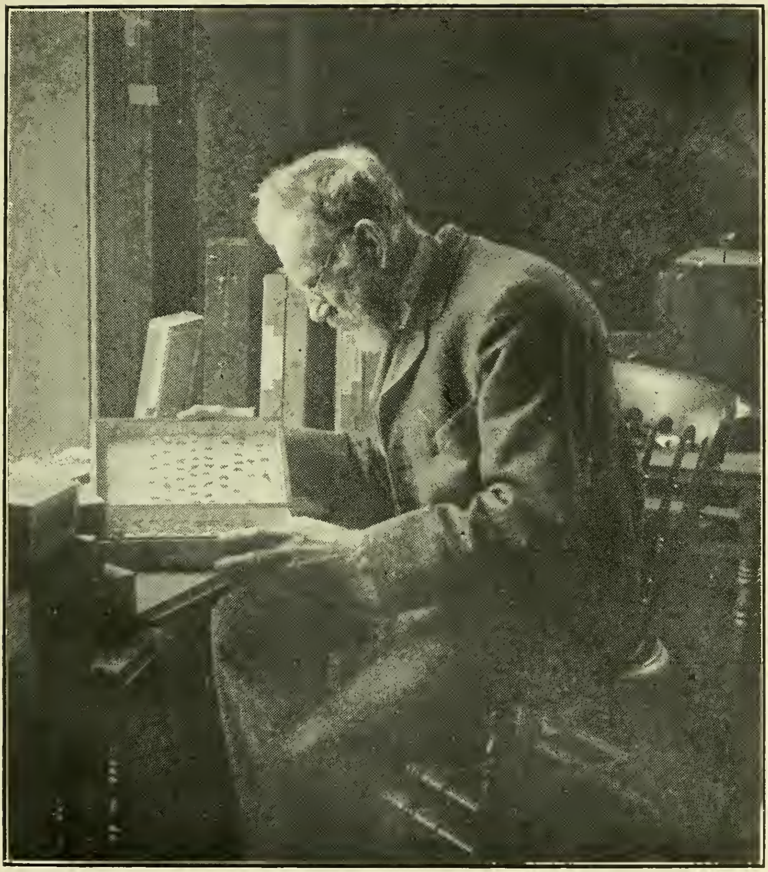
Oh! all too rare the thoughtful mind
  That keeps abreast of Science way
  And still reveres the older day,
The simpler faith that lags behind.

Dead now, but while the ages run
  His work shall live; 'tis such as he
  Alone inspire posterity,
Fathering their kind from son to son.

We know not when our days are sped,
  And I, who through his friendship stand,
  Would lift some falterer by the hand
Ere I lie nerveless with the dead.

Trinity College School, Port Hope .

—Frank Morris.



THE LATE DR WM. BRODIE.


PLATE A.

1. Vein Gall on White Ash. *Eriophyes sp.*
2. Chokecherry Mite Gall. *Eriophyes sp.*
3. Hawthorn Serpentine Gall. *Eriophyes sp.*
4. Manitoba Maple Wart Gall. *Eriophyes sp.*
5. Poison Ivy Mite Gall. *Eriophyes sp.*
6. Birch Bud Gall. *Eriophyes sp.*

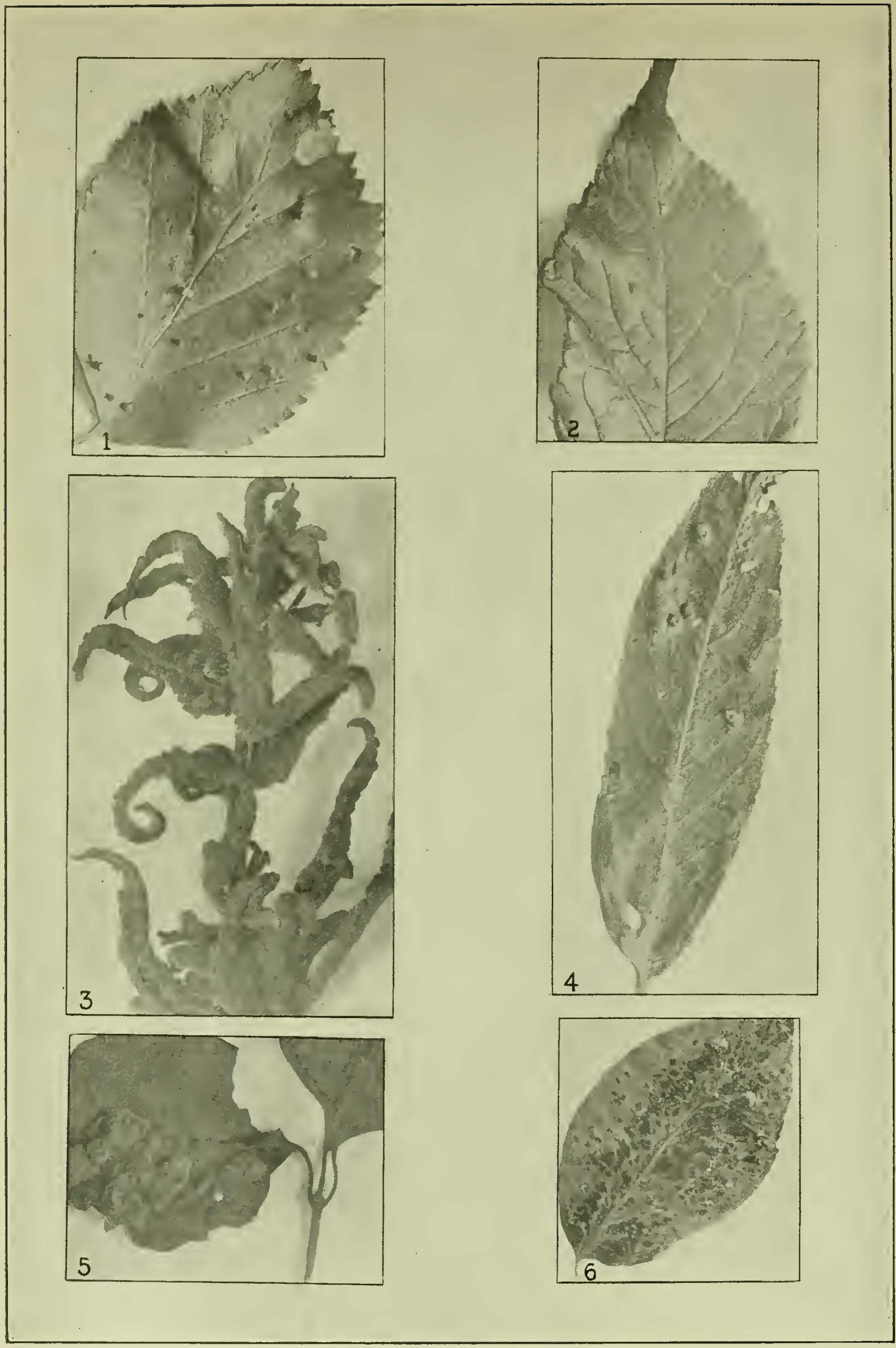


PLATE B.

1. Eriophyes sp., Betula papyrifera.
2. Eriophyes sp., Prunus Americana.
3. Eriophyes sp., Rhus Cotinus.
4. Eriophyes sp., Salix discolor.
5. Eriophyes cephalanthæ, Cephalanthus occidentalis.
6. Eriophyes pyr' sp., Pyrus communis.

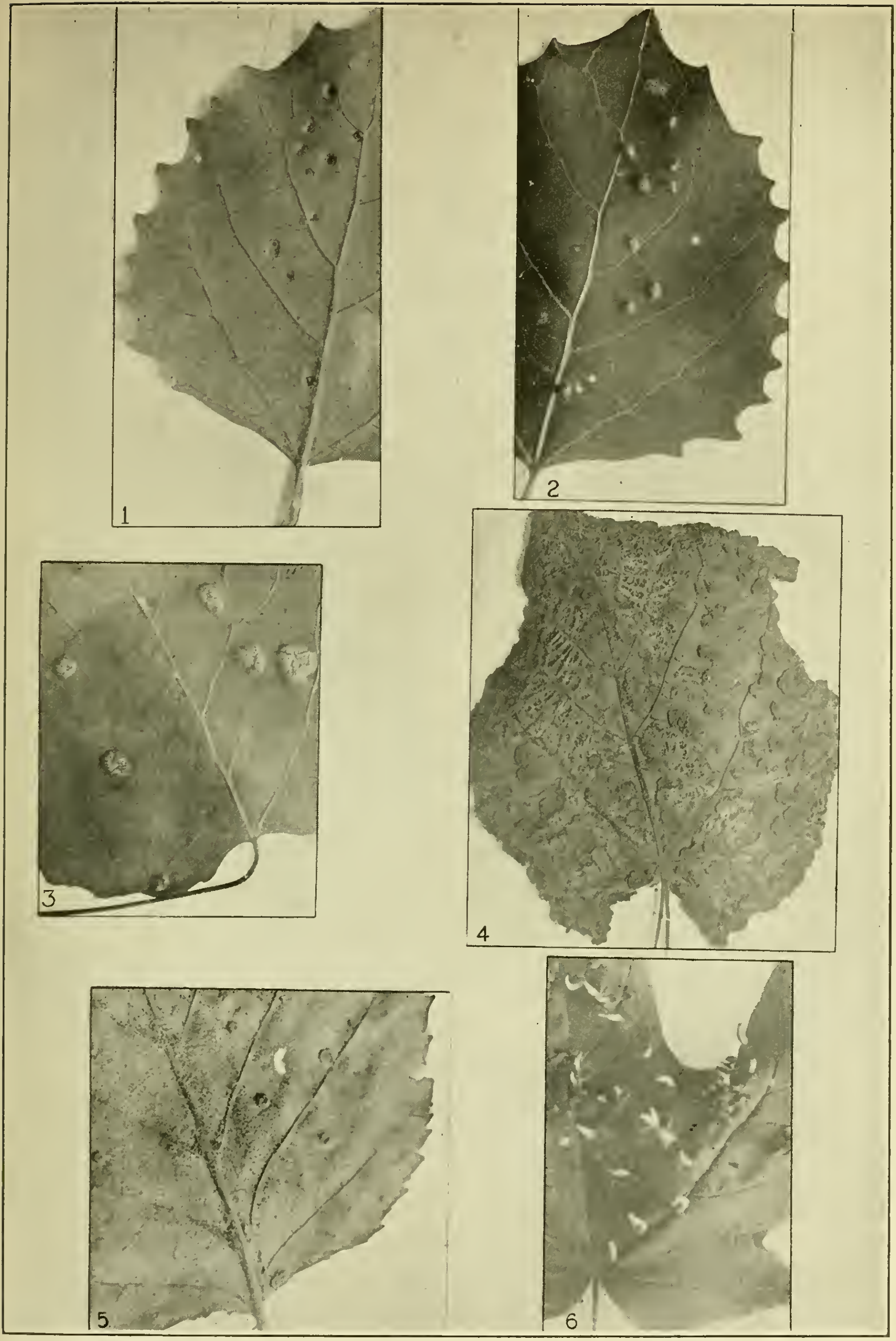



PLATE C.

1. Eriophyes sp., (under surface) Populus grandidentata.
2. Eriophyes sp., (upper surface) Populus grandidentata.
3. Eriophyes sp., Populus tremuloides.
4. Eriophyes sp., Tilia Europea.
5. Eriophyes sp., Betula papyrifera.
6. Phlœoptes aceris, Acer saccharinum.

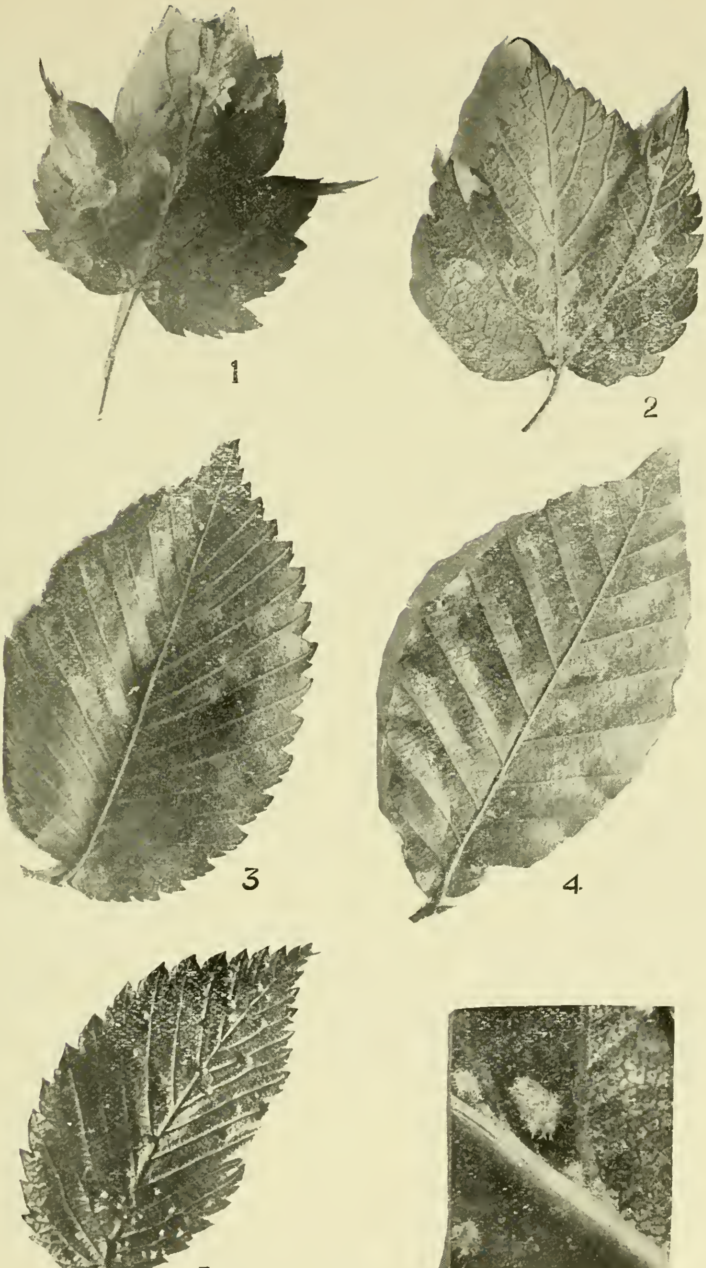


PLATE D.

1. Sugar Maple Pink Frost Gall. *Eriophyes sp.*
2. Manitoba Maple Frost Gall. *Eriophyes sp.*
3. Rock Elm Frst Gall. *Eriophyes sp.*
4. Beech Frost Gall. *Eriophyes sp.*
5. Elm Mite Gall. *Eriophyes ulmi.*
6. Elm Mite Gall. Enlarged opening on under surface.


PLATE E.

1. Eriophyes sp., Amelanchier Canadensis.
2. Eriophyes sp., Juglans nigra.
3. Eriophyes sp., Populus italica.
4. Eriophyes sp., Vitis cordifolia.
5. Eriophyes sp., Salix Iragilis.

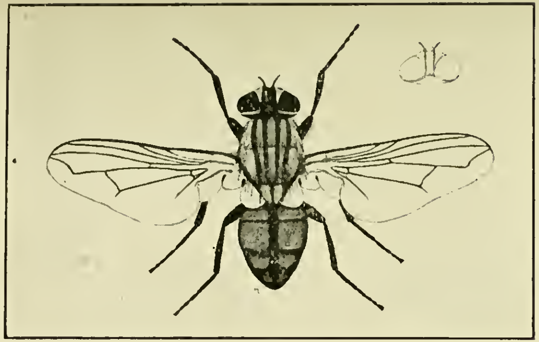


Fig. 1.—The House-Fly, *Musca domestica*, L. Female.

Fig. 2.—The Lesser or Small House-Fly, *Homalomyia canicularis*, L. Male.

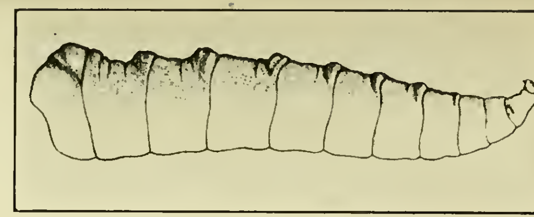


Fig. 3.—Full-grown Larva or "Maggot" of *Musca domestica*.

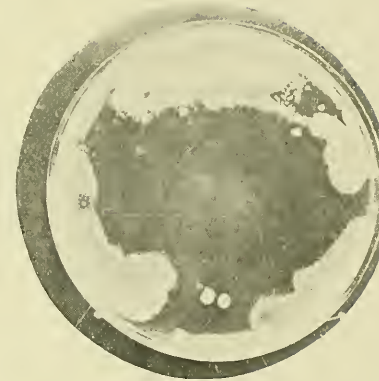


Fig. 4.—Colonies of Bacteria obtained by allowing a fly caught in the open to walk over a culture plate.

Plate F. (See page 36.)

# INDEX.

# FORTY-FIRST ANNUAL REPORT

OF THE

# Entomological Society

## OF ONTARIO

## 1910

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
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Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO.

*To the Honourable John Morison Gibson, K.C., LL.D., etc., etc., etc.*

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present herewith, for the consideration of your Honour, the Report of the Entomological Society of Ontario for 1910.

Respectfully submitted,

JAMES S. DUFF,

*Minister of Agriculture.*

Toronto, 1911.

# CONTENTS.

# FORTY-FIRST ANNUAL REPORT

OF THE

# Entomological Society of Ontario

## 1910

*To the Honourable James S. Duff, Minister of Agriculture.*

Sir,—I have the honour to present herewith the Forty-first Annual Report of the Entomological Society of Ontario.

The Forty-seventh Annual Meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 3rd and 4th, 1910. The proceedings are given in full in the following pages, and include the reports of the various officers and branches of the Society, together with the addresses delivered and the audited financial statement of the Treasurer.

The "Canadian Entomologist," the Society's monthly journal, has been issued regularly during the past year, and has now completed its forty-second volume. It continues to maintain the wide circulation and high scientific value which have characterized it in the past.

I have the honour to be, Sir,

Your obedient servant,

Edmund M. Walker,

*Editor.*

Biological Department,
University of Toronto.

PROFESSOR TENNYSON D. JARVIS, B.S.A. (Ontario Agricultural College, Guelph). President of the Entomological Society of Ontario, 1908-1910.


PLATE A.—1. Work of Lesser Apple Worm. Note the large area injured. 2. Feeding punctures of Plum Curculio made by the new beetles in autumn. 3. Cherry Fruit Flies. (Natural size.) 4. Opened Cherry showing maggot about full-grown inside. (See pages 21 and 24.)

Plate B.—5. Sweet Cherry tree on the left almost completely defoliated by the Slug; tree on the right only slightly injured. 6. Galls on White Spruce caused by *Chermes similis*. 7. Galls on Norway Spruce caused by *Chermes abietis*.
(See pages 24 and 26.)

# Entomological Society of Ontario.

## OFFICERS FOR 1910-1911.

*President*—DR. EDMUND M. WALKER, Lecturer in Zoology, University of Toronto.

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Director of the Experimental Farms of the Dominion.
Bethune, Rev. C. J. S..... Guelph.
Professor of Entomology, Ontario Agricultural College.

# The Entomological Society of Ontario.

## ANNUAL MEETING.

The forty-seventh annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 3rd and 4th. Professor Tennyson D. Jarvis, President of the Society, occupied the chair during the day meetings, and at the evening session the meeting was presided over by Mr. C. C. James, Deputy Minister of Agriculture for Ontario.

Amongst those present were Mr. H. H. Lyman, Montreal; Dr. C. G. Hewitt, Mr. Arthur Gibson and Mr. Groh, Central Experimental Farm, Ottawa; Prof. Swaine, Macdonald College, St. Anne's, P.Q.; Mr. John D. Evans and Miss Evans, Trenton; Mr. F. J. A. Morris, Trinity College School, Port Hope; Dr. E. M. Walker and Messrs. C. W. Nash, J. B. Williams and A. Gummer, Toronto; Prof. Needham, Cornell University, Ithaca, N.Y.; President Creelman, Professors C. A. Zavitz, W. H. Day, S. F. Edwards, E. J. Zavitz, C. J. S. Bethune, Messrs. J. E. Howitt, J. W. Eastham, L. Cæsar, D. H. Jones, Morley Pettit, of the staff; and a number of the students of the Ontario Agricultural College.

Letters expressing regret at their inability to attend were received from Dr. William Saunders, Director of the Dominion Experimental Farms, Ottawa; the Rev. Dr. Fyles, Hull, P.Q.; Prof. Wm. Lochhead, Macdonald College, P.Q.; Messrs. R. C. Treherne and G. E. Sanders, Central Experimental Farm, Ottawa; Messrs. A. F. Winn and G. Chagnon, Montreal; Dr. Watson, Port Hope; Mr. C. E. Grant, Orillia; Mr. A. Cosens and Miss Brodie, Toronto; Mr. R. S. Hamilton, Galt; and Prof. J. Dearness, London.

On Thursday morning a meeting of the Council was held, at which the report of the proceedings during the past year was drawn up, and several questions concerning the welfare of the Society were discussed. Amongst others was the consideration of a proposal to hold the next annual meeting at either Macdonald College, P.Q., or the Experimental Farm at Ottawa. This was referred to the Executive Committee for further action. Dr. Bethune was elected a Life Member, in recognition of his services to the Society since its inception 47 years ago.

In the afternoon the proceedings began with the reading of reports by the Directors on the insects observed in their respective districts during the past season. No report was furnished by Mr. C. W. Nash, Director for District No. 4, East Toronto.

## REPORTS ON INSECTS OF THE YEAR.

### Division No. 1, Ottawa District—Arthur Gibson, Central Experimental Farm, Ottawa.

Throughout the Ottawa district, injurious insects were remarkably abundant during the season of 1910. Most of the regularly-occurring pests were present in greater numbers than usual. The season, on the whole, was much drier than that of 1909, the rainfall being below the average; July and August were particularly dry.

## Attacking Field Crops.

The Hessian Fly (*Mayetiola destructor,* Say) was conspicuously present in wheat fields in the district. In 1909 no trace of it could be detected in fields where it did noticeable injury in 1908. During the past season large numbers of broken-down straws were seen in the middle of July, and all examined contained the well-known "flax seeds." In one plot on the Central Experimental Farm fully 10 per cent. of the plants were infested. The "flax seeds" were just above the first and second joints of the stems.

The Greater Wheat-stem Maggot (*Meromyza americana,* Fitch) again attacked many of the varieties of wheat in the plots on the Central Experimental Farm, but as in 1909, the infestation was not serious. The so-called "silver-tops," or "dead heads," were easily detected in July. The larvæ were full grown about the middle of the month. The insect was present in larger numbers in the varieties of Durum and Emmer wheats.

Cutworms. The Red-backed Cutworm (*Paragrotis ochrogaster,* Gn.) and the Greasy Cutworm (*Agrotis ypsilon,* Rott.) were responsible for much damage throughout the Ottawa district. Rows of young beets were entirely destroyed, radishes were freely attacked, and young cabbages and cauliflowers were cut off soon after planting out. In larger fields many mangels were rendered useless. The cutworms were present in particularly large numbers in the first week of June.

White Grubs were reported as doing some injury, especially to potatoes. A friend of mine, living at Meach Lake, lost many of his potatoes from the work of these larvæ, which ate into them, making large holes and rendering them useless.

Wireworms were also destructive in the district. On one farm, a few miles from Ottawa, land which had been in sod for many years was used for growing celery. Just recently the owner of the place mentioned to me that his celery plants had been practically all destroyed by the wireworms.

Some injury by the Clover Root-borer (*Hylastinus obscurus,* Marsh.) was observed on July 14th. At this time the larvæ were nearly full grown; at one place they had done a good deal of harm to Red Clover. The Green Clover Weevil (*Phytonomus nigrirostris,* Fab.) was also present in injurious numbers in the district. The work of the larvæ was very apparent towards the end of June. On 29th June some mature larvæ were collected; these spun their pretty little cocoons soon afterwards, and the beetles emerged on July 9th: at this date larvæ were still to be found.

The Turnip Flea Beetle (*Phyllotreta vittata,* Fab.) was noticed to be very abundant on young turnips and radishes, particularly the former, on May 27th. These small, very active, shining black beetles are responsible for much damage, but they can be controlled by dusting the plants with Paris green and flour, or Paris green and land plaster, one pound of the former to 20 lbs. of the latter.

Root Maggots. During the present year these very destructive insects have been extremely abundant in eastern Ontario. On the Central Experimental Farm the Radish or Cabbage Maggot destroyed radishes, cabbages and cauliflowers. Onions on the Farm were not attacked by the Onion Maggot, but in my own garden in the city about half of my onions were infested. The Corn-seed Maggot (*Phorbia fusciceps,* Zett.) did a good deal of injury to beans. In some fields examined towards the end of June, where pea beans had been planted, it was seen that the maggots first attacked the cotyledons, but as the plants grew and these were pushed up above the ground the maggots left them, and, in most plants examined, entered the stem, mostly near the roots. In some cases, however, the maggots had burrowed down through the stem from the cotyledons. The important injury caused by this maggot, of course, is in the destruction of the primary shoot. Some white beans, which were planted near these pea beans, were not injured by the maggot. An interesting result obtained in our rearing of these maggots this season was the discovery that root maggots were not altogether responsible for the damage done. From infested radishes we also obtained, in early July, large numbers of the larger fly, *Muscina stabulans,* Fallen. A few specimens were also reared from pea beans. The food of *Muscina stabulans* is chiefly decaying vegetable matter, but it is known to attack growing vegetables. On the 14th October, mature larvæ and puparia of the Radish and Cabbage Maggot were found at the roots of cabbage plants.

## Attacking Fruit Trees.

The Oyster-shell Scale (*Lepidosaphes ulmi,* L.) is very prevalent throughout the district. Apple trees are especially attacked. This autumn large numbers of the fruit bear many of the characteristic scales.

The Cherry and Pear Slug (*Eriocampa cerasi,* Peck.) has this year been again abundant around Ottawa. In September, many of the dull-coloured slimy larvæ were present on plum and cherry trees, as well as on mountain ash. This late brood seldom does serious damage. The foliage of some of the ornamental mountain ash trees on the Experimental Farm was conspicuously eaten, and when the skeletonized portions turned brownish the trees showed the attack very plainly.

The Apple-leaf Hopper (*Empoasca mali,* LeB.) was fairly abundant in apple orchards, and although it apparently did not do any very noticeable injury, its work could be easily seen on the leaves late in the season.

The American Tent Caterpillar (*Malacosoma americana,* Harr.) In spring and early summer many nests of this Tent Caterpillar were observed. The egg clusters were seen in the end of July to be very abundant, and for this reason we will most probably see next year a very much increased outbreak of the insect. Orchardists would do well to look for the nests of this caterpillar next spring, and as soon as they are noticed, cut them off and destroy them.

The Eye-spotted Bud-moth (*Tmetocera ocellana,* Schiff.). This well-known apple pest was abundant in the district the past season, and did much injury in some orchards. At Ottawa this year the larvæ were noticed to be almost full-grown on July 9th.

Other such well-known pests of the apple as the Codling Moth (*Carpocapsa pomonella,* L.), the Woolly Aphis of the Apple (*Schizoneura lanigera,* Hausm.), and the Apple Aphis (*Aphis mali,* Fab.) were, as usual, present in injurious numbers.

## Attacking Forest and Shade Trees.

The Fall Webworm (*Hyphantria textor,* Harr.) was extremely numerous during the season. During my residence in Ottawa, since 1899, I have never seen so much injury by this well-known pest, as was done this year. Apple and wild cherry were the trees principally attacked; some of the smaller trees were entirely defoliated and rendered very unsightly by the many nests they bore. The work of this caterpillar was particularly noticeable in August. The Fall Webworm has been abundant this year all through eastern parts of Canada and the United States. In Maine, in the same month, I saw large numbers of the nests, dozens on a single tree. On July 6th I took from a raspberry bush near Ottawa a large nest, and by actual count it contained 318 larvæ. These varied in size from ⅛ of an inch to ½ an inch in length.

The Spruce Bud-worm (*Tortrix fumiferana,* Clemens). In my report last year I mentioned an outbreak of this insect, which occurred particularly in the Upper Gatineau district, north of Ottawa. We had hoped that the outbreak of 1909 would not be repeated in 1910, but most unfortunately the insect was again present in enormous numbers during the past season, not only in the Upper Gatineau district, but throughout other areas in the Province of Quebec. In the immediate vicinity of Ottawa the larvæ could be found without difficulty on spruce trees, but they were not present near the city in numbers sufficient to do noticeable injury. At Ottawa, this year, many larvæ were mature in the first week in June, and specimens collected at that time produced the moths about two weeks later. On June 27 many empty chrysalides were seen on spruce trees on the grounds of the Central Experimental Farm. Female moths collected on July 16th deposited eggs on July 18, the larvæ hatching 7 days later. On July 23 thousands of the moths were present in store windows on Sparks Street.

The Larch Sawfly (*Nematus erichsonii,* Hartg.), is continuing its ravages all through the district. Many trees were seen which had been entirely defoliated. At Ottawa I found the clusters of the eggs on May 28 and at that time some of the young larvæ were just appearing.

Two other insects were very abundant on larches this year, viz., the Larch Case-bearer (*Coleophora laricella,* Hbn.), and the Woolly Larch Aphid (*Chermes strobilobius,* Kalt.) The Larch Case-bearer made its first appearance at Ottawa, as recorded by the late Dr. Fletcher, in 1905. Since then it has not been abundant until the present year. The attack this year was very apparent early in May. The moths began to emerge towards the end of that month. On June 15, moths were seen in numbers around the trees. This autumn the larvæ are plentiful on the trees, in their small incomplete cases. On May 27, the larches on the Central Experimental Farm were abundantly infested with the Woolly Larch Aphid. Clusters of the brownish eggs were found at the fascicles of the leaves on this date, and the young woolly aphids were scattered all over the leaves, the white woolly secretion being very conspicuous. The young were small and had only recently hatched. From one egg mass brought into the Division, some young emerged May 31.

The White-cedar Twig Borer (*Argyresthia thuiella,* Pack.) is this year again present in numbers throughout the district. It is not, however, as numerous as it was in 1905 and 1906. The tiny green larvæ of this species bore inside of the young tips of white cedar, causing the same to die, which injury, of course, is conspicuous and gives the trees a sickly appearance. The partly grown larva passes the winter within the twig where it has been working.

The Maple Phenacoccus (*Phenacoccus acericola,* King). On many of the trunks and lower branches of maple trees along the streets of Ottawa there are, at the present time, small, but conspicuous deposits of a cotton-like waxy secretion beneath which are colonies of this insect. Towards the end of September adult females, which are light yellow in colour and about one-fifth of an inch long, were found and large numbers of eggs. These latter were noticed to be hatching on Oct. 13. The young larvæ, which winter on the trees, were, on hatching, white with a yellowish tinge on the dorsum. As yet the trees are not seriously infested but the insect has increased abundantly this year and, as it is capable of doing important injury, if this continues, the trees may, of course, require some treatment. This is the first record of the Maple Phenacoccus occurring in the Ottawa district.

An interesting outbreak of the small Curculionid beetle, *Orchestes rufipes*, Lec., occurred locally on willow toward the end of May and during the first half of June. The beetles were first noticed on a large laurel-leaved willow, (*Salix pentandra*, L.), on the Experimental Farm, on May 31; four days later the beetles were more plentiful and by the 15th of June they were quite numerous and their work very noticeable. While the beetles did not do any serious injury their habit of eating small, round holes into the epidermis on the underside of the leaves, destroyed, of course, the beauty of the foliage to a marked degree. In one leaf, which measured 2¼ inches long by 1 inch wide, at its widest part, I counted 329 of these little holes. When standing beneath a tree and looking up among the foliage the work of this insect is very conspicuous.

The Butternut Tingis (*Corythuca arcuata*, Say.) At Chelsea, Que., Mr. Herbert Groh found a pretty little lace-bug in large numbers on butternut on June 20. The species answers to the description by Fitch of *C. arcuata* which appears in "Packard's Forest Insects." The species is known to occur also on birch, willow and other trees. The injury is done by the insects puncturing the leaves and sucking the juices.

The Pine Bark Aphid (*Chermes pinicorticis*, Fitch.) This insect is abundant on some white pine trees at the present time near Ottawa. The trunk of one large tree recently under observation is much infested with the aphid, and the patches of the flocculent downy matter give the trunk a very white appearance not unlike snow. A Syrphid larva is present in numbers feeding upon the aphides.

Plant Lice were extremely abundant on shade trees. The large green aphis on cut-leaved birches occurred in great numbers. In the middle of September the trees showed conspicuously the result of the attack. Manitoba maples were heavily infested with plant lice. The Elm Leaf Woolly Aphid was again injurious. The Snowball Aphis rendered unsightly the foliage of many beautiful Virburnums in gardens.

The Fall Cankerworm (*Anisopteryx pometaria*, Harris) was noticed in numbers on basswood and other trees. At the end of May the work of the larvæ was very apparent.

The Birch Leaf Skeletonizer (*Bucculatrix canadensisella*, Chamb.). The presence of this insect on cut-leaved birches was apparent in August and September; on September 16th some full-grown larvæ were seen. The small white pseudo-cocoons, which are made by the larvæ as temporary shelters during the time they are moulting, were conspicuous on the leaves.

## Greenhouse and Flower Gardens.

Of the greenhouse insects which were specially troublesome in the district, the following may be briefly mentioned:

The Greenhouse Leaf-tyer (*Phlyctænia ferrugalis*, Hbn.) occurred in large numbers in the houses of one of our local florists; roses were chiefly attacked. In the same house, last month, a small black Thrip was doing considerable injury to the buds of roses. The White Fly is troublesome in some houses, attacking a large variety of plants; it was noticed to be working particularly on *Coleus* and *Primula*.

In flower gardens the worst insect of the year was the Tarnished Plant Bug (*Lygus pratensis*, L.). This insect does a tremendous amount of damage almost every year to all kinds of flowering plants. It takes a special delight in destroying the tender buds.

The Four-lined Leaf Bug (*Pœcilocapsus lineatus*. Fab.) was found destroying dahlias in July; it attacked the leaves and buds. Many of these insects, as well as of the Tarnished Plant Bug, can be destroyed by spraying the infested plants with either kerosene emulsion or whale-oil soap. They can also be jarred from the plants into an inverted umbrella and then put into a receptacle containing coal oil and water.

The Grape-vine Leaf-hopper (*Typhlocyba*) occurred abundantly the past season. Virginia creepers all through the city of Ottawa were severely infested, and before the middle of July much of the foliage had turned whitish in places, owing to the attack of the insect.

The Destructive Pea Aphis (*Nectarophora pisi*, Kalt.) was again present in the district, but was not particularly injurious. Small colonies were seen on field peas at the end of July, but later it was found in numbers on sweet peas in gardens. In my own garden, the parasite *Praon cerasaphis*, Fitch. did good service in reducing the numbers of the plant louse; the lady-bird beetles (*Hippodamia convergens*, Guer., *Adalia bipunctata*, L., and *Coccinella transversoguttata*, Fab.) were also present in fair numbers, feeding upon the aphis.

The Curled Rose Worm (*Emphytus cinctipes*, Nort.) was more than usually abundant, and infested roses could be seen in many gardens. The larvæ were particularly noticed in the middle of July, when they were about full-grown and when their work was easily detected. This is an extremely easy insect to control, and there is no reason why beautiful rose bushes should be rendered unsightly by the attacks of this false caterpillar. A weak Paris green mixture sprayed over the bushes will quickly destroy all the larvæ on the leaves.

## Household Insects.

All of the worst household insects were present in Ottawa during the year. Cockroaches were complained of from many sources. The Buffalo Carpet Beetle was abundant in some houses, and caused a good deal of anxiety. Both of the two common Clothes Moths were especially numerous, and much havoc was wrought in houses where woollen clothing, furs, etc., had carelessly been left to hang in cupboards during the summer. A few weeks ago I saw a beautiful Persian lambskin coat, which had been practically destroyed by the larvæ of the Southern Clothes Moth (*Tineola biselliella*, Hum.). Although called the Southern Clothes Moth, this insect, unfortunately for us, does not confine its work of destruction to localities to the south of us. The Black Carpet Beetle (*Attagenus piceus*, Oliv.), during the winter of 1909-1910, was present in destructive numbers. In one instance, that came under my notice, these insects did serious injury. In two cupboards, the contents of which had not been examined for some months, damage was done to woollen goods, and also to a beaver collar of a fur-lined coat. Larvæ noticed in the early part of April were from 6 to 10 mm. in length.

## Division No. 5, Port Hope District—F. J. A. Morris, Port Hope.

Owing to prolonged absence I have had little opportunity of direct observations. At the end of September I interviewed a young farmer east of the town, whose orchards two or three seasons ago were badly infested with the Oyster-shell Bark-louse. He tells me that the pest has almost entirely disappeared in the neighbourhood; and this good result he believes is due to careful cleaning and spraying under advice from the Agricultural Department.

Mr. Hume, a well-known seedsman in Port Hope, who is a large grower of peas, informs me that a greenish black louse (presumably *Nectarophora destructor*) has been abundant this year, far more so than he has ever found it before; he thought that it was most prevalent just after damp spells in the hottest part of the season; this would be rather contrary to the habit of most plant lice which multiply in dry seasons. The insect had destroyed a great many of his pea-vines.

The larva of the SAW-FLY (*Selandria cerasi*) has been abundant in our neighbourhood this season, and has completely destroyed the foliage of some trees. Mr. Mitchell, of the Ontario Gardens, had some young pear trees stripped; a neighbour some cherry trees; and in one orchard the larva was found prevalent on plum trees, as well as cherry and pear. The damage in all cases was done by the later brood at the end of August and in September.

The larva of *Rhagoletis pomonella* (the APPLE MAGGOT) has been quite a severe pest in our neighbourhood, chiefly affecting the early apples; a great many of the apples that ripen in September were attacked by this fly, and the fruit fell to the ground spoiled. In the east section of Port Hope the apple-pickers complain of the damage done by the "Railroad Worm," or by some disease that turns the flesh of the apple to a woody consistency and causes the fruit to develop irregularly; on the outside the apple has a gnarled and deformed appearance. This does not appear to be caused by an insect, though one apple-picker assured me that "the railroad worm" was not a grub, but a name given to the green fibrous thread that sometimes showed in the flesh of the apple where it had turned woody. In some orchards the entire crop was ruined; in all the affected area the apples that were gathered were marked second grade. It was first noticed in Snow apples, but Talmon Sweets were also affected, and the worst sufferers were Spies.

The day after returning to Port Hope I examined a large field of asparagus north of the town, and found both species of asparagus beetle fairly abundant; it was three years ago that I first found *Crioceris 12-punctatus* so far east, and this season of 1910 is the first in which the other species (*C. asparagi*) has come under my notice. The spotted kind was more abundant than the more recent arrival in the neighbourhood. I examined two other asparagus beds, east and north-east of the town; in each case the two species were present. Larvæ as well as beetles were observed in the foliage as late as the 20th of September. They do not appear to do much harm to the full grown plant, and there was little sign of the spring brood having wrought havoc; the asparagus rows appeared well filled, as though few heads had been destroyed at the beginning of the season.

To turn from economics, some remarkable gatherings of butterflies were noticed this year; Mr. Mitchell, of the Ontario Gardens, saw great masses of a yellow butterfly along the road sides while driving through the country. This was doubtless one of the Clouded Yellows (*Colias philodice*). In August, too, were noticed in two or three parts near Port Hope, millions of the Milkweed Butterfly (*Anosia plexippus*). In one case a small beech wood was filled with swarms of this butterfly, so that the branches of the trees appeared as if covered with brown foliage; if a stick was thrown up, myriads of the insects rose into the air and settled down again.

In the order Coleoptera, nothing new was taken by myself, and Dr. Watson, my fellow-collector, noticed nothing much that was unusual in our collecting grounds, though few of our old friends about the blossoms and foliage failed to return to their haunts as usual. On June 26th were captured one or two specimens of *Acmæops proteus* settling on a pine trunk; and between that date and July 13th were taken some five or six specimens of *Neoclytus erythrocephalus* on the trunk of a felled oak. From the latter date till August 7 were found some specimens of *Leptostylus* resorting to a pile of oak billets at the same spot; they appeared to be about to oviposit between the bark and the wood at the ends of the billets, probably attracted by the smell of fermenting sap. Two species of *Oberea* were captured between June 26 and July 13, one feeding in dogwood blossom, the other resting on raspberry foliage. About raspberry foliage, too, as well as about basswood leaves there were more specimens of *Agrilus* than usual seen, mostly of two species, *ruficollis* and *anxius*.

Among Hymenoptera, the Horn-tails seem to have been active on the young elms bordering some of our residential streets; I found in October as many as three females of *Tremex columba* imprisoned in the bark of one young elm.

### Division No. 2, Orillia District—C. E. Grant.

The season of 1910 was again, like 1909, very cold and late in spring, the warmest weather 73° in the shade occurred in March, in which month the temperature was over 70° on three different occasions (though we did not have much warm weather until near the middle of June), and several species of moths were taken by me at light in March, an unusual occurrence here.

Injurious insects were not remarkably plentiful. Complaints were made of the turnip-root maggot, in fact late sown turnips were almost a failure from the depredations of this insect. The Raspberry Cane-Girdler (*Oberea bimaculata*) was noticeably abundant; in some gardens the broken tops of the canes looked as if someone had been going through the patch with a stick. The apple crop was almost a failure here; I have reason to suppose that it was caused by the very wet weather which occurred during the time the trees were in blossom, and in consequence the bees had no chance to carry the pollen for fertilization. *Carpocapsa pomonella* should be rare next year if scarcity of food lessens their numbers.

Canker Worms were very common here this spring; the moth of these and of *Erannis tiliaria* are in great numbers around my lamp as I write this, October 25.

*Nematus ribesii*, the Currant Worm, was very prevalent, and the first brood coming in the wet season of this year made it almost impossible to keep any insecticide on the plants long enough to check their ravages.

On a hedge of hawthorn a species of Schizoneura was so plentiful that the trees appeared as if they had been whitewashed. On examination it closely resembled the alder louse, on which *Feniseca tarquinius* feeds.

During a wind storm in July a large quantity of maple trees, or large limbs of the same, were broken. This occurred particularly in two or three localities where the trees were full of the burrows of the Pigeon Tremex (*Tremex columba*), and many of the grubs and even parts of the perfect insect were present; there seemed to be no other reason for their rotten appearance except what might be from heavy top pruning. I have taken some moths this season which are rare to me, viz., *Fentonia martesia, Elida caniplaga, Notodonta simplaria, Plusia oxygramma, Syneda Alleni,* etc.

### Division No. 6, Galt District—R. S. Hamilton.

The weather conditions in this district during the past spring and summer have not been favourable for insect life, and as a consequence fruit growers, nurserymen and the farming community in general have had little to contend against in the way of insect pests.

It is rather remarkable that plant lice, which were responsible for considerable damage in the orchard and field in 1909, were scarcely in evidence this season. The same is true of the cutworms and the codling moth.

Slight exceptions to the general freedom from insect pests were the Colorado potato beetles, which were unusually abundant. Some complaint was also made of the ravages of the CANKERWORM (*Paleacrita vernata*), which did some injury to the beech, maple and apple trees. Maple trees in Galt and vicinity have been attacked by the PIGEON TREMEX (*Tremex columba*), but investigation showed that no very serious injury has been done.

### DIVISION NO. 3, TORONTO DISTRICT—J. B. WILLIAMS, TORONTO.

I have been away in England most of the summer; so that the only matter on which I can report anything is the well-worn subject of the TUSSOCK MOTH.

These insects have been very numerous in Toronto during the past summer, and I have noticed quite a large number of trees that have been seriously damaged by them, nothing being left on large portions of the foliage, except the veins of the leaves.

Our Park Commissioner obtained, this autumn, a grant of $3,500 for the purpose of collecting the egg masses of the cocoons; and, I believe, he is employing three gangs of men in this work as long as the fund lasts; but the egg masses must be more generally collected in the private grounds and gardens of the city if the work is to be really successful.

Great numbers of the cocoons this year were found on two apple trees in the garden of the house where I live, though there were no signs that the caterpillars had been feeding on the leaves of these trees. I picked a large handful of the egg masses off them a few days ago; and so did a little towards the destruction of this troublesome pest.

### DIVISION NO. 7, NIAGARA DISTRICT—R. C. TREHERNE.

I have the honour to present my first report as representative for the Niagara District.

I regret to say that my report must be lacking in detail, for the reason that I have been absent from the district for a greater part of the summer, consequently I am compiling this report with the assistance of friends residing in the district and from a few notes I had in hand previous to leaving the district.

The fruit-growers of the Niagara district are still greatly troubled by several very serious insect pests. There are four insects which are present every year, and which, I regretfully have to believe, are yearly increasing over a larger area. These four are—

1. The CODLING MOTH (*Carpocapsa pomonella*).
2. The PLUM CURCULIO (*Conotrachelus nenuphar*).
3. The SAN JOSE SCALE (*Aspidiotus perniciosus*).
4. SHOT HOLE BORER (*Scolytus rugulosus*).

In none of these cases am I able to give figures or statistics, showing effects of spraying or degrees of infestation. I can merely mention them as being the most serious pests with which the fruit-grower has to contend.

The CODLING MOTH has been more than ever abundant this year, especially so in unsprayed orchards. Even in cases where orchards have been sprayed at the correct time and with the right mixtures two or three times during the summer, the results have been disappointing. In orchards where the trees are attended to several years in succession satisfying results with sprays have been obtained, thus demonstrating that combined and continued attack on this insect results in success.

The Plum Curculio during this last summer has been more plentiful than usual, at least not perhaps in point of numbers, but in comparison with the fruit crop, which has been light. The early spring and blossoming period was cold and wet, and it was hoped that these climatic conditions, while reducing the fruit yield, would also affect the numbers of this insect. Later reports show, however, that it was as much in evidence as usual, if anything, attacking a larger proportion of the fruit crop.

This insect attacks a variety of fruits, and the members of the Entomological Society should be urged to regard this insect with more attention. More observations are needed on the best time to spray. It is considered best to use an insoluble poison in a spray and to coat the leaves and the small developing fruits with it. But whether to spray early or late is the point to be determined. If spray is applied too early the calyx cup protects the young plum and when, in course of a few days, the calyx cup drops off, the plum is left clean and free for attack.

The San José Scale is steadily increasing, despite the greater number of men who are spraying, and if my information is correct, spreading to new orchards. I saw an excellent result of a spraying with lime sulphur (commercial) on a tree well encrusted.

The Shot Hole Borer is well on the level with the above insects in the matter of destructibility. We have no definite practical means of fighting it, and its attack usually means death to the tree. Such injury cannot be said of the other insects which we can fight with a more reasonable hope of success. The destruction of worthless trees and the cleaning up of lumber piles and fence corners cannot be too strongly advised.

There are other insects which have been more or less plentiful this year. The Pear Tree Slug (*Eriocampa cerasi*) has been particularly abundant on young cherry trees throughout the entire district. The Currant Aphis (*Myzus ribis*), an insect causing currant leaves to discolour and fall prematurely, has been commonly seen. The Snowy Tree Cricket (*Œcanthus niveus*) has been more abundant than usual attacking in particular the raspberry. The Grape Berry Worm is reported from St. Catharines vineyards. Aphids common to the apple, which were reported in numbers last year, were present in considerably reduced numbers this year. The Woolly Aphis (*Schizoneura lanigera*), considered to be one of the worst pests of the apple in more temperate climes, is fortunately by no means abundant in the Niagara District. It is present, however, throughout the entire district, making itself shown in pruning scars and cracks and crevices of the bark. Its numbers are very small, but perhaps 25 per cent. of the apple trees of the district harbour, to a greater or lesser extent, a few of these insects. My observations, in this regard, only extend over comparatively few orchards.

One other insect might be mentioned as causing considerable annoyance to certain fruit-growers who were planting out sweet cherry trees this spring. It is a species of wood-boring wasp, the name of which has not yet been determined. This spring, on my own farm, I had occasion to set out upwards of 500 sweet cherries of various varieties. After they had taken a fair hold of the ground I pruned them, leaving merely a straight stem standing. The central portion of the stem is soft and pithy, and it is not for several weeks after pruning that the exposed surface hardens. One day, going over these trees, I noticed small, round holes bored down the soft, central pith and some castings of wood on the leaves below. Over 300 of my 500 trees were attacked in this way, the holes extending down the stem upwards of three inches. Stored snugly and tightly in some of these holes were numerous aphids. The cause of this injury was, apparently, one of the wood-boring wasps. Adults were captured and taken to Ottawa for identification.*

I heard of two other cases, within a radius of three miles of Grimsby, in which young cherry trees were attacked, and while the injury was not serious, it was distinctly annoying to have to rehead your trees. I punched out the aphids and filled the holes with a lime and lead arsenate paste as remedies.

I have to thank Messrs. Tennyson D. Jarvis and Wilfred Ryan for their assistance in this report, and also Dr. C. Gordon Hewitt, Dominion Entomologist, who has kindly allowed me to incorporate a few notes, which were obtained under his authority.

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## Insects of the Year in Ontario—Lawson Caesar, B.A.; B.S.A., Ontario Agricultural College, Guelph.

Orchard Insects—Codling Moth (*Carpocapsa pomonella*). The apple crop was very light this year and, as usually happens in such cases, a large percentage of the fruit was wormy. Many would place the amount of damage in unsprayed orchards at 50 per cent. of the total crop; it will probably be safe to estimate it at at least 40 per cent. Much more spraying than usual was done and fruit-growers are gradually learning that to get the best results they must do the work not only at the right time, but also very thoroughly. In every case very satisfactory results have followed good work; in fact it is a long time since the benefits of spraying were so clearly demonstrated. This is partly because the season was so favourable to the development of Apple Scab that only in sprayed orchards in many districts could any clean fruit be purchased.

Lesser Apple Worm (*Enarmonia prunivora*), Plate A, Fig. 1. While probably not more than 2 to 5 per cent. of the wormy apples of the Province could be attributed to attacks of the Lesser Apple Worm, individual orchards were discovered where the percentage was much higher. For instance, in one orchard near Guelph, fruit on the ground in October showed that 38 injuries out of a total of 80 had been caused by this insect; the rest were due to Codling Moth. Fruit purchased on the market from farmers in the vicinity of Guelph showed a considerable number of Lesser Apple Worm injuries. It is easy to find the larvæ in haws in this district up to almost the end of October. Specimens for class study each year are obtained from this source. The same spray as for Codling Moth seems to control this pest fairly well. It is just probable, however, that an additional spray with arsenate of lead about the first week in August would help greatly.

Plum Curculio (*Conotrachelus nenuphar*), Plate A, Fig. 2 (p. 7). Observations the last two years in various parts of the Province show that the damage to apples from the fall feeding of the new adults is very great in many districts. Wherever orchards are neglected or are situated near good hiding-places for winter quarters, such as woods, a large percentage of the apples, especially of the rougher skinned varieties, are rendered unsaleable by feeding punctures made from about the middle of August up into October. Thorough cultivation of the soil and the

* This insect, through the kindness of Dr. L. O. Howard, of the Bureau of Entomology, Washington, has been determined by Mr. S. A. Rohwer as *Cemonus inornatus* Say.

removal of rubbish of every kind has been observed in many cases to be quite as important as spraying in controlling this pest.

MR. GIBSON: What is the largest hole you found?

MR. CAESAR: There are often several small holes close together which may be worked into one large hole. The injured area is usually from ⅛ to ¼ of an inch. in diameter, and quite circular.

DR. HEWITT: We have had a number of cases of where the holes are large. In some cases I think wasps have been responsible for the enlargement.

APPLE MAGGOT OR RAILROAD WORM (*Rhagoletis pomonella*). It has usually been supposed that this insect was found only in Prince Edward County and in a few orchards not far away on the mainland. In reality it is much more extensively distributed than has been suspected, and can probably be found here and there throughout most of the Province, though there are many orchards quite free from it. Infested apples have either been sent in from the following counties, or have personally been observed by the writer in them: Prince Edward, Hastings, Northumberland, Durham, Ontario and Lincoln. The insect seems to be worse on trees in villages or towns, wherever there is good shelter. In such places it has been seen to be very severe on Spy, Snow, Alexander and Tolman Sweet varieties, almost every apple being so badly attacked as to be much deformed and useless. Adults did not appear until July 15th this year east of Toronto. Methods of control in co-operation with the fruit-growers are being planned for the coming season. At present the prompt destruction of fallen fruit from August 1st to the end of the season is the remedy commonly advocated.

MR. NASH: We have found as yet that the only method of control is absolutely rigid destruction of the fallen fruit.

MR. CAESAR: Has it been proven that the larvæ never emerge from the fruit before it falls?

MR. SWAINE: The evidence points that way.

MR. CAESAR: Have all the maggots come out after the apples have fallen in your tests?

MR. SWAINE: I do not think any come out till then. Sometimes the maggots are very small, but I have always had the impression that they did not come out until a short time after the apples drop, but I am not certain about it.

MR. CAESAR: I have seen a number of cases this year that seem to me to make that doubtful.

MR. JARVIS: Have you made sure it was the Apple Maggot in the Niagara district?

MR. CAESAR: The external injury and the appearance of the larva itself corresponded so exactly with the genuine thing that I have no doubt that it was the Apple Maggot I found in that district.

DR. HEWITT: The way to breed them is to get apples that have just fallen and put them in a box containing soil, and allow the maggots to come out.

MR. CAESAR: I saw, I suppose, one hundred in Michigan that had changed to pupæ even without any soil. They came out of apples that had been placed in a vessel for another purpose. This merely shows how readily they change to the pupal stage.

MR. HOWITT: Do the apples always fall when attacked?

MR. CAESAR: They often remain on the trees until quite late. Some Tolman Sweets that are attacked might be still found on the trees, but as a rule they fall earlier than they otherwise would.

DR. HEWITT: They ripen prematurely.

Mr. Caesar: I have seen some orchards where Spies nearly all fell two or three weeks prematurely.

Dr. Hewitt: I could give you a practical illustration in regard to control by destruction of the fruit. One of the most serious places for the Apple Maggot has been in the orchards around Como, in Quebec, and Mr. Shepherd told me that he had cleared them out of his own orchard by destroying the fallen fruit.

Mr. Swaine: That case is the standard one quoted for the Apple Maggot all over the northern part of Eastern United States.

Mr. Caesar: I was aware of Mr. Shepherd's experience, and was much interested in it.

Mr. Swaine: He was particularly careful in his work.

## Aphids of the Orchard.

These insects were not nearly so abundant this year as last, and only in a few cases were there any complaints of damage. Our most common species of green apple aphis is evidently *Aphis avenæ,* Fab. In a few orchards specimens of a rosy aphis, probably *Aphis pyri,* Boyer, were seen. On the sweet cherry the Black Aphis (*Myzus cerasi,* Fab.) was fairly abundant in the early part of the season, and caused considerable loss.

The Woolly Aphis (*Schizoneura lanigera*) was rather more abundant than usual. So far as I know this pest does not attack the roots to any appreciable extent. On the branches it can easily be destroyed by a spray of kerosene emulsion forcibly applied.

Mr. Caesar: Have you got the Rosy Apple Aphis at Montreal, Mr. Swaine?

Mr. Swaine: It is fairly abundant this fall.

Dr. Hewitt: *Aphis sorbi* is quite abundant in the West.

Mr. Caesar: What is your common green aphis on the apple?

Mr. Swaine: *Aphis pomi* (DeGeer).

Oyster-shell Scale (*Lepidosaphes ulmi*). This pest is rapidly being brought into subjection in all the best apple districts by the use of the lime-sulphur wash. This spray is rapidly displacing all others for this purpose, and wherever it is continued year after year it completely frees the orchard from the scale.

San José Scale (*Aspidiotus perniciosus*). Though specimens of San José Scale have been sent in this year from Northumberland County and last year from Prince Edward County, it is still doubtful whether it is capable of establishing itself firmly in these colder districts. Lime-sulphur is the standard remedy.

Blister Mite (*Eriophyes pyri*). This mite is now to be found in almost every district in the Province, although many orchards here and there are still exempt. It may prove a blessing in disguise, as it will in many cases force the farmer to spray his trees rather than let them look so unsightly and be so greatly injured. Lime-sulphur applied just as the buds are bursting has given very satisfactory results both last year and this.

Mr. Jarvis: Do you think it has spread so rapidly, or are people just opening their eyes and noticing it?

Mr. Caesar: In my brother's orchard there were only two pear trees, on which this had evidently been brought in. Those two trees two years ago were completely infested. To-day almost every tree in the whole orchard is attacked.

Mr. Jarvis: Five or six years ago I found it nearly everywhere in the Province.

Mr. Caesar: The fruit-growers tell me that in orchards where they are not spraying with lime-sulphur it has been spreading very rapidly. It certainly is all over the Province, though not in every orchard, by any means, but in every district.

Mr. Gibson: Dr. Fletcher used to say that where you can find a pear tree you will find a Blister Mite all over Canada.

Mr. Caesar: It is probably found now more on the apple than on the pear.

Anametis Grisea. Specimens of this Snout Beetle and of apple leaves injured by it were sent this year from Albury, Prince Edward County, and Grafton, Northumberland County. In the latter place it was suspected also of feeding on the bark of apple twigs. The beetles are nocturnal in their habits, so far as could be learned. In the day time they hide under loose bark on the tree. Specimens of injured leaves obtained at Albury, early in July, showed that they fed around the margin, causing it to become very jagged.

Pear Psylla (*Psylla pyricola*). It is several years since this tiny pest has been so abundant in the Niagara district as this year. In many cases the spring application of lime-sulphur should have been supplemented by the use of kerosene emulsion soon after the leaves had opened.

Pear and Cherry Slug (*Eriocampoides limacina*), Plate B, Fig. 5. Neglect to control this pest has led to its becoming exceedingly abundant the last two years. Many otherwise good cherry orchards have been rendered unsightly by the feeding of the slugs on the leaves. Young trees are most subject to attack, and are usually the ones most likely to be overlooked until the damage has been done. Plum trees were attacked in some places, as well as sweet and sour cherries and pears. Arsenate of lead readily controls the insect.

Cherry Fruit Fly (*Rhagoletis cingulata*), Plate A, Figs. 3 and 4. When the sour cherries were ripening I paid a visit to an orchard near Homer village, where it was said some grub, evidently not that of the Plum Curculio, was to be found in the cherries. As was suspected, the culprit proved to be the Cherry Fruit Fly. Many adults, chiefly males, were seen on the leaves and fruit, and not a few of them were captured with comparative ease. On examining the ripe fruit, maggots, very like those of the Railroad Worm, were found inside, some of them nearly or quite full grown. A few wormy cherries were brought back and put in a breeding cage. On examination of the soil in the autumn eight puparia were found about one inch below the surface. No experiments on control have been tried yet, but evidently care should be taken to gather all the fruit, so that none of it may fall to the ground and give the larvæ a chance to escape into the soil. All wild cherry trees in the neighbourhood should be cut down and burned, as these doubtless serve as breeding quarters. Discing the orchard and allowing chickens to run in it should be very helpful. Prof. Pettit, of Michigan, tells me that in that State the pest seems to disappear almost entirely from time to time. This is encouraging news, if it be true of Ontario as well as of Michigan.

Mr. Caesar: Does anyone know of any other district where this pest occurs?

Mr. Swaine: I have not heard of it down our way.

Mr. Howitt: It is in New York State, especially on cherries which have gone wild on the roadsides.

Fruit Bark-beetles (*Eccoptogaster rugulosus* and *Phleotribus liminaris*). These troublesome little beetles are not nearly so abundant as they were a few years ago. This apparently is to be attributed chiefly to the numerous parasites which are found to be attacking them. There are clearly two broods of *E. rugulosus*, the adults of the first appearing about the middle of June, and of the later brood about the middle of August. This species is much more common than *P. liminaris*.

Mr. Jones has discovered that *E. rugulosus* is frequently the cause of the spread of the Pear Blight germs (*Bacillus amylovorus*). The best means of control is clearly the destruction by fire of all dead and dying branches, and of all old brush heaps early in spring. If any trees are seen to be attacked during July they should be burned shortly before the end of the first week in August, to destroy the larvæ and pupæ. After this date it is better to leave dying or attacked trees in the orchard to act as traps and entice the beetles from healthy trees. Those thus left should, of course, be destroyed next spring early.

The Blackberry Leaf-miner (*Metallus* (*Scolioneura*) *rubi*). This saw-fly larva has spread over most of the Province, and in some districts has done much damage to blackberries by mining in the leaves; sometimes almost every leaf is severely attacked by one or more larvæ. This year the adults appeared in the Niagara district by about July 1st, and egg-laying at once began, the eggs being placed, so far as I could observe, just under the epidermis, and not being visible externally. When full grown the larvæ enter the earth. There are almost certainly two broods each year, living larvæ of the last being found in the leaves as late as November 16th last year. The winter is passed in the larval (not pupal) stage in tiny oval earthen cases, about one inch below the surface of the ground. (Apparently this point has not been observed before.) These earthen cases are not held together with silk, but with some mucilaginous substance. Sometimes they seem to be hard to break open, and sometimes easy. Kerosene emulsion was tested on the leaves, but was clearly useless, as it could not penetrate through the epidermis, even though this was dead. The only remedy that seems practicable where the pest is severe is to stir the soil frequently with a hoe around the base of the plants very late in autumn and in spring up to July, so as to break the cases and destroy the larvæ or pupæ inside. If there are only a few leaves attacked these can be either pulled off towards the end of July or the larvæ crushed inside with the fingers, using a leather glove to protect against the thorns.

Raspberry Sawfly (*Monophadnoides rubi*). The larvæ of this sawfly were more abundant than usual. Arsenate of lead should easily control them.

Wireworms and White Grubs. The cold, late spring retarding the growth of grain after it came through the ground seemed to give Wireworms and White Grubs a chance to do much more damage than usual. During the farmers' excursions in June I was almost constantly being asked for information on how to combat these pests. About all the remedy I could give was the old-time one of fall ploughing and rotation of crops. On enquiries I found that only in a very few cases were peas attacked. Frequently where peas and barley were sown together, the barley was destroyed and the peas left. This experience could be made use of by farmers where they feared attacks from Wireworms if they sowed oats or barley. I recommended that the new remedy originated by Prof. Fernald for preventing Wireworms from attacking seed corn be tried on a limited scale. Prof Fernald puts tar on the seed in the manner practised to keep off crows, then, to dry it so that it will go through the seeder, he places it in a large bucket containing fine dust and Paris green mixed in such proportions that the corn, after being shaken up in the bucket, shows a greenish color. The corn in his two years' experiments never failed to germinate and was quite uninjured by the Wireworms, which, he thinks, were probably repelled by the covering substance rather than killed by it.

Mr. Nash: Prof. Slingerland investigated a number of remedies and found that they were of no use.

Mr. Caesar: Yes, but he did not use the tar and Paris green combined in this way.

Mr. Nash: You can understand that it will not act as a preventive, because the Wireworms will eat off the rootlets as quickly as formed.

Mr. Caesar: The Wireworms attacking the kernels have been in this way a great pest, and never give the corn a chance at all.

Mr. Nash: It does not seem at all practicable.

Dr. Hewitt: It protects the kernel, but will not protect the roots of the plant.

Mr. Caesar: Possibly the odor of the tar has something to do as a repellant.

Mr. Nash: We know quite well that the tarred seed does not protect the plant at all.

Mr. Caesar: Prof. Fernald has been working on this for two years, and he claims that he has got excellent results. I was reading the other day results from further trials, and the writers claim that they did not care how badly the field was infested the corn would not be attacked if treated with the tar and Paris green. As for Prof. Fernald, it is well known that he is a thorough man in his work.

Mr. Nash: They got hold of a susceptible breed of Wireworms.

Mr. Howitt: Have you found the Wireworm attacking potatoes to any extent? I came across a district around London where about 30 per cent. of the potatoes were bored through with the Wireworms.

Mr. Caesar: Yes, quite often. Have you known of the above method of controlling them, Mr. Swaine?

Mr. Swaine: I have known it to be reported upon favorably a number of times.

Pea Aphis (*Nectarophora destructor*). This very serious pest was only found locally, but in a few districts it destroyed whole fields of peas. One farmer thinks its presence on the vines has led to the death of some of his cattle by poisoning. This scarcely seems possible.

Root Maggots (*Pegomya brassicæ* and *P. cepetorum*). These troublesome pests have been about as abundant as usual. Late cabbage has been almost free from them.

Cabbage Aphis (*Aphis brassicæ*). Fortunately this species of insect is at last being brought under control by its natural foes, and this year in most parts of the Province did comparatively little damage.

Spruce Galls (*Chermes sp.*,) Plate B, Figs. 6 and 7. Some attention has been given to spruce galls this year, chiefly by my summer assistant, Mr. W. A. Ross. It has been found so far that we have on spruce in the Province, *Chermes abietis, C. similis, C. pinifoliæ,* and a species that seems to be *C. pinicorticis,* but was not studied early enough in the season to get the adults, and so make sure of its identity. Of these, *Chermes abietis* is the most abundant, and is found on Norway, Black and White Spruce. *Chermes similis* is very abundant on White Spruce, and is doing much damage. *Chermes pinifoliæ* has been found by us only at Port Hope, where I saw it on one tree, which I think was White Spruce, although it might possibly have been Black. Experiments on the control of *C. abietis* showed that because of its exposed condition it could be destroyed by an application of whale-oil soap or lime-sulphur in April. Excellent results have been obtained from the latter, both this year and last.

So far we do not know when *C. similis* can be best attacked. It looks as though it would be a much harder species to combat than *C. abietis.* In spring it is so enveloped in a flocculent mass that lime-sulphur has no effect on it, and probably an oil spray would likewise be ineffective.

Dr. Walker: Did you say you found *Chermes pinifoliæ* on the White Spruce?

Mr. Caesar: I have been looking for it wherever I have gone, and only found it in Port Hope.

Dr. Walker: I have seen it at Nipigon, on the north shore of Lake Superior, confined to a single tree, and had to hunt a good deal to find as many as eight or ten specimens. I took it to be *C. pinifoliæ*, but may be mistaken. I think it was also this species that was sent to me from Snelgrove. I have found *C. similis* only on White and Black Spruce, never on Norway.

Mr. Jarvis: There is a species very common in the far west; it is about half an inch in length. Do you know that one?

Dr. Hewitt: I have collected that same one all through Saskatchewan, Alberta and British Columbia this fall. It seems to be a more compact and more regular species. I have got here about six different species of *Chermes*. The box has been arranged for me by Miss Patch. I find that *floccus* and *similis* are far more common than heretofore supposed. *Floccus*, I think, occurred in Quebec this year, too.

Mr. Caesar: We have not found *C. floccus* in Ontario yet.

## THE MORE INJURIOUS INSECTS IN CANADA DURING THE YEAR 1910.

C. Gordon Hewitt, D.Sc., Dominion Entomologist, Ottawa.

As reference has already been made by the directors of the various districts in eastern Canada, and by Mr. Caesar, to those insects which have been brought to their notice as being more or less prevalent and injurious, it remains for me to briefly mention those insects which have occurred in other parts of Canada, or whose injuries have been more than usually serious.

In the northern districts of Saskatchewan considerable damage has been caused by the Red-backed Cutworm (*Paragrotis ochrogaster*, Gn.), the injuries being chiefly to wheat. Another cereal pest, especially upon oats, which seems to be spreading is a species of Thrips. Oats which had been injured by this insect were received from Quebec, Saskatchewan, Alberta and British Columbia. It produces a characteristic whitened appearance of the ears.

The Western Blister Beetle (*Cantharis nuttalli*, Say) was very abundant in the western provinces of Manitoba, Saskatchewan and Alberta, where it was reported as injuring chiefly peas.

The Potato Beetle (*Leptinotarsa decemlineata*, Say) is gradually working its way north in Alberta, its northern limit at present being somewhere in the neighborhood of Edmonton.

The Hop Flea-beetle (*Psylliodes punctulata*, Melsh.) was again serious in British Columbia, but on some of the ranches the Red Spider was a much more serious pest. The manager of one hop yard stated that it was compelling them to cease growing hops. In one locality, where a crop of six or seven hundred pounds of hops to the acre is usually produced, they were reduced to two hundred pounds to the acre by the ravages of the spider, and the resulting hops were of very poor quality. The destruction of the mite wintering in the hop poles would appear to be the best method of controlling it, as they were found there in large numbers. This can be accomplished by dipping the poles in a caustic solution, such as lye, or in coal oil.

One of our most serious pests in Canada at present is the Brown-tail Moth, now established in Nova Scotia. During the last summer we have also received the first record of its breeding in New Brunswick, a single egg mass having been found at St. Stephen, N.B. This was not surprising nor unexpected, in fact it is singular that it has not been found breeding in numbers in that locality before, in view of the fact that it extends along the coast of Maine as far north as the Ste. Croix River. In July a visit was made to the eastern States, for the purpose of studying the distribution of the Gipsy and Brown-tail Moths, and the means that were being taken to control them and to prevent their spread. One object of this visit was to ascertain to what extent nursery stock and other vegetation shipped from these States into Canada was liable to be infested with these two insects: on account of the conditions which prevailed a regulation was passed under the new Destructive Insect and Pest Act, providing that all nursery stock from the six eastern States: Connecticut, Rhode Island, Massachusetts, Maine, New Hampshire and Vermont shall be inspected at the point of destination. Reference may be made here to the passing of the "Destructive Insect and Pest Act" during the last session of Parliament. With the Brown-tail Moth and the San José Scale already within our borders there was urgent need for legislation which would enable the Federal Department of Agriculture to take such measures as would insure, so far as is humanly possible, the freedom of nursery stock and other vegetation from serious pests which are liable to enter Canada by such means. It was also necessary for the Minister of Agriculture to be empowered to carry out such eradicative measures as shall be considered necessary to combat those insects which have already established themselves in the country. Briefly, then, the new Act provides for the fumigation of imported stock when it is necessary for the San Jose Scale, the inspection of European and certain other classes of imported stock for Brown-tail and Gipsy Moths, the carrying on of such work as shall be necessary for the eradication of those pests scheduled and the compulsory treatment on the part of the owners of trees and other vegetation infested. The insects at present scheduled are the San Jose Scale, the Brown-tail and Gipsy Moths, the West Indian Peach Scale and the Woolly Aphis. Armed with this machinery we hope to be able to fight against the introduction of those pests to which Canada, as a rapidly-developing country, is specially subject. Reverting to the Brown-tail Moth, the result of the last season's inspection in Nova Scotia would indicate that, although in certain localities the winter webs were numerous, on the whole the area infested was more restricted, thanks to the energetic action of Prof. Cumming, the Secretary for Agriculture for Nova Scotia. During the coming winter season we intend to co-operate with the Provincial Government and carry on an active campaign. It was interesting to find that the only batch of eggs discovered in New Brunswick was parasitised by a small egg parasite, apparently a species of *Trichogramma*.

Another alien which, unfortunately, has been added to our gradually increasing fauna of injurious insects, is the Narcissus Fly (*Merodon equestris*, Fab.). This was reported from Victoria, B.C., and during my recent visit to the district I had the opportunity of looking into the matter. It was probably introduced on Dutch bulbs. The fly somewhat resembles the Drone Fly, belonging to the same family, the Syrphidæ, and the maggot feeds in the centre of the bulb, thereby causing its death. The bulb-grower who reported this insect to the Division of Entomology had about 50,000 bulbs of narcissus and daffodils destroyed last year by the fly. On account of the habits of the larvæ it is difficult to devise effectual preventive or eradicative measures; some benefit resulted from spraying with an arsenical. Further details of the life-history and habits of the fly in Canada must be elucidated before measures can be suggested.

Last year Mr. Gibson called the Society's attention to the outbreak of the SPRUCE BUD-WORM (*Tortrix fumiferana*, Clem.), which had been reported to the Division of Entomology as causing serious defoliation of the spruce and balsam trees in the Province of Quebec, about 100 miles north of Ottawa. During my visit to British Columbia, in October of last year, it was found to be defoliating the Douglas fir on Vancouver Island, and when that region was revisited a month ago I found that the attack had been more serious this year, many young five-year old and older trees of the second growth having been killed. The area of infestation in Quebec appears to have spread also, and reports have been received from a number of owners of timber and pulp-wood limits as to the seriousness of the defoliation, which is very conspicuous from Mattawa across to the Saguenay River in Quebec. It has also been recorded from other districts in Quebec. What the results of this defoliation will be cannot be foretold. It is known that the insect was chiefly responsible for great destruction among the spruces in Maine some years ago. Now that it has spread over so wide a stretch of country nothing of a practicable nature can be done to control it. We are, therefore, studying the parasitic means of control, to which I hope to refer to-morrow, and we are also clearing up some obscure points in the life-history of the insect.

The WHITE-MARKED TUSSOCK MOTH (*Hemerocampa leucostigma*, S. and A.) has been unusually abundant in the Maritime Provinces during the past year, especially in Nova Scotia. In Halifax and Charlottetown it has caused considerable alarm on account of its defoliation of the shade trees in those cities. The citizens appear to be fully alive to the danger of the repeated defoliation of their shade trees, and it is hoped that timely destruction of the egg masses in the winter and, if necessary, spraying in the summer will be resorted to.

Mr. Caesar has already referred to the occurrence of the FOREST TENT CATERPILLAR. These insects occurred in very large numbers in New Brunswick, and also in British Columbia, where whole tracts of country were defoliated. We also received them from Edmonton, Alberta. The great abundance of the Fall Webworm, especially in some localities, was very noticeable during the past season.

Another caterpillar, of which I do not think we have yet heard the last, is the GREEN-STRIPED MAPLE WORM (*Anisota rubicunda*, Fab.). This species was reported to the Division last year as defoliating the maples in a sugar bush, and this defoliation was stated to have caused a decrease in the amount of sap obtained from the trees. During the present year it was reported as defoliating maples in the Rideau Lakes, and along the northern shores of Georgian Bay the maples were stripped of their leaves.

MR. CAESAR: Have you seen much of the Thrips in Ontario?

DR. HEWITT: I have not had any cases of the Thrips to which I refer reported as yet from Ontario.

MR. CAESAR: Does the whole of the wheat get that silvery appearance?

DR. HEWITT: It is on oats that we have found it. The white and silvery appearance of the head and stem of wheat is usually due to the wheat-stem maggot.

MR. NASH: Is the Rose Beetle generally reported?

DR. HEWITT: I do not think that we have had many reports.

MR. CAESAR: It is fairly abundant round Clarkesville.

MR. SWAINE: I might mention, Dr. Hewitt, that I found the Spruce Budworm at Hudson, P.Q., this season. Have you had it reported as far south as that?

DR. HEWITT: We have had it reported from a number of localities in Quebec, other than those which I have mentioned. I have found it within a few miles of the Vermont boundary.

## NOTES ON THE SEASON OF 1910.

Rev. Thomas W. Fyles, D.C.L., Hull, Que.

The season of 1910 has been a very fine one, interrupted, however, with heavy thunderstorms. Some interesting species of insects have come under my notice in the course of the season.

Eucosma Scudderiana, Clemens The galls of *Eucosma scudderiana* have been very abundant. They begin to appear on the Golden Rod early in June. They are somewhat irregular in shape, and are covered with a rusty-looking scurf.

The larva is greenish-white. Its head is of a dark madder-brown; and the plate on the second segment is spotted with brown. On the body are numerous oval tubercles or plates. The spiracles are small and brown.

This species continues in the larval stage through the winter, and does not go into pupa till May. I have opened galls in March and April and found the larvæ active. They feed on the pith above and below their galls. The moths appear at the end of May.

Holland, in his beautiful and very useful work, "The Moth Book," telling of *Eucosma scudderiana,* says—

"The insect is not uncommon in western Pennsylvania, and is possibly an inquiline or intruder in the galls which are produced by another species, *Gnorimoschema gallæ-solidaginis,* Riley."—*The Moth Book,* p. 418.

The author is mistaken here. The galls of *G. gallæ-solidaginis* begin to appear at the same time as those of *scudderiana,* at a time when the moths of both species have passed away. It is not likely that a *scudderiana* larva would leave its own gall to go in search of one of the other kind.

The galls of *G. gallæ-solidaginis* may be readily known: they are of the shape of a half-grown turnip-radish; and they have not the rusty apearance of the Eucosma gall. *The moths from them appear in the month of August.*

Tetrastichus gelechiae, Ashmead. I have found two galls of *G. gallæ-solidaginis* this season—one at Abercorn in the eastern townships, and the other at Hull—in which the pupæ appeared abnormally large. By aid of the microscope I found that the enlargement was caused by the closely-packed chrysalids of a parasite *Tetrastichus gelechiæ.* The flies in due time appeared.

Camponotus pennsylvanicus, DeGeer. On June 14th—a very hot day—there was a remarkable flight of the large, black Carpenter Ants (*Camponotus pennsylvanicus*). The creatures were everywhere in the streets of Hull; but they were not abundant long, for the sparrows regarded a Black Ant as a *bonne bouche,* and banquetted upon the unexpected provision to their hearts' content. Useful sparrows! May the memory of Colonel Rhodes, who introduced them to Canada, be honoured!

A Strange Butterfly. On August 8th I captured a curious melanic form of *Argynnis myrina,* Cramer. Both the primaries and secondaries of this insect were suffused on the upper side with sooty black; but in the secondaries the inner margins, and a few spots in the centre of each, were of the normal color. On the under side the primaries were dusky brick red, with sooty black patches between the veins. The marginal silvery spots appeared. The secondaries on the under side were of a rich chocolate red. The black spot towards the base of each was enclosed by a narrow silvery ring. The spots were as usual. The body was black above and yellow beneath.

Mononychus vulpeculus, Fab. At Quyon, Province Quebec, on August 17th, I found that the seed-pods of the Blue Flag (*Iris versicolor*) were much infested with a small beetle (*Mononychus vulpeculus*), in all its stages. The larvæ and pupæ were waxen in appearance. The beetle was a trim and handsome little insect. The following is a description of it:—Length, 5 millimetres; breadth, 3 millimetres. Color above, deep seal-brown. Elytra and thorax bordered with yellow. Thorax granulated. Elytra roughly striated. Eyes small and black, close to the proboscis .

Color beneath, that of burnt sienna on the sides, and grey under the abdomen and between the legs. Femora and tibiæ furry. Femur stout, somewhat flask-shaped. Tarsi ending with two pads or cushions, side by side, with a claw between them. Joints of tarsi very distinct.

Proboscis extending between the front pair of legs, as far as the middle pair; blunt, scaly—the upper part sienna-colored; the lower, dark grey.

I am indebted to the kindness of Dr. Howard and Prof. Schwarz, of the U. S. Bureau of Entomology, for the determination of the beetle.

I obtained from the affected Iris pods a considerable number of specimens of the parasite *Pimpla inquisitor,* Say.

### Hemiptera on the Milk Vetch.

On September 1st, on a small patch of Milk Vetch (*Astragalus canadensis*), growing at Aylmer, Province Quebec, I found no less than six kinds of bugs. Amongst them were:—*Alydus conspersus,* Mont., and *Megalotomus quinquespinosus,* Say.

*A. conspersus* is black with an orange patch on the abdomen above. This can be seen only when the wings are spread.

*M. quinquespinosus* is a handsome insect, of a neat ochreous color. Its abdomen has black edges marked with pale yellow spots. It was named from the five spines on the femur of each of its hindmost legs.

For the identification of these two bugs I am indebted to Prof. Heidemann.

### Basilona imperialis, Drury.

On October 2nd, Miss Effie Garrioch sent me, from Marshall's Bay, on the Ontario side of the Ottawa, three larvæ of *Basilona imperialis.* They were full fed, and went into the earth on the evening of their arrival. Two of them were of the deep green of the pine foliage; the other was of a rich rosy brown. They changed to pupæ on the 10th of the month. The following is a description of these remarkably handsome caterpillars:—Length, 3 inches; diameter, 5-6 inch. Head lobed, black, with clay-yellow upright markings in front, and paler yellow marks on the sides.

Forelegs, clay-yellow with black tips. Prop-legs, dark brown with a clay-yellow bar across them.

Body color a dark green—sometimes a rosy brown—with a purple dorsal-line, and a broad faintly purple band along each side.

The second segment has a black shield with four glossy warts on the front edge of it.

On the third, and again on the fourth, segment are two prominent warts, one on each side of the dorsal-line, pale yellow at the base and tip, and black, spotted with yellow, in the middle. In line with each of these pairs of warts, and on the seven next following segments, are creamy-white, pointed warts—one on either side of each of the segments. On the twelfth segment, at the top, is a glossy black, prominent wart, tipped with yellow; and, a little behind it, are two small black warts. On the top of the thirteenth segment is a small black wart, faced with yellow. Along the purplish sideband, from segment three to segment twelve, there is a row of creamy-white, pointed, warts; and along the base, above the legs, from segment two to segment thirteen, on either side, is a row of similar, but smaller warts.

The spiracles are conspicuous, large, creamy-white, bordered with black.

The claspers are remarkably large. They are surmounted by a large triangular shield, edged on two sides with clay-yellow, and dotted with white. The claspers are bordered and dotted in the same way.

The creature is sparsely set, with light, brownish-yellow, bristles.

Pelopaeus cementarius, Drury. Adjoining the Matthews' Factory at Hull there is an electrical sub-station, belonging to the Hull Electric Company. In this station, three yards from a window, a telephone is affixed to a wall. One day, in August last, the man who occasionally visits this sub-station found that the telephone was out of order, and gave notice of this at the head office. The superintendent, Mr. Alfred Gale, went to see what was wrong, and, on opening the magneto-box, found a number of Mud-Wasps at work, piling up their cells upon the bar, which terminates on the outside of the box in the hook, or fork, in which the receiver is placed. Within the box, the spring, under the bar, was not strong enough to raise the additional burden; and consequently, no pressure was brought to bear upon the contact points, and the telephone failed to work.

The wasps found ingress to the magneto-box through the slot in which the bar plays.

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## REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for the year 1909-1910.

The forty-sixth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 4th and 5th, 1909. There were a goodly number present from a distance as well as a large attendance of students and others connected with the College.

During the first afternoon the reports of the Directors on the insects of the year were read and discussed, papers were read by Mr. L. Caesar on " A few insects of the season"; by Mr. A. Gibson on " Nests of the Brown-tail Moth in importations of French nursery stock"; by Dr. C. Gordon Hewitt on " The large Larch Sawfly"; by Mr. R. C. Treherne on " Nursery work in Ontario," and by Mr. F. J. A. Morris on " Some Guests at the Banquet of Flowers." In the evening a public meeting was held in Massey Hall, which was well filled with members and students from both the Agricultural College and the Macdonald Institute. A very interesting lecture on " House Flies and their Allies," illustrated with excellent lantern pictures, was delivered by Dr. C. Gordon Hewitt, the newly appointed Dominion Entomologist.

The morning and afternoon of the second day were occupied with the reading of the reports of the various branches and officers of the Society, and a number of papers on a variety of subjects, which have all been published in the Annual Report for 1909. This volume, the fortieth of the series, was issued in May last and contained 144 pages, illustrated with 6 full-page plates, 39 figures in the text and a portrait of the late Dr. William Brodie. In addition to the papers already mentioned, the volume contained the following articles: "The origin and diffusion of Entomological Errors," by Mr. H. H. Lyman; "Conflicts between Ants," by Mr. G. E. Sanders; "The Snow-white Linden Moth," by Mr. A. F. Winn; "Notes on Fruit-tree Scolytids," by Mr. J. M. Swaine; "Observations on Ontario insects in 1909," by Dr. Bethune; "Injurious Insects of Quebec in 1909," by Prof. Lochhead; "Adaptations in the structure of insects" and "Anisota virginiensis," by Dr. Fyles; "The Acarina, with a Host Index to the species found in Ontario," by Prof. T. D. Jarvis; "The Spruce Bud-worm" and "'The Entomological Record for 1909," by Mr. Arthur Gibson; concluding with a sympathetic obituary notice of the late Dr. Brodie, by Mr. Frank Morris.

The *Canadian Entomologist,* the monthly magazine of the Society, has been regularly issued at the beginning of each month. The forty-first volume was completed in December last; it consisted of 440 pages, and was illustrated with 11 full-page plates and 13 figures from original drawings. The contributors numbered 73, and included writers in Ontario, Quebec, British Columbia, England, sixteen of the United States, the Hawaiian Islands, Panama Canal Zone; Calcutta, India; and Russia. During the year seven new genera were described and 239 new species, sub-species and varieties.

At the close of the volume, Dr. Bethune resigned the position of editor, which he had held since October, 1886, owing to the disability caused by impaired eyesight in addition to the weight of advancing years. His place has been ably filled by Dr. E. M. Walker, Lecturer in Zoology at the University of Toronto, and the magazine has continued to be issued with unimpaired excellence.

Meetings of the Society were held during the winter months at the Ontario Agricultural College on alternate Wednesday afternoons. The attendance included several of the more advanced students and much interest was taken in the papers and discussions. The following subjects were taken up during the course of the meetings: "Achievements in Economic Entomology," illustrated with lantern pictures, by Prof. Bethune; "Insects as causes of disease, with special reference to the Protozoa," by Prof. Jarvis; "The Insects of Saskatchewan," by Mr. S. J. Neville: "Aphids," by Mr. A. C. Baker; "An account of the Meeting at Boston of the American Association for the Advancement of Science," by Mr. L. Cæsar; "Notes on the Calliphorinean Genus Lucilia," by Mr. J. D. Tothill.

The unveiling of the drinking fountain erected in the grounds of the Central Experimental Farm at Ottawa in memory of our late President, Dr. James Fletcher, took place on Tuesday afternoon, July 19th, and was largely attended. Our Society was represented on the occasion by two former Presidents, Dr. William Saunders, Director of the Dominion Experimental Farms, and Dr. Bethune, of the Ontario Agricultural College, who both took part in the proceedings by giving short addresses. There were also present a number of our members resident in Ottawa and the neighborhood.

The first International Congress of Entomology was held during the month of August last at Brussels and was in every respect a complete success. Our Society was represented by our former President, Mr. Henry H. Lyman, of Montreal, who read a paper on Nomenclature. He has furnished us with an interesting report of the proceedings.

It is with much regret that the Council has learned that the members in Quebec have been unable to maintain the branch of the Society which for many years was in successful operation there. The removal of the Rev. Dr. Fyles has taken away the most active member whose enthusiasm inspired the rest of the members and kept up the meetings with great interest. No one has so far been found to take his place, and accordingly the operations of the branch have been suspended.

A similar fate, we regret to say, has befallen the branch of the Society in British Columbia. Mr. R. V. Harvey, Headmaster of the University School at Victoria, has found his time so much occupied that he has been unable to give any attention to the work of the branch. Its operations have on this account been suspended for the time being, but it is hoped and expected that before very long its operations will be resumed. The great difficulty consists in the geographical distribution of the members, who are very widely separated from one another and consequently are unable to hold meetings.

The Council has to deplore the loss of Mr. G. W. Kirkaldy, of Honolulu, who died in San Francisco on the 2nd of February last. He was a very able and energetic entomologist and contributed frequently to the pages of our magazine. He especially devoted himself to the Hemiptera, and had begun a catalogue of the species throughout the world, the first volume of which has just been issued.

Respectfully submitted,

TENNYSON D. JARVIS, *President.*

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## FIRST INTERNATIONAL CONGRESS OF ENTOMOLOGY.

HENRY H. LYMAN, MONTREAL, QUEBEC.

If anyone entertained any doubts of the possibility of making a Congress devoted exclusively to Entomology a success, such doubts must have been dispelled by the results of the First International Congress of Entomology held at Brussels from August 1st to 6th, 1910.

A correspondent of the London *Times* writing of the Congress said: "Entomology is at last recognized officially as an important science. The study of insects, so long looked upon with disdain as a pastime for children and old men, has at last vindicated its claim as a valuable branch of human mental activity. That is to say, from being a purely intellectual exercise, entomology has developed a most important practical aspect that will, in the near future, have a profound and far reaching effect upon the lives and fortunes of millions. The discovery of the astonishing phenomenon that one species of mosquito, and one only, is the vehicle for the transmission of yellow fever, another of malaria, while a single kind of biting fly communicates sleeping sickness to the teeming millions of the African continent, has a direct and vital influence upon tropical medicine; and the Americans have long since realized that an accurate knowledge of the habits of one kind of beetle may save agriculturists from damage that may result in the loss of hundreds of thousands of pounds. Thus entomology has won the serious attention of practical men who, acting together with the purely academical devotees of the pure science, have demonstrated their attachment to and appreciation of their study by organizing an International Congress that has received the hearty support of institutes, departments and governments."

The following important bodies were represented at the Congress: the British Colonial Office, the Tropical African Entomological Research Committee, Cambridge University, Oxford University, the Board of Agriculture, the Royal Colonial Institute, the Imperial Department of Agriculture in the West Indies, the British (Natural History) Museum, the Royal Society, the Linnean Society, the Zoological Society, the Entomological Society of London, the University of London, the Commonwealth of Australia, the Commonwealth of South Africa; the Royal British Arboricultural Society, the University of Edinburgh, the East of Scotland College of Agriculture, the Royal College of Science of Dublin, the Agricultural Research Institute of Pusa, Bengal; the Carnegie Institute of Pittsburg, the Entomological Society of America, the Academy of Natural Sciences of Philadelphia, the Entomological Society of Ontario, etc., etc.

Besides entomologists residing in Brussels, delegates were also present from other parts of Belgium and from Madrid, Zaragoza, Barcelona, The Hague, Leyden, Amsterdam, Berlin, Zürich, Königsberg, Vienna, Bologna, Genoa, Milan, Luxemburg, Paris, St. Petersburg, Moscow, Budapest, Pittsburg, Philadelphia, Columbus, Montreal, Tokio, Buenos Ayres, etc.

On the evening of Sunday, July 31st, a reception was held by the Entomological Society of Belgium for those attending the Congress and accompanying ladies at the Maison des Medicins, while the first meeting of the Congress was opened the following morning at the Salle des Fêtes of the Exhibition by the President of the Congress, Prof. Auguste Lameere, Rector of the Free University of Brussels, the Secretary being Mr. G. Severin.

The meetings were divided into general sessions and sectional meetings, ten sections being arranged for as follows:—

1. Systematics.
2. Nomenclature and Bibliography.
3. Museology and History of Entomology.
4. Zoogeography.
5. Bionomy, Œcology, Cecidiology and Mimicry.
6. Physiology and Psychology.
7. Economic Entomology.
8. Medical Entomology.
9. Anatomy and Ontogeny.
10. Phylogeny, Palæontology and Evolution.

Members were given a very handsome silvered bronze badge of Gothic design, having on the obverse an illustration of the Hotel de Ville and "Bruxelles," "1910," and on the reverse "1r Congrès International d'Entomologie," and, by the courtesy of the Exhibition Committee, passes to the Exhibition for the term of the Congress.

The more serious work of the Congress was varied by visits to the Exhibition, museums, excursions and receptions. At the Royal Museum of Natural History an excellent portrait group was taken.

Among the most important papers read may be mentioned a lecture by Dr. R. Blanchard, of Paris, on Medical Entomology, dealing with the transmission of malaria, yellow fever and sleeping sickness, and it may be mentioned that there was a most interesting exhibit in connection with these subjects in the Exhibition. Mr. Theobold, of Wye College, gave a lecture on the distribution of *Stegomyia fasciata,* the conveyer of yellow fever. Sir Daniel Morris described the methods employed by the Imperial Department of Agriculture in the West Indies to prevent the introduction of insect pests by fumigation and quarantine. Dr. G. H. Carpenter, of the Royal College of Science, Dublin, gave an instructive account of the warble fly, *Hypoderma bovis.* He declared the so-called preventive washes quite useless, but had not concluded his investigations.

Dr. R. Stewart MacDougall, of Edinburgh University, described the ravages of a small beetle, *Galerucella lineola,* that has done an immense amount of damage to the osier beds in the Midland and Eastern counties of England, and recommended arsenical sprays for its control.

Good lectures on Ants and their guests and enemies were delivered by Father Wasman, S.J., of Luxemburg, and Mr. H. S. K. Donisthorpe, of London, with lantern slides, showing the various domestic animals kept and used by the ants.

The highly interesting study of mimicry was dealt with by Prof. E. B. Poulton, of Oxford, who exhibited a large number of boxes of butterflies, all caught in one small patch of forest in Uganda, showing the common species which are distasteful to birds and other enemies, and the rarer species which, though belonging to a totally different group, and in no way related structurally, enjoy a relative immunity from attack by a very close resemblance to the distasteful forms. Dr. F. A. Dixey, Mr. Frederick Merrifield, and Dr. K. Jordan also spoke on the same subject.

Prof. Y. Sjostedt, of the Natural History Museum, of Stockholm, gave an account of the Swedish expedition of twelve months to Kilimandjaro and its prolific results.

Mr. J. N. Howlett, of Pusa, Bengal, described the difficulties of preserving collections of insects in the climate of India. Dr. Holland spoke on the preservation of type specimens, and Dr. Henry Skinner read a paper on One Hundred Years of Entomology in the United States, but ignoring the influence exerted upon it by the *Canadian Entomologist.* He referred to the steady and great growth of Economic Entomology during recent years and the very large sums appropriated by the Federal and State Governments for the control of injurious insects.

On the last afternoon a brief paper was read by Mr. Lyman, urging the importance of an authoritative pronouncement upon the correct use of such terms as type, co-type, etc., and of universal adhesion to such use and protesting against changes by some authors in the spelling of scientific names.

The number of adherents reported was 270, but the list of those reported as attending the Congress gave 141 names of gentlemen, many being eminent in the science, and 32 ladies accompanying delegates. And of all countries represented the British Empire had the largest number of delegates.

The representatives of the United States were Dr. Holland, Dr. Skinner and Mr. Osborn, while Mr. Lyman was the only representative from Canada.

At the last General Session on the morning of Friday, August 5th, the election of a Permanent Committee took place, and it was decided to hold the next Congress in the summer of 1912, and on the invitation of the gentlemen from Oxford that ancient seat of learning was selected as the next place of meeting, and Prof. Poulton was chosen President.

The Permanent Committee for the United States consists of P. P. Calvert, T. D. A. Cockerell, J. H. Comstock, H. C. Fall, C. P. Gillette, W. J. Holland, A. D. Hopkins, L. O. Howard, C. W. Johnson, V. L. Kellogg, H. Osborn, J. B. Smith, C. W. Stiles, C. Wellman, W. M. Wheeler, and for Canada C. J. S. Bethune, C. G. Hewitt, H. H. Lyman; while the Permanent Executive Committee consists of M. Burr, K. Jordan, W. Horn, P. Lesne, G. Severin and H. Skinner.

The conclusion of the Congress was celebrated by a grand banquet on Friday evening at the Taverne Royale, participated in by the ladies accompanying some of the delegates, when after the inner man (and woman) had been satisfied with the excellent repast served in the best style, many speeches were made and good fellowship prevailed. The gathering broke up before midnight, as all-day excursions had been arranged for the next day, the majority going to Bruges and Ostend.

The concluding reception was the grand one given at the old and wonderful Hotel de Ville by the Burgomaster, Mons. Max, on Sunday evening, August 7th, when that magnificent building, so rich in beautiful architecture, tapestries, pictures, frescoes and bric-a-brac, was thrown open to the guests of the city. Thus, amid scenes of brilliance and splendour in this stately mediæval building, came to an end this First International Congress of Entomology, all looking forward with pleasure to the next meeting at Oxford in 1912.

## ANNUAL REPORT OF THE MONTREAL BRANCH.

The thirty-seventh annual meeting of the Montreal Branch was held at 74 McTavish Street, on Saturday evening, May 14th.

Members present: Messrs. H. H. Lyman, in the chair; G. A. Southee, G. Chagnor, E. C. Barwick, Geo. A. Moore, A. E. Norris, W. G. Gerth, and A. F. Winn.

The minutes of the April meeting, and of the last annual meeting, were read and confirmed.

Mr. H. Earby was elected a member of the Branch.

The Secretary read the following

### Report of the Council.

Nine meetings have been held during the season 1909-'10, the average attendance being a fraction over 9, which is an improvement on the previous year; but, considering that the population of Montreal is over 600,000, there should be more than a score of persons interested in Entomology. Three new names have been added to our roll, but three others have resigned.

Below is a list of the papers read (most of which were illustrated by specimens), and the discussions following them were of interest.

Annual Address of the President, Geo. A. Moore.
A Spring Outing, H. H. Lyman.
Lepidoptera taken at St. Hilaire, May 24th, 1909. A. F. Winn.
Notes on Coleoptera taken at St. Hilaire, May 24th, 1909, G. Chagnon.
Life History of Philometra metonalis, H. H. Lyman.
How can we increase the interest in our meetings? H. H. Lyman.
My Best Captures in 1909, G. Chagnon.
Occurrence of Ennomos subsignarius at Montreal, A. F. Winn.
Hemiptera taken at St. Hilaire, G. A. Moore.
Proposed List of Insects of the Province of Quebec. A. F. Winn.
Account of Annual Meeting and a Visit to Trenton, A. F. Winn.
On Panthea and Demas, H. H. Lyman.
A New Scolytid Enemy of White Spruce, J. M. Swaine.
The Winter Quarters of Doryphora clivicollis, A. F. Winn.
Our White Butterflies, A. F. Winn.
Calligrapha rowena, G. Chagnon.
Paonias astylus at Biddeford, Me., A. F. Winn.
The Berytidæ, or Stilt-bugs, G. A. Moore.
Random Notes on Lepidoptera, A. F. Winn.
An Hour at Montmorency, H. H. Lyman.
The Noctuidæ and how to Collect Them, I., A. F. Winn.
Butterfly Collecting in British Columbia (by John Russell, Hope, B.C.), read by A. F. Winn.
The Cydnidæ or Burrowing Bugs, G. A. Moore.
The North American Copper Butterflies, H. H. Lyman.

The annual outing at St. Hilaire, on Victoria Day, was well attended, but the backward season made the captures of insects much smaller than usual, but among the Coleoptera several good catches were made and the Lepidopterists had the pleasure of finding two specimens of a little Heliothid moth, probably undescribed, closely resembling *Heliaca nexilis* of the Rocky Mountains. No species of the genus have hitherto been recorded from the East.

At the January meeting we had the pleasure of a visit from Mr. F. H. Wolley Dod, of Millarville, Alberta, who gave an account of his visits to collectors of Noctuidæ throughout Canada. It was hoped that the Rev. Dr. Fyles would be able to attend our meeting this evening, but it could not be arranged.

The annual meeting of the parent Society at Guelph was attended by the President and the Secretary.

The report of the Treasurer shows a balance on hand of $76.79.

The Curator reports that the specimens in his charge are in good condition but that no additions have been made to the collection and that the members have made little use of either the specimens or the books. It is probable in connection with the preparation of the List of Insects of the Province of Quebec that a considerable number of specimens of the more neglected orders will be collected, determined and eventually find their way into our collection. The books added to the library consist of a copy of Pierce's "Genitalia of British Noctuidæ," the current volume of the *Canadian Entomologist,* and the entomological publications of N.Y. State.

Respectfully submitted on behalf of the Council.

(Signed) Albert F. Winn, *Sec.-Treas.*

Mr. Lyman then read his annual address, after which the election of officers for the ensuing year was proceeded with, and last year's officers were all re-elected, namely: Henry H. Lyman, President; G. A. Southee, Vice-President; A. F. Winn, Secretary-Treasurer; L. Gibb, Curator and Librarian; Members of Council—G. Chagnon, G. A. Moore, E. C. Barwick, F. Parkins, jr.

## ANNUAL REPORT OF THE TORONTO BRANCH.

The 51st regular and 14th annual meeting of the Toronto Branch was held in the Biological Department of the University of Toronto, on June 9, 1910.

During the year eight meetings have been held with an average attendance of seven members. The place of meeting has been changed from the Normal School to the Biological Building, and library and collections have been moved.

The following papers were read:—

White Pine Weevil, Dr. E. M. Walker.
Structural Peculiarities of Galls, A. Cosens.
A Month at the Biological Station at Go Home Bay, J. B. Williams.
The Relation between Parasitism and Structure in Insects, Dr. Walker.
Wing Venation, Arthur Smith.
The Work of Scolytid Beetles in Queen's Park, Toronto, Dr. Walker.
The Oriental Moth, H. H. Lyman, of Montreal Branch.
A Hunt and What Came of It: Discovery of *Copidosoma Lymani*, H. H. Lyman, of Montreal Branch.
Some Types of Saw-flies, A. Cosens.
The Larch Saw-fly, Dr. Walker.

The following officers were elected for the next year:—

President—Dr. E. M. Walker; Vice-President, A. Cosens; Secretary-Treasurer, Arthur Smith; Librarian-Curator, J. B. Williams; Council—Messrs. Wood, Laing, Ivey, and Dr. Abbott.

The Treasurer's report shows a balance on hand of $0.20.

Arthur Smith, *Secretary-Treasurer.*

## REPORT OF THE LIBRARIAN.

During the year ending September 30th, 1910, eighteen bound volumes have been added to the Library, making the total number on the register 2,018; there are besides a number of volumes of periodicals in the hands of the bookbinder, which should have been ready for inclusion in this report. The Library continues to receive by exchange a large number of serial publications, bulletins, and pamphlets from many different countries and in a variety of languages, many being of great scientific value. A card catalogue of the bound volumes was made during the winter, but has not yet been finally completed for reference; to make it entirely useful it will be necessary to rearrange all the books in the Library on a definite system; it is hoped that this may be accomplished before very long.

Among recent additions may be mentioned the following works: Sir George Hampson's Catalogue of the Lepidoptera Phalænæ in the British Museum, volume viii.; Rothschild and Jordan's Revision of American Papilios; Needham's General Biology and Lefroy's Indian Insect Life.

The Library is constantly made use of by the senior students and members of the staff during the College year and is highly appreciated by them.

Respectfully submitted,

Charles J. S. Bethune, *Librarian.*

## THE CURATOR'S REPORT.

The Society's collections have been carefully examined from time to time throughout the year and the necessary precautions taken against injury from museum pests or from other causes. Since the last annual meeting, 268 new specimens have been added. Of these 262 were contributed by Mr. John D. Evans, of Trenton, 134 belonging to the order Hymenoptera, and the remainder to the Hemiptera. As these orders are not at all fully represented in the Society's collections, Mr. Evans' gift is very valuable and will be much appreciated by the members. The remaining 6 specimens were contributed by the curator from insects of some economic importance not found in the collections.

Respectfully submitted,

L. Caesar, *Curator.*

# REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

Rev. Thomas W. Fyles, D.C.L., Hull, Que.

I have the honour to present the following report from the Entomological Society of Ontario:—

This Society held its forty-sixth annual meeting in the Ontario Agricultural College, Guelph, on the 4th and 5th days of November last. There was a large attendance—members from Ottawa, Toronto, Montreal, Port Hope, Trenton, Grimsby and Guelph being present. Important subjects were brought before the meeting by the district directors and discussed: The destruction of cut-leaf birch trees by the Red-necked Borer; attempts to control the Tussock Moth; the extension of the San José Scale to Prince Edward County; the work of the Blackberry Saw-fly; that of the Spruce Gall-louse; the importation of Brown-tail Moth larvæ on French nursery stock; and other matters of interest to fruit-growers and foresters.

In the evening a public meeting was held in the Massey Hall auditorium, which was well filled with students of the College, both male and female, and a number of visitors from the town, together with members of the Society gathered in session. "Dr. C. Gordon Hewett, the newly-appointed Entomologist at the Experimental Farms of the Dominion, gave a highly interesting and instructive address, illustrated by a series of admirable lantern pictures, on 'House Flies and Their Allies.' The College orchestra added much to the enjoyment of the evening by the musical selections they rendered." (*Can. Ent.*, vol. xli., p. 429.)

In the forthcoming Annual Report of the Society, the papers read before the meeting will be found in full. The titles of them denote their interest to naturalists and to the agricultural community. They are:—

Observations on Insects of the Season, L. Caesar.
Injurious Insects of Ontario, C. J. S. Bethune.
Injurious Insects of Ottawa, A. Gibson.
Injurious Insects of Quebec, W. Lochhead.
The Origin and Diffusion of Entomological Errors, H. H. Lyman.
Some Guests at the Banquet of Blossoms, F. J. A. Morris.
Nests of the Brown-tail Moth, A. Gibson.
Nursery Inspection Work in Ontario, R. C. Treherne.
House-flies and their Allies, C. G. Hewitt.
The Larch Saw-fly, C. G. Hewitt.
Conflicts between Two Species of Ants, G. E. Sanders.
Snowy White Linden Moth, A. F. Winn.
Adaptations of Insect Structure, T. W. Fyles.
The Life-history of Anisota virginiensis, T. W. Fyles.
The Acarina found in Ontario, T. D. Jarvis.
Notes on Fruit-tree Scolytids, J. M. Swaine.
Entomological Record for 1909, A. Gibson.
The Spruce Bud-Worm Tortrix, A. Gibson.
Memoir of Dr. Brodie, F. J. A. Morris.

The Report is illustrated with a portrait of the late Dr. Brodie and with five half-tone plates. There are also thirty-nine illustrations in the text.

The *Canadian Entomologist*, the monthly organ of the Society, maintains its well-earned reputation. From its mail list for last month it appears that the magazine is not only circulated in Canada, but is taken in the United States, in fourteen countries of Europe, in India, Japan, the Philippine Islands, Egypt, Cape Colony, Natal, Portuguese E. Africa, Australia, New Zealand, Tasmania, Brazil, the Argentine Republic, Uruguay, Hawaii, and in five of the West Indian Islands.

The volume for 1909, the forty-first volume, contains articles from seventy-three contributors. Amongst these are correspondents in Calcutta, Honolulu, Panama, and St. Petersburg. These facts show how widely the influence of the Society extends. In this volume no less than two hundred and twenty-eight newly discovered species of insects are brought into notice and named, together with fourteen sub-species and eight varieties. The following are the titles of some of the more important of the articles that appear in the volume:—

Preparation of Beetles for the Microscope, H. F. Wickham, Iowa City.

Lepidopterous Galls collected in the Vicinity of Toronto, Dr. Wm. Brodie.

Notes on Tenthredinoidea, with Description of New Species, S. A. Rohwer, Boulder, Colo.

New Histories and Species in Papaipema (Hydrœcia), Henry Bird, Rye, N.Y.

The Fruit-infesting Forms of the Dipterous Genus Rhagoletis, with One New Species, J. M. Aldrich, Moscow, Idaho.

Some North American Jassidæ, E. D. Ball, Logan, Utah.

On the Orthoptera of Northern Ontario, E. M. Walker, Toronto.

New Coleoptera from the South-West, H. C. Fall, Pasadena, Calif.

Some New Bees, and Other Notes, T. D. A. Cockerell, Boulder, Colo.

Some Curious Californian Leaf-hoppers, E. D. Ball, Logan, Utah.

The Hepialidæ, or Ghost-moths, Albert F. Winn, Westmount, Que.

Some New Species of N. A. Geometridæ, John A. Grossbeck, New Brunswick, N.J.

List of Siphonaptera of California, M. B. Mitzmain, San Francisco, Calif.

A Summer with Chrysophanus Dorcus, William W. Newcomb, M.D., Detroit, Mich.

New Geometrids of the Genus Hydriomena, L. W. Swett, Boston, Mass.

Notes on Pachybrachys, and Descriptions of New Species, Fred. C. Bowditch, Brookline, Mass.

Studies in the Caraboidea and Lamellicornia, Thomas L. Casey, Washington, D.C.

Some Recent Contributions to Hemipterology, J. R. De la Torre Bueno, White Plains, N.Y.

Coccidæ from the Society Islands. R. W. Doane and Evelyn Hadden, Stanford University, Calif.

New Pseudoscorpionida, Nathan Banks, East Falls, Church, Va.

Notes on the Larva and Pupa of Sthenopis thule, J. M. Swaine, Macdonald College, P.Q.

A New Genus and Some New Species of Tenthredinidæ, Alex. D. Macgillivray, Ithaca, N.Y.

Notes on the Preparatory Stages of Philometra metonalis, Henry H. Lyman, Montreal.

Synonymical and Descriptive Notes on North American Heteroptera, Edward P. Van Duzee, Buffalo, N.Y.

Notes on Lachnus caryæ, H. F. Wilson, U. S. Dept. Agr., Bureau of Entomology.

Hemiptera, Old and New, G. W. Kirkaldy, Honolulu, Hawaiian Islands.

Some Guests at the Banquet of Blossoms, F. J. A. Morris, Trinity College School, Port Hope, Ont.

Phylogeny of the Lithocolletid Group, Annette F. Braun, Univ. of Cincinnati, Ohio.

The Eupitheciæ of Eastern North America, George W. Taylor, Nanaimo, B.C.

The volume also contains obituary notices of Mr. G. W. Peck and Professor M. V. Slingerland, and a memoir of William Henry Edwards—all well-known entomologists.

Eleven plates and thirteen other illustrations add interest to the volume.

At the close of last year the Rev. C. J. S. Bethune, who had conducted the *Canadian Entomologist* for many years with great care and ability, found it necessary to retire from active editorial work, much to the concern of the members of the Society, who have highly appreciated his services. However, a worthy successor in the editorship of the magazine has been found in Dr. E. M. Walker, of the Biological Department of Toronto University.

Dr. Bethune has been appointed *editor emeritus* by the executive of the Society.

In the Society's library at Guelph there are more than two thousand bound volumes and a very large number of unbound publications, bulletins, proceedings of societies, etc.

The Society's cabinets contain a very complete collection of the Lepidoptera and Coleoptera of the Provinces of Ontario and Quebec and a good number of representatives of the other orders. In addition there are many very beautiful specimens of exotic Lepidoptera.

The Branch Associations connected with the Society are doing excellent work. They spread the knowledge of economic entomology to the great benefit of the farmers, horticulturists, and fruit-growers, in their several localities.

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## EVENING SESSION—THURSDAY, NOVEMBER 3RD, 1910.

A public meeting was held at 8 o'clock p.m. in the Massey Hall Auditorium, at which there was a good attendance of students and representatives of the College staff, as well as of members of the Society. The chair was taken by Mr. C. C. James, Deputy Minister of the Ontario Department of Agriculture. The proceedings were enlivened by some musical selections given by members of the College Philharmonic Society. After a few remarks by the Chairman congratulating the Society on reaching its forty-seventh annual meeting, and referring to the amount of good work that it has accomplished, he introduced the speaker of the evening, Professor James G. Needham, of Cornell University, Ithaca, N.Y., who occupies the chair of Limnology in the Department of Entomology. His subject was "The Role of Insects in Water-life," illustrated with many beautiful lantern pictures. The following is an abstract of his remarks:—

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## THE ROLE OF INSECTS IN WATER-LIFE.

PROF. JAMES G. NEEDHAM (*Abstract*).

Aquatic insects are not found in all the waters of the earth, but are mainly restricted to shoal parts of fresh water and to the shelter of rocks and vegetation. There are but few found inhabiting even the bottoms of our deeper lakes and streams, a few blood worms, caddis-worms and the burrowing nymphs of May-flies, and there is but one, *Corethra,* that is strictly free-swimming in habits and a constant denizen of the open water. Moreover, it is mainly the larval stages of insects that are aquatic; only these breathe by gills, and the larvæ are tied by parentage to the shores.

Alongshore, however, insects constitute a very important part of the submerged population, being present often in inconceivably vast numbers. Sometimes a species, like the great May-fly, *Hexagenia,* that is synchronous in its habits of transformation, comes forth in swarms that darken the air on a midsummer evening, but the vast majority of aquatic insects are not thus concerted in habits and give us no visible demonstration of their abundance. Yet they abound in all aquatic situations in shoal water. Some groups, like the stone-flies, are fitted for life in rapid waters only, but most of the larger groups, like the flies and the beetles and the dragon-flies, contain representatives expressly adapted to situations of the utmost diversity. The rapid-water forms are usually flattened and depressed in body for attachment to the surface of stones where the water glides over them. And, on the other hand, those in stagnant waters usually possess devices for protecting their delicate gills from the accumulation of sediment.

The collector who knows something about the habits of the insects he gathers alongshore is usually struck with the apparent preponderance of carnivorous forms. All of the dragon-flies and bugs, nearly all of the beetles and the larvæ of many flies, are of strictly carnivorous habits and are very much more in evidence than the herbivorous May-flies or midge larvæ or those algæ-feeding beetle larvæ of the family Haliplidæ that has recently been demonstrated to be herbivorous.

The lecturer then showed many lantern slides illustrating species of May-flies, beetle larvæ and caddis-worms that are being studied especially at the Biological Field Station of Cornell University. He discussed the varying reproductive capacity, length of life, food and shelter requirements of these species, and showed in conclusion the possibilities of artificial increase by rearing in pure cultures and the possibilities of conservation of the natural supply of these excellent items of fish food by providing proper shelter and by protecting the foraging grounds.

The Chairman, Mr. C. C. JAMES, expressed the pleasure that all present had derived from the address and the surprise that all shared in at the importance of aquatic insects as regards the provision of food for fishes. A vote of thanks to Prof. Needham was moved by President Creelman, seconded by Dr. C. Gordon Hewitt, and heartily adopted by the meeting.

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## SECOND DAY'S SESSION—FRIDAY, NOVEMBER 4TH, 1910.

The first portion of the morning was spent in the Society's part of the College Museum, and was devoted to an inspection of the extensive collections of Lepidoptera and Coleoptera and the specimens brought by the members. Among the various interesting examples presented may be mentioned a large collection of beetles captured upon foliage in illustration of Mr. F. J. A. Morris's paper; these specimens were beautifully mounted and carefully labelled. Prof. J. M. Swaine exhibited a series of specimens of Scolytid beetles and their work as wood-engravers and timber destroyers.

Dr. Hewitt exhibited a case containing the partial life-history of the Spruce Budworm (*Tortrix fumiferana*). This contained moths, larvæ, chrysalids, and several species of parasites, as well as drawings of the mature larva and end of twig showing the winter shelters of the young larvæ. In a separate case was exhibited the characteristic work of the caterpillars. Dr. Hewitt also placed on view a case containing the work of six different species of *Chermes* which had been donated to the Division of Entomology by Miss Edith M. Patch, of Orono, Maine, and specimens of the parasite, *Tropidopria conica,* reared from *Eristalis.*

Mr. Gibson exhibited a case containing rare Noctuids and Arctians. Among these were *Stretchia plusiiformis* and *Apantesis michabo* from Hymers, Ont.; *Momophara comstocki,* from McNab's Island, N.S.; *Sphinx perelegans,* from Wellington, B.C.; and a series of moths of the genus *Xylina* from the Ottawa district. An inflate of the mature larva of *Estigmene prima* was also shown, which had been reared from eggs obtained at Shawville, Que., by Mr. A. F. Winn.

The following were noted among the specimens exhibited by Mr. Lyman:—

*Grapta gracilis,* from the White Mountains.

*Argynnis montinus, Chinobas semidea, Colias interior, Parchnobia wockei?* and *Anarta schoenherri* from Mt. Washington.

*Hepialus gracilis* from the White Mountains.

Also the following from Hymers, Ont., received from Mr. Horace Dawson:—

A beautifully suffused specimen of *Argynnis atlantis.*

A curious completely suffused specimen of *Argynnis bellona.*

*Phragmatobia assimilans,* var. *franconia* Sloss.

*Hyphoraia parthenos,* the outer brown band on secondaries reduced to dots.

*Graptolitha hemina.* (This specimen was compared with Grote's type in the British Museum by Mr. Lyman and positively identified.)

*Leucobrephos brephoides.*

*Cossus centerensis.*

*Cossus undosus?*

*Sthenopis argenteomaculatus.*

*Hepialus hyperboreus.*

Dr. Walker exhibited a case containing the nymphs or larvæ of the following species of Canadian Aeshninae (a group of large dragon-flies): *Boyeria vinosa, B. grafiana, Basiaeschna janata, Nasiaeschna pentacantha, Anax junius, Aeshna juncea, eremita, interrupta (?), clepsydra, canadensis, palmata, umbrosa, constricta, californica and multicolor.* This includes all the known nymphs of North American species of Aeshna. He also showed an aberrant specimen of the butterfly *Charidryas nycteis* and the galls of three species of *Chermes* from black and white spruce in Ontario.

At eleven o'clock the election of officers for the year 1910-1911 was proceeded with and Dr. E. M. Walker was unanimously elected President and Dr. C. Gordon Hewitt Vice-President. The complete list is given on page 9.

The following resolution, moved by Mr. Henry H. Lyman and seconded by Mr. Arthur Gibson, was adopted:—

"That Past Presidents of the Society be invited to present to the Society framed photographs of themselves taken on a plate 10 by 8 inches with mat or border not over 3 inches wide, and that in the case of deceased Presidents the Council endeavour to have similar portraits prepared where photographs can be obtained for enlargement."

Professor J. M. Swaine, of Macdonald College, St. Anne de Belleville, P.Q., addressed the Society as follows:—

Mr. Chairman and gentlemen,—I have the honour this afternoon to represent officially the Quebec Society for the Protection of Plants. Two years ago, at a meeting at Macdonald College, we formed a society which we called The Quebec Society for the Protection of Plants from Insect Pests and Fungus Diseases. The name is rather long but it expresses very well our purpose. The Society receives financial assistance from the Quebec Government, and is thereby enabled to publish an annual report. Prof. Lochhead has been our President since the organization of the Society. We hold two meetings annually—a winter meeting, so far held at Macdonald College, at which papers are read, and business is transacted; and a summer meeting at La Trappe. This summer meeting lasts for two days and is devoted chiefly to collecting and discussions. La Trappe is an excellent collecting ground, and we have always a delightful outing among the beautiful orchards and vineyards and fine farms of those most hospitable gentlemen, the Trappist Fathers and Brothers.

Our members are few as yet, but we are ambitious, and hope to do something in the way of investigation and distribution among the Quebec farmers of a knowledge of the methods of controlling injurious fungi and insects which will justify our existence as a society.

I have then, sir, the privilege this afternoon of presenting to you and your Society the greetings and the good wishes of the Quebec Society for the Protection of Plants.

## BEETLES FOUND ABOUT FOLIAGE.

F. J. A. Morris, Trinity College School, Port Hope.

During my five years or more of collecting, I have captured, on and about foliage, species belonging to eight or ten of the great families of beetles. Some of these have been merely incidental and I know of nothing in their habits to connect them with the tree or herbaceous plant on which I found them. For instance, there is a species of Lagriid, a family closely related to the Tenebrionidæ or Darkling Beetles, which I have often taken on foliage—*Arthromacra ænea*; usually the beetle is found feeding in blossoms of the dogwood, occasionally on the foliage of that shrub, but quite often I have seen it on the leaves of the May-apple (*Podophyllum peltatum*), the New Jersey Tea (*Ceanothus americanus*), and the Sweet Fern (*Comptonia asplenifolia*); it appears to have a special fondness for this last shrub and on bright, hot days of July is often abundant in patches of Sweet Fern.

So far as I know it does not eat the leaves, but contrary to the general habit of the Tenebrionids it certainly courts bright sunshine. There is an allied genus in Great Britain (*Lagria hirta*) said to be found on blossoms and in hedges, which even in the larval stage is remarkable for its habit of wandering openly about foliage. Most of the Tenebrionid larvæ feed obscurely on vegetable matter, preferably in a dry condition; probably the best known, in domestic economy, is *Tenebrio molitor*, the famous meal-worm, which I have occasionally had served to me at breakfast in a plate of porridge.

There are three families of beetle in particular, many of whose members are extremely fond of sunshine. The Elaters or Click Beetles, their next of kin, the Buprestids or Metallic Wood-borers, and the Cerambycidæ or Long-horns.

I have often captured some of the smaller species of Elaters, chiefly of the genus Corymbites, resting on the upper side of leaves, apparently indulging in the luxury of a sun-bath. Early in May two seasons ago I took a magnificent specimen of *Buprestis striata* basking on the tip of a branch of white pine, and in August of the same year I saw darting about in the mid-day heat and settling from time to time on the foliage of a spruce the gorgeous little Buprestid, *Chrysobothris harrisii.* This dazzling vision in peacock blue was vouchsafed to me for a moment only and then withdrawn, but in my mind's eye I have been "following the gleam" ever since. Altogether that proved a red-letter day in my calendar, for I captured on the trunk of a newly-felled balsam fir at the same spot my sole specimen of *Monohammus marmorator.*

A great many of the Cerambycidæ or Long-horns are fond of this sun-basking; and I have made occasional captures on foliage of species that usually seek the shade: once a specimen of *Callidium antennatum* on a blade of grass by the roadside, and once a fine specimen of *Calloides nobilis* on a stalk of sedge by the railway track. But of those that are active by day, many of them feeding in blossoms, I have found many species on leaves, especially of the two tribes *Clytini* and *Lepturini;* in one or two cases, the insect seems to prefer one foliage to all others and perhaps such captures ought not to be regarded as merely incidental: for instance, I have found *Clytanthus ruricola* show a decided preference for the leaves of the thimbleberry, though it does not often feed in the blossom of this plant.

The capture I look back upon with greatest pride was that of a small specimen of *Eupogonius subarmatus* in my first season of collecting. I was going through a belt of basswood on the look out for various things, but chiefly "Walking Sticks" and the larvæ of *Chrysomela scalaris*: by "Walking Sticks" I mean the

Phasmid, *Diapheromera femorata,* an Orthopterous insect next of kin to the Praying Mantids; it occurred not infrequently that season about the Rideau on basswood; still more abundant on basswood leaves were the larvæ of *Chrysomela scalaris,* and I was rearing some in captivity. While scanning the underside of the foliage just above my head I noticed a leaf through which the sunlight passed imperfectly; there was a small opaque area near the centre, in short, something rather smaller than a house fly was casting its shadow on the upper surface. I drew the leaf cautiously down and surprised a diminutive longicorn sunning itself in the middle of the leaf; unfortunately, I surprised it in more senses than one, for, in response to a stimulus of self-preservation, it instantly collapsed and, tumbling down the leaf in a series of somersaults, like the clown in a pantomime, disappeared from the stage. For nearly half an hour I hunted among the *débris* at my feet and at last discovered the little harlequin playing 'possum under a twig.

At first I took this beetle for *Amphionycha flammata,* to which superficially it bears an extraordinary resemblance; but I found the ungues or claws (which are divaricate) simple instead of cleft; as they are distinctly cleft in *Amphionycha,* the foot appearing to end in four minute claws, it became certain my capture was *Eupogonius subarmatus.*

Another form of incidental capture is where beetles of a carnivorous habit resort to foliage in search of food. I have once taken *Calosoma scrutator,* and several times *Calosoma calidum* on the foliage of the white pine; these enterprising ground beetles poaching on the arboreal preserves for caterpillars; many of the diurnal fireflies, which are carnivorous, may be found resorting to foliage for the same purpose, and the *Coccinellidæ* or Lady-birds are regularly so taken. One July I found two or three species of Lady-bird resorting in large numbers to an asparagus bed where they were doing yeoman service in devouring larvæ as they fed on the foliage; on the *menu* of their banquet if not the *pièce de résistance* was *Crioceris asparagi,* and they were feasting royally.

Passing from incidental captures to those where the insect was found on its food-plant, I shall begin with an insect I saw in July three years ago which did not devour the leaves, but using its jaws as a pair of scissors, cut them and rolled them up into cylinders. I mean the weevil, *Attelabus analis,* the oakleaf roller.

I was examining the leaves of various plants, herbaceous and woody, along the railway track some 12 miles north of Port Hope—especially willow shrubs and oak-seedlings whose foliage was lush and tender, the leaves being, many of them, still pink and soft—when I noticed a curculio with black head and snout, the thorax and elytra of a shining chestnut red. I recognized it from having seen cabinet specimens as one of the oak-leaf rollers, and on diligent search I found it fairly abundant and always on young leaves, which no doubt proved more pliable and easily worked by this ingenious little artificer. It was not easy to see much work done, as the beetle is easily alarmed and drops from the leaf if approached too closely. I was able in one case, however, to watch the actual process of rolling and in another some of the preliminary work of cutting. Observations published in an American journal of entomology go to prove that though the act is instinctive and involves neither practice nor imitation, it is not absolutely perfect; leaves have been found cut in more than one place and then abandoned as unsatisfactory.

There is a very interesting account of a British leaf-roller (*Rhynchites betulæ*) given by Sharpe in the Cambridge Natural History. The female beetle goes to the margin of the leaf—at the base, but some way out from the stalk—and cuts through the leaf from the margin to the mid-rib somewhat in the shape of an upright letter S; it then crosses the mid-rib and cuts through the other half of the leaf to the margin somewhat in the shape of a prostrate letter S. The beetle then returns to the margin where it began cutting and, much as a grocer makes a paper funnel for sugar, rolls the edge over round an ideal axis till it brings it to the mid-rib; here it holds the funnel in position with the legs of one side while, with the other three, it draws the further side of the leaf towards it and wraps it around the part of the funnel already formed. When it finds the material stiff to work with it bites the surface of the leaf with its mandibles or pushes it into position with its feet, adjusting means to ends like a sailor at work in the shrouds furling canvas. It then enters the funnel, bites two or three small pits into the leaf, deposits an egg in each and then emerging completes the funnel by folding over and tucking in the tip of the leaf.

Mr. Sharpe, in comment, points out that the insect has never seen a funnel in its life and yet manages to make one perfectly the very first time of trying. But the author's perplexity is partly due to his confusing a purely instinctive act with an act of intelligence (*vide* the Peckhams' book on Wasps). How can an insect be a highly-skilled engineer, working with mathematical accuracy and on a scientific plan? It is an insoluble problem if you try to state your answer in terms of intelligence and individual consciousness. But place it among impulsive acts, involuntary and more or less mechanical, common to all members of the species, and you can give a fairly satisfactory explanation in terms of instinct.

Among insects especially are found instincts whose perfection is simply diabolical, often involving a highly complex series of acts performed but once in the whole life-time of the individual and therefore admitting of neither practice nor imitation. To look upon such acts as the result of conscious intelligence is absurd; the intellect has no place here and would be simply a meddler, likely to bungle and make a botch of the artificer's work. On the other hand a whole-hearted Darwinian like Weismann has no difficulty in applying his great principle of selection to such an act and seeing in it one more beautiful illustration of how all things living in the world, whether flora or fauna, are adapted to their environment.

As I have begun with one of the weevils, which come at the end of the Coleoptera in classification, I shall pass to a family not far removed from the weevils, the Blister Beetles (*Meloidæ*), many of which in the mature state occur abundantly on foliage and are very destructive. Four species of the genus *Epicauta* are known in Ontario; some of them occasionally attack the leaves of the potato, but more usually they feed harmlessly on flowers like golden rod and helianthus or the low herbage by river banks. I have not seen any of this genus and think it uncommon east of Toronto, or at least in the neighborhood of Port Hope. One species of an allied genus (*Macrobasis unicolor*), which also attacks the potato, I have found in great abundance about Port Sydney in low grounds feeding and breeding on the foliage of meadow-rue. The family consists of two tribes, *Cantharidae* and *Meloidae;* the former all have power of flight and are frequently found about foliage or flowers; in the latter the wings are abortive or entirely absent, and the beetle's most daring excursion into the realm of air consists in crawling up a grass-blade or the stem of some herbaceous plant. One or two species of *Meloe* or Oil-beetle are frequently found early in the spring and late in the summer, but the insect does not appear to eat foliage. Both tribes of this family are famous for their possession of a principle known as cantharidine, whence they are called Blister beetles, some of the species being of great medicinal value.

A more remarkable feature about them which they share with some of their neighbours, the *Mordellidæ,* is the phenomenon of hyper-metamorphosis. They are all parasitic in the larval stage, their hosts being usually bees, occasionally wasps and (in the case of *Epicauta*) locusts. The normal form of the larva is preceded by a very active louse-like insect known as a triungulin (each leg terminating in a triple set of hooks). The larva that succeeds the triungulin is inactive and almost legless; moreover, in some cases the true pupa is preceded by a sort of preliminary pupal form from which emerges a larva of habit almost as active as the original triungulin, though it does not feed.

The triungulin is a monomaniac; I mean a creature of but one idea, one single goal of ambition, and its six active legs enable it to get there. The loadstone that draws the triungulin like a steel-filing to a magnet is the egg of its host. In the case of *Epicauta vittata* this is the egg cluster of a locust, and the parent beetle takes the precaution of laying its eggs near where the locust has hidden its egg-batches in the ground. Among the Cantharids whose host is a genus of bee (*Anthophora*), the beetle oviposits near the bees' nest, but in order that the triungulin may reach the egg of the bee, it has to be carried into the nest by a queen bee; its instinct impels it to seize the first hairy object within reach. This frequently proves to be the leg of a drone and in some cases the triungulin manages to transfer itself to the leg of a queen bee during the nuptial flight and so reaches its goal, the egg-cell in the hive. But hundreds of triungulins must perish from seizing a wrong object, and in order to compensate for this, selection has enormously increased the fertility of the female beetle, which lays as many as 2,000 eggs. In the *Meloe* or Oil-beetle the instinct is even more imperfect; the beetle does not lay her eggs near the home of the host and the triungulin mounts to the top of grass stems or enters a blossom and waits there for a hair (any hair will do); this more often than not proves to be growing on the leg of a fly, or if a bee, the wrong kind, and thousands of the triungulins, instinctively seizing the first hairy object that offers, are carried into space to perish miserably. All that saves the *Meloe* from utter extinction is the stupendous fecundity of the female, the clutch of eggs laid by this Apteryx among insects producing a brood of no fewer than 10,000 triungulin chicks.

Apart from the great Phytophagous group of beetles, easily the best known family of leaf-eaters is the Scarabæids. One section of this family consists of scavengers pure and simple, the larva being nourished in manure or rotting wood, and the female laying her eggs in such material. But an important branch of the family is phytophagous, the larvæ feeding on living vegetable matter, usually the roots of grasses and herbaceous plants, and the mature insects often feeding voraciously on leaves of trees or soft vegetable tissue.

In this family of beetles, structurally so different from the Phytophagous Beetles, strictly so called, it is interesting to note how far one group has diverged from another in response to conditions entailed by their chosen food material. Among the *Coprini* you find the larval stage completed in a few weeks or at most months, while the life of the mature beetle (as in Scarabæus) extends over a period of two or three years. Among the *Melolonthini* almost the converse obtains; the larva takes two, three or even five years to mature, and the beetle, after emerging from the ground, lives for only a week or two.

In Ontario the most familiar of these phytophagous scarabs are the leaf-chafers popularly known as June bugs. After three years passed in subterranean obscurity the beetles emerge, often in vast quantities; they are inactive during the day and remain hidden in the grass at the foot of trees or on the foliage itself, but at dusk they rouse up from their lairs and fly about among the trees in irregular flight, noisy and blundering; before midnight their activity on the wing ceases.

The life of the individual beetle after emerging from the ground lasts little more than a week or two, and you would naturally expect its chief concern to be the perpetuation of its kind.

But often Melolonthinus, like Launcelot Gobbo, is a huge feeder, sometimes entirely stripping fruit trees and ornamental shade trees of their foliage. There are one or two genera in this group containing species a good deal smaller than *Lachnosterna,* the true June bug, which are also very destructive in some parts and seasons. The Rose-chafer (*Macrodactylus subspinosus*), not content with eating the buds and petals of rose blossoms, frequently attacks the grape-vine and the foliage of various fruit trees; it is also sometimes a pest on young corn; it does not seem so far to have made its way east of Toronto in any serious numbers.

A closely allied genus is the *Dichelonycha,* one species of which (*D. elongata*) I have often seen eating the foliage of basswood. Three seasons ago it was very abundant in the woods near Port Hope, and responsible for a good deal of damage done in July to the foliage of forest trees; it shows a decided preference for basswood, eating its foliage more readily and more rapidly than other leaves, though I have found it on hawthorn and on maple.

Another genus, that of *Hoplia* (*trifasciata*), occurs often on hawthorn leaves, but it is almost entirely a pollen-feeder like *Trichius piger* and *Euphoria inda. Hoplia,* which occurs often on choke cherry, early elder and hawthorn, the males appearing at the beginning of May and the females a fortnight later, disappears at the beginning of June. Another species of *Euphoria,* a beautiful beetle, called *E. fulgida,* I suspect of eating forest leaves; I have picked it up several times under trees in open rocky hardwoods on the north shore of the Rideau.

Among Scarabs that frequent foliage are also two species very destructive in the tribe *Rutelini,* large handsome beetles—*Pelidnota punctata,* found on grapevines, and *Cotalpa lanigera,* chiefly on pear trees, but occasionally on elm, poplar and oak. I have never found this beetle, but the *Pelidnota* has been taken occasionally in the neighbourhood, usually on the cultivated grape-vine, but once or twice on wild vines, some miles north of the town; it does not appear to be at all frequent east of Toronto.

I mentioned at the outset of my paper the Buprestids as a family peculiarly fond of basking in the sun. There are two genera of Buprestid that eat leaves, *Agrilus* and *Brachys.* The first of these is a long, narrow beetle, taken occasionally on the leaves of basswood, but more common on the foliage of raspberries. The larva bores in the stem of the raspberry. A curious feature about the Agrilus is that in appearance and shape, as well as in some of its movements for escape or to elude observation, it closely resembles the longicorn beetle Oberea; moreover, the habits and life-history of the two beetles are almost identical; they both lay their eggs in raspberry stems, where the larva bores and feeds, and they both in maturity resort to the leaves of the plant as a resting place and occasionally for food.

The genus *Brachys* is a short form of beetle, almost as broad as it is long, the species I have most commonly found being *Brachys ærosa;* it is not uncommon on basswood and two or three other forest leaves, but I have usually found it feeding on the foliage of a hazel (*Corylus rostrata*), where it is sometimes abundant. It is stated in Sharpe's article on insects in the Cambridge Natural History that some of the smaller kinds of Buprestid have been discovered to feed on the parenchyma of leaves. I know nothing about the larval habit of *Brachys,* but arguing on analogy from *Agrilus,* I would hazard the guess that the larva is a leaf miner on hazel or other forest leaves.

In drawing a parallel between *Agrilus* and *Oberea* I referred to both form and habit. The form of *Brachys,* short and broad and somewhat flat, suggests the form of *Odontota,* a leaf-miner among the *Chrysomelians;* in habit, since the mature beetle of *Agrilus* responds to the same food-stimulus as its larva, the eating of hazel and other leaves by the *Brachys* beetle may mean that the larva mines in such leaves. (*Vide* Can. Ent., 1887, xix, 159.)

I have found a great many instances among the Coleoptera where the mature insect seems to be affected in a greater or less degree by the same stimulus as the larva. Perhaps the sight of the larva's food-plant strikes on some happy chord of childish recollection in the mature beetle.

To the student of animal instinct it is no doubt far more wonderful that an insect in its comparatively short life should at different stages respond to two quite distinct food-stimuli. The syrphus fly (*Eristalis tenax*), whose larva feeds in liquid manure, is at maturity a honey-sucking haunter of blossoms; in extreme cases, like that of the parasitic oil-beetles, as many as three distinct food-stimuli occur in the life of the individual.

But in my rambles through the realm of Coleoptera, it is the opposite phenomenon which has struck me most. I mean the number of beetles that are attracted to the food of their larva. I have noticed this especially among the Cerambycidæ. In many of them the smell of fermenting sap (where a tree is newly felled or has been injured by the lopping of branches or the mutilation of bark) seems to act as a direct and powerful stimulus in liberating the instinct of reproduction. This is specially noticeable in the Monohammi. In others, again, where perhaps the smell of sap has first drawn the insects to the tree for breeding purposes, the sight of the foliage seems to impel the beetles to eat the leaves. This is particularly the case in some genera that approach most nearly to the Chrysomelians. We have a familiar illustration of it in *Tetraopes,* the Milkweed beetle, whose larva feeds in the stem of the plant while the beetle resorts in large numbers to the leaves, on which it feeds freely as well as breeding. Less conspicuous examples of the same phenomenon are the *Oberea,* and still more the *Saperda.* I have several times captured *Saperda vestita* feeding on the sheaf of leafy twigs surrounding the basswood stumps, under whose bark the eggs are laid. I have found *Saperda moesta* eating the leaves of the poplar, where its larva develops, and on a single willow I once counted over 200 specimens of *Saperda concolor* breeding on the leaves and eating the foliage with evident relish.

These last few paragraphs have brought me right into the great group of Phytophagous beetles, properly so called; whose larvæ, without exception, find support on living vegetable tissue. They comprise three families, the Bruchids which devour seeds, the Cerambycids which attack the woody tissue of trees and shrubs, and the Chrysomelids which feed at all stages on foliage and the more succulent parts of vegetation.

The Bruchids form only a small group, and the genus *Bruchus* is the only one of much importance; besides the Pea and Bean Weevils (so called), the only species I have found at all abundant is a minute insect, *Bruchus discoideus,* sometimes plentiful in the blossoms of the white convolvulus or Morning Glory.

The Cerambycids appear to have been in their origin scavengers, rarely attacking sound wood; but the larvæ of many of them, before reaching full growth, eat right into solid timber; while others appear to eke out their existence by draining the afflux of sap to the part they have wounded; yet others again have deserted the forest tree that formed their ancestral home and taken up their abode in the fruit trees of our orchards. The larvæ develop slowly, and must greatly reduce the vitality of the tree they infest. They are exceedingly tenacious of life, and many instances are on record to show that the larval stage is capable of enormous extension.

The imago of *Monohammus* has been known to emerge from chairs and tables years after the manufacture of the furniture. Mr. C. O. Waterhouse, an English naturalist, heard one of these larvæ at work in a boot-tree (an implement for stretching top boots), which he had in his possession for 14 years; he then presented the implement to the Natural History Museum at Kensington, where for 6 or 7 years longer the larva continued to saw wood. The entire absence of sap had, of course, arrested the development of the larva, and it was unable to complete its transformation. Sereno Watson, the American botanist, relates another case (Packard, U. S. Ent. Comm., 1890, p. 689) that seems to prove the life of one longicorn to have lasted 45 years. When you add to this tenacity of life the larval obscurity which makes even detection difficult, it will be seen how serious a pest the longicorns may and often do become.

The Chrysomelians, on the other hand, live openly on foliage, which they devour as beetles no less than as larvæ. The larval stage is short, and the insect, as a rule, helpless and easily destroyed. They more than compensate, however, for their exposure to attack by their rapid breeding, many genera producing two broods every season. There are 11 tribes of the family in boreal America, all of them represented in Ontario. But the great bulk of our Chrysomelidæ belong to the four consecutive tribes—*Cryptocephalini, Eumolpini, Chrysomelini* and *Galerucini;* the last of these is far the greatest, and contains more genera and almost as many species as the other three combined. Together these four tribes contain more than two-thirds of the entire genera and species in the family.

As, geologically, the woody fibred vegetation preceded the leafy and succulent plants, it is probable that the Cerambycidæ attained their greatest development far earlier than the Chrysomelidæ. But the two families are undoubtedly closely akin, and the Donacias may be regarded both in form and in habit as in many respects intermediate between some of the less highly specialised genera of Cerambycids and the Chrysomelids.

## THE POOL.

Rev. Thomas W. Fyles, D.C.L., Hull, Que.

Within an easy distance of my present place of abode there is, in the landscape, an abrupt descent, clothed with forest trees, and extending for a considerable distance.

Such a descent would have been called in England, in the olden times, a "hanger."

In that delightful book, "White's Natural History of Selbourne," such a hanger is described; and the word itself is found in the names of places, such as Oakhanger, Westonhanger, etc.

It may be that the appellation is an Anglicised form of the Norman French *hangar,* a shed—a word common in Quebec Province, but almost obsolete in England. Thackeray, however, makes use of it in his "Life of Henry Esmond."*

At a spot under the elevation I have in mind, the Trenton limestone of the

*"Mademoiselle, may we take your coach to town? I saw it in the hangar, and this poor Marquis must be dropping with sleep."—*The Hist. of Henry Esmond.* Bk. III., Ch. 13.

district crops out, around a hollow some yards across and always containing water. A projecting slab on the edge of the pool affords me a welcome place of rest. When I am seated upon it, my attention is naturally drawn to the creatures inhabiting the limpid water at my feet. I have found them a numerous and interesting assembly.

One day, early in June, I noticed a number of Newts (specimens of *Diemyctylus viridescens*), asprawl, and motionless on the bottom of the pool. Presently a small fly, either by accident or design, touched the water: immediately one of the newts, that had seemed so inert, rose to the surface and swallowed it. The propelling guiding powers of the newt were in its tail. A few undulations of this, and the creature ascended directly to its mark—its feet hanging motionless by its sides.

I much desired to examine the newt more closely; but how was I to secure it without injuring it? I called to mind that when I was a boy in England, I made a visit to friends in Surrey; and my young companions there took me to a pond to shew me how to catch "effets"—those formidable, saw-backed creatures that bear the name of *Triton cristatus*.

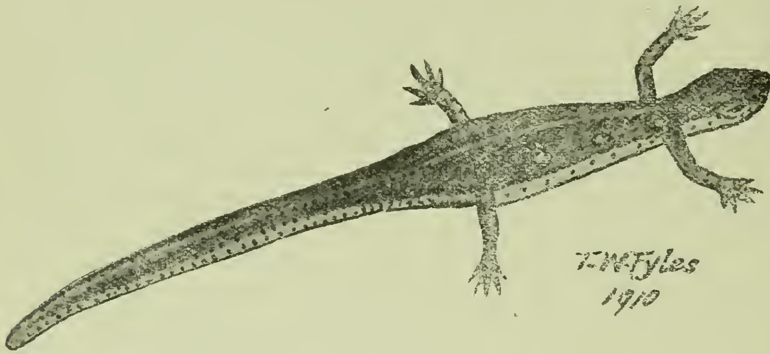


FIG. 1 *Diemyctylus viridescens*. Natural size.

My friends took with them a stick, a piece of string, and some worms. On reaching the pond they fastened one end of the string to the stick, and tied a worm by the middle to the other, and then dangled the bait before the eyes of a Triton. The little reptile seized it with the greatest avidity; and, so tenacious was its hold, that it allowed itself to be lifted from the water, and landed on the bank, without relaxing it.

I tried this plan with my newt; but it was a failure—the creature would not bite. It wriggled away. But a handsome Leopard Frog—cream-breasted, green-coated, and adorned with jet-black markings—which was sitting near with its head out of water—could not resist the lure, but swallowed it incontinently. I tightened the line to see if the frog would allow itself to be drawn from the water. It sat, as Mark Twain's "Jumping Frog" sat, after the shot had been poured into it; but it let the worm come from its maw with a slobbering gasp.

It may have been imagination, but I thought that a look of astonished disgust passed over the visage of the frog.

While I was considering how to secure a specimen of the newt, a mosquito lit upon my knee, and proceeded to present its little bill; but I brought a weighty argument to bear upon it, and put it out of occupation. I pitched its remains upon the water. expecting to see a newt rise to them; but instantly a hungry Water Strider (*Hygrotrechus remigis,* Say) seized them and glided away. At the same instant another newt rose to a fly. I had my Entomological net in my hand, and, on the impulse of the moment, I slid it into the water and caught the reptile.

What a beautiful little creature it was! Its back and sides were olive green; its under parts chrome yellow; and it was dotted all over, down to its toes, with jet black spots. In a row, on either side of its body, were some oval spots, crimson-lake in colour, and each inclosed by a black ring. Its tail, set edgeways, was broad and thin, and as long as its body. It moved with easy grace. I took the little creature home with me, made a drawing of it, and then carried it back to its companions in the pool.

The newts all disappeared at the end of July.

The Water Strider deserves our attention. It is a wonderful object. It stands and moves *upon* the water: its body does not touch the surface. Do you want a proof of this? It is before us. Notice on the rocky bottom of the pool, the little cluster of six black spots, that moves as the insect moves above. It is a group of shadows from the creature's feet. There is no shadow from its body—the light passing under it and the sheen on the water cut off that—but the feet, being in actual contact with the surface, cast their shadows below.

How can the Strider stand and walk upon the water? The length of its limbs, and the adjustment of its weight, enable it to do so.

A needle dropped lightly on still water will float; but a shot of the same weight will sink instantly.

If you place the living Strider upon water in a basin, it will at first dash about wildy, for it is possessed of an excess of energy; but, if you remain motionless, it will soon quiet down; and then, strange to say, you will easily perceive that at each foot the water is slightly depressed—the surface is not broken but bent in. The long legs of the insect stretch out like rays, and its body is suspended between them, distributing its weight to six points. It weighs barely one grain—I have had it carefully weighed by a chemist's scales—so one-sixth of a grain only impinges at one point upon the water (or one-fourth, when the insect is employing its front legs against its prey), but this is sufficient to cause a slight depression.

The dimensions of the Strider are as follows:—Length of body, 15 millimetres; breadth, at widest part, 5mm.; thickness, at thickest part, 3mm.; length of antennæ, 6mm.; length of proboscis, 3mm.

*Front Legs:* Length of femur, 5mm.; length of tibia, 3½mm.; length of tarsus, 2mm.

*Middle Legs:* Length of femur, 10mm.; length of tibia, 8mm.; length of tarsus, 4mm.

*Hindmost Legs:* Length of femur, 8mm.; length of tibia, 6mm.; length of tarsus, 2½mm.

These further particulars may be interesting:—The legs are densely clothed with short bristles—these, stretching backwards, must aid the creature's movements. The tarsi are two-jointed, and terminated with sharp claws. The antennæ have four long joints (that next the head being the longest), and a ring-joint between the second and third. The eyes are jet black, closely reticulated, and so prominent that they seem to be starting out of their sockets. The front legs are much stouter than the others and are formed for clasping—they are weapons of offence. The body beneath has the appearance of fine glossy leather.

The Striders are cannibals. I saw one of them leap upon a smaller relative, grapple fiercely with it, clasp it tightly to its chest, and then drive its proboscis into its body—the victim soon succumbed.

While sitting by the pool I learned, with other facts, that wasps resort to the water to drink. I do not think that this should occasion surprise, for the mastication of wood pulp, for the construction of their nests, must be thirsty work for the wasps.

At the edge of the pool some broken pieces of rock had fallen in, and a little water found its way between them. I saw a specimen of *Vespa diabolica,* Sauss, alight on the edge, walk down to the water, take a drink, and then fly away. Soon a second came to the same spot, and did likewise. Then there was a flash of brighter yellow; and a very bustling object came on the scene, and took the same course. I caught this insect to make sure of its identity—it was *Vespa germanica,* Fabricius. Soon afterwards a fourth insect, a specimen of *Polistes pallipes,* St. Farg., came to the same place for refreshment. No doubt all these wasps had nests not far away, and that this drinking-place was one of common resort for them.

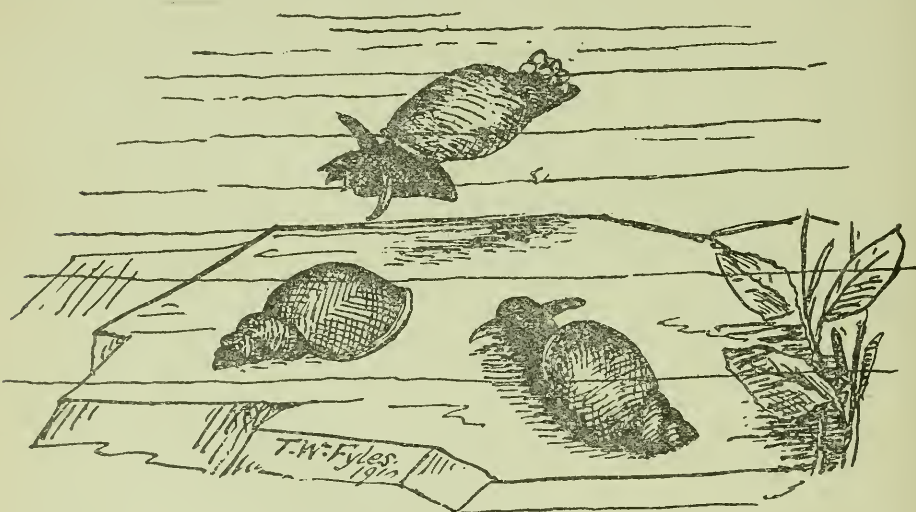


Fig. 2. Water Snails.

Another species of the wasp that frequented the pool was the Mud Wasp, *Pelopœus cementarius,* Drury. It came to gather material for the construction of its—we may well say—*orphanages.* These are built of mud, in snug nooks of houses, or other buildings. They consist of cells—each of about the capacity of a pea-nut—closely packed in masses which are smoothed on the outside. Before closing up a cell, the mother wasp fills it with spiders paralyzed by its sting, and drops a solitary egg amongst them. The mud castle contains no chamber for its builder—she soon dies.

Clinging to the rocky sides and bottom of the pool, I found a number of Water Snails, belonging to the genus Limnæa. Their shells appeared larger than those of *Limnœa palustris,* and not so large as those of *Limnœa stagnalis.* The snail itself was an ungainly object, dull black in colour, and with flat horns, the shape of brush-scythes. These probably aid the creature to steer its course in the water, when it loses its foothold.

Of Water Beetles three kinds were to be seen in the pool, viz.:—*Colymbetes sculptilis,* Harris, *Dytiscus fasciventris,* Say, and *Acilius fraternus,* Harris. *Gyri-*

*nus borealis,* Aubé, which was very abundant in a neighbouring stream, was not to be seen in the pool.

On one of my last visits to the pool, I drew from the bottom of it a broken limb of a tree that had lain there, water-logged, for the whole season. Attached to the under surface of this piece of wood, I found a strip of some kind of spawn. It was three-quarters of an inch long and about three-sixteenths of an inch thick, and so firm that I was able to loosen it from the wood without damaging it. It was translucent, and I counted in it sixty minute eggs. I placed it in water, and shifted it to fresh water frequently. The jelly-like matter surrounding the eggs, whether designed to nourish or protect them, gradually dissolved, and the eggs became free. At this stage the embryo, curled round within the egg, could be easily seen with the naked eye. The eggs began to hatch in the beginning of the present month (November). This is a description of the larvæ in their first stage:—

Length, two millimetres. Translucent and colourless throughout—except that the tips of the mandibles were ochreous and the eyes were small brown dots. The head was large in proportion to the body. The antennæ were straight and tapering. The thoracic segments were slender, and angulated where the limbs were attached. The femora—especially of the hindmost pair of legs—were remarkably large. The segments of the somewhat enlarged and flask-shaped abdomen could be easily counted. At the end of the body were two respiratory tubes.

Were these the larvæ of *Dytiscus fasciventris,* Say?

On August 3rd an American Bittern (*Botaurus lengtiginosus*) flew up as I approached the pool. I think the bird was merely a passing visitor, for, in my frequent walks around the spot, I did not see it again.*

One day in September, while occupying my favourite seat by the pool, I became aware of a dozen heads protruding from the water, and a dozen pairs of eyes fixed intently upon me. The position struck me as ludicrous, and I laughed aloud. Immediately a dozen pairs of heels turned up with a splash, and my interviewers disappeared. In less than five minutes they showed themselves again, and resumed their watchful gaze, as much as to say, "What will you do next?" They were half-grown Leopard Frogs.

I made the acquaintance of these creatures early in May, when they were dirty-brown tadpoles, about the size of our hazel nuts, and possessing long tails. They developed hind-legs in the beginning of July, and, before the end of that month, had absorbed their tails, and become possessed of fore-legs.

About the time of their metamorphosis, the full-grown frogs disappeared from the pool: they were gone probably in search of land adventures; for their kind were plentiful in the low-lying meadows near.

Not the least interesting of the frequenters of the pool were the Dragon-flies.

The first of these to attract my attention was *Tetragoneura canis,* MacLachlan. I had not met with it previously, and am indebted to Dr. E. M. Walker for its identification. The following is a brief description of it:—

*Tetragoneura canis,* MacLachlan: Length of body 1⅜ inches; expanse of wings, 2 3-8 inches. Colour brown. Face and thorax hairy, with a white gloss. On either side of each segment of the abdomen there is a clay-yellow patch. Abdomen somewhat spatulate, widest in the middle, tapering towards the end. Venation of wings pale brownish red. Stigmata dark brown. At the base of the secondaries are some small brown blotches.

*On the 10th of June, 1904, I found a Bittern's nest containing three eggs, at the "Gomin," near Quebec. It was merely a depression in the herbage. The eggs were 1 7-8 inches long and 1 7-16 inches broad, of a pure oval, and fawn-coloured.

In the course of the season the pool was visited by representatives of the five species undermentioned:—

*Basiæschna janata,* Say.
*Libellula quadrimaculata,* Linneus.
*Libellula pulchella,* Drury.
*Plathemis trimaculata,* De Geer.
*Æshna umbrosa,* E. M. Walker.

The last named was a particularly brilliant object. It was seemingly set with jewels. It flashed in the sunshine with the glories of emerald, sapphire, and topaz. It hovered over the pool, as a kestrel hovers over an English meadow.

The whole scene in the bright autumn days was very lovely. The Golden Rod grew thickly around, its colors relieved by the blue of the Michaelmas Daisy. Here and there a clump of the Glaucous Willow gave an air of seclusion to the spot; and a few yards away the stately forest trees ascended, with foliage already tinged with russet, crimson, and gold.

It was a spot in which the contemplative man might hold communion with his Maker, and muse upon all His works, and "rejoice in giving praise for the operations of His hands."

On October 17th—the day being bright and warm—I visited the pool again, but could detect no living thing within it. All its frequenters had lived out their lives, or sought their winter retreats.

The ground was covered with dead leaves, brown and sear; and silence reigned —"*Sic transit gloria mundi.*"

## THE BEAN MAGGOT IN ONTARIO IN 1910.

J. E. Howitt, M.S.A., Ontario Agricultural College, Guelph.

It was the writer's privilege and pleasure to attend the inaugural meeting of the Bean Growers' Association of Kent County, at Ridgetown, in May. At this meeting the fungus diseases and insects injuring beans were discussed at some length. During the discussion many of the growers asked about a little white "weevil" which they claimed was their worst insect pest. Most of them had the idea that it was the bean weevil, but, from the descriptions given of it, the writer came to the conclusion that the pest was not the bean weevil. It was, however, impossible to say what the insect was from the accounts given by the growers at the meeting. An arrangement was, therefore, made for the Biological Department of the Ontario Agricultural College to investigate the insect and fungus diseases of beans which might become prevalent in Kent County during the summer of 1910.

About the 10th of June word was received at the College that "the little white weevil" was doing serious harm in Kent County. Many fields of beans had failed to germinate properly owing to the ravages of the pest. On June 21st the writer went down to Ridgetown, in Kent County, to investigate as fully as possible the cause of the trouble. At Ridgetown Mr. W. E. Galbraith, President of the Bean Growers' Association, met the writer and a start for a trip of inspection was made. The farm of Mr. Galbraith was first visited. On looking over the bean fields, here and there in the rows were seen plants which were little more than blackened stubs. The plumule and cotyledons had come above the ground, then withered and discolored. When some of these stubs were examined the cotyledons were seen to have little holes eaten in them, usually many holes in a single cotyledon, and very often the plumule had a little hole bored in it from above downwards for a short distance, less than one-sixth of an inch. It was quite evident that some insect had done the damage. Many of the other plants in the rows which were more advanced in growth were also noticed to be unhealthy and dying. The first pair of true leaves were limp and hanging down around the stem, instead of erect and spread out in their natural horizontal position. On digging up some of these plants a discolored hole was noticed in the stem usually just above the root, but sometimes in the root. When these stems were cut open they were found to have a little tunnel running up through the centre, and at the end of each tunnel a little white maggot was usually found. These maggots were evidently killing the plants by boring in the stems.

At the next farm visited a field was examined in which the beans had failed to germinate properly. Only a very few plants had come up in the rows and the owner was about to resow the field. The beans in this field had been planted just before a cold rainy spell lasting about three days. On uncovering some of the beans it was found that they were badly eaten by the same little white maggot that had been found in the stems. Half a dozen or more of the maggots were often found feeding upon a single bean. They were generally beneath the seed coat and between the cotyledons. Many more bean fields were examined and in all the maggots were found in greater or less numbers. Sometimes the seeds had been so badly eaten that they had failed to germinate, but in many instances though the cotyledons had been attacked by the maggots, the seed had germinated and pushed the damaged cotyledons above the ground and the plants appeared in the rows as discolored stubs. Though the maggots caused many blackish stubs in the rows and killed many of the more advanced plants by boring in the stems, the chief damage done by them was undoubtedly the destruction of the seed in the ground, making replanting necessary. The writer was informed that in some seasons many hundreds of acres had to be replanted on account of the work of the maggots.

While looking over one of the fields a large number of small flies were noticed hovering over and lighting on the bean plants. Suspicion was at once aroused that these these flies were the adults of the maggots. After some little trouble a number of them were captured and put on one side for closer examination than could be made in the field. At the same time a large number of the little white maggots, with the beans they were feeding on, were collected and placed in tin tubes and covered with a little moist earth.

The maggots were collected on June 21st, and on June 23rd, the day the writer returned to the College, they were all removed from the tubes. They had not apparently suffered from their journey, as they all seemed active and healthy. Two lots of the maggots and beans were put in large glass vials, the mouths of which were closed with plugs of cotton batting. A third lot was placed in a pot of moist sand in a breeding cage. On June 25th it was noticed that four or five of the maggots in the vials had pupated, and by June 27th practically all the maggots had transformed. On July 4th two flies emerged in one of the vials, and a week later it was found that flies had emerged from nearly all the pupæ, both in the vials and in the breeding cage. These flies appeared to be identical with those taken in the fields near Ridgetown. In order to make certain as to their identification some of the flies taken in the field and some of those bred in the vials were sent to Professor Coquillett of Washington, who identified both lots as *Pegomya fusciceps,* the adult of the seed corn or bean maggot.

The seed corn or bean maggot (*Pegomya fusciceps*) has been known for years as a destructive pest of seed corn and of beans. In the Entomological Society Report of 1900 Professor Lochhead mentions this pest among the insects of the year as doing serious harm to beans in Lambton County, Ontario. In Kent County, according to the reports received by the writer from the bean growers, it is by far the most serious insect pest of beans. Up to the present time the growers have apparently not known exactly what it was, nor have they had any exact knowledge of its life history, habits, or measures for its control. A brief account of these is, therefore, given here.

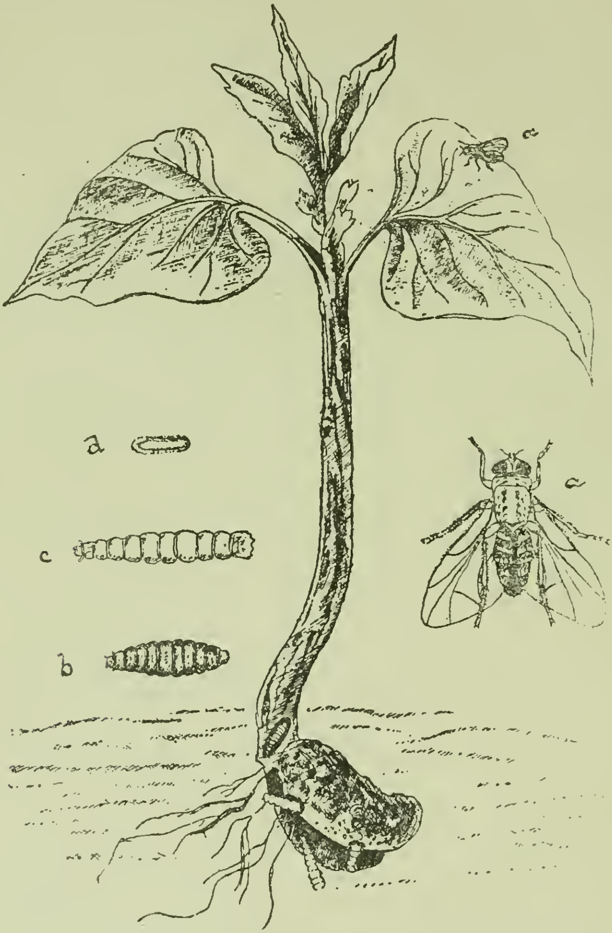


FIG. 3 The Bean-Fly—(*a*) adult fly, (*b*) pupa case, (*c*) maggot, (*d*) egg.—After Lugger.

DESCRIPTION.—The parent fly of the bean maggot looks very much like a small house fly. The maggots are white or yellowish white in color, footless, cylindrical in form, tapering towards the head, and about one-third of an inch in length. The puparia are light brown, barrel-shaped or elliptical in outline and about one-fourth of an inch in length.

LIFE-HISTORY.—It is thought that this insect passes the winter as the fly or pupa. In the spring the flies lay their eggs on decaying matter in the soil, and, when the maggots hatch, they find their way to the seed beans or seedling plants.

After the maggots cease feeding they change to the puparia from which the flies emerge in about two weeks. It is probable that there are two broods each season in the bean fields in Ontario.

Means for Control.—While investigating this pest in Kent County the writer found that in every case where the maggot had done serious harm its presence in large numbers could be accounted for by one or other of the following conditions: Planting the seed just before a prolonged cold rainy spell, planting the seed too deeply, the heavy application of farmyard manure, or the neglect to follow the usual three years' rotation of crops. Means for control are, therefore, chiefly methods of prevention. Planting the beans at the right time and at the proper depth in order to insure a quick start seems to be one of the best means to prevent the ravages of this pest. Anything which retards germination, such as cold wet weather shortly after planting, or covering the seed too deeply, gives the maggots a chance to get started in the seed and to prevent its proper germination. As the eggs are deposited in decaying matter the application of farmyard manure increases their number, and the substitution of commercial fertilizers is often advised but not always practicable. If the maggot becomes very serious in a field, it will often be advisable to stop growing beans in that field for a number of years, in order to get rid of the pest.

## THE HORSE-RADISH FLEA-BEETLE (*Phyllotreta armoraciae,* Koch).

A. F. Winn, Westmount, Que.

About the middle of May last I purchased at Bonsecours Market, Montreal, a few roots of horse-radish, which I cut up and planted. In due course they began to put up their leaves.

Early in June, when the leaves were only four or five inches long, holes appeared, evidently the work of flea-beetles, but as it was the first time I had grown the plant, I did not know what species was likely to be the culprit. A glance showed the beetles in abundance, and also that they were something quite new to me.

They were about 3 mm. long, oval, and very convex. Head and prothorax black, elytra creamy white with a black sutural stripe, broadest in the middle, and a narrower black marginal line. Both prothorax and elytra dotted over with punctures. Many of the beetles were mating.

There was no difficulty in identifying the insects, as in Insect Life, Vol. vii., pgs. 404-406, 1895, there is an article by Mr. F. H. Chittenden giving an excellent figure and an account of its first captures in the U.S.A., at Chicago, Ill., and Guttenburg, Iowa. Whether this well-known European species has spread to the districts about Montreal overland eastward from Chicago, or whether we have had a direct immigration via the St. Lawrence route is a question, but not a very important one, as the fact remains that it has settled down in Canada, and will have to be entered among our insects injurious to vegetables. It seems remarkable that these little beetles could find my new plants so quickly and in such numbers. Doubtless someone within a few blocks of our house has been growing horse-radish, and has been harbouring a rather interesting beetle, perhaps for several years, all unknown to the Montreal Branch of the Entomological Society of Ontario.

Towards the end of June a plant of horse-radish was noticed by the roadside about a mile from my house, and on examination was also found to have its leaves riddled with holes, and scores of beetles were ready to hop off when approached too closely.

Although our common species of Phyllotreta, *P. vittata,* has a wide range of food plants among cruciferous plants both wild and cultivated, *P. armoraciæ* seems to have restricted itself to the horse-radish (*Nasturtium armoracia*) and marsh cress (*Nasturtium palustre*). If it should develop a liking for cabbage, it will be able to find an abundance of food in this part of the Island of Montreal. There was no sign of either eggs or larvæ on leaves or stems of the horse-radish plants at any time during the summer; if the larvæ attack the plants they must do it below ground among the roots.

## THE MIGRATION OF SOME NATIVE LOCUSTS.

Norman Criddle, Treesbank, Manitoba.

We read from time to time, and have done so for many years past, of vast hordes of locusts darkening the sky, as they sweep onward from unknown breeding grounds. How they devastated the crops and ate up every living leaf in any locality they happened to make a stopping place, and in fact left behind a desolate and leafless waste where a few hours previous all had been luxury and beauty. Such is said to be the case, at times, in parts of Africa, India, and certain South American countries. There is, however, no longer any mystery connected with these visitations. Science has explained all that; has discovered the breeding grounds and is doing much to eliminate the injury by guarding against attacks and providing for them when they occur.

We are not, as a rule, apt to associate our common grasshoppers—many of which, however, are true locusts—with those devastating species. In fact of all our many different kinds we usually claim but one as truly migratory, namely the Rocky Mountain Locust, *Melanoplus spretis,* the locust made famous by having a special Commission appointed to investigate its ravages. This species in the past, has done immense damage to vegetation mostly in the United States, but it also invaded a great portion of Manitoba in the seventies, and is specially remembered on account of its having practically swept the Red River Valley clear of vegetation. Since then there have been two minor outbreaks confined to Southern Manitoba, the locusts having evidently flown from somewhere south. In spite of the prevalence of this species in Manitoba, at times, it is very doubtful whether it can be classed as a native, a distinction which, after all, we are not anxious for.

Leaving out *M. spretis* we have still several distructive species, foremost among them being the lesser Migratory Locust,*Melanoplus atlanis,* with several minor lights such as *M. gladstoni, M femur-rubrum, M. angustipennis, M. packardii, M. minor M. bivittatus* and others, all of which are very injurious at times and migrate regularly during the months of July and August.

It is a wonderful thing this migration. Few animals are free from a desire or instinctive stimulus to move to other parts and so spread the species. Plants, also, are constantly doing it by means of their seeds and those that cannot go far by their own exertions, fasten themselves to such as can, and so, as with ourselves, air, land and water are all made use of for the purpose of travel

With regard to grasshoppers, it is strange that their regular periodic movements have been largely overlooked, though no doubt this is partly due to a lack of knowledge as to where to look. At Aweme, Man., where locusts have been troublesome of recent years, one instinctively looks up towards the sun, taking care to get behind some building, or in some way hide the sun's disc and then, if there are any flying, they will be easily observed within a radius of from one to fifteen diameters from the sun.

When a locust has the instinctive incentive to fly, it is said to inflate the air sacks along the side of its body; it then rises with a spiral movement, round and round, higher and higher, until reaching a height of some hundred feet or more and feeling the resistance of the wind it sails slowly away, usually flying with its head facing the breeze if it is at all strong, and gradually getting higher as it moves along with it until it becomes a mere speck of glistening whiteness, when close in line with the sun and invisible elsewhere. When there is no breeze it will return obliquely to earth to await a more favorable opportunity.

That this desire or instinct to fly elsewhere is no sudden impulse is shown by the fact that a locust when disturbed seldom flies any great distance and in fact seems incapable of doing so, while those that are prepared rise easily. Nor is the movement due to lack of food as one often sees them rise in the midst of plenty. No! it is Dame Nature's way of spreading her children over the country and she has taught them through the law of natural selection to go and also how to prepare for the journey.

The migratory season commences soon after the locusts reach maturity, that is when they have passed their final moult, and some three or four weeks before they commence laying eggs. It lasts almost a month. There is not, however, a continual movement, only hot sunny days are chosen and even then the locust is dependent on the wind which not only carries it along but indicates its direction also. The days most preferred are days when the breeze averages some fifteen miles an hour, though lesser winds as well as higher, are used to advantage; locusts seldom fly, however, when the wind is blowing hard.

It is interesting to watch these movements on a gusty day, when calm one moment and breezy the next. Then every fresh gust is taken advantage of and one sees hundreds of locusts rise on such occasions, as if having waited their opportunity. It is the same while looking up towards the sun, one moment will only discover a few, the next a perfect swarm moving at different angles owing to the breeze having slightly different directions at different heights, and so the journeys continue first east, then west, south or north as the wind varies. At night they apparently drop to earth * to infest new neighborhoods or perchance rise and move elsewhere next day. But not all go. Among the Orthoptera especially, nature has made a wise provision. Some are endowed with long wings; these are built especially for locomotion and conveying the insect long distances. Others of the same species have short or rudimentary wings which obliges them to stay at home. So that while the long-winged forms seek new homes, there are enough short-winged brothers and sisters to carry on the family at home and incidentally the work of destruction also.

*It is well known that some grasshoppers travel throughout the night. Such an instance is related by Prof. S. J. Hunter of *Dissosteira longipennis*, and though I have no direct evidence, it is possible that some of the Manitoba species are also nocturnal during the migratory season.

# SOME OBSERVATIONS ON THE PRACTICAL IMPORTANCE OF THE STUDY OF PARASITIC INSECTS.

C. Gordon Hewitt, D.Sc., Dominion Entomologist, Ottawa.

This subject of the practical significance of a study of the parasitic species of insects is becoming increasingly important each year, and my reasons for bringing the subject forward are chiefly two, first to reiterate the significance of this study; and secondly, to give an account of a little of the work that we have begun at Ottawa, some of which is a continuation of the work I was carrying on in England. We are all acquainted with the importance of parasitic insects in the natural control of serious outbreaks of injurious insects; so much so, in fact, that the sudden disappearance of an injurious insect which has attained very large proportions is not infrequently attributed to the work of parasites, upon the slightest, and often in the entire, absence of evidence in support of the supposition. Nevertheless we have a very large number of instances on record when such disappearances are due to the enormous increase of parasites. These sudden disappearances of serious outbreaks usually occur when man would be perfectly powerless and on that account, therefore, it is of great importance that we should study, so far as is possible, the course of such outbreaks, with the idea of learning the methods by which control is obtained and a balance regained in a state of nature. This is becoming increasingly necessary. Our own present methods of combatting insect attacks are comparatively inadequate. They are practicable only when the area attacked is not large, where the vegetation makes the expense entailed justifiable and where the insects have certain definite types of life-histories. But take an insect devastating a large area, as the Larch Sawfly has done in Canada in past years, no means could be adopted to control it, the area under attack was too large. Our cut-leaved birches are being killed by the Bronze Birch Borer, *Agrilus anxius*, nothing can be done at present on account of the peculiar life-history and habits of the insect. Many other instances may be quoted of cases similar to these where we are powerless at present to adopt practicable remedial measures. The reason for this is that we know so little. Our knowledge of the natural means of control, the parasitic insects and also the parasitic fungi which under natural conditions frequently obtain control, is still very meagre. One reason for this is, I think, that economic entomologists have been too much occupied in devising sprays and other mechanical means of attacking injurious insects, and the study of parasitic means of control, the natural means of control has been unduly, though on account of instances well-known to all, one cannot say entirely neglected.

The impossibility of using ordinary methods of insect control in the case of the Gipsy and Brown-tail Moths in Massachusetts has resulted in a great stimulus being given to the study of parasitic means of control and I firmly believe that the work now carried on under the Bureau of Entomology of the United States Department of Agriculture under the direction of Dr. Howard, who was responsible for its initiation, is the real beginning of the study and the practical applications of that study of parasitic and other natural means of control. This type of control will increase in importance as the importance of the conservation of our forests, for example, increases, as it is doing year by year.

During the last few years an interesting instance of the value of this kind of work occurred in connection with my investigations upon the Larch Sawfly, *Nematus erichsonii*, in England. I had the pleasure of bringing to your notice last year some of the results of this work and the different natural means of control which had been discovered were described.* The chief of these was the ichneumon, *Mesoleius aulicus,* Grav., which was found emerging from the cocoons about the same time as the adult sawflies were emerging. In the spring of 1908, during which year the defoliation of the larches was very serious, a beginning was made in studying the course of the chief factor in the natural means of control, namely *Mesoleius aulicus,* and the average number of cocoons parasitized by this insect in 1908 (strictly speaking one should say 1907, as 1908 is the year of their emergence from the hibernating larvæ,) was six per cent. In the following year, 1909, the percentage of ichneumons emerging had increased to twelve and fifteen per cent, showing that the parasites were increasing in number, though not very rapidly, and there did not appear to be any falling off in the abundance of the sawfly. In 1909, I relinquished charge of the English work on coming to Canada. As this investigation was of considerable interest to me and as I was continuing my study of the insect and its parasites, arrangements were made for a shipment of the cocoons collected in the English districts in which the investigations were previously carried on, to be sent to Canada. During the spring of this year the percentage of cocoons parasitized with *M. aulicus* was again counted and to my great pleasure and surprise I found that they had increased to over 60%. This was confirmed, in England, by Mr. J. Mangan, who continued the work on my departure; he found 62% parasitized. What was originally considered to be of theoretical importance only, is now seen to be of practical importance. We know that in about another year the sawflies will be practically controlled by the parasite in those localities so severely infested previously; where trees had been killed by repeated defoliation and the owners were cutting and contemplating cutting down immature timber to save it. This is now unnecessary and Mr. Mangan informs me that in those localities where the sawflies were so abundant previously it is almost impossible to find them. The trees which in previous years had all the appearnce of having been burnt, so complete was the defoliation, this year appeared almost normally green. Other localities, however, were more severely infested, and the Board of Agriculture, I understand, are adopting the recommendation in my paper to which reference has already been made, namely the collection of cocoons from localities where the percentage parasitized is very great and their distribution in localities where the outbreak is first beginning. In this way the practical application of natural means of control is made and we are able to assist nature in gaining this control and to hasten on the control far more rapidly than would be the case if affairs ran their natural course. This accelerating of natural eradicative measures will prevent also the loss of trees which occurs in the natural course of events. Several hundreds of the chief parasites *Mesoleius aulicus* which I reared at Ottawa were liberated there, and some were sent to Algonquin Park.

A further parasite of *N. erichsonii* and which appears to be abundant both in Canada and the United States is a small Chalcid, which Packard was the first to figure as *Pteromalus nematicida,* although he did not describe it. We found this parasite very abundant in some cocoons collected on the Experimental Farm, at Ottawa, in 1909. This year, through the kindness of Mr. Fiske, of the Gipsy Moth Parasite Laboratory, Melrose Highlands, Mass., I was able to secure a further supply of cocoons from Wellesley, Mass., infested with the same parasite, the life-history of which we are now studying, as I believe it is one of the most important natural means of control that we find. It is very easy to get them to oviposit under laba-

*These have already been described in my paper, "The Large Larch Sawfly, *Nematus erichsonii*, Hartig." Journal Board of Agric. (London), Vol. XV., pp. 649-660. 1908.

tory conditions and as a comparatively large number of eggs are laid in each cocoon, it should be possible to breed this parasite in large numbers. This work is still in progress but I have a number of drawings of the parasite in different stages which may be of interest, and I think that one of the most important functions of these meetings is to report and discuss work that is being carried on, as such discussion is frequently of the greatest value to the investigator.

(Specimens and drawings were passed round.)

## THE COCCIDÆ OF CANADA.

Prof. T. D. Jarvis, O. A. C., Guelph.

Like a great many other families of minute insects the Coccidæ have been comparatively little studied in America, but to the fruit grower, forester, florist and others, the scale insects are of very great economic importance. Most of the species found in Canada have been introduced from other countries, only a few species being native to Canada. It is the imported species that give most trouble to agriculturists. It almost invariably occurs that when the balance of nature is disturbed, as is the case of introducing new form of life into a new country hitherto free from that form, unusual increase in numbers immediately follows. The habits of the Coccids are interesting and varied, and they are one of the most cosmopolitan insects known. They are found in the north as far as the 60th degree and equally as far south. In the tropics they are most at home, but when exported abroad they readily adapt themselves to nearly all conditions of temperature and climate. In some instances the spread is gradual, as in the San José; spreading northward the covering of the scale must undergo a thickening to protect it from the severer weather. Sometimes the spread is limited by the lack of suitable host plants, but in many cases, such as New York Plum Scale (*Eulecanium cerasifex*) the insect readily adapts itself to almost any kind of plant food, scarcely a tree, shrub or vine being immune. The writer has found many different species of herbs under badly infested trees literally covered with this pest.

A study of the habits of the Coccidæ furnish some very interesting phenomena of animal life. In Australia some species produce galls of all shapes and sizes on the eucalyptus trees. In Africa a large species found underground (*Margarodes*) are collected by the natives to make necklaces, bracelets, and other ornaments. Another species (*Tachardia lacca*) forms a useful product known as lac. The cochineal insect is noted for its commercial value as a dye, and numerous other scales are important from a commercial standpoint.

### Gall-Makers.

Perhaps there is no more interesting species than those belonging to the genus *Brachyscelcs,* which are found in the land of anomalies, Australia. Mr. Claud Fuller, has published a bulletin on Gall-making Coccids in which he describes the galls as follows:—

"*Galls of the Male Coccid.*—These are invariably short cylindrical tubes, two to six inches in length, generally growing upon the leaves; they are mostly of a purple claret colour, but often brown or green. Some are simple tubes with a notched rim at the summit, others have the rim dilated forming a saucer-like top. The male gall of *B. rugosa,* Froggatt, is emerald green, cylindrical, constricted at the base, stout with thick, soft walls, the apex truncate; length, four lines; breadth one line. In several species these male galls grow upon the female gall; *B. munita,* Shrader, has the males separate and springing from the horns; in *B. phratrata,* Shr., *B. thorntoni,* Frogg., and *B. nux,* they are congregated together in a cup-like growth. This growth expands like a flower, and is, I am afraid, rather inaptly described by Shrader as a cockscomb, and as a mushroom-like growth by Froggatt. There is generally only one cup-growth attached to a female gall, but *B. nux,* as a rule, has two and often three. They are attached at one side of the summit of the female gall, which they often exceed several times in size.

*The Female Galls* exhibit a great variety of forms, which are the easiest means of distinguishing the different species, varying in size from one-half to six or seven inches in length. In the shape there is as great a variety as in the size; many of them resemble cone-like fruits, others nuts and fruits, whilst the lateral growths of *B. duplex* are not unlike leaves. Occasionally growing on stalks, they more often sit close upon either the twigs, branches, or leaves, from which they spring.

*The Formation of Galls.*—The number of various gall-making insects which have the remarkable power of diverting the forces of nature, as represented in the growth of a plant, to their own advantage, has given rise to a deal of speculation and experiment to discover the inherent element of property possessed by the insect by means of which it operates. Up to the present we can go no further than to say that the galls are due to an irritation set up by the insect, yet each individual species must have some peculiar properties or how would we find such widely differing results when in their initial stages the producers are as alike as the two proverbial peas? Mr. Tepper asserts that the larvæ always select an embryo-bud, and by the context he evidently wishes an undeveloped but true bud to be understood. This, is, however, not the case; it may hold good in some instances, but certainly not in all. Whether upon stem or leaves the gall-growth originates from the cambium ring; the developmental activity of the cells is released by the insect, and a shoot forms over the growth of which the animal maintains direction. This is proved by the cessation of growth when the coccus, in a young stage, is killed by parasites.

The rudimentary gall, according to Dr. Alder, draws its nourishment from the surrounding tissue; later on, however, processes are driven into the gall from the spiral vessels of the cambium ring, which form a new element to assist in its development, and it thus becomes an independent structure, having individual powers which regulate its shape, position, etc. These remarks, whilst referring to galls formed by wasps, apply equally to coccid galls."

## Secretions.

One of the main characteristics of the Coccidæ is their habits of secretion. Like the Aphids the insects secrete a sweetish substance known as honeydew, which is the sole food of several species of fungi and the chief food of many species of Ants. This fluid is excreted entirely by the females by a special organ, a cylindrical tube exserted from the genital orifice after the manner of the telescope. Honeydew is attractive to many other nectar feeding insects besides the ants, such as the Hive Bee and Bumble Bee and many species of Wasps.

A species known as *Physokermes abietis* found at Guelph, gives off a wax-like secretion which is collected and used by the Hive Bees in constructing their cells. This species is very abundant on Norway Spruce, and although causing considerable harm in the tree is very beneficial to the bee in supplying material for the foundation of its cells.

Another species, *Ericerus pela,* secretes a pure white wax, which in China is collected and made into candles for special use. In India similar use is also made of a wax obtained from a species of *Ceroplastes ceriferus.*

In India a species known as the Lac insect (*Tachardia lacca*) furnishes us with the useful product known as lac, which forms a basis for varnish, French polish and other important products. It is collected in its native home, India or Ceylon, and sent abroad on the twigs and branches upon which the insect has worked and deposited the substance. This raw material is then subjected to a process of refining by which the material is gathered in the form of shell-lac and is then ready for use. It may be interesting here to offer a brief life history of the insect itself which produces this very valuable material. Mr. Robert Newstead, quoting from the Royal Horticultural Journal in his work on the Coccidæ of the British Isles, writes as follows on the species:—

"Like all other Coccids, the young (larvæ) are active; they are at first very tiny creatures, resembling mites, and are generally spoken of by the horticulturist as 'lice.' These young arrange themselves in groups of various dimensions round the twigs of the food-plant, and, having settled matters satisfactorily as to space, insert their thread-like sucking-tube (mouth), into the plant tissues, and pump up the sap of the tree. At the same time they commence covering their bodies with the peculiar 'lac' which, by the time they are fully developed adult females, assumes the form and size shown in the illustration. By taking a hot knife a transverse section of the material may easily be made, when it will be seen that the covering material or 'lac' is not a solid mass, but is honeycombed by large, somewhat ellipsoidal cells, each of which was once tenanted by a single female . . . If we examine a female we find she is shaped somewhat like the cavity in which she lives, with the cephalic portion bearing the mouth parts touching the bark at the narrow end of the cavity, and the abdominal extremity at the opposite end, having connection with the exterior by means of a minute perforation; and she is destitute of legs antennæ, etc. Where she has lived she dies, leaving as a legacy the wonderful product which she manufactured during life, and which all the world over is of so great importance in commerce. And this is not all; the bodies of the females also furnish an excellent dye, which in former times was of much value also."

## Dissemination.

The female scale is wingless, hence they must be borne from place to place by agencies outside themselves, such as wind, water, plants and animals. It is very noticeable that with such scales as the San José the spread is always greatest in the direction of the prevailing winds. This, however, is possible only when the insects are in the active moving stage; as soon as they come to rest and attach themselves to their host no further spread occurs in this way. Rain too is supposed to help spread the scale when they are in the egg or young active stage, by washing them from the upper to the lower parts of the trees, but it is animals that effect the greatest dissemination from tree to tree. Birds frequenting orchards and forest trees undoubtedly carry numbers of scale insects attached to their feet and beak. A very wide distribution may occur in this way, even across bodies of water or mountain ranges. The insects and Acarids also assist in the local distribution of the scales. Lady Bird beetles and Ants among the insects and the predaceous species of mites are responsible for a great deal of the spread of the injurious scales. Another probable factor in distributing scale insects is the careless handling of the infected fruits, such as apples and pears. Refuse fruit is often allowed to come in contact with unaffected trees and thus cause the free plants to become infested. The spread from one province or country to another is due almost entirely to the interchange of plants by nurserymen and florists. There is always the possibility of introducing scale wherever a shipment of shrubs or trees is made from one place to another. If the trees can adapt themselves to the new environment and become thrifty under the new condition, there is hardly any question about the scale surviving. In nearly all cases the scale undergoes the change without any apparent inconvenience.

## Nature of the Injuries.

As nearly all scales derive their nourishment from the juices of the plant it is evident that a considerable weakening in its vitality must result. When only a few insects are present as we found on trees attacked by our native species, there seems to be very little injury to the tree, but when swarms of these occur in the case of the imported species the health of the tree is so impaired that in some cases death occurs. In cases where the trees do not actually die, but are rendered weak, a corresponding weakening is shown in the quality and quantity of the fruit. Some of the characteristics of the injury are seen in discolorations of the leaves and tissues, malformed and discolored fruit, and to some extent early maturing and falling of the leaves.

## Life-History.

Most of the Homoptera have incomplete metamorphosis, but in the Coccidae only the females have incomplete metamorphosis; the males pass through the four stages. The eggs are seldom laid in exposed situations as is the case in their allies, the Aphids and Aleyrodids, but various means are provided for their protection from predaceous animals and from the weather. The Cottony Maple Scale lay their eggs in sacks formed of a cottony-like substance, which surrounds them. Others, such as *Physokermes abietis,* are deposited in a very peculiar pouch-like organ formed by the folding in of the outer epidermis. In Orthezia the female carries the eggs between the long waxen plates at the posterior extremity of the body. The most common color of the egg is yellow or pink, but a few are crimson, such as that of *Chionaspis salicis* and in some species of *Paralatoria* they are dark mauve. The number of eggs laid by an individual varies from 25 to two or three hundred.

The larvae, upon hatching, in the majority of species, remain for a few days within the covering provided for them. Soon they leave this house and become quite active, seeking the new and tender tissues, where in most cases they settle down and immediately insert their long sucking apparatus into the tissues, and in the case of the female, remain stationary until death.

The pupal stage occurs only in the males. After a few days of active larval life they withdraw their tubes and undergo marked changes characteristic only of the Coccidae.

Most of the adult males being destitute of mouth parts live only a few hours, or at most a few days.

The female adult is characterized by the absence of wings and by its well developed mouth parts. They are usually flat and pyriform in shape and covered with scales made from the secretions of their bodies. There are sometimes one and sometimes several generations in a season.

## Characteristics and Classification.

The Coccids belong to the order Hemiptera and to the suborder Homoptera, which includes the Aleyrodidae. Psyllidæ Jassidæ, Membracidæ, Aphididæ and Cicadidæ. These females bear a striking resemblance to each other, which is especially noticeable in the immature stages of development. The larvæ of the Aleyrodidæ are often mistaken for the female adult scale insect. Among the Aphididæ, *Ceratophis lintaniæ* is frequently mistaken for a Coccid and is known by horticulturists as the "black seed scale." All the insects of this order have sucking mouth parts, and with few exceptions, incomplete metamorphosis. In the larval stages the male and female bear a close resemblance to each other, but in the adult stages they are readily recognized. In the female the wings are always absent; the metamorphosis is incomplete, with a mouth or rostrum placed on the ventral surface. In the male the metamorphosis is complete, the mouth is obsolete, usually a pair of wings, the posterior pair represented by a pair of halteres.

### Ortheziinæ.

90. *Orthezia americana* (Walk.). This scale has been found at Grimsby, Ontario, on Golden Rod; at Woodstock, Ontario, on Ragweed. It has also been recorded by Dr. Fletcher at Ottawa, and several places in Quebec.

98. *Orthezia insignis* (Dougl.). This species was first found at the Fruit, Flower and Honey Show, Toronto, in 1906. It was next seen in the conservatories at Guelph in 1907, and since that time the writer has collected it in many parts of Ontario.

103. *Orthezia occidentalis* (Dougl.). This interesting and beautiful species was found by J. Wm. Cockle, Kaslo, B. C., on roots of grass and trees amongst rotten wood. He remarks that he has found them in great numbers on several occasions on the roots of apple trees, which had grown wild amongst a pile of chips. The specimens were identified by Prof. J. G. Sanders of Washington.

### Dactylopiinæ.

192. *Asterolecanium variolosum* (Ratz). This species was found by Dr. Fletcher in 1900, on young oak trees at Ottawa, Canada, which were set out in 1895, and came from a nursery in Pennsylvania. It has been found destructive to oaks at Niagara Falls, Ontario.

242. *Kermes galliformis* (Riley). These scales occur either singly or in clusters on the twigs and branches of Red Oak (*Quercus rubra*). It is beautifully variegated with yellowish, gray and black, and nearly always accompanied by a Lepidopterous parasite. It is found all through the Niagara District, in the city of Toronto, and to some extent in the south-western corner of the Province.

254. *Kermes pettiti* (Ehrh). This species was first found at Jubilee Point on Rice Lake, near Peterborough, Ontario, by Dr. Fletcher, in 1899. The writer has found this species at Guelph, Toronto, Ottawa, and other places in Ontario. It is very common and has a wide range in Ontario.

255. *Kermes pubescens* (Bogue). The writer has found this species on oak at Guelph, Toronto and Perth, Ontario, and is probably wide spread over the Province. It was found abundant on each infested tree and undoubtedly does considerable injury. It is usually found in the cracks of the bark on the trunk and branches.

279. *Gossyparia spuria* (Moden). This species was found attacking a few Elm trees in the city of Toronto in 1906, and since that time it has spread to nearly all parts of Toronto and has proven to be a very destructive pest.

293. *Eriococcus borealis* (Ckll.). This is a native species found on Willow (*Salix*) at Dawson City, 64 degrees North Lat., by Mr. John Morley, in 1899. As far as I am aware this species has not been found in any other locality.

391. *Phenacoccus aceris* (Sign.). It has been received from Amherstburg and St. Catharines, Ontario. So far it has confined its attacks to the Soft Maple (*Acer saccharinum*). *Several* trees were badly attacked by this scale and the writer ordered the destruction of the infested trees.

401. *Phenacoccus dearnessi* (King). This species was found by John Dearness on Hawthorne (*Crataegus sp.*) at London, Ontario.

454. *Pseudococcus citri* (Risso). It is found in conservatories on many species of plant throughout Canada. Closely related species or varieties are found on the Apple and other Rosaceous plants in the open, at Guelph and Toronto, Ontario.

490. *Pseudococcus longispinus* (Targ.). Very abundant on many species of indoor plants in all parts of the Dominion.

529. *Pseudococcus trifolii* (Forbes). The writer found this species very abundant on the roots of cultivated clover at Collingwood, Ontario.

572. *Ripersia lasii* (Ckll.). This species was found in Ants' nest (*Lasius americanus*) at Toronto, Canada, in 1897, by Mr. R. J. Crew. The writer has found this species in Ants' nest at Guelph, Ontario.

## COCCINÆ.

661. *Pulvinaria floccifera* (Westw.). This species was found in a greenhouse at Ottawa, Canada, December 15, 1894, on leaves of *Brassia verrucosa.* King described this as a separate species, *P. brassiae.*

675. *Pulvinaria occidentalis* (Ckll.). This species was found infesting in a serious manner a whole plantation of Red and White Currant at Chilliwack, British Columbia, by Rev. G. W. Taylor, in the spring of 1899. In July (the same year) Dr. Fletcher visited the plantation and found these scales to be in enormous numbers, the white flocculent threads giving the bushes the same appearance as if a light fall of snow were upon them. It has also been found by Dr. Mackay, June 14, 1901, on Gooseberry bushes at Dartmouth, Nova Scotia.

699. *Pulvinaria vitis* (Linn.).—*P. innumerabilis* (Rathvon)—*P. tiliæ* (King and Ckll.)—*P. viburni* (King). This species is commonly known as the Cottony Maple Scale and is found all over the Western part of the Province at least, and also in the woods at Aylmer in the Province of Quebec, nine miles from Ottawa. As the name indicates it attacks the Maple chiefly, and in cities often does much damage to maple shade trees. It is, however, rarely abundant for many seasons in succession, because of the attacks of parasites. Although the maple trees are the ones most commonly attacked, the scale is found on many other trees and shrubs as well. It has been found at Guelph on *Acer saccharum, A. saccharinum, A. nigrum, A. rubrum,* and *A. negundo, Tilia americana, Ulmus americana, Crataegus sp., Populus alba, Salix sp., Cornus stolonifera, Ilex verticillata, Spiræa salicifolia,* and *Vitis cordifolia.*

724. *Eriopeltis festucæ* (Fonse). The Cottony Grass Scale was found by Mr. A. H. Mackay, on grass in large numbers in Cumberland Co., Nova Scotia, in 1889. It has occurred in conspicuous numbers several times in Nova Scotia and

New Brunswick. This species has been recorded at Ottawa, Ontario, but Dr. Fletcher says, it was a mistake and, if so, we have no record of this species in Ontario.

848. *Coccus hesperidum* (Linn.). Commonly known as the Soft Scale, is found abundantly in conservatories in Oleander, Orange, Lemon, etc., in all the provinces of the Dominion.

860. *Coccus pseudohesperidum* (Ckll.). This is a very large species found on Orchids in the conservatories at Guelph and Ottawa. It is usually most abundant on *Cattleya sp.* These are the only records for this species. Its nativity is unknown.

902. *Toumeyella pini* (King). This species was found by Mr. J. Dearness on Austrian Pine (Pinus austriaca), at London, Ontario.

902b. *Toumeyella liriodendri* (Gmel.). This species was first reported by Dr. Fletcher on Tulip at Ottawa, Ontario.

911. *Eulecanium persicæ* (Craw).—Fab. 1.—*E. armeniacum*). In Mr. King's account of the scales of British North America he reports this species infesting orchards at Sherbrooke, Quebec, in 1899. This species has also been reported from Prince Edward Island.

918. *Eulecanium caryæ* (Fitch). This species is said to be the largest known species of Eulecanium. It has been in Ontario for at least 12 years, having been first found by Dr. Fletcher in the Niagara district in 1898. Judging from the fact that it has been found in that district on Peach trees and that we have found it plentiful on forest trees at Guelph, it probably occurs at least all over the southwestern part of Ontario. The scale is seldom sufficiently injurious enough to cause any alarm. It has been found on *Crataegus sp.; Ulmus americana; Ulmus racemosa; Ostrya virginica; Carpinus caroliniana* at Guelph, Ontario, and on the Peach (*Prunus persica*) at St. Catharines, Ontario. It has also been reported from Nova Scotia on forest trees. It is usually accompanied with parasites in Ontario.

921. *Eulecanium cerasifex* (Fitch).—*E. canadense* (Ckll.); *E. caryarum* (Ckll.); *N. corylifex* (Fitch); *E. cynosbati* (Fitch); *E. fraxini*, (King); *E. guignardi* (King); *E. juglandis* (Bouche); *E. maclurarum* (Ckll.); *E. websteri* (Ckll. and King); *E. fitchii* (Lign); *C. pruinosum* (Cqul.). The New York Plum Scale has become the most common scale in Ontario and Quebec. The writer has found this scale on a great range of trees, shrubs, vines and herbs, the following being a list of those so far recorded: *Acer nigra, Acer saccharum, Acer saccharinum, Acer spicatum, Acer negundo,* and many varieties of the above mentioned species, *Aesculus hippocastanum, Staphylea trifolia, Rhamnis cathartica, Psedera quinquefolia, Vitis cordifolia, Tilia americana, Tilia europea, Carya ovata, Carya glabra, Corylus americana, Ostrya virginiana, Carpinus caroliniana, Betula lenta, Betula lutea, Alnus incana, Fagus grandifolia, Castanea dentata, Quercus robur, Quercus macrocarpa, Quercus rubra, Quercus coccinea, Ulmus americana, Ulmus campestris, Ulmus fulva, Ulmus racemosa, Celtis occidentalis, Juglans nigra, Juglans cinerea, Salix sp., Populus alba, Populus tremuloides, P. balsamifera, Populus deltoides, Crataegus sp., Rubus occidentalis, Rubus strigosus, Prunus serotina, Prunus virginiana, Prunus nigra, Prunus persica, Pyrus malus, Pyrus japonica, Pyrus communis, Amelanchier canadensis, Sambucus canadensis, Sambucus racemosa, Ribes nigrum, Ribes vulgare, Hamamelis virginiana, Ribes cynosbati, Cornus stolonifera, zanthoxylum americanum.* In addition to these many species of herbs near infested trees. It is spread over practically the whole of Ontario and the eastern provinces. Though not so destructive as the Oyster Shell Scale, it is often quite injurious where abundant and sometimes kills the infested tree.

935. *Eulecanium fletcheri* (Ckll.).—*E. pallidor* (Ckll. and King). In 1907, the writer found this species on White Cedar at Guelph. It was originally described from specimens found by Dr. Fletcher abundant on a hedge of *Arbor vitæ* and on trees of the same species at Stittsville, Ontario, fifteen miles from Ottawa. This species is nearly always parasitized by a Chalcid. In 1908, *E. fletcheri* was found on the Red Cedar (*Juniperus virginiana*) at Guelph and Hamilton, Ontario.

946. *Eulecanium lymani* (King). Recorded by Mr. King on a young Oak at Quebec city and North Hatley, Quebec. This may be the same as *E. cerasifex.*

950. *Eulecanium nigrofasciatum* (Perg.). This strikingly marked species has been received from Walkerville on Soft Maple and on Peach at St. Catharines, Ontario. In both cases the trees were badly infested and no parasites were found. As far as I am aware it has not spread to any other parts of the Province.

958. *Eulecanium pyri* (Schr.). King records this species on Apple trees in Prince Edward Island.

959. *Eulecanium quercifex* (Fitch).—*E. quercitronis* (Fitch); *E. antennatum var.* (Ckll.). This species occurs on Oak (*Quercus coccinea*) at Ottawa, Ontario and on Oak (*Quercus rubra*) from Jubilee Point, Rice Lake, Ontario.

965. *Eulecanium rosæ* (King). Recorded by Mr. King in his account of the Scales of British North America. I have not found *E. cerasifex* on any cultivated or wild species of rose. The species was found in Rosebush at Sherbrooke, Quebec.

974. *Eulecanium vini* (Bouche). This species has been found by the writer on Grape vines in the Niagara district and to some extent on Grape vines in the City of Toronto. Mr. King received specimens from Dr. Fletcher at Ottawa, on *Spiraea salicifolia.* These scales have in all probability been imported on nursery stock from Germany.

993. *Saissetia hemisphæricum* (Targ.). It is a very common scale in conservatories in all the Provinces. Its favorite hosts are Oleander, Cocos, Sago Palm, Croton and Orchids.

1008. *Physokermes piceæ* (Schr.). The Spruce Physokermes was found attacking the Norway Spruce on the College grounds at Guelph. The domesticated bees collected wax from this species. This species has been reported from one or two other parts of Ontario.

DIASPINÆ.

1036. *Chionaspis americana* (Johnson). This species was found on American Elm (*Ulmus americana*) at Guelph.

1055. *Chionaspis furfura* (Fitch). The Scurfy Scale, though widely distributed through Ontario and the Eastern Provinces, is seldom found in so great abundance as the Oyster Shell. Badly infested trees or other plants are very much weakened and not infrequently killed as a result. Many kinds of trees and shrubs are attacked by this scale, but the most common are the Apple, Mountain Ash, Japan Quince, Horse Chestnut, Hawthorn, White Ash, Currant and Gooseberry.

1062. *Chionaspis lintneri* (Comstock) is found at Guelph on Alder (*Alnus incana*) ,Dogwood (*Cornus stolonifera*). It has been received from Ottawa and Rondeau in Ontario.

1073. *Chionaspis pinifoliæ* (Fitch). The Pine-leaf scale is very common in many parts of the Dominion. It has not, however, so far as we know, caused any perceptible injury to the trees, although reports from New York State go to show that whenever it is abundant on a tree it does much damage. This scale confines its attacks solely to Conifers. The writer has found it at Guelph on the following Pines: White, Bull, Austrian, Scotch, Jack and Dwarf Mugho, and also on the Norway and White Spruce.

1081. *Chionaspis salicis* (Linn.).—*C. Salisnigrae.* This species is found on Leatherwood (*Derca palustris*), White Ash (*Fraxinus americana*) at Guelph, Ontario.

1096. *Aulacaspis boisduvalii* (Sign). This species has been found in the conservatories at Guelph and Ottawa. At Guelph the writer found it very abundant on several species of Palms, and at Ottawa Dr. Fletcher found it on the Orchid belonging to the genus *Cattleya.*

1127. *Aulacaspis rosæ* (Bouche). Here and there all over the Dominion we find this rose scale attacking rose bushes and Blackberry and Raspberry canes. The plants attacked are nearly always in damp, shady places, such as overcrowded gardens. Dr. Fletcher has found it common in British Columbia and Nova Scotia.

1143. *Hemichionaspis aspidistræ* (Sign). It is found in conservatories at Ottawa on *Pteris serrulata.*

1198. *Aspidiotus abietis* (Schr.). The Balsam Aspidiotus has a wide range in Western Ontario. It is found on Hemlock (*Tsuga occidentalis*) and Balsam (*Abies balsamea*). In the woods at Guelph this species is very abundant.

*Aspidiotus hybridum?* This peculiar scale is found very abundantly on Willow and Balm of Gilead at Collingwood, Ontario. This species very closely agrees with *Aspidiotus juglans-regiæ and Aspidiotus ostræformis,* although it is not exactly like either one of them, and Prof. Marlatt, believes that it is a hybrid or cross between these two species. Judging from the infestations, I believe that this species has several generations in a season. It is a very destructive pest and nearly every tree around the fair grounds at Collingwood was attacked and many limbs and trees were dead.

1199. *Aspidiotus æsculi* (Johnson). This species is very common in Western Ontario. It has been found at Guelph, Brantford and Toronto on Basswood (*Tilia americana*) and Horse Chestnut (*Æsculus hippocastanum*).

1200. *Aspidiotus ancylus* (Putn.). The Putnam Scale is distributed fairly widely throughout Ontario. Quebec and Nova Scotia. It has not, however, been known to do much damage, although in some of the States across the boundary it is said to have been quite destructive. It is recorded from Ottawa on Elm; from Toronto on Willow; and St. Catharines on Plum; from Guelph on Cherry and Apple; from East Essex Co. on Plum and Shell-bark Hickory.

1220. *Aspidiotus diffinis* (Newst). This was found in the woods on Basswood (*Tilia americana*) at several places in Western Ontario. Mr. King thinks that this species may prove to be a variety of *A. diffinis.*

1229. *Aspidiotus forbesi* (Johnson). The Cherry Scale, although found in several localities in Ontario, has not yet, with one or two exceptions, been reported as doing much damage. It has been found in Ontario, at Ottawa, London, St. Catharines, Grimsby and Prince Edward County. It is also recorded for Nova Scotia and Quebec. The host plants so far discovered are Cherry, Apple, Hawthorn, Fragrant Currant and Beech.

1233. *Aspidiotis hederæ* (Vall.). This species has been reported from nearly all the Provinces of the Dominion. It is confined to conservatories and house plants. It is a common species on Palms, Ivy, etc.

1239. *Aspidiotus juglans-regiæ* (Comst.). The English Walnut Scale has been found in Ontario in only two or three localities, although it probably exists in several other parts and also in the other provinces. The host plants so far discovered in Ontario are Apple, Willow and Poplar.

1250. *Aspidiotus osborni* (Newell and Ckll.). Osborn's Scale is found on forest trees in northern and western Ontario. It has been found on Paper Birch

(*Betula papyrifera*), Yellow Birch (*Betula lutea*), Cottonwood (*Populus deltoides*), White Oak (*Quercus alba*), White Pine (*Pinus strobus*). It is undoubtedly a very destructive scale.

1252. *Aspidiotus ostræformis* (Curt.). The Curtis Scale is much more widely distributed throughout Ontario than has been hitherto supposed but, in spite of its prevalence, it does not seem to be very destructive. It has been found at Collingwood in Western Ontario and as far east as Trenton in Eastern Ontario. It has also been reported from Chilliwack, British Columbia, and from several places in Prince Edward Island.

1256. *Aspidiotus perniciosus* (Comst.). Wherever it occurs the San José Scale is considered, and rightly so, the most destructive insect in the Dominion that fruit-growers have to combat. Almost every kind of fruit trees and bush fruits are liable to be attacked by the scale. Many shade trees are also attacked. It has become established in the following counties: Peel, Halton, Wentworth, Welland, Lincoln, Haldimand, Norfolk, Elgin, Kent and Essex.

1270. *Aspidiotus ulmi* (Johnson). The Elm Aspidiotus has been found by the writer in several localities in Western Ontario. It is most abundant at Guelph on the Soft Elm (*Ulmus americana*).

1294. *Chrysomphalus aonidum* (Linn.). This Coccid occurs in conservatories on *Ficus elastica*, at Guelph, Ontario.

1295. *Chrysomphalus aurantii* (Mask.). This species has been found on fruit imported from California.

1300. *Chrysomphalus dictyospermi* (Morg.). This Coccid has been found on Cinnamon in a conservatory at Ottawa.

1305. *Chrysomphalus obscurus* (Comst.). This species has been found in Ontario, but my notes on habitat and host plant have been lost.

1330. *Targionia dearnessi* (Ckll.). This interesting species was found by Mr. John Dearness, on Bearberry (*Arcostaphylos uva-ursi*) in the Bruce Peninsula Ontario.

1377. *Lepidosaphes beckii* (Newm.). This species only occurs on imported fruit, oranges, etc., from the South.

1431. *Lepidosaphes ulmi* (Linn.). The Oyster-shell Scale is generally distributed over Ontario, Quebec, British Columbia, Nova Scotia, and Prince Edward Island. It is one of the most injurious scales found in Canada. It is found on a host of plants, some of which are Apple, Pear, Plum, Cherry, Mountain Ash, Hawthorn, Red-osier Dogwood, Black and White Ash, Aspen, Prickly Ash, Mulberry and Horse Chestnut.

1422. *Inchinaspis longirostris* (Sign.). A palm (*Kentia sp.*) was badly infested at the Fruit, Flower and Honey Show, Toronto, 1908.

1442. *Parlatoria pergandei, var. theæ* (Comst.). This species was found on Lemon plants in the Ontario Agricultural College greenhouse at Guelph.

*Undetermined Species of Pseudococcus.* Specimens have been found on a host of plants, roots, stems, and leaves, but the species have not yet been determined.

## Enemies of the Coccidæ.

There are upwards of seventy species of Scale Insects found in the Dominion of Canada at the present time, and these are held in check very largely by other forms of predaceous or parasitic plants or animals which by feeding upon them prevent them from increasing to such an extent as to be uncontrollable. As transportation has developed and commerce and international trade have taken place between different countries, we have introduced not only many useful plants, but the insects which prey upon them. Often in the case of scale insects we have imported the scale and left behind some of the enemies which attack it. This gives the scale a tremendous advantage and often before the balance is restored very great damage is done. To restore the balance more speedily the entomologist looks to the native home of the scale to ascertain its most effective enemies. These are then imported and bred and liberated in various parts of the infested areas. In some cases, such as the Lady Bird Beetle, belonging to the genus Pentilla, has rendered excellent service to the fruitgrower. The chief enemies in Canada are birds, Acarids, insects and fungus parasites. The most effective of these are the Acarids and insects.

It is difficult to calculate accurately the amount of good service rendered by many of the insectivorous birds. Warblers and Vireos, on account of their aesthetic value and also the fact that they are insectivorous are rarely taken and subjected to examinations of stomach contents. Furthermore their minute size render it almost impossible to observe their actual work. The larger birds, such as the Hairy and Downy Woodpecker, have been secured, stomach contents examined and found to contain, in some cases, hundreds of scales in a single stomach. This is especially noticeable in the case of the very destructive New York Plum Scale. It is highly probable that these insectivorous birds rank first in the control of the larger kinds of scale insects, such as Eulecanium, Coccus and Kermes.

The mites again deserve a great deal of credit for their very efficient service to the fruit grower, in that they consume large numbers of scale insects all through the season. Some confine their attacks to one particular species, while others are general feeders, attacking a large variety of insect life. There are about eight known species of Acarids in Canada that are in some way associated with injurious forms of scale insects. There are at least, three species working upon the San José Scale:*Hemisarcoptes malus* is commonly found in the St. Catharines district. Species of *Monieziella* and *Rhyncholophus* were found feeding upon San José at Grimsby, Ontario. Four species were found either feeding upon the eggs or the adult of New York Plum Eulecanium. Three of these species belong to the genus *Rhyncholophus,* and the other to the genus *Gamasus.* All four undoubtedly help to keep this scale in check. Two species are found attacking the eggs of the Oyster-shell Scale. *Tyroglyphis longior* is very common at Guelph, and *Hemisarcoptes malus* at St. Catharines, Ontario. Another species belonging to the genus *Galumna* was found feeding upon the scale known as *Eulecanium fletcheri.*

### Insect Enemies.

These, if not the most destructive are at least the most numerous of all Coccid enemies. They represent four orders of insects: the Hymenoptera, Coleoptera, Lepidoptera and Diptera. Mr. Alfred Eastham investigated the parasites of scale insects in Ontario and found twenty-three species belonging to the Hymenoptera.

### Host Relations of Species of Aphelinæ Reared During the Summer in the Vicinity of Guelph.

| *Parasite.* | *Host.* |
|---|---|
| Aphelinus mytilaspidis .......... | Lepidosaphes ulmi. |
| | Chionaspis pinifoliæ |
| | Chionaspis salicis |
| | Aspidiotus perniciosus. |
| | Aspidiotus ostreæformis. |

| *Parasite.* | *Host.* |
|---|---|
| Aphelinus diaspidis | Aulacaspis rosæ. |
| Aphelinus fuscipennis | Aspidiotus perniciosus. |
| Coccophagus lecanii | Pulvinaria innumerabilis. |
| | Eulecanium cerasifex. |
| | Eulecanium fletcheri. |
| Coccophagus cognatus | Eulecanium fletcheri. |
| | Coccus hesperidum. |
| | Eulecanium cerasifex. |
| Coccophagus flavoscutellum | Pulvinaria innumerabilis. |
| | Eulecanium cerasifex. |
| Coccophagus fletcheri | Eulecanium fletcheri. |
| Ablerus clisiocampæ | Chionaspis furfurus. |
| Physcus varicornis | Chionaspis pinifoliæ. |

HOST RELATIONS OF THE SPECIES OF ENCYRTINÆ REARED DURING THE PAST SUMMER IN THE VICINITY OF GUELPH.

| *Parasite.* | *Host.* |
|---|---|
| Comys fusca | Eulecanium cerasifex. |
| Comys bicolor | Eulecanium fletcheri. |
| Comys scutellata | Eulecanium caryæ. |
| Chiloneurus albicornis | Eulecanium fletcheri. |
| | Eulecanium cerasifex. |
| | Eulecanium caryæ. |
| Aphycus jarvisi | Eulecanium fletcheri. |
| Aphycus pulchellus | Kermes pubescens. |
| Aphycus pulvinariæ. | Eulecanium fletcheri. |
| | Eulecanium cerasifex. |
| Aphycus johnsoni | Eulecanium cerasifex. |
| Aphycus flaviceps | Eulecanium cerasifex. |
| Blastothrix longipennis | Eulecanium cerasifex. |
| | Eulecanium fletcheri. |
| | Kermes pubescens |
| Encyrtus cyanocephalus | Eulecanium caryæ. |
| | Eulecanium cerasifex. |
| Encyrtus flavus | Eulecanium fletcheri. |
| Encyrtus sp. | Eulecanium fletcheri. |
| Encyrtus sp. | Kermes pubescens. |

In the Coleoptera the Coccinellids are most conspicuous in combatting the more injurious species of scale insects. A small species known as *Hyperaspis signatus* in the larval stage has been found feeding upon the Curtis Scale at Guelph, Toronto, Grimsby and St. Catharines. In Toronto the same species was found in large numbers feeding upon the Forbes scale on a Hawthorn tree. The larva has also been found at Guelph feeding upon *Aspidiotus æsculi* and the New York Plum Scale. They probably do their most effective work upon the Cottony Maple Scale as it is estimated that they devour about eighty per cent. of the total scales produced in a season. Other species of Coccinellidæ are also beneficial in destroying a number of different scales. Two of the most common species are *Chilocorus bivulnerus* and *Scymus punctatus.*

In the order Diptera only one species is found to be effectual. This is the one known as *Leucopsis belulila* which parasitizes the Grass Scale (*Eriopeltis festucæ*) in Nova Scotia. There are also two species of Lepidoptera which are parasitic upon scale insects. One species is found attacking *Kermes galliformis* and the other species has been taken on the Cottony Maple Scale (*Pulvinaria vitis*).

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## ALEYRODIDÆ OF ONTARIO.

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There are at the present time three species of Aleyrodidæ found in Ontario: ALEYRODICUS ASARUMIS (Shimer) on the Wild Ginger (*Asarum canadense*) and the White Baneberry (*Actea alba*); ALEYRODES FORBESII (Ashmead) on Soft Maple (*Acer saccharinum*) and Red Maple (*Acer rubrum*); ALEYRODES VAPORARIORUM (*Westwood*) on Salvia, Solanum, Coleus, Coreopsis, Cucurbita, Cuphæ, Fuchsia, Hibiscus, Lycopersicum, Monarda, Rosa, Rudbeckia, Helianthus, Tropæolum, Verbena, Zinna, Digitalis, Pelargonium, Phlox, Cobea, Dahlia, Ribes, Fragaria, Solidago, Aster, Smilax, Polemonium, Delphinium, Achillea, Calliopsis, Chrysanthemum, Callistemma, Campanula, Antirrhinum, Berberis, Aquilegia, Lonicera, Nicotiana, etc.

Those who have made a special study of this group believe that the White Fly had its origin in some part of South America, the Neotropical region, where they formed the genus Aleurodicus, which except through human agency have remained there ever since. A branch belonging to the genus Aleyrodes has spread over the greater part of the world.

*Aleyrodicus asarumis* is a very common species in Ontario and was noticed in 1902 on a species of Wild Ginger at Guelph. *Aleyrodes forbesii* was first observed in the fall of 1907 up the River Speed from Guelph where the nymphs were found rather abundantly on the leaves of Soft Maple. *Aleyrodes vaporariorum,* which is most interesting and of greatest economic importance, is believed to be a native of Florida or Mexico; though it was first described and named by Westwood after it had reached England in 1856. Since reaching the United States it has spread gradually through the North-eastern part principally; and wherever introduced has multiplied very rapidly. Previous to 1900 there are only one or two reports of the species in Ontario. In 1903 it had appeared at the Ontario Agricultural College greenhouse and by 1906 had become fully established.

The White Fly or Mealy-wing Fly belongs to the Homopterous division of the order Hemiptera, in which the four similar membranous wings are held roof-like over the body. It is a member of the family Aleyrodidæ, which consists of small, active insects, easily recognizable by a characteristic, white, wax-like secretion, completely covering the wings and giving them the popular name Mealy-wings and White Fly. The young Mealy-winged Flies look much like scale insects and have the same general habits. The larvæ are flattened, oval, scale-like creatures found stationary on the lower sides of leaves. Most species of them bear numerous wax rods and copious secretions of wax all over their bodies. The pupa, also are characterized by their secretions of wax; and the amount and disposition of the rods and fringes on them are made use of very largely in the distinction of species in this family.

In their relationship with other insects the Aleyrodidæ come nearest the Aphididæ and the Coccidæ; from the former they differ most markedly in being stationery during their immature stages, and from the latter in being winged in both sexes of the adults and therefore capable of moving about rapidly.

The life-history of the White Fly (*Aleyrodes vaporariorum*) covers a period of approximately five weeks; and the broods succeed each other constantly, the year round. The eggs are oval, light green, changing to almost black in color, smooth and with a short stalk from one end raising it off the leaf. They are deposited irregularly on most kinds of leaves; but on smooth leaves it is quite characteristic for many of them to be deposited in more or less nearly complete circles. The female has been observed by different persons to accomplish this arrangement of them by inserting her beak into the leaf and rotating around this as on a pivot. The eggs hatch in about ten days, and the young larvæ move about for a short time and then insert their mouth parts into the tissues of the leaf and assume their scale-like form. When fully grown, which is in about two weeks, the larvae are less than a millimetre in length. After about two weeks longer in the pupal stage the adults emerge. It is difficult to say how long they may live in the mature form.

It is only a small family consisting of two genera and about 150 species. Like many of the other families of insects of small size it has been much neglected.

The two species attacking the Maple and Wild Ginger have a wide distribution in Ontario, especially in the Western portion of the Province. *Aleyrodicus asarumis* have been found almost everywhere that the Wild Ginger grows. It is sometimes found on the White Baneberry at Guelph, but it seems to have a decided preference for the Wild Ginger. It confines its attacks to the lower side of the leaves and is usually so numerous as to almost cover this side of the leaf. Large quantities of honey dew are given off by this species and the honey dew fungus nearly always accompanies the insect. The life-history in Canada has not yet been fully determined, but sufficient is known to prove there are at least two broods during the season. It passes the winter in the mature form, but the writer has not yet been able to find the hibernating quarters. Shortly after the Wild Ginger leaves have expanded in the spring the White Fly may be found in the egg stage on the leaf. In the course of a few weeks the affected leaves turn yellow and myriads of the creatures may be seen at work. No insect parasites have been observed at work on this species and from this we may infer that it has been somewhat recently introduced.

*Aleyrodes forbesii* has been found as far east as Toronto, as far north as Gravenhurst, and as far south as London, Ontario, and the indications are that it is almost as widely distributed in Western Ontario as the maple itself. It is the largest of the three species under discussion. The adults are rarely seen and the large, box-like larvæ are sparingly scattered over the under surface of the leaf. The larvæ are pale green or whitish, somewhat the same color as their surroundings or environment and it is probably due to these two things that this species has not been reported more often. The work of insect parasites has been observed on several occasions in connection with this species and this probably accounts for the comparatively small amount of injury done to the host. The ravages are much less some seasons than others.

It is interesting to note that the above two species are both found in the State of Illinois.

*Aleyrodes vaporariorum* is of very great concern to people engaged in greenhouse work. From enquiry made to florists in all parts of Ontario it would appear that not a single section is free from the pest. As it cannot, so far as is known, winter in any stage out-of-doors, at least in its northern part of its range, it is recognized principally as a greenhouse pest, but it is sometimes very common and destructive to gardens and small fruits, especially in the vicinity where it is carried over the winter in greenhouses. It appears to be very partial to members of the family of plants known as the Solanaceæ, i.e., tomato, tobacco, etc. Several reports have been received from gardeners in different parts of the Province where crops had been ruined by this pest. It is sometimes very abundant on the strawberry and currant plants. In the fall when the temperature lowers they seek shelter in green houses or homes where plants are kept and a constant reproduction is kept up the year round.

Another way in which these species do injury is due to the supply of honey dew given off where a fungus grows and spreads over the surface of the leaf, interfering with the nutrition of the plant.

The insect is not a good flyer, but can go considerable distances with the wind, and whole neighborhoods are often infected in this way. The flies are often carried from place to place on infested plants or parts of plants for identification purposes. They cling tenaciously to clothing and are sometimes carried from greenhouse to garden in this way.

So far very few parasites have been found at work on the Aleyrodidæ of this country and these have not yet been identified. In South America and other tropical countries many species have been found, notably the families Trichogrammatidæ, Aphelinidæ, Eupelinidæ, Mymaridæ, Platygastridæ, Diapridæ, Formicoidæ of the Hymenoptera, Chrysopa of the Neuroptera, Thrips, belonging to the Thysanoptera; Mites of the Acarina. In addition to the above-mentioned families of insects and acarids two genera of fungi, Aschersonia and Sphaerostilbe also assist in the control of the White Fly.

It is my experience that considering all kinds and conditions of plants and greenhouses cyanide of potassium, although perhaps used the least, is the cheapest and most effective means for fumigation. The best results are obtained by using ¾ of an ounce of potassium cyanide at a cost of 2½ cents, and 1½ ounces of sulphuric acid at a cost of about ¼ cent, per thousand cubic feet. This method, besides costing only about 2½ cents per thousand feet, is thoroughly effective and requires little labor in its application.

As this means has heretofore been considered by a great many florists as dangerous to human life in its application, it has been but sparsely used. The solution, however, is so weak that there is not the least danger to human life or health if only the simplest precautions are taken.

The formula recommended is as follows:

Potassium cyanide, 1 ounce by weight;
Sulphuric acid, 1½ ounces by volume;
Water, 3 ounces by volume.

The cyanide should in all cases be chemically pure, 98 per cent pure cyanide, and the sulphuric acid should be the best commercial, or 85 per cent. grade. It is always best to have the cyanide broken up into small pieces. Generators should always be earthen or glass vessels, never metal, having a gallon capacity. In order to distribute the gas equally throughout the greenhouse it is well to place the generators at equal distances apart along the walls. The greenhouse should be as much as possible airtight, with dry atmosphere and a temperature of below 60 degrees Fahrenheit, and the generation of gas should be done after darkness has set in. After having placed the generators properly, with water and sulphuric acid, the packages of cyanide are then added, commencing at the generator farthest from the place of exit, and the operators should then leave as soon as possible and close the door. The dropping of the packages of cyanide into the generators by means of a cord operated from a position outside of the greenhouse is entirely unnecessary and is now quite obsolete, as the fumes from the composition are too weak to do any injury. The quantity of the doses must, however, always be regulated by the florist from the condition of the greenhouse, the plants, and the insects to be destroyed.

It is the confidence I have in the remedy which prompts me to highly recommend it as the cheapest and most effective means for destroying the White Fly in greenhouses, without, however, destroying or endangering the health or life of plants or of the operator of this remedy, and I would encourage in every way possible the use of this means that these insects, if not totally destroyed, are still so kept in check as to do but the minimum of harm.

## SOME INSECTS OF THE LARCH.

J. M. Swaine, Macdonald College, Que.

It is my intention to describe to you this afternoon rather briefly an attack made this summer upon a small clump of larch by a series of scolytid beetles; and to use this attack as an illustration of the breeding habits of Scolytidæ in our great forests of pine and spruce.

The larch bush to which I refer is situated at Hudson, about ten miles west of Ste. Anne's. The trees were fine specimens of Larix of medium size, with an average height of perhaps 40 feet, and until this season had been particularly healthy. Previous to this season I had not taken a scolytid from larch in that immediate neighborhood. Last winter a wide section was cut through the bush, and a plank walk laid through it, about three feet from the ground. The stumps were left rather high; the greater part of the rubbish was removed; several untrimmed larches were left lying in the clearing and one was lying well shaded by standing trees; and the trunks which had not been removed were piled in the clearing and left to dry through the summer.

The scolytids which attacked the dying bark, thus provided, belonged to five species: *Dendroctonus simplex, Dryocoetes autographus, Dryocoetes* n. sp., *Ips caelatus* and *Ips balsameus.* In the wood of the stumps an ambrosia beetle, *Gnathotrichus materiarius,* bred in large numbers.

I wish first to discuss the habits of these species very briefly.

*D. simplex,* Lec. This species is the common Dendroctonus of larch and is probably to be found wherever that tree is abundant. It is recorded from West Virginia northwards to Ungava and west to Michigan, and I have seen specimens in Mr. Evans' collection from Mackinak, Man. As the larch is found throughout all Eastern Canada excepting Northern Ungava and westwards to the Rockies, excepting the Barren Grounds, this beetle will probably be found throughout all that region. It is not a particularly injurious species. It prefers the bark of stumps and recently cut and dying trees, but will attack apparently healthy trees when dying bark is not to be obtained. It occurs chiefly in the bark of the trunk.

This species was first noticed this season on July 10th in the bark of larch stumps. The trees had been cut the preceding winter, and cleared away, leaving stumps about 1½ feet high. The place was swampy, and although the stumps were in the open sunlight, they remained sappy throughout the season. Only a part, perhaps half, the stumps of the clearing were attacked by this species. On July 10th—the date on which they were first noticed—the egg-tunnels contained eggs in the outer ends; and larvæ of all sizes, from those recently hatched up to nearly full-grown, were boring in the bark. There were no pupæ and no young adults.

About a month later (August 6th) the tunnels in these stumps contained full-grown larvæ, pupae, recently transformed, light coloured adults, and older, darker adults; and many adults had escaped, as evidenced by the holes through the bark above the ends of the larval tunnels. The larvæ were in tunnels coming from the distal end of the egg-tunnel; the pupæ in the ends of larval tunnels arising nearer the entrance hole; the light-coloured adults in tunnels arising still nearer the entrance hole; and, lastly, the darker adults in tunnels coming from the proximal end of the egg-tunnel.

On the same day, August 6th, this species was found in large numbers starting tunnels in a felled larch which lay near the stumps just referred to, but shaded by standing trees. A few felled larches lay in the open clearing, but these were not attacked. Egg-tunnels of this second brood were also found in many of the stumps. A standing larch, evidently dying, contained many fresh tunnels of *Ips balsameus* but none of *D. simplex.*

The tunnels of *simplex* in the fallen larch were, on Aug. 6, usually well started, with numbers of eggs already laid, but no eggs had hatched. Very evi-

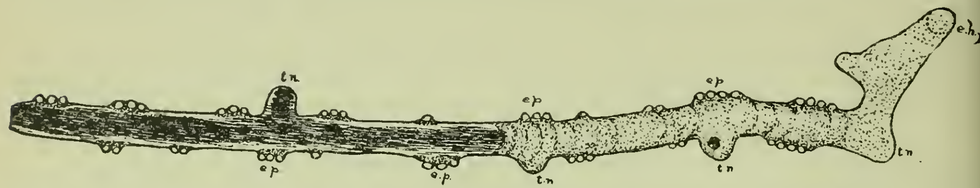


Fig. 4. *D. simplex*, Lec. An egg-tunnel showing egg-pocket, e.p., containing eggs; turning niches, t.n., and entrance-hole, e.h.


Fig. 5. *D. simplex.* Development of larval galleries; larvæ half-grown. e.t., egg-tunnels; l.g., larval galleries; larvæ were working in the clear spaces.

dently we had there a second brood, although I did not actually trace the newly transformed beetles from the stumps to the felled tree, and one brood a season has hitherto been recorded for this beetle.

The egg tunnels are about ⅛ inch wide, although the width is very irregular in the different parts of the tunnel. In an egg-tunnel recently started, the half nearest the entrance hole will be packed tightly with chips and excrement, and in the distal—empty—half will be found the beetles, a pair or more. In some I have found one female and as many as three males. As the tunnel is lengthened, the refuse, chips and excrement, is packed towards the entrance, leaving always a short, clear space at the distal end. As the tunnel increases in length, shallow pockets are cut in the bark along the sides, and in these the eggs are deposited, on end, and packed in dust. Usually three eggs are found in a pocket, but sometimes 4, 2 or 1. The pockets are cut at the end of the tunnel on the side, so that the female must reverse her position to oviposit. The diameter of the tunnel will not admit of this, so along the sides of the tunnels are found wide niches, as wide as the tunnel, which may be called turning-niches. These seem to be used by the beetles in turning about and in passing each other in the tunnel. Very rarely an egg or two will be laid on their sides. The eggs of one pocket being laid, the female lengthens the tunnel and cuts another egg-pocket, and so on until all her eggs are deposited.

The chips resulting from the boring operations, together with the excrement of the beetles, are packed firmly backwards towards the entrance hole, and not uncommonly eggs are found packed in this mass. By the time the tunnel has neared completion, we find usually a female in a clear space at the tunnel's end, and behind her the dust packed firmly with one or two clear spaces at intervals, in each of which will be a male completely walled in and contentedly feeding on the chips or on the sides of the tunnel. Not infrequently there will be an egg-tunnel branching from the first, cut by a female which had entered the first tunnel before the entrance was blocked with chips. These side tunnels often open into neighboring egg-tunnels, so that adjoining tunnels appear to anastomose. Occasionally ventilation holes are cut in the bark forming the tunnel roof, but very few of these were noticed.

The larvæ which hatch from the eggs along the tunnel sides bore into the bark away from the egg-tunnel, cutting the larval galleries, which at first very tiny and entirely in the bark, gradually increase in diameter as the larvæ grow, and finally score the wood. The larval galleries are extremely irregular, crossing and recrossing each other until the bark of that part is almost entirely reduced to powder, which packs the galleries. The larvæ which hatch from eggs laid in the chips packing the egg tunnel feed upon the mass of chips for a time, and later enter the bark from the tunnel sides.

Egg-laying lasts over a considerable period. Eggs and newly hatched larvæ of the second brood were found as late as August 26th. This second brood matured in sticks in the laboratory early in October, and emerged through holes in the bark.

*Polygraphus rufipennis.* This common bark beetle of spruce and pine seems quite as ready to attack dying larch bark, for we found it this season in great numbers in the piled larch trunks and tops and the felled larches lying in the clearing. I have never found this species in healthy trees. It is very common in dying bark of spruce, and, in our section, in red and white pine. This is a small bark beetle, 3mm. long, of a uniform dark brown or nearly black colour. It is readily distinguished by the combination of divided eyes and undivided, distally pointed, pubescent antennal club. Its work is well illustrated in the collection exhibited. An entrance hole is cut through the bark and a shallow chamber, called the nuptial chamber is excavated therein. From this chamber are cut in a radiating fashion, and between the bark and wood, from three to five egg-tunnels. The females cut the tunnels and in the nuptial chamber will be found the only male busy ejecting through the entrance hole the boring dust which the females have brought to the tunnel entrances. The eggs are laid singly along the sides of the tunnels, each in a tiny pocket called an egg-niche, and firmly packed in dust; so that the sides of the tunnel are smooth and the eggs completely hidden. From a few to twenty eggs will be found on each tunnel side. The larvæ which hatch from the eggs bore into the bark directly away from the egg-tunnels. When the larvæ are not much crowded their tunnels are fairly regular, but when many egg-tunnels lie close together, as is usually the case, the larval galleries cross and re-cross, completely riddling the bark eventually. The larvæ pupate in the ends of the galleries and emerge by cutting each a round hole through the overlying bark. Often, as with many bark beetles, the young adults feed for a short time on the bark before cutting through to escape.

We have two broods of this species. The tunnels of the over-wintered beetles were started the last of May this year in the larch. By July 10th in these tunnels could be found well-grown larvæ, pupæ and young adults; and light coloured, and therefore recently transformed adults, were busy starting tunnels in felled larches lying in the clearing. The adults continued to emerge for several weeks, and on August 6th egg-tunnels were being cut and eggs laid in the fallen larch before referred to in connection with *D. simplex*. So far as my observations go, the tunnel is started by a female, and a male, and other females, join her later. The egg-tunnels are usually kept clean in this species, although more or less boring-dust is at times found in them. They seem to start their tunnels, at times, from the sides of a *simplex* tunnel, where they are sometimes found exploring during the entrance season. This second brood will apparently mature completely this fall, and hibernate as adults.

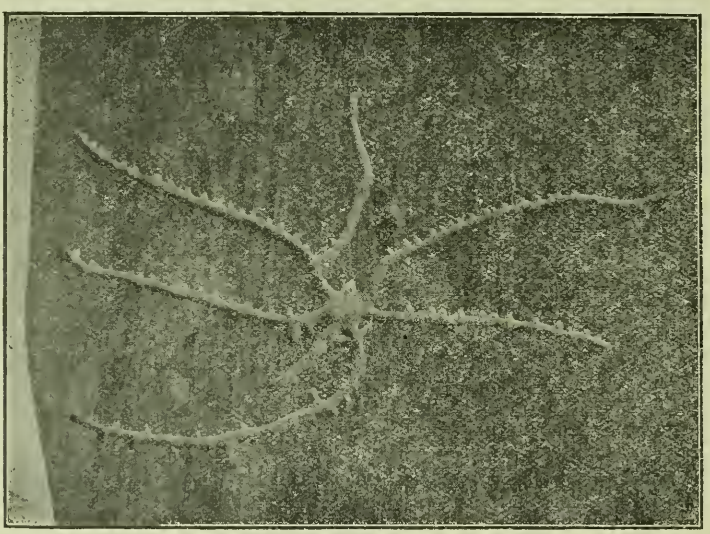

Fig. 6.
Work of *Ips balsameus* in Abies, showing nuptial chamber, egg-tunnels, and egg-niche. The eggs were removed before hatching.

*Ips balsameus* was found on the 10th of July, starting tunnels in a diseased larch in the same bush. I could not be sure that this species had been the primary cause of the injury, apparently not, but certainly *balsameus* was helping things along merrily. This species breeds chiefly in the fir, sometimes also in the pine; and it frequently attacks and destroys trees, which, while certainly unhealthy at the beginning of the *balsameus* attack, might otherwise survive. It is to be considered an injurious species in fir and larch. There are two broods each season with us; the first eggs were laid in pine this season in the middle of May, and the second was, in larch, as just stated, early in July.

*Ips cælatus*—a larger but closely allied species—was numerous in the larch stumps. Its entrance hole is deep, and the nuptial chamber is often entirely in the thick bark. From the nuptial chamber come off the winding, irregular egg-tunnels. The eggs are laid in groups of two to eight, in deep pockets along the sides of the egg-tunnel. The borings of the larvæ are very irregular and penetrate the bark in all directions. The larvæ pupate in their tunnels in the bark, and appeared through their exit holes early in July to start tunnels for a new brood. Egg-laying for the second brood was well advanced in the bark of the stumps on July 10th of this season. This species is common in our district in red and white pine. It works in the bark towards the base of dying trees; particularly it is found in stumps cut the preceding winter. I have never noticed it in healthy trees, although it might injure them when no dying bark was available. The first brood was egg-laying in white pine at Ste. Anne's, the second week in May this year, and when first noticed in larch, May 24, the eggs were practically all laid.

*Dryocoetes autographus* was breeding in the bark of the larch stumps. Its egg-tunnels are irregular, anastomosing, and when numerous difficult to follow.

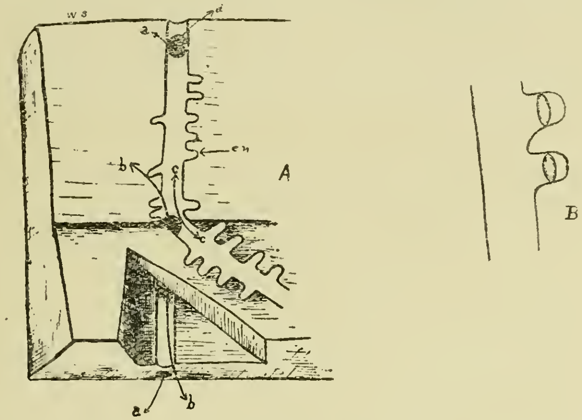


Fig. 7.
*G. materiarius.* Work in larch wood. A.—w.s., wood surface; e.n., egg-niche; d., a tunnel ending blindly behind a. In this tunnel the fungus develops rapidly. Eggs and larvæ have been removed from the niches. B.—Two eggs in position in the niches.

The eggs are laid side by side in shallow niches along the side of the egg-tunnel, and packed in dust. The longer axis points away from the centre of the tree. Frequently the eggs are sunken irregularly into the bark of the tunnel roof and packed in dust. The larval galleries are very irregular, usually destroying the bark. Both egg-tunnels and larval galleries are often entirely in the bark. There are two broods each season with us. By July 10th this season the egg-tunnels were about completed in the larch stumps, with the eggs practically all laid and many larvæ working into the bark. By the first of August these larvæ had matured in part and eggs were being laid in new tunnels from the sixth to the twentieth of that month. This insect prefers dying and dead bark of pine, spruce and larch, and works mostly at the base of the tree. It is not particularly injurious. A smaller, undescribed species of *Dryocoetes* was working with *autographus,* and has very similar habits.

This completes the list of the true Bark-beetles found in those larches. There was also present another scolytid—*Gnathotrichus materiarius*—one of the Ambrosia beetles. This species bores well into the wood, cutting several side tunnels; each tunnel is cut, usually, by a separate female. The eggs are laid in shallow niches cut in the wood along the sides of the tunnels. The eggs are spindle-shaped and wedged into the niches, one in each, a little above the bottom, and a mass of chips and excrement, on which the ambrosia starts, is plugged into the opening. The larvæ deepen the niches until the depth is slightly greater than the length of the larvæ when full-grown. In these niches the larvæ pupate, and from them the adults push their way through the wall of dust and fungus which has previously blocked them in from the tunnel. The chief food of both adults and larvæ seems to be a fungus which grows on the walls of the tunnels and niches. The fungus is carried from tunnel to tunnel by the beetles, and stains the walls deep brown or black. The habits of the Ambrosia beetles are very interesting, but I shall not discuss them further at this time. There are two broods of this species in our district. The first brood was egg-laying this season on May 24th, and matured late in July. By the 6th of August new tunnels were being started in the stumps, and eggs laid for the second brood. Many eggs of the second brood were apparently destroyed by minute nematode worms.

This species breeds in pine and spruce as well as larch and its tunnels often injure lumber for the most valuable uses.

Only two of these beetles, *D. simplex* and *I. balsameus*, can be considered as serious larch enemies, and this is the first time that I have taken *balsameus* from that tree. *D. simplex* is known to attack and destroy but slightly diseased larches under certain conditions, and those conditions I wish to discuss now very briefly. Previous to this season *D. simplex* had been rare in that neighborhood, but it came in in fairly large numbers this spring, attracted from a considerable distance by the dying larch bark. Only half the stumps were attacked by the spring swarm, but the progeny which matured in midsummer numbered thousands of individuals. These parents of the second brood entered the bark of the remaining stumps, and of the felled larch in the shade in great numbers. They did not attack the dried bark of the cord-wood, nor of the felled trees in the clearing. The individuals of the second brood at present in that swamp must number many thousands. Whether or not they are of sufficient number to successfully attack standing trees is a problem which I shall watch with interest next season.

If, after the available dying bark has been utilized by the beetles next spring, there are but few individuals left, they will gradually scatter in search of a further supply of bark in such condition. If, however, there are immense numbers in the swamp unable to find bark in the condition which suits them best, they may succeed in ovipositing in the bark of but slightly injured, or even healthy, trees, in which case the larvæ would probably mature and the trees be killed. When a few scolytid beetles attack a healthy tree, usually the vigorous flow of sap drives them back before the eggs are laid, and the tree suffers but little. When the number attacking a tree is very great, the many entrance holes and started tunnels check the sap flow so that the beetles succeed in laying their eggs and the resulting larvæ develop in the devitalized bark.

The level of numbers at which a species, usually not injurious, will attack healthy or but slightly diseased trees is known as the Pest Level.

It will be seen that a slight modification of the method of cutting would have averted any danger from these beetles. If the stumps had been cut lower a few blows of the axe would have removed most of the bark from each. If then all the trunks had been trimmed and left in the open sunlight of the clearing there would have been but little sappy bark for the parents of the second brood, and they would have scattered from the region, leaving a very small and harmless second brood.

The pest level of *D. simplex* is high. It is perhaps rarely injurious. But the pest level of certain species attacking pine and spruce is low, and when that level is reached the finest trees of the region are in danger.

It can be easily seen from this that careful destruction of wastes from cutting is of utmost importance in lumbering operations, the more so that many other forest insects breed in such dying bark and wood.

The conditions which obtained in this larch bush will be found everywhere in Canada, in the woodlots, in the lumbering districts, and in our virgin forests.

In the great forests under natural conditions we find that when, through the agency of forest fires, heavy storms or the attacks of other insects, scolytid beetles find much dying bark in a suitable condition, they breed in this until they reach their pest level for those conditions; then they attack and kill the healthy trees. Witness the terrible destruction of *D. piceaperda* in the spruce of Maine and New Brunswick, as described by Dr. Hopkins.

In the lumber woods the present careless method of cutting leaves culls and refuse to breed these beetles and other forest pests by myriads.

I pointed out a few moments ago that scolytid beetles followed forest fires, breeding in the dying bark of injured trees. Dr. Hopkins, the leading forest entomologist of America, has shown that the relations are at times reversed; so that fires which would otherwise have caused no considerable injury, gain headway in districts of forest devastated by these beetles, and sweep as great conflagrations over square miles of territory.

It is well to discuss the injury which these forest insects are known to do, but can anything be done to check them in our timber limits and in our great forests?

The control of certain forest insect pests, e.g., the larch saw-fly, is, so far, beyond man's ability. But a method of control has been worked out whereby many forest pests, chiefly Scolytidæ, can be effectively kept below the pest level. Such methods have been successful in European forests, and in certain sections of the United States, and will most surely be followed in Canadian forests in years to come. They consist in modifications of the methods of cutting. Injured trees, with the bark filled with thousands of these beetles, are cut, and either barked or got into the water before the beetles emerge to start their tunnels in other trees. Either the barking, if done at the right time, or the immersion in water, destroys the greater part of the larvæ or adults. These beetles seem, perhaps invariably, to prefer dying bark. Therefore by girdling, early in the season, trees selected for later cutting, the greater part of the beetles in the immediate neighborhood can be attracted to the bark of these "trap-trees," and later these trap-trees are barked or got into the water early, so that the contained brood will be killed. The refuse, tops and branches, are destroyed, removing what would otherwise be a suitable breeding-ground for many species.

Such modifications in methods of cutting can be relied upon when control is needed.

Before such methods can be outlined, however, it is necessary to obtain much information from forest entomologists. The insect pests of our Canadian forests have been studied but little. There are many injurious forest insects in Northern Quebec and Ontario about which we know absolutely nothing. There is much work to be done, therefore, by the systematist; work which is absolutely essential. The practical entomologist must be able to distinguish with certainty the injurious species when he finds them. For instance, if recently killed pines are found with the bark filled with *Ips pini,* there is little cause for alarm. The pest level of that species is high. The same is true of a new species of Phlœotribus, which I have from spruce, and many other, indeed most, scolytids of this region. These species prefer, and usually are able to find dying bark for breeding purposes. But if spruces are found with *Dendroctonus piceaperda* in the bark, the matter may be serious enough; for this species is quite capable of destroying the finest of the spruce over miles of territory if once it surpasses the pest level. Much work should be done in the near future in collecting and studying the forest insects.

It is further necessary to know the exact life histories of the injurious species in the regions where they are numerous. The lumberman must know when to girdle the trap-trees, when to cut them and others with the bark filled with the brood, and bark or immerse them. He must know how many broods occur, and just when they appear to attack fresh trees. Many things must be known before we can outline profitable methods for the control of many of these pests.

This information must be obtained by entomologists; and those of us who are interested in forest insects have a great field before us, a splendid opportunity, and also a serious duty.

Insect control is only one factor in the great problem of forest culture; but it is an extremely important factor, and the sooner we know the injurious insects of our great forests, and their life histories, the sooner will the control of forest insects be undertaken in the Canadian woods.

The great forests of the United States have been almost swept away by forest fires, insects enemies and careless cutting. Now, perhaps too late, the people there are awake to the importance of forest control. We in Canada are following exactly in their footsteps. Great fires—there are hundreds of fires in our Northern forests every season—insect devastations, careless cutting, little effort towards reforestation; it needs no prophet to foretell the result.

Quebec, New Brunswick, Nova Scotia and British Columbia will surely soon follow the lead of this Province in taking decided steps towards forest control. And that good time will come the sooner if we entomologists preach at every opportunity that most important practice in the control of insect pests and fungous diseases, whether in the field, the orchard, or the forest—*Clean Culture.*

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## INSECT NOTES FROM STE. ANNE'S —NOV. 15, SEASON OF 1910.

J. M. Swaine, Macdonald College, Que.

### Orchard Insects.

The Apple Woolly Aphis, *S. lanigera,* has been gradually increasing in numbers with us for the last few years. It is found on many of our older trees in small masses, and is quite thickly scattered over the young orchard. On the young trees there is much more of it on the twigs than on the trunk just at this season, and the scars it causes are becoming numerous enough to need attention. Kerosene emulsion diluted 1-9 and driven in a strong stream controls it readily. I have never found the root form in Quebec, although it probably occurs in small numbers.

The Round-headed Borer, *Saperda candida,* occurs in very small numbers in our orchards; although it is common enough in an orchard about a mile away. At Cote St. Paul and at Rougemont it is doing serious injury.

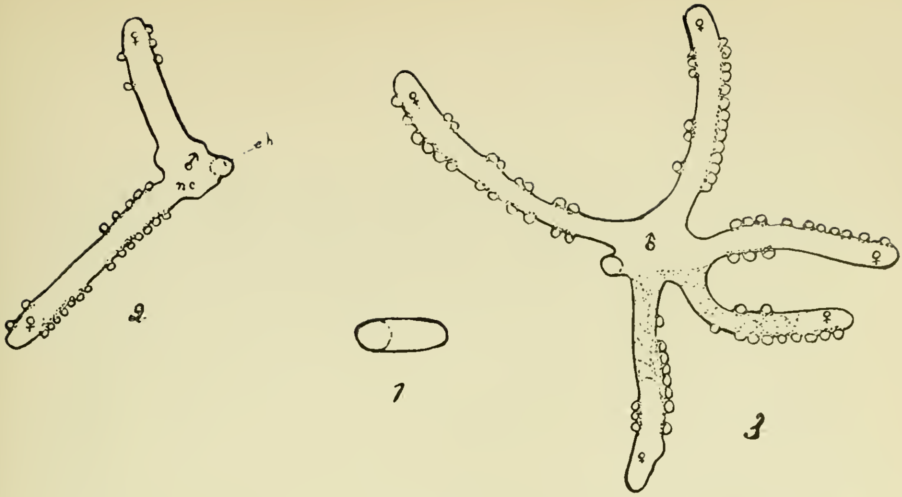


FIG. 8.
Work of *P. rufipennis.* Three stages in the development of the egg-tunnels.

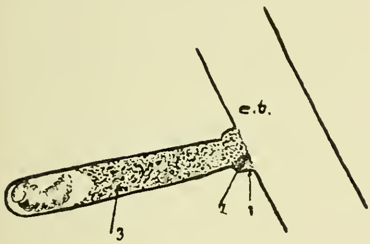


FIG. 9.
*I. balsameus.* Development of larval gallery. 1, egg-niche; 2, egg-packing; 3, chips and excrement of larva, darker in color; e.t., egg-tunnel.

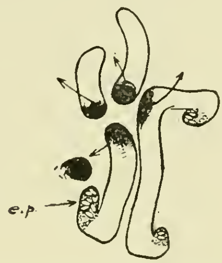


FIG. 10.
Larch Ips. Under side of bark.

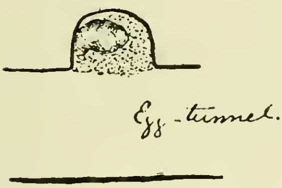


FIG. 11.
*I. balsameus.* Newly hatched larva.

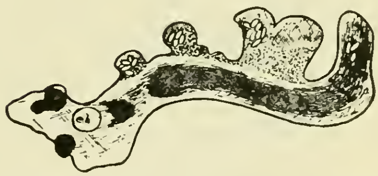

FIG. 12.
The Larch Ips (24-V-10). Under side of the bark shown, with eggs in the pockets.

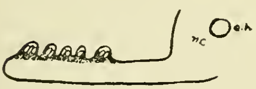

FIG. 13.
*I. caelatus.* From white pine.

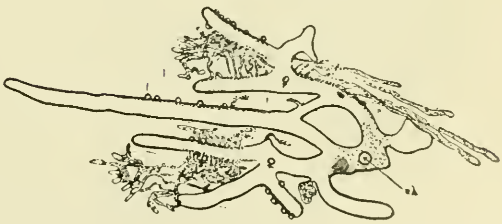

FIG. 14.
*Dryocoetes autographus.* Work in larch bark; larvæ one-third grown.

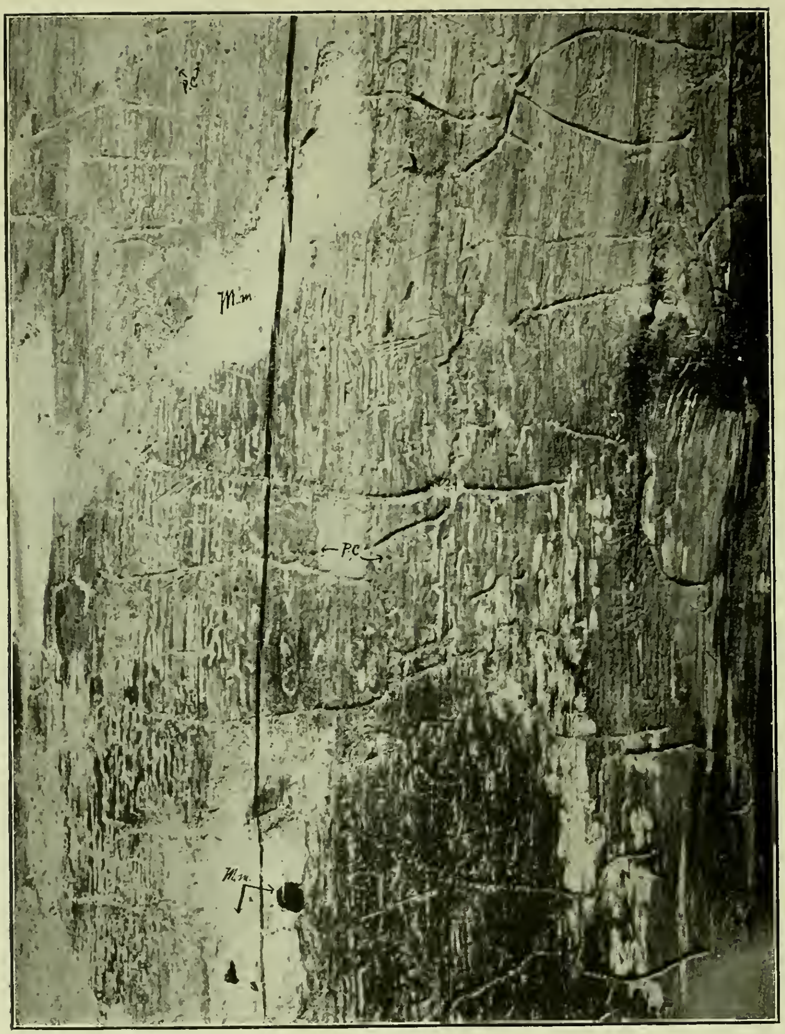


Fig. 15.
Work of *Ips balsameus* in Abies, showing the wood surface scored by the chambers, egg-tunnels, larval galleries, and pupal cells. The latter are often sunken as indicated at "p.c." The work of *Monohammus marmorator*, which was bred from that trunk, is shown at "M.m."

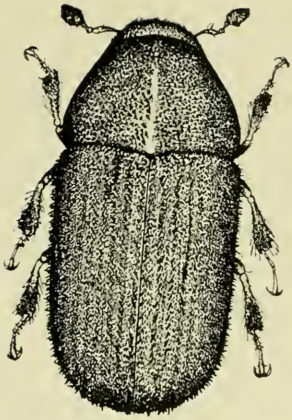

Fig. 16.
*Polygraphus rufipennis*
(Kirby).

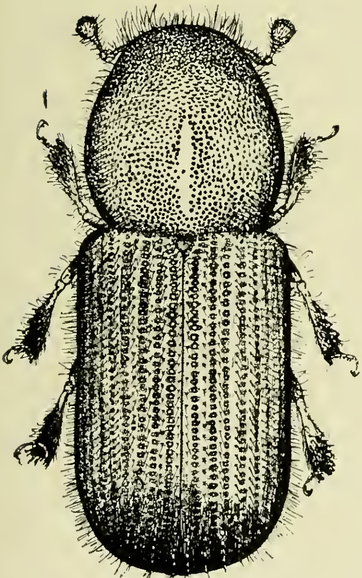

Fig. 17.
*Dryocoetes autographus* (Ratz).

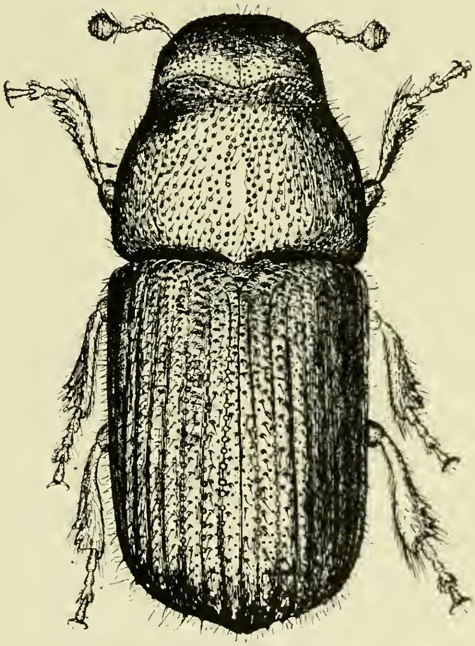

Fig. 18.
*Dendroctonus simplex* (Lec.).

The Flat-headed Borer, *Chrysobothris femorata*, is hardly found in our apple trees at all. And this is interesting, for the species is very common in the neighborhood, breeding in great numbers in fallen hickory and oak, particularly the former. This spring I took scores of specimens from one fallen hickory at Hudson, a few miles from Ste. Anne's. The beetles run about over the bark on fine days, mating and egg-laying, and fly very readily with a distinct "hum." Egg-laying begins with us on hickory in June, and lasts until late in July, although the greater part of the eggs are laid by the second week of July.

In our region at least the beetles much prefer dying hickory to apple trees in any condition, and I feel confident that Mr. Chittenden's suggestion that broken branches of hickory scattered about the orchard would trap most of the beetles, is one well worth trying when these beetles are injurious in orchards.

The Fruit Bark-beetle, *Eccoptogaster rugulosus*, is not yet to be found in our orchards. I have never taken any indeed in this Province.

The Peach-tree Bark beetle, *Phloeotribus liminarus*, was found in great numbers this season in wild cherry near the college. Over a score of large trees were studded with the gum from its entrance holes, although the beetles succeeded in breeding in very few of them. The entrance holes, and in a few places on some trees the egg tunnels, were cut this spring but very few eggs were laid. Again on the tenth of August, light coloured adults were starting tunnels in the bark.

Next year these cherry trees will probably have a hard time of it. They had enemies enough before, indeed, for the common cherry borer was altogether too plentiful.

*Xyleborus dispar* I have never taken in Quebec. A close ally, *X. serratus*, is very common in several forest trees, notably in yellow birch.

Last spring I bred from apple-twigs sent from Cambridge, N. B., a species of *Oberea*, which is possibly *O. tripunctata*. The female cuts three rows of bites and lays the egg between the bark and the wood above the second row. The grub feeds at first in the dying tip, and later bores downwards through the twig. The twigs are found dead during the summer and are frequently broken by storms. The injury is not serious, as yet, but the species may easily become an injurious pest.

The Buffalo Tree-hopper, *Ceresa bubalus*, has badly scarred several of our young trees. The cuts were made on both the stems, which are very small, and the branches. Soft maple seems to be preferred by this insect for egg-laying, and until the young maples were cut away from near our orchard the fruit trees were left entirely alone.

The Bud Moth, *Tmetocera ocellana*, was present in considerable numbers in our young orchard this season. Owing to lack of labor, early sprayings had to be omitted, and the result is intimated in the accompanying photograph. A poison spray, late in July, should control this insect effectively for the next season. The caterpillars begin to pupate about June 10 with us. The first adults appeared in the cases June 28, but empty cases were found in the field as early as the 18th.

When our orchard is sprayed with lime sulphur, winter strength, early in spring, we see little of the bud-moth, the case-bearers, or the leaf-aphides. I do not say that lime sulphur controls these insects, but our experience, so far, seems to indicate it.

The Cigar Case-bearer of the Apple, *Coleophora fletcherella*, was unusually abundant on our fruit trees this summer, and apparently the same species was breeding on thorn. The larvæ ceased feeding about June 15th, this season, and the first pupæ were found on the 20th. The first adults appeared in the cages on

Fig. 19.

*Tmetocera ocellana*, Bud-moth. Work on apple-leaves.

June 29th, and on the same day a larger, distinct, undetermined species of *Coleophora* was bred from cases on the thorn.

The Pistol Case-bearer of the Apple, *C. malivorella,* was present also in considerable numbers.

The Permanent Apple Aphis, *Aphis pomi,* was exceptionally numerous this season, and with it many *A. sorbi.* The leaves were badly curled, but its parasites controlled it before serious injury was done. Very few Aphides of either species could be found on the trees during the summer, but early in October both species were again common, and the leaves were curling badly. *A. pomi* was vastly more numerous, however, and seemed responsible for the curling. It has been reported that the leaf curling was due mainly to *sorbi.* It does not seem so with us. K. emulsion, or better, fish oil soap, about the middle of October would effectually control them for the following season; and lime sulphur, 1.04 S. G., sprayed in the early spring seems to be effective. Even in Quebec, where the San José is as yet practically unknown, a regular annual spray of lime sulphur, 1.04 S. G., seems a most excellent orchard practice.

The Apple-tent, *Malacosoma americana,* has its cycles with us, as elsewhere, and just now is on the increase. Many egg-masses are found this fall, whereas for the last two years but few were to be had. The Leaf-roller, the Leaf-crumpler, and two Leaf-miners have been common but not injurious.

The Codling-worm, *Carpocapsa pomonella,* has furnished us nothing new; except perhaps that it has discovered that we want it for class use and refuses to spin its cocoons on the trees. For some reason or other we found only about six cocoons on the trees this spring, although the species is not by any means rare.

The Plum Curculio, *C. nenuphar,* is not troublesome in our apples, although it will soon be a plum pest with us—our plums are just beginning to bear. The species causes more injury to apples than any other insect in some Quebec localities. As an apple pest I am quite of the opinion that it can be partially controlled by having a few plum trees in the orchard as traps. Thorough spraying with poison for the codling-moth, and rigid destruction of all fallen "wormy" fruit usually controls this pest.

The Apple Curculio, *A. quadrigibbus,* is injurious in a few Quebec localities, notably in Covey Hill region. A large orchard there has a considerable portion of the fruit distorted this season, and I think much of the injury is due to the punctures of this pest. Careful destruction of the fallen fruit is of importance in the control of this insect, and jarring is of use on small trees. Probably it is effectively controlled by spraying regularly for the codling-worm. This curculio lays its eggs in a simple puncture, and does not cut the crescent-shaped slit as does *nenuphar.* It pupates within the apple fruit.

The Apple Maggot, *T. pomonella,* is found in but few localities in Quebec, notably at Como, and in the region about Hemingford and Covey Hill. It has been effectively controlled at Como by careful destruction of the fallen fruit. That is, so far as known, the only effective method of control.

The San José we do not know in Quebec, although it has been reported from one place this summer near the Ontario line. *A. ostreaformis* was found here this season on plum trees. Our only apple scale is the Oyster-shell, *L. ulmi.* It is, however, often injurious, and is too frequently overlooked. There is no excuse for its presence in injurious numbers. Lime-wash in the late fall, or lime-sulphur in the early spring, with a contact-spray as the young appear in the late spring effectively control it. It is in neglected orchards that we find the Oyster-shell in abundance.

The Canker worms, *A. pometaria,* and *vernata,* trouble us but little at Ste. Anne's. In parts of Quebec, however, they are of local importance, and in the Annapolis Valley of Nova Scotia are among the worst of the apple pests. Under ordinary circumstances we recommend lead arsenate, applied as needed, and *when the caterpillars are small.* Carefully applied, and carefully watched bands of tree-tanglefoot are perhaps profitable in the districts worst affected. The males and females of *A. pometaria* have been common here this fall and were abundant until late in November; but we find most about the maple trees.

## Small Fruits.

The Currant Span-worm, *C. ribearia,* has become a pest with us. Its spotted looping caterpillars feed voraciously, and seem harder to kill than the common saw-fly larvæ. Paris green is always effective, and plenty of hellebore will do the work. The caterpillars are very common early in June, and pupate the last of the month. The first moths appeared in our cages on July 4th, but were found outdoors on June 29th. The egg-laying period extends over several weeks.

The Currant Borer, *Sesia tipuliformis,* has nearly ruined a currant patch in this neighbourhood. Last year, on July 9th, we noticed a number of dying canes, which proved to have been killed by larvæ of this species. The larvæ had escaped and only two parasitized pupæ were found. There was nothing to be done then, of course, as the moths were all out and egg-laying partly over. This season by April 14th the larvæ were working in the canes in which they had wintered. While small they keep to the pith and may be found in all parts of the cane. Their work leaves a black tunnel through the centre of the cane, and the species may be recognized by this character of their tunnels. When full grown the larva spins a cocoon within the cane near an exit hole through the side previously cut by it. Shortly after the cocoon is spun the larva pupates. Often these pupæ wriggle from the cocoon and project, head foremost, from the opening, after the fashion of other Lepidopterous wood-boring species, thus enabling the moth to emerge without touching the wood. In many instances, however, the pupa-cases remain within the cocoons. In the laboratory cages the later stages are passed rapidly, and give little indication of the condition in the field. Larvæ pupated in the cages on the 1st of May, and emerged seven days later; but on this date, May 8th, the caterpillars outdoors were still feeding, and only a few even spinning cocoons. The first pupa was found outdoors on May 11th, and the greater number of the adults were flying during the third week in June. Mating and egg-laying take place at this time. The moths are extremely active, darting back and forth over the patch during the sunshine, but disappearing in cloudy weather. The eggs are laid on the canes, and the larvæ enter the canes and feed for the rest of the season, becoming perhaps two-thirds grown by winter time.

The injury to the canes appears in June, or late in May, usually about the time of pupation. The leaves wilt, turn yellow and fall, and the cane rapidly dies. Occasionally the canes survive the attack and bear fruit the following season. In these cases the old exit hole can be found in the side of the cane.

This insect is a very injurious pest, and quite capable of completely destroying a large plantation in a few years. The only method of control consists in rigidly destroying, *burning,* the diseased canes, as soon as they can be distinguished. Usually they are noticeable after, or even before, pupation, and can always be detected after pupation by the exit holes.

Our experience with this insect illustrates very well the value of clean culture in insect control. The moths appeared in the currants suddenly and in great numbers. They came from a row of old, neglected currants in a nearby orchard. They had bred in those canes, increasing in numbers, until finally there were no sound canes left. Then they took the shortest route to the currants first mentioned, about eight hundred yards away.

It is true of many of our injurious insects that a rigid system of clean culture is the cheapest and most effective method of control. Clean culture is a gospel well worth preaching. It would save our farmers and orchardists many thousands of dollars every year if rigidly practised; and the expense would be small. I know an apple orchard carefully sprayed and cared for, yet badly infested with apple pests every year. Why? Because just over the fence is a neglected orchard of perhaps fifty trees. These trees are worthless and absolutely uncared for. They serve, however, to breed apple insects for the whole neighbourhood. Clean culture even with us in Quebec is one of the most important factors in successful fruit-growing. In Ontario it is even more important, for here you have serious pests, the San José, and the bark-beetles, which we do not need, as yet, to consider.

Another currant borer, *Psenocerus supernotatus,* bred in considerable numbers in our canes this season. The beetles breed in the tips of the canes, and seem to do but little damage.

The Raspberry Cane-borer, *Oberea bimaculata,* was particularly numerous this season in raspberries. The adults appeared about June 20th, and were present in great numbers until the last of the month. Scores of specimens were picked from the canes during mid-day. Probably the same species breeds commonly here in wild raspberry and blackberry. Egg-cuts found here this season on roses may have been from *O. b. basalis,* a species which Mr. Morris, of Port Hope, has taken this season from rosebushes.

The Currant Saw-fly and the Currant Aphis were of course more or less common but easily controlled. I notice that currant growers seldom bother much about the late appearing larvæ of the former. Where these are killed the first brood of the succeeding season is usually few in numbers. The Currant Aphis appears to spread but slowly, at least with us. I have been watching it for three years now on a small group of canes where it is allowed to breed. Although it curls up practically every leaf on those bushes every season, it has so far caused no trouble in our plantation some thousand yards away.

The Grape-Vine Root-borer, *Fidia vitticida,* appeared in our vineyard three years ago in small numbers. The characteristic holes in the leaves were quite evident. Possibly our cold winters are too much for them for we have never seen the species since.

## MISCELLANEOUS.

The Rust Fly, *Psila rosæ,* has appeared in Montreal Island, and threatens to render carrot raising a precarious business. It has long been a serious pest in the Maritime Provinces and in Eastern Quebec, but until recently has been rare with us. It is difficult to control, and I know of nothing better than the practice recommended by Dr. Fletcher, of spraying with kerosene emulsion every ten days from the time the carrots are thinned until four or five sprays have been given. The spray should soak the ground about the roots.

The Clover-root borer, *Hylastinus obscurus,* is widely spread throughout the Montreal region. Apparently it will soon allow but one good crop of clover in our neighborhood.

Red and Mammoth Clovers are seriously injured; and I find the beetles breeding also in Alsike and in Crimson Clover, but not to an injurious extent. They sometimes start their tunnels in White Dutch and Sainfoin, but I have not so far found them breeding there. Alfalfa and sweet clover are not affected here.

The beetles started their tunnels here this season in the last of May and first part of June. They cut an entrance hole either in the base of the crown or through

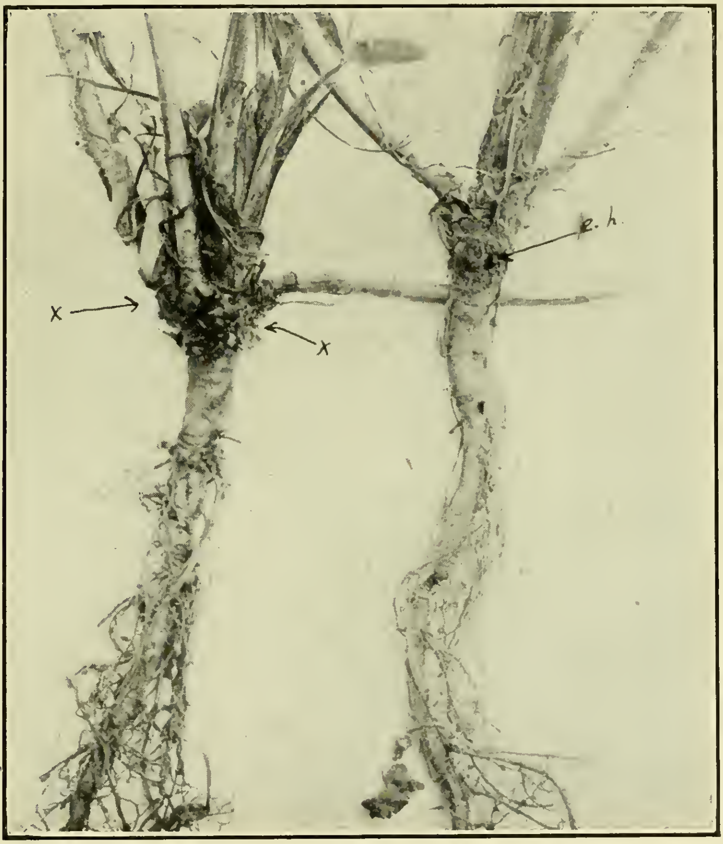


Fig. 20.
*Hylastinus obscurus.* Work in clover roots. *e.h.*, entrance hole; *x.*, borings of adult beetle. The crown would separate easily from the root.

the side of the root, and continue a cylindric tunnel down the root, sometimes near the surface, sometimes deeper into the tissue. Along the sides of the tunnel shallow niches, egg-niches, are cut, and in these the eggs are deposited, one in each niche. The larvæ bore irregularly through the substance of the root, and as the majority are working just below the crown the tissue is there often largely destroyed. The crown for this reason frequently breaks away from the root when an attempt is made to pull the plant. The first pupæ are formed the third week in July, and from this time until the first week in October pupæ are always to be found. On October 10th, this season, a very few pupæ were obtained, but nearly all had transformed. When these beetles are established in a section there is apparently no practical method of control. But this is perhaps not unfortunate for it is usually considered the best farm practice to take out one crop of clover from a rotation, and the first crop is not commonly affected seriously, although clover planted in May is sometimes attacked in numbers the following spring and the first crop injured. Plowing under the sod as soon as the first crop is cut should always be practised when this insect is common. Many of the larvæ can thus be destroyed.

The Cabbage maggot was more injurious this season than in other years, and the onion maggot was present though not in great numbers.

*Anisota senatoria* has been extremely numerous in the district between Howick and Hemingford. Many oaks through that country were completely stripped last season by hordes of these caterpillars.

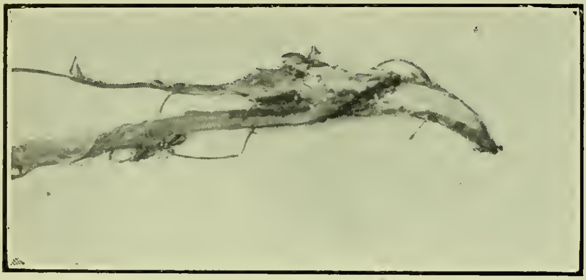

FIG. 21.
*Hylastinus obscurus.* Tunnel and eggs.

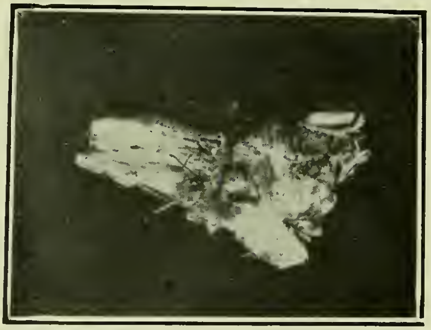

FIG. 22.
*Hylastinus obscurus.* Tunnel and eggs.

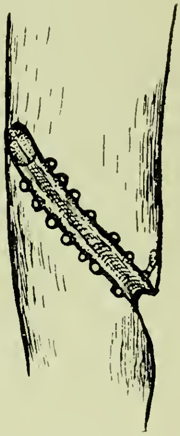

FIG. 23.
*Hylastinus obscurus.* Eggs in the egg-niches, with adult beetle in the end of the egg-tunnel. (Twice enlarged.)

Grasshoppers were not so serious a pest in this province as in the last three years, but still were very numerous in some localities. In sections where the grasshoppers were very destructive two or three years ago but were not numerous this season, the blister-beetles, whose young feed upon grasshopper eggs, were reported very plentiful. "Criddle mixture" and "Hopper-catchers" would save many dollars in the grass and grain fields of this province in grasshopper years. The Blister beetles mentioned above, mostly *M. unicolor,* were injurious in a few places. Their young, apparently, do much to control the grasshoppers, and the adults should not be destroyed unless they are really doing injury.

The Fall Web-worm which has been so abundant on shade and forest trees for several years seems to be decreasing in numbers. The White-marked Tussock, which was so injurious in Montreal recently, has not yet revived from the attack of its parasites.

*Otiorynchus sulcatus* has been doing considerable injury to cyclamen and primroses in two of the Montreal greenhouses. Injury was reported from the feeding of the adults on the flowers; and the larvae which live in the soil, destroyed the roots, and even fed upon the corms of the cyclamen. Carbon bisulphide has had no effect upon the larvæ. Probably carbolic acid emulsion or strong kerosene emulsion will be effective. We are not yet able to report any success in its control. Only two sets of greenhouses were affected so far as we know; others near by were not at all troubled.

The Apple-leaf hopper, so injurious here on potato and other crops in 1908 and 1909, was not numerous this season.

The Cucumber beetle, *D. vittata*, was again injurious throughout this district. It certainly seems to prefer squashes to melons and cucumbers; and can be effectively kept from the two last by having a few "trap plants" of squash growing close by. These "trap" squashes should be covered with Arsenite, dusted on in large quantity, as soon as the beetles appear, and at the same time the valuable crop should be sprayed with Bordeaux, which the beetles dislike. Many beetles can in this way be poisoned during the first few days of their feeding. By repeating the spray of Bordeaux on the main crop as often as needed, and leaving the "trap" squashes unsprayed the beetles can be kept away from the cucumbers and melons. The same method is effective in squash fields; a few plants being used as "traps" and the rest being covered with Bordeaux. For several years I have had squash, melons, cucumbers, and pumpkins growing close together. The squashes have always been attacked by the beetles, but the melons and cucumbers have escaped completely, and without treatment.

The Spruce Budworm, *Tortrix fumiferana*, was noticed in small numbers at Hudson. The Larch Sawfly, *N. erichsonii*, was present, but did little damage.

## BASSWOOD OR LINDEN INSECTS. IV.

Arthur Gibson, Ottawa.

In 1904, the writer published, in the annual report of this Society, notes on 94 different species of insects which had been found attacking *Tilia americana* L. In 1906, notes on other species were contributed which brought the list up to 102, and, in 1907, a further paper increased this latter number to 122. The following additional notes have since been made.

### ATTACKING THE FOLIAGE.

#### Order Homoptera.

123. *Ceresa constans* Wlk. This insect has been found commonly on basswood at the Beaver Meadow, Hull, Que. in August and September, by Mr. W. Metcalfe. Mr. Van Duzee has also found the species on basswood near Buffalo, N. Y.

104 of 1906 list. *Telamona reclivata* Fitch. This species was collected on September 26, 1907, and again on Sept. 2, 1908. The 1906 specimens were taken on July 1.

124. *Cixius basalis* Van D. Beaver Meadow, Hull, Que. August 11, 1907, (Metcalfe.)

125. *Amalopota uhleri* Van D. Ottawa, Aug. 25, 1907, (Metcalfe.) This insect has been recorded as feeding on maple.

126. *Gypona albosignata* Uhl. Beaver Meadow, Hull, Que. Sept. 1, 1907, (Metcalfe.)

109 of 1906 list. *Diedrocephala coccinea* Forst. This species was abundant in 1905 but the specimens were not identified until 1907. (Det. by Heidemann.) Pupæ which were found on July 7, produced the perfect insects on July 10.

## Order Hemiptera.

127. *Lygus tenellus* Uhl. MS. This species was collected by me from basswood on June 27, 1905, the determination being made by Mr. Van Duzee. In 1907, Mr. Metcalfe also found the same insect on linden at the Beaver Meadow, Hull, Que. on Aug. 11.

128. *Lygus monachus* Uhl. Mr. Metcalfe found this species commonly, at Ottawa, on basswood on July 1, 1904. In Miss Murtfeldt's account of this bug in Bulletin No. 13 of the U. S. Division of Entomology, the insect is stated to have been found infesting the growing points of young maples (*Acer dasycarpum.*). Besides maple, alder is also given as a food plant and " many other kinds of small trees and shrubs." The insect evidently has a wide range of food plants.

129. *Camptobrochis nebulosus* Uhl. Beaver Meadow, Hull, Que., Aug. 11, 1907, (Metcalfe). Box-elder and willow are also recorded as food plants for this insect, the former by Baker and the latter by Gillette.

## Order Lepidoptera.

19 of 1903 list. *Ennomos alniaria* L. In 1906, Mr. Young found the larva at Meach Lake, Que. This was the first record of its feeding on basswood in the Ottawa district. On Sept. 2, 1908, the writer found a mature larva which measured two and one-eighth inches long, also feeding on basswood, on the Experimental Farm.

130 *Pyrausta pertextalis* Led. Larvæ of this pyralid were found on basswood at Ottawa in June, 1908, the moths emerging June 27.

131. *Archips fractivittana* Clem. A single larva which produced this moth was found on basswood in 1908. It pupated on June 1, and the moth emerged on June 10. A brief note reads "larva like *rosaciana.*"

## Order Hymenoptera.

67 of 1903 list. The Willow Sawfly, or American Cimbex, C. *americana* Leach. A single specimen of this larva was found by the writer feeding on basswood, at Ottawa, on October 8, 1907. This specimen, instead of being the usual pale yellow colour, was of a light vermilion shade.

## Order Acarina.

69 of 1903 list. The Linden Gall Mite, *Phytoptus abnormis* Garman. Very abundant at Ottawa in June 1908. Some leaves were much infested; quite a few of the galls were on the undersides of the leaves.

## OCCURRING ON THE BARK.

### Order Homoptera.

132. *Lachnus dentatus* LeB. Specimens of apterous females, depositing eggs on basswood were shown at the annual meeting of this Society, at Guelph, on 31 Oct., and 1 Nov., 1907, by Dr. Bethune and Mr. Jarvis. This is probably the species which I found on the same tree at Ottawa a few years previously. In Packard's Forest Insects, the insect is mentioned as having been found on the branches of willow and also on small nursery apple trees.

133. *Pulvinaria vitis* Linn. This species is recorded from Western Ontario as occurring on *Tilia americana,* (Jarvis, Rep. Ent. Soc. 1907, p. 51). In Mrs. Fernald's Catalogue of the Coccidæ of the World the only food plant mentioned is grape vine.

134 *Toumeyella liriodendri* (Gmel.) Ottawa, (Jarvis, Rep. Ent. Soc. Ont., 1907, p. 51).

135. *Aspidiotus æsculi* Johns. Mr. Jarvis records this scale insect as infesting basswood at Toronto, Brantford and Guelph (Rep. Ent. Soc., 1907, p. 51). In Mrs. Fernald's Catalogue *Æsculus californica* is mentioned as the food plant and the habitat given as California.

136. *Aspidiotus diffinis* Newst. Mrs. Fernald records this species as occurring on basswood as well also as on lilac. Jarvis lists the species from basswood, from Guilds, Ont. (Rep. Ent. Soc. Ont., 1907, p. 51).

137. *Aspidiotus juglans-regiæ* Comst.

138. *Aspidiotus ulmi* John.

In April, 1907, Mr. J. Fred. Smith, late Provincial San José Scale Inspector, sent to the Division at Ottawa some basswood heavily infested with scale insects. The wood was taken from a tree near Beamsville, Ont. The material was sent to Dr. Howard, at Washington, and was reported upon by Mr. Marlatt as follows: "The scale insects on basswood from Mr. J. F. Smith are of two species, viz. *Aspidiotus juglans-regiæ* Comst. and *Aspidiotus ulmi* Johnson." *A. juglans-regiæ* has a wide range of food plants. Mrs. Fernald mentions walnut, apricot, apple, pear, peach, cherry, Japan plum, locust and maple. *A. ulmi* is recorded from elm, catalpa and *Cycas revoluta.*

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## THE ENTOMOLOGICAL RECORD FOR 1910.

Arthur Gibson, Ottawa.

The season of 1910 in Canada was, on the whole, a most favorable one for the collection of insects. Reports from many widely separated localities refer to the remarkably fine and dry weather. In the east, the season was much drier than that of 1909. From the many interesting records sent in, the year, too, has been an improvement with regard to the number of rarer forms which have been collected. As yet, of course, much material gathered in 1910, still remains to be worked up. As this is done a mention of the more interesting species, it is hoped, will be made in future issues of the Record. In the present Record are included notes on a number of rarer forms collected in other years, but only studied in 1910.

The compiler of the Record is exceedingly grateful to his many friends who have either helped him by sending in records for the "Notes of Captures", or in giving assistance in the identification of doubtful species.

Canadian collectors and students, as in previous years, have received invaluable help from the leading specialists in the United States and elsewhere. Particular acknowledgment is due to Dr. L. O. Howard, and his expert associates, Dr. H. G. Dyar and Mr. W. D. Coquillett, of Washington, D.C.; Dr. J. B. Smith, of New Brunswick, N.J.,; Sir George Hampson, of the British Museum; Mr. W. D. Kearfott, of Montclair, N.J.; Prof. H. F. Wickham, of Iowa City, Iowa; Mr. E. P. Van Duzee, of Buffalo, N.Y.; Mr. W. Beutenmuller, of New York, N.Y.; Dr. Henry Skinner, of Philadelphia, Pa.; Dr. E. M. Walker, of Toronto, Ont.; Col. Thos. L. Casey, of Washington, D.C.; Mr. Chas. Leibeck, of Philadelphia, Pa.; Rev. G. W. Taylor, of Departure Bay, B.C., Mr. C. H. Roberts, of New York, Mr. J. D. Evans, of Trenton, Ont., Mr. W. H. Harrington, of Ottawa, and Mr. F. H. Wolley-Dod, of Millarville, Alta. Mr. Dod is specializing in North American noctuidæ and will be pleased to name and return any specimens submitted to him.

## Literature.

Among the many valuable publications which have been received during the past year, and which are of interest to Canadian students, mention may be made of the following:—

Banks, Nathan. Catalogue of Nearctic Spiders. Smithsonian Institution, United States National Museum, Bulletin No. 72. This publication takes the place of the Marx Catalogue prepared some twenty years ago. The author states that the catalogue includes a little over 1,300 species. "The largest family is the Theridiidæ, with 298 species; the Attidæ is next with 213; two other families, the Lycosidæ and Epeiridæ, have over 100 species in each. Sixteen families have less than 10 species apiece." This work will be a most useful one. Many of the species occur in Canada,, but comparatively few definite records are available. The publication of this catalogue will undoubtedly lead to more systematic work, and it is to be hoped that entomologists in Canada will do their share in working up local species.

Beutenmuller, William. The North American species of Neuroterus and their Galls, (issued May 20, 1910); The North American species of Aylax and their Galls, (issued May 20, 1910); The North American species of Aulacidea and their Galls, (issued July 16, 1910): American Museum of Natural History, New York. These papers are a continuation of the results of Mr. Beutenmuller's studies on American Cynipidæ and their Galls. They are very useful publications. The illustrations are particularly good; in fact they could not be otherwise, coming from the hand of Mrs. Beutenmuller. Several Canadian records appear in the above contributions.

Blatchley, W. S. The Coleoptera or Beetles of Indiana; Department of Geology and Natural Resources; Bulletin No. 1, State Printers, Indianapolis; 1386 pages, with nearly 600 excellent illustrations. No book has appeared during the year which will give such general pleasure to entomologists as Professor Blatchley's magnificent work on the beetles of Indiana. Such a work has been much wanted, and although the author has confined it to the above State, it will, nevertheless, be of the greatest use to students in Ontario and other parts of Canada. Many of the species which occur in Indiana are to be found in Canada, and from the descriptions of families and genera and the keys to the genera and species and the descriptions thereof, students are now able to run down many insects which otherwise could only be determined by the specialist. Unfortunately the edition of this work is small, and many, doubtless, will be unable to obtain a copy.

Casey, Thos. L. Memoirs on the Coleoptera. 1; New Era Printing Co., Lancaster, Pa.; issued September 24, 1910. This memoir, of 205 pages, by Col. Casey, the well-known student of coleoptera, is indeed an important publication. It is divided into 2 parts: 1—New species of the Staphylinid Tribe Myrmedoniini; 2—Synonymic and descriptive notes on the Pæderini and Pinophilini. Altogether 365 species are described as new, 25 of which are from Canada. Of these 25, all but two occur in British Columbia, and were mostly collected by the Rev. J. H. Keen, the enthusiastic naturalist, at Metlakatla. The two other species are from Ontario, one collected at Toronto and one at Ottawa. This further work on Staphylinid beetles will be of great interest to coleopterists. Such memoirs represent much close study, and the author deserves great credit for this additional contribution to the knowledge of these insects which are so difficult to study.

Coquillett, D. W. The Type-species of the North American Genera of Diptera. Proc. U. S. Nat. Museum, Vol. 37, pages 499-647; published August 4, 1910. "The great importance of knowing definitely what species is the type of any given genus is now recognized by practically every worker in the field of biology." This important contribution is the result of several years of work in ascertaining the types of the genera of diptera reported as occurring in North and Middle America. It contains all the genera known to the writer up to January 1, 1909, together with their type-species and synonymy. Students of diptera will find this publication of extreme value. In the *Canadian Entomologist* for November, 1910, Mr. Coquillett points out several corrections and omissions to the above paper, which should be noted by those who possess a copy of the article.

Dietz, W. G. Revision of the Blastobasidæ of North America. Trans. Amer. Ent. Soc., Vol. xxxvi, Jan.-March, 1910, pp. 1-72, plates I.-IV. This interesting paper deals with 66 different species, several of which are recorded from Canada. Thirty-six are described as new. The author states in the beginning of the paper that "the Blastobasidæ, as now understood and distinguished from the Œcophoridæ, form a well defined family of the Tineina. This revision will be of much use to students of the microlepidoptera. Doubtless many others of the species listed will be found in Canada.

Grossbeck, John A. Studies of the North American Geometrid Moths of the Genus Pero. U. S. Nat. Museum, Vol. 38, pages 359-377, with Plates 13-16; published August 19, 1910. In this interesting paper Mr. Grossbeck gives the results of his investigation in the above named genus (= *Azelina* Guenee in part). Long series were gathered together from different parts of the United States and Canada, and four new species recognized. Four plates are added, one of these figures the adult moths, another structural characters and the remaining two show the genitalea of the species.

Hampson, Sir George F. (Bart.). Catalogue of the Lepidoptera Phalænæ in the British Museum, Vol. IX, Noctuidæ, 1910. 552 pp., plates cxxxvii to cxlvii. Received May 2. This volume "is the third and final part of the very large Noctuid subfamily *Acronyctinæ:* it contains 725 species belonging to 185 genera, as compared with 843 species belonging to 96 genera in Vol. VII, and 720 species belonging to 104 genera in Vol. VIII." Many of the species figured in the beautiful plates occur in Canada, and owing to the great care of the artist, in most instances, it is an easy matter to determine our North American forms. These volumes are eagerly looked forward to by lepidopterists. Vol. IX. is extremely interesting as it deals with many species which have of recent years been studied by American entomologists. Collectors in Canada should assist Sir George Hampson in his great work by sending him material from their respective districts. In this way, of course, future volumes will be made much more useful for those who are studying specially the lepidoptera of our country.

Johannsen, O. A. The Mycetophilidæ of North America: Maine Agric. Exp. Station, Bull. 172, Part 1, (March, 1910), pp. 209-276, plates 3; Bull. 180, Part II, (June, 1910), pp. 125-192, plates 4. This monographic treatment of the Fungus Gnats of North America is a most valuable contribution to our knowledge of diptera. In Part 1 the lower and economically less important subfamilies Bolitophilinæ, Myçetobiinæ, Diadocidiinæ, Ceroplatinæ and Macrocerinæ, are treated; in Part II the Sciophilinæ are dealt with.

Kirby, W. F. A Synonymic Catalogue of Orthoptera, Vol. III, Locustidæ vel Acridiidæ; British Museum (Natural History), March, 1910. This volume completes Mr. Kirby's general Catalogue of the Order Orthoptera. It is a book of 674 pages, and therefore considerably larger than Vols. I and II. This is owing to the fact that the Locustidæ (the short-horned Grasshoppers or Migratory Locusts) is a much larger family than the others. This work will be of the greatest use to systematists, and now that the whole Catalogue has been completed, the order Orthoptera will doubtless attract more and more students from year to year. Pages 562 to 586 are given up to "Additions and Corrections" to the three volumes.

Muttkowski, Richard A. Catalogue of the Odonata of North America: Bulletin of the Public Museum of the City of Milwaukee, Vol. I, article I, pp. 207. This well prepared catalogue, which was issued on June 27th, is a publication which will be widely welcomed by students of the Odonata. Such a catalogue has been much wanted. It presents in convenient form what purports to be a complete list of these insects from the North American region. The author has had the co-operation of the leading students in this order in the preparation of the catalogue; the classification and nomenclature employed, therefore, represents the more approved and advanced ideas of odonatologists. The publication is an important one, and should be in the hands of all Canadian students of these neuropteroid insects.

Pierce, W. Dwight. A Monographic Revision of the Twisted Winged Insects comprising the Order Strepsiptera Kirby. Smithsonian Institution: U. S. Nat. Museum, Bulletin 66. Received Jany. 7, 1910. In this extensive contribution of 232 pages, 37 genera are treated of, comprising 103 species. Sixty-two new species are described from North America. The introductory chapters on "History" and "Biology" give much information about these interesting insects, which have been so little studied by North American students. Fifteen plates appear at the end of the Bulletin.

Rohwer, S. A. On a Collection of Tenthredinoidea from Eastern Canada. Proc. U. S. Nat. Museum, Vol. 38, pages 197-209; published June 6, 1910. This paper is a report of an interesting collection of sawflies made by Mr. A. Gordon Leavitt, in the County of St. John, New Brunswick. Fifty-three different species are listed, 12 of which are described as new.

Smith, John B. A List of New Jersey Insects: Annual Report of the New Jersey State Museum, 1909; pp. 888. This report, with the exception of 13 pages, is devoted to Dr. Smith's New List of the Insects of New Jersey. No less than 10,385 different species are listed, comprising 3,486 genera and 331 families. In the 1899 list 8,537 species were included. Considerable progress has therefore been made in a knowledge of the insects of the State. This List is an extremely useful publication. Unfortunately its edition is limited, and it will be impossible to supply everyone who will want this work with a copy.

Snodgrass, Robert Evans. The Thorax of the Hymenoptera. Proc. U. S. Nat. Museum, Vol. 39, pages 37-91, with plates 1-16; published October 25, 1910. In this paper the author gives much extremely useful information on the thorax of hymenopterous insects. In such a study it was necessary, of course, to make many dissections and drawings. The reproductions of these latter are particularly good. In addition to the 77 figures on the plates, 16 other figures appear in the text.

Wheeler, William Morton. Ants: Their Structure, Development and Behavior. New York: The Columbia University Press, 1910. This remarkable book of 663 pages is one of the most important contributions to the literature of entomology which has appeared during the year. It is a work that has been much wanted and will be of extreme value the world over. The book is divided into thirty chapters, each of which contains a number of parts. Chapter I treats of "Ants as Dominant Insects." This is followed by chapters on external and internal structure, development, polymorphism, history of myrmecology and classification of ants, distribution, fossil ants, etc. At the end are several appendices: A—Methods of Collecting, Mounting and Studying Ants; B—Key to the subfamilies, genera and subgenera of the North American Formicidæ, for the identification of the workers; C—A list of described North American ants; D—Methods of exterminating noxious ants; E—Literature. Beautiful illustrations appear throughout the text. This magnificent work will undoubtedly lead many to make serious studies of these most interesting insects, about which so much reliable information has now been made readily available.

Williamson, Edward Bruce. The North American Dragonflies (Odonata) of the Genus Macromia. Proc. U. S. Nat. Museum, Vol. 37, pages 369-398, with plates 35-36; received 7 Jany., 1910. This paper on the genus Macromia will be of much value to students of dragonflies. The American species are distributed generally over the United States and Southern and Eastern Canada. Nine species are treated of at length, three of which are described as new. Seven figures, showing wing venation, are included in the text.

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The following is a list of names and addresses of collectors heard from during 1910:—

Anderson, E. M., Provincial Museum, Victoria, B. C.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., care King Brothers, Quebec, Que.
Bush, A. H., 1105 Ninth Ave., Vancouver. B.C.
Carr, F. S., Edmonton, Alta.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kaslo, B.C.
Crew, R. J., 561 Carlaw Ave., Toronto.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Dod, F. H. Woolley-, Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fyles, Rev. T. W., Hull, Que.
Gibson, Arthur, Experimental Farm, Ottawa.

Groh, H., Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Haight, D. H., Sudbury, Ont.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harms, J. F., Treesbank, Man.
Harrington, W. H., P.O. Department, Ottawa.
Heath, E. F., Cartwright, Man.
Hewitt, Dr. C. Gordon, Experimental Farm, Ottawa.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph.
Keen, Rev. J. H., Metlakatla, B.C.
Leavitt, A. G., St. John, N.B.
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancover, B.C.
McIntosh, W., St. John, N.B.
Metcalfe, W., 288 Bank Street, Ottawa.
Moore, G. A., 850 St. Hubert St., Montreal.
Moore, W. H., Scotch Lake, N.B.
Morris, Frank, Port Hope, Ont.
Nelles, Douglas H., Dept. Interior, Ottawa.
Nicholls, A., 18 Electric Street, Ottawa.
Perrin, Jos., McNab's Island, Halifax, N.S.
Rowland, Alton, Windsor Mills, Que.
Russell, John, Hope Station, B.C.
Sanders, G. E., Experimental Farm, Ottawa.
Sanson, N. B., Banff, Alta.
Saunders, Henry, 21 Harbord Street, Toronto.
Sherman, R. S., 2285 Sixth Avenue, Vancouver, B.C.
Simpson, W., Dominion Observatory, Ottawa.
Southee, G. R., Sherbrooke, Que.
Swaine, J. M., Macdonald College, Que.
Taylor, Rev. G. W., Departure Bay, B.C.
Tipping, E. Dalton, Minnehik P.O., via Bluff Centre, Alta.
Treherne, R. C., Grimsby, Ont.
Venables, E. P. Vernon, B.C.
Walker, Dr. E. M., Biological Dept., Univ. of Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Willing, T. N., Saskatoon, Sask.
Winn, A. F., 32 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O. A. C., Quelph, Ont.

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## NOTES OF CAPTURES.

### Lepidoptera.

(Arranged according to Dyar's List of North American Lepidoptera, U.S. N.M. Bull. No. 52).

(Dyar's number).

14. *Papilio thoas* L. Toronto, a fine specimen seen at the corner of Queen and Yonge Streets, July 2, (Crew).

64. *Eurymus boothii* Curtis. Dawson, Y.T., 1908, (A. Day).
95. *Speyeria idalia* Dru. Toronto, end August, (J. R. McMurrich). First record for this district.
131. *Brenthis myrina* Cram. A remarkable melanic specimen of this common butterfly was taken at Hull, Que., Aug. 8, by Dr. Fyles. The forewings are almost entirely suffused with black, very little red.
185. *Charidryas nycteis* D. & H. East Toronto, near Golf Links, August, (J. R. McMurrich.) This is another remarkable aberration in which the central large band across the wings is entirely white, not yellow as is usual.
282. *Coenonympha kodiak* Edw. a. *yukonensis* Holland. Dawson, Y.T., 1908, (A. Day).
284. *Coenonympha typhon* Rott. a. *laidon* Bork. Belleville, Ont. (Miss M. C. Melburn).
289 *Œneis macounii* Edw. Hymers, Ont., June 9, (Dawson).
295. *Œneis norna* Thunb. f. *taygete* Hbn. Dawson, Y.T., 1908, (A. Day).
378. *Incisalia niphon* Hbn. Hudson, Que., May 5, (Winn).
419 *Nomiades couperii* Grt. Sherbrooke, Que., June 4, (Southee).
430. *Rusticus shasta* Edw. Lethbridge, Alta., July 5, (Wallis).
440g *Cyaniris ladon* Cram. g. *piasus* Bdv. Bird's Hill, Winnipeg, Man., June 5, (Wallis).
656a. *Hemaris ruficaudis* Kirby. Edmonton, at sallow blossoms, May 13, (Carr), new to Alberta. I have the same form from Field, B.C., and from Chicago, and it is the *thysbe* of Holland's figure, with the marginal band even instead of dentate, and seems to be the *ruficaudis* of Smith's Monograph, (Dod).
657. *Lepisesia flavofasciata* Wlk. Sudbury, Ont., June 7, (Haight).
699. *Phlegethontius convolvuli* L. a. *cingulata* Fab. Ottawa, no date, (Bro. Germain). First record for the district.
713. *Sphinx canadensis* Bdv. Britannia, near Ottawa, July 19, (Groh).
741. *Samia columbia* Smith. Dryden, Ont., June 6, (McNicol & Pitt).
778. *Eacles imperialis* Dru. In addition to the captures recorded in the Ottawa Naturalist, Aug. 1910, 2 other specimens were collected at Ottawa, one on July 7, and the other at end of July, (W. Gibson). Mr. Grant also took 3 specimens at Orillia, Ont.
853. *Estigmene prima* Slosson. Several specimens of this rare moth were taken the past season in widely different localities: Shawbridge, Que., June 4, (Winn); Ottawa, (Nicholls); Sudbury, Ont., June 16, (Haight); Winnipeg, Man., June 2, (Wallis).
867. *Neoarctia brucei* Hy Edw. Mt. Cheam, B.C., Aug. 12, 1907, (Bush). First Canadian record that I know of.
876. *Apantesis michabo* Grt. Aweme, Man., May 27, (Criddle); var. *minea*, Hymers, Ont., June 7, (Dawson).
911. *Euchaetias oregonensis* Stretch. Ottawa, no date, (Nicholls), first record for district; Maynooth, Ont., June 18, rare in my experience, (Evans).
958. *Panthea portlandia* Grt. Banff, Alta., June 1, (Sanson). A Banff male, dated July 16, is in Prof. Smith's collection. Both are rather dark. New to Alberta, (Dod).
960. *Panthea acronyctoides* Wlk. Montreal, May 21, (Winn).
964. *Charadra deridens* Gn. Aweme, Man. June 28, (Criddle; Winnipeg, June 17, (Wallis). Rare in Manitoba.

*Apatela cyanescens* Hamp. Cowichan Lake District, B.C., 1 specimen, June 22, 1908, (Day).

974. *Apatela hesperida* Sm. Aweme, Man., June 28, Criddle).
992. *Apatela lætifica* Sm. Winnipeg, Man., June 17, (Wallis).
1001. *Apatela spinigera* Gn. Winnipeg, Man., June 17, (Wallis).
1005. *Apatela lithospila* Grt. Worthington, Ont., near Sudbury, July 6, (Haight).
1008. *Apatela funeralis* Grt. Ottawa, June 14, (Nicholls).
1010. *Apatela minella* Dyar. Winnipeg, June 15, (Wallis).
1097. *Platyperigea prœacuta* Sm. Duncans, B.C., July 15, not previously recorded from Vancouver Island, (Hanham).
1101. *Caradrina meralis* Morr. Duncans, B.C., Aug. 25, not previously recorded from Vancouver Island, (Hanham); Trenton, Ont., Sept. 2, (Evans).
1109. *Caradrina miranda* Grt. Victoria, B.C., July 5, not previously recorded from Vancouver Island, (Hanham).
1149. *Hadena bridghami* G. & R. Rimouski Wharf, Que., Aug., (Gibb).
1189. *Hadena barnesii* Sm. Banff, Alta., July 30 to Aug. 4, not rare, (Sanson). This is the species so standing in my Alberta list. It seems almost, but not quite, to connect with *sora*.. Typical *barnesii* from Colorado is smaller and brighter coloured than either, (Dod).
1199. *Hadena versuta* Sm. Hymers, Ont., June 20-28, (Dawson).
1202. *Hadena miseloides* Gn. Winnipeg, June 17, (Wallis).
1210. *Hadena niveivenosa* Grt. Hymers, Ont., Aug. 7, 1909, (Dawson).
1221. *Hadena apamiformis* Gn. Winnipeg Beach, Man., July 5, (Wallis); Hymers, Ont., July 7, (Dawson).
1217. *Hadena remissa* Hbn. Duncans, B.C., May 23, not previously recorded from Vancouver Island, (Hanham).
1223. *Hadena morna* Strk. Duncans, B.C., Aug. 2, a rare species, (Hanham). The record of this species from High River in the Record for 1909 is wrong. The name was probably given by me, as the species stands as *morna* in Hampson's Catalogue, though erroneously. It is the *Orthosia conradi* Grt. of the Alberta List, and is either a local race or close ally of that species. Prof. Smith has described it as new under the name of *Agroperina lineosa* in Jour. N. Y. Ent. Soc., xviii, 145, Sept., 1910, (Dod).
1226. *Hadena cogitata* Sm. McNab's Island, near Halifax, N.S., June 30, (Perrin).

*Hadena enigra* Sm. Winnipeg, June 24, (Wallis).

*Hadena multicolor* Dyar. Duncans, B.C., June 2-29, (Hanham).

*Hadena bonilla* Barnes. Metlakatla, B.C., Aug. 6, 1904, (Keen).

*Hadena sora* Sm. Banff, Alta., July 16 to 22, three specimens, (Sanson).

1259. *Polia epichysis* Grt. Victoria, B.C., Aug. 24, not previously recorded from Vancouver Island, (Hanham).

*Trachea jocasta* Sm. Cartwright, Man., Sept 5, (Heath).

1356. *Oncocnemis barnesii* Sm. Banff, Alta., one worn female, Oct., 17, (Sanson). It agrees pretty closely with the description and with Hampson's figure, copied from a figure of the type from Yellowstone Park. The specimen is unlike any other species known to me, and a most interesting new Alberta record, (Dod).
1393. *Rhynchagrotis anchocelioides* Gn. Duncans, B.C., 1 sp. bred, July 5, not previously recorded from Vancouver Island, (Hanham).
1405a. *Rhynchagrotis formalis* Grt. a. *falcula* Grt. Winnipeg, Aug. 31, a surprising capture, (Wallis).

1421. *Platagrotis imperita* Hbn. Banff, Alta., 4 specimens, July 30 to Aug. 4, (Sanson); Calgary, Alta., July 23, 1908; Didsbury, Alta., Aug. 5, 8, 1905, (C. G. Garrett). I have a Labrador specimen from Prof. Smith's collection, and a B.C. specimen, probably from the Okanagan, is in the British Museum. It appears to be the *imperita* of Hampson's Catalogue. First Alberta records, (Dod).

1426. *Semiophora elimata* Gn. Banff, Alta., July 25, (Sanson). New to Alberta.

1449. *Setagrotis vernilis* Grt. Banff, Alta., July 30, (Sanson). A very dark specimen, but I think this species. New to Alberta, (Dod).

*Setagrotis filiis* Sm. (Trans. Amer. Ent. Soc. xxxiii, 125, April, 1907). Banff, Alta., Sept 1. The type is from Pullman, Wash.; a female from Laggan, Alta., Aug. 9, is in Prof. Smith's collection. I do not feel sure that it is not merely a very dark blue-grey form of *infimatis*. A new Alberta record, at any rate, (Dod).

1486. *Noctua oblata* Morr. Barrington Passage, N.S., July 5, (Young).

1544. *Feltia gladiaria* Morr. Trenton, Ont., Sept. 13, second specimen taken, (Evans).

1581. *Paragrotis olivalis* Grt. Duncans, B.C., rare, 1 at sugar, Aug. 15, and another at rest, Sept. 5, (Hanham).

1588. *Paragrotis brocha* Morr. Duncans, B.C., at sugar Sept. 15, 1908, not taken since, (Hanham).

1623. *Paragrotis personata* Morr. Rounthwaite, Man., (Marmont); Aweme, Man., July 13, 1904; Aug. 25, 1905 (Fletcher). See Ottawa Naturalist, Sept. 1910.

1639. *Paragrotis vallus* Sm. Banff, Alta., Sept. 8, (Sanson). The type is a female from Laggan. I have a female taken at Millarville on Oct. 5, 1907, which I had believed to be the female of *vulpina*, of which I have seen males only. Mr. Sanson's specimen is a male, and indicates a distinct species from *vulpina*, (Dod).

1682. *Paragrotis fuscigera* Grt. The species referred to by me under this name in the Record for 1909, turns out to be *pestula* Smith, which is an ally of *pleuritica* Grt. and distinct from *focinus* Smith, to which I have referred it, (Dod).

1692. *Paragrotis intrita* Morr. Winnipeg Beach, Man., Aug. 19-24, four specimens, (Wallis). Smaller only than Vancouver Island specimens of which I have a long series. I believe *strigilis* Grote, *titubatis* Smith and *reuda* Strecker, to be variations of *intrita*, and have specimens compared with all the types except *reuda*, which I overlooked. The "*intrita*" of my Alberta list is another species, and so have been all previous Manitoba records of any of the above names that I have been able to investigate, (Dod).

*Paragrotis esta* Sm. Duncans, B.C., Aug. 16, 1907, (Day).

1693. *Paragrotis mollis* Walk. Millarville, July 5, (Dod).

1703. *Paragrotis basiflava* Sm. Banff, Alta., Aug. 19, (Sanson). This was described from "N. W. B. C." *Compressipennis* was described from Yosemite, B.C., The types are identical, (Dod).

1734. *Paragrotis colata* Grt. Banff, Alta., July 22, (Sanson). Mrs. Nicholl took a specimen at 8,000 feet, on Wilcox Peak, near the head waters of the Saskatchewan, which is in the British Museum, and which I have compared with the type there from Mt. Hood, Oregon. The species resembles a dark *mollis*, (Dod).

1745. *Paragrotis silens* Grt. Rimouski Wharf, Que., Aug., a new locality, (Gibb).

1773. *Mamestra nimbosa* Gn. Duncans, B.C., at sugar, middle July, rare here, (Hanham).

1792. *Mamestra atlantica* Grt. This species does not appear to be included in our British Columbia list; I have one specimen labelled Victoria, (Hanham).

1805. *Mamestra congermana* Morr. McNab's Island, near Halifax, N.S., July 28, (Perrin); Winnipeg, June 15, 17; 2 females, (Wallis). Holland's figure under this name is *artesta* Smith. Sir George Hampson places them in different genera upon characters which are well marked, (Dod).

1806. *Mamestra rubefacta* Morr. McNab's Island, N.S., June 3, (Perrin); Winnipeg Beach, June 17, (Wallis).

1809. *Mamestra pulverulenta* Sm. Banff, Alta., (Sanson). *Pulverulenta* was described without locality, as a variety of *assimilis* Morr., and the Banff specimen agrees with the description, though I have seen the type of neither form. The "*assimilis*" of the Kaslo list is the same species. *Assimilis* is a black species common at Calgary, and I have seen it from Banff also. *Pulverulenta* is dark fuscous, powdery. I am under the impression that they are two species, (Dod).

1813. *Mamestra variolata* Sm. Victoria, B.C., July 15, only record, (Hanham).

1840. *Mamestra sutrina* Grt. Duncans, B.C., 2 at sugar, June 8, 12, a rare species in B.C., (Hanham).

1876. *Mamestra negussa* Sm. Winnipeg, Man., May 30, (Wallis).

*Mamestra acutermina*. Winnipeg, July 13, (Wallis).

1882. *Barathra curialis* Sm. Edmonton, June 17. New to Alberta, (Carr teste Dod).

2048. *Stretchia plusiiformis* Hy Edw. Hymers, Ont., May 15, (Dawson). First Ontario record.

2070. *Cleoceris rectifascia* Sm. Duncans, B.C., July 18, (Hanham).

*Pleroma conserta* Grt. Banff, Alta., April 25, and May 7, (Sanson). The type is from the State of Washington and is largely suffused with black. That of *apposita* Smith is from Victoria, B.C., and is similarly suffused. Sir George Hampson treats them as the same species, I think correctly. Mr. Sanson also took a form without the black suffusion, which I believe to be the same species, (Dod).

*Pleroma cinerea* Sm. Duncans, B.C., late Oct., (Hanham).

2086. *Xylina hemina* Grt. Hymers, Ont., Sept. 4, (Dawson).

*Cucullia indicta* Sm. Millarville, Alta., June 5 and 11, (Dod).

2148. *Bellura diffusa* Grt. Barrington Passage, N.S., July 12, (Young).

2171. *Papaipema cerina* Grt. Winnipeg, Sept. 15, (Wallis).

2190.1. *Papaipema insulidens* Bird. Duncans, B.C., at light, Aug. 21, 1908, (Day).

2199. *Xanthia flavago* Fab. Waswanipi River, Hudson Bay Slope, Aug. 1896, (Dr. R. Bell).

2210. *Pseudoglæa blanda* Grt. Duncans, B.C., Sept. 18, 1907, (Day).

2244. *Scopelosoma devia* Grt. Duncans, B.C., 1 specimen at sallow, March 26; *tristigmata* is, I believe, the only species previously recorded from British Columbia, (Hanham).

2280. *Pippona bimatris* Harv. Treesbank, Man., July 20, (Wallis).

2341. *Schinia acutilinea* Grt. Calgary, Alta., town lights, Aug. 8, (Hudson). Agrees with Hampson's figure of type from Colorado, and is like my specimens from Glenwood Springs. Apparently a new record for Canada, (Dod).

*Autographa V-alba* Ottol. Banff, Alta., Aug. 19, (Sanson). The specimen is a female and agrees with Ottolengui's figure of the type in all except the sign, which is more like the sign in his figure of *surena,* though not nearly as wide. It can be no other known species than *V-alba,* and the sign probably varies to that extent, (Dod).

2509. *Autographa selecta* Wlk. Banff, Alta., Aug. 4 to 19, (Sanson). Walker's type has the subterminal line waved, rather than dentate, as in Grote's type of *viridisignata.* Autographas do not usually vary that way, and the character may prove to be of specific value. *Viridisignata* is the common form, though the sign is not always green. Mr. Sanson has both forms. The first Alberta records, (Dod).

2514. *Autographa celsa* Hy. Edw. Ucluelet, B.C., Aug. 20, 1909, (Young).

2526. *Autographa speciosa* Ottol. Duncans, B.C., July 12, 1907, (Day).

*Autographa sansoni* Dod. Banff, Alta., June 10, (Sanson).

2548. *Pæctes oculatrix* Gn. Winnipeg, June 15, (Wallis).

2784. *Syneda alleni* Grt. Orillia, Ont., (Grant).

2819. *Catocala obscura* Strk. Ottawa, (Nicholls). First record for district.

2858. *Catocala coccinata* Grt. "E. Ont., Can.," (Evans).

2871. *Catocala subnata* Grt. Belleville, Ont., (Evans).

2886. *Catocala cœlebs* Grt. Belleville, Ont., (Evans).

2890. *Catocala whitneyi* Dodge. Stony Mt., Man., Aug. 11, (Chaplin & Wallis).

*Catocala caerulea* Beut. Penticton, B.C., Aug. 11, 1909, (Wallis). First record for Canada, hitherto known from Oregon.

3125. *Symmerista albifrons* S. & A. Montreal West; moths in great abundance on tree trunks, June 19, not a trace of larvæ in August, (Winn).

3165. *Fentonia marthesia* Cram. Orillia, Ont., (Grant).

3176. *Pseudothyatira cymatophoroides* Gn. Edmonton, July 1, (Carr). New to Alberta, (Dod).

3180. *Euthyatira pudens* Gn. Winnipeg, May 20, (Wallis).

3226. *Oreta rosea* Wlk. Montreal, Aug. 19, taken at rest in city. First time I have taken it here, (Winn).

3227. *Oreta irrorata* Pack. Rimouski Wharf, Que., (Gibb).

*Tephroclystis russeliata* Swett. St. Fabien, Rimouski Co., Que., July, (Chagnon).

3455. *Petrophora algidata* Mosh. Westbourne, Man., July 30, 1908, (Wallis).

3476. *Mycterophora slossoniæ* Hulst. Winnipeg, Man., July 23, 1908, (Wallis). In identifying this specimen Mr. Grossbeck reports: "Dr. Dyar says this is a noctuid, and apparently he is correct."

3545. *Eois persimilis* Hulst. Winnipeg, Man., June 27, 1908, (Wallis). A rare species.

3657. *Sciagraphia hebitata* Hulst. Banff Alta. June 23, 1909, (Wallis).

3693. *Cymatophora flavicaria* Pack. Yukon, collected on wagon road, between White Horse and Dawson, (R. Stewart).

3876. *Apocheima rachelæ* Hulst. High River, Alta., March 12, (Baird).

*Cingilia rubiferaria* Swett. Montreal, Sept. 28, 1905, (Chagnon).

3902. *Sicya macularia* Harr. "Nordenskiold", Yukon Territory, Aug. 21, 1908, (R. Stewart).

3963. *Euchlæna astylusaria* Walk. Millarville, Alta., May 31, (Dod).
3991. *Priocycla decoloraria* Hulst. St. John's, Que., July 1, 1906, (Chagnon).
4095. *Cochlidion rectilinea* G. & R. Trenton, Ont., July 12, (Evans).
4142. *Cossus centerensis* Lint. Hymers, Ont., June 27, (Dawson)
4148. *Prionoxystus macmurtrei* G. M. Port Hope, Ont., June 21, 1896, (Metcalfe).
4210. *Sesia morula* Hy. Edw. Aweme, Man., 2 specimens, July 20, 21, (Criddle). Apparently the first Canadian record.
4622. *Argyria auratella* Clem. St. John's, Que., July 12, (Chagnon).
4658. *Tetralopha militella* Zell. Rigaud, Que., July 28, (Chagnon).
4693. *Acrobasis betulella* Hulst. Mt. St. Hilaire, Que., July 1, (Chagnon).
4694. *Acrobasis comptoniella* Hulst. Mt. St. Hilaire, Que., July 1, (Chagnon).
4711. *Dioryctria abietella* D. & S. Montreal, July 25, ( Chagnon).
4723. *Glyptocera consobrinella* Zell. Mt. St. Hilaire, Que., June 27, (Chagnon).
4734. *Nephopteryx ovalis* Pack. Mt. St. Hilaire, Que., July 2, (Chagnon).
4746. *Meroptera pravella* Grt. Mt. St. Hilaire, Que., July 5, (Chagnon).
4748. *Meroptera unicolorella* Hulst. Mt. St. Hilaire, Que., June 27, (Chagnon).
4759. *Salebria contatella* Grt. St. John's Que., July 1, (Chagnon).
4776. *Laodamia fusca* Haw. Mt. St. Hilaire, Que., Sept. 1, (Chagnon).
4843. *Canarsia ulmiarrosorella* Clem. Mt. St. Hilaire, Que., July 6, (Chagnon).
4870. *Homœosoma stypicellum* Grt. Mt. St. Hilaire, Que., July 6, (Chagnon).
4939. *Platyptilia acanthodactyla* Hbn. Trenton, Ont., Sept 13, 1908, (Evans).
5049. *Olethreutes duplex* Walsm. Ottawa, leaf roller on poplar, May, 1908, (Gibson).
5131. *Eucosma nisella* Clerck. Trenton, Ont., Aug. 26, 1908, (Evans).
5207. *Episimus argutanus* Clem. Trenton, June 13, (Evans).
*Proteoteras crescentana* Kearf. Winnipeg, Man., (Wallis); Regina, Sask., July, (Willing). Larvæ probably in stem galls on box elder, (W. D. K.).
5261. *Ancylis goodelliana* Fern. Trenton, July 25, 1908, (Evans).
5287. *Ecdytolopha insiticiana* Zell. Trenton, June 18, Aug. 14, (Evans).
*Sparganothis tristriata* Kearf. Ottawa, June 27, 1908, (Gibson). A rare species.
5371. *Archips fractivittana* Clem. Chelsea, Que., emerged June 10, 1908, (Gibson); Montreal, June, (Chagnon).
*Tortrix alleni* Fern. Trenton, 3 dates, July 1-July 6, (Evans).
5419. *Eulia quadrifasciana* Fern. Trenton, 4 dates, June 25-July 17, (Evans).
5452. *Phalonia bunteana* Rob. Trenton, July 4, (Evans).
*Hysterosia baracana* Busck. Trenton, July 11, (Evans).
5504. *Plutella porrectella* L. Trenton, June 14, 1904, (Evans).
5579. *Aristotelia fungivorella* Clem. Trenton, June 28, (Evans).
5595. *Eucordylea atrupictella* Dietz. Trenton, July 18, (Evans).
5655. *Trichotaphe flavocostella* Clem. Trenton, July 4, (Evans).
5769. *Gelechia rileyella* Chamb. Trenton, (Evans).
5870. *Depressaria nebulosa* Zell. Sudbury, Ont., (Evans).
6010. *Coleophora spissicornis* Haw. Trenton, 13 dates, June 20-Sept. 24, (Evans).
6048. *Coleophora tiliæfoliella* Clem. Ottawa, case on basswood, Sept. 24, (Gibson).
6096. *Lymnœcia phragmitiella* Stainton. Trenton, 2 specimens, July 14, 1906, July 16, 1907, (Evans).
*Mompha stillella* Busck. Trenton, Sept. 19, 1906, (Evans).

6282. *Lithocolletes sexnotella* Chamb. Trenton, 5 specimens, June 13-July 9, 1908, (Evans).
6306. *Lithocolletes guttifinitella* Clem. Halifax, N.S., Sept., larvæ mining the upper surface of *Rhus toxicodendron*, (A. H. Mackay).
*Lithocolletes hamameliella* Busck. Halifax, N.S., Sept., larvæ mining leaves of *Hamamelis virginica*, (A. H. Mackay).
6496. *Tinea bimaculella* Chamb. Trenton, June 20, (Evans).
6497. *Tinea canariella* Clem. Trenton, July 2, (Evans).
6534. *Amadrya effrenatella* Clem. Trenton, July 29, (Evans).
6537. *Diachorisia velatella* Clem. Trenton, July 22, (Evans).
6606. *Sthenopis thule* Strk. Ottawa, at light, (Nicholls). Second specimen taken in this district.
6609. *Hepialus mustelinus* Pack. Hymers, Ont., July 7, (Dawson).

## Coleoptera.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico).

178. *Notiophilus sibiricus* Mots. Vicinity of Stewart River, Y. T., (Nelles).
411. *Bembidium acutifrons* Lec. Winnipeg, Man., May 14, 1909, (Wallis).
413. *Bembidium cautum* Lec. Winnipeg, Man., May 14, 1909, (Wallis).
558. *Pterostichus scitulus* Lec. Lethbridge, Alta., July 5, 1909, (Wallis).
564. *Pterostichus sayi* Brulle. Deseronto, Ont., Sept. 25, 1 specimen, the only one I have ever taken, (Evans).
587. *Pterostichus patruelis* Dej. Vicinity of Stewart River, Y.T., (Nelles).
636. *Amara brunnipennis* Dej. Fullerton, Hudson Bay, July 5, 1904, (Halkett).
813. *Platynus perforatus* Lec. Vicinity of Stewart River, Y.T., (Nelles).
1157. *Bradycellus cordicollis* Lec. Winnipeg, Man., May 14, (Wallis).
1225. *Haliplus cribrarius* Lec. Winnipeg Beach, Man., Sept. 6, (Wallis).
1226. *Haliplus ruficollis* DeG. Winnipeg Beach, Man., June 12; Peachland, B. C., July 28, 1909, (Wallis).
1227. *Haliplus longulus* DeG. Winnipeg, June 5, (Wallis).
1228. *Cnemidotus callosus* Lec. Peachland, B.C., Aug. 18, (Wallis).
1233. *Cnemidotus edentulus* Lec. Winnipeg Beach, Man., June 12, (Wallis).
1275. *Bidessus affinis* Say. Winnipeg, May 27, (Wallis).
1285. *Cœlambus punctatus* Say. Winnipeg Beach, Man., June 12; Peachland, July 31, (Wallis).
1289. *Cœlambus turbidus* Lec. Winnipeg, May 1, (Wallis).
1290. *Cœlambus lutescens* Lec. Winnipeg, April 13, (Wallis).
1293. *Cœlambus sellatus* Lec. Peachland, B.C., Aug. 18, (Wallis).
1297. *Cœlambus nubilus* Lec. Winnipeg, June 19, (Wallis).
1302. *Cœlambus impressopunctatus* Sch. Winnipeg, April 13, (Wallis.
1303. *Deronectes depressus* Fab. Winnipeg Beach, Man., June 12, (Wallis).
1306. *Deronectes striatellus* Lec. Peachland, B.C., July 27, (Wallis).
1320. *Hydroporus consimilis* Lec. Winnipeg Beach, June 12, (Wallis).
1338. *Hydroporus septentrionalis* Gyll. Peachland, B.C., July 27, (Wallis).
1340. *Hydroporus rivalis* Gyll. Peachland, B.C., July 27, (Wallis).
*Hydroporus rusticus* Sharp. Winnipeg, April 13, (Wallis). Mr. Roberts considers this to be a good species.
1352. *Hydroporus tristis* Payk. Winnipeg, May 1, (Wallis).

1354. *Hydroporus rufinasus* Mann. Winnipeg, May 8, (Wallis). A rare species.
1376. *Hydroporus oblongus* Steph. Winnipeg, April 13, (Wallis). I have never seen this species in any collection but my own, (C.H.R.).
1396. *Coptotomus interrogatus* Fab. Winnipeg Beach, Sept. 6, (Wallis).
1399. *Ilybiosoma bifarius* Kirby. Winnipeg, April 13, (Wallis).
1423. *Agabus semipunctatus* Kirby. Winnipeg, April 12, (Wallis).
*Agabus æneolus* Cr. Winnipeg, April 13, (Wallis).
1434. *Agabus subfuscatus* Sharp. Winnipeg, May 13, (Wallis).
1450. *Agabus clavatus* Lec. Winnipeg, May 1, (Wallis); Aweme, Man., (Criddle). A rare species.
1466. *Rhantus bistriatus* Bergst. Winnipeg, Sept. 11, (Wallis).
*Graphoderes perplexus* Sharp. Winnipeg Beach, Sept. 6, (Wallis); Aweme, Man., (Criddle). A rare species.
1508. *Gyrinus fraternus* Coup. Winnipeg Beach, June 12, (Wallis).
1519. *Gyrinus affinis* Aube. Winnipeg Beach, June 12, (Wallis).
1529. *Gyrinus picipes* Aube. Winnipeg Beach, June 12, (Wallis).
*Athetá nimia* Casey. Metlakatla, B.C., (Keen).
*Athetá keeni* Casey. Metlakatla, (Keen).
*Athetá insolens* Casey. Massett, Q.C.I., (Keen).
*Athetá fanatica* Casey. Massett, Q.C.I., (Keen).
*Athetá massettensis* Casey. Massett, Q.C.I., (Keen).
*Dimetrota retrusa* Casey. Metlakatla, B. C., (Keen).
*Sabletá canadensis* Casey. Toronto, Ont.
*Sabletá phrenctica* Casey. Metlakatla, B.C., (Keen).
*Acrotona adjuvans* Casey. Ottawa, Ont., (Harrington).
2114. *Quedius ferox* Lec. Trenton, Ont. Sept. 4, 1 specimen, never took it before, (Evans).
2301. *Dianous zephyrus Casey*. Vernon, B.C., (Venables).
2618. *Tachinus nigricornis* Mann. Victoria, B.C., July 17, (Wallis).
3052. *Hippodamia folcigera* Cr. Stewart River, Y.T., (Nelles).
3709. *Epuræa truncatella* Mann. Stewart River, Y.T., (Nelles).
3848. *Peltis pippingskoeldi* Mann. Penticton, B.C., Aug. 16, (Wallis).
4150. *Cryptohypnus bicolor* Esch. Roland, Man., May 24, (Wallis).
4382. *Pityobius anguinus* Lec. St. Andrew's, N.B., July 11, (Treherne and Sanders).
4503. *Asaphes morio* Lec. Victoria, B.C., July 17, (Wallis).
4594. *Pœcilonota cyanipes* Say. Stewart River, Y.T., (Nelles).
4602. *Buprestis consularis* Gory. Stewart River, Y.T., (Nelles).
4611. *Buprestis adjecta* Lec. Peachland, B.C., Aug. 23, (Wallis).
4629. *Anthaxia deleta* Lec. Peachland, B.C., July 23, (Wallis).
4948. *Telephorus curtisii* Kirby. Vicinity of Stewart River, Y.T., (Nelles).
5271. *Hadrobregmus carinatus* Say. Stewart River, Y.T., (Nelles).
5329. *Cœnocara scymnoides* Lec. Strassburg, Sask., June, 1907, from puff ball, (Willing).
5603. *Geotropes balyi* Jek. St. Paul's Island, Hudson Bay, Aug., 25, 1904, (Halkett).
*Lachnosterna*. Among 404 specimens of May beetles collected at Round Hill, N.S., by Miss E. Grace Sanders, from May 21 till June 15, only two species were represented, viz., *dubia* and *grandis*. The latter species was rare, only six being taken, three of these on *Cratægus*. The determinations were made by Mr. R. D. Glasgow, of the University of Illinois,

Urbana, Ill. Mr. Glasgow is making a special study of the Lachnosternidæ, and would be glad to examine and return Canadian material. No specimens should be pinned without having the genitalea extruded. It is important, too, that the specimens be collected in the evening, when they are feeding, and a note of the food plant taken.

5880. *Xyloryctes satyrus* Fab. Mt. St. Hilaire, Que., May 20, (Chagnon).
5924. *Cremastochilus crinitus* Lec. Peachland, B.C., July 25, (Wallis).
6240. *Toxotus vittiger* Rand. Pincher, Alta., July 10, 1904, (Willing).
6250. *Pachyta rugipennis* Newm. Hymers, Ont., June 6, (Dawson).
6253. *Anthophylax malachiticus* Hald. Twp. Sabine, Ont., 1 specimen, June 17; I took one other about 1875 at Madoc Village; a rare species, (Evans).
6260. *Acmœops atra* Lec. Pine Creek, Alta., July 12, 1903, (Willing).
6320. *Leptura tribalteata* Lec. Peachland, B.C., Aug. 2, (Wallis).
6349. *Leptura tibialis* Lec. Peachland, B.C., Aug. 7, (Wallis).
6445. *Acanthocinus obsoletus* Oliv. Vicinity of Stewart River, Y.T., (Nelles).
6487. *Saperda puncticollis* Say. Guelph, Ont., May 18, (Zavitz); Macdonald College, Que., (Swaine).
6532. *Donacia hirticollis* Kirby. Penticton, B.C., Aug. 11 (Wallis).
6782. *Prasacuris phellandrii* L. Victoria, B.C., July 17, (Wallis).
6904. *Galeruca tuberculatá* Say, var. *punctipennis* Mann. Goldstream, B.C., on alder, Aug. 12, (J. R. Anderson). Not heretofore recorded from Canada, so far as I am aware, except that Horn in his synopsis of the genus gives it as occurring on Vancouver Island, (Evans).
6968. *Haltica evictá* Lec. Halfway Lake, Alta., on turnips and cabbages, (F. Strutton); Vernon, B.C., (Venables).
*Phylotreta armoricæ* Kock. Montreal, June 20, (Winn).
7257. *Asida politá* Say. Swift Current, Sask., Aug. 1901, (Willing).
7666. *Serropalpus barbatus* Schall. Cupar, Sask., June 4, 1907, (Willing).
7704. *Mycterus concolor* Lec. Peachland, B.C., Aug. 7, (Wallis).
7704a. *Mycterus flavipennis* Horn. Peachland, B.C., Aug. 7, (Wallis).
7724. *Calopus angustus* Lec. Hymers, Ont., July 22, (Dawson).
8121. *Pomphopœa sayi* Lec. Shawbridge, Que., June 4, (Winn).
8221. *Rhynchites eyanellus* Lec. Quill Lake, Sask., on willow, June 30, 1907, (Willing).
8203. *Auletes subcræuleus* Lec. Vernon, B.C., (Venables).
*Apion commodus* Fall. Aweme, Man., (Criddle).
8543. *Erycus puncticollis* Lec. Cupar, Sask., under chips and bark, June 4, 1907, (Willing).
8760. *Acalles porosus* Lec. Lethbridge, Alta., July 5, (Willing).
8825. *Mononychus vulpeculus* Fab. Quyon, Que., (Fyles).
9320. *Creniphilus moratus* Horn. Vernon, B.C., (Venables).
11079. *Phytobius griseomicans* Sz. Last Mountain Lake, Sask., June 5, (G. C. McBean).

### DIPTERA.

(Arranged according to a catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI, No. 1,144. The numbers refer to the pages in the catalogue).

During the past year Mr. D. W. Coquillett has determined collections of diptera made in 1908 and 1909 in Manitoba, Alberta and British Columbia, by Mr. J. B. Wallis, of Winnipeg. In these collections are many species of interest, some of which are new to the Canadian list.

97. *Pachyrhina altissima* O. S. Winnipeg, Man., Aug. 23, 1908, (Wallis).
97. *Pachyrhina erythrophrys* Will. Winnipeg, July 6, 1908, (Wallis).
98. *Pachyrhina ferruginea* Fab. Winnipeg, June 19, (Wallis).
112. *Chironomus cristatus* Fab. Winnipeg, May 5, 1908, (Wallis).
126. *Theobaldia incidens* Thom. Metlakatla, B.C., emerged 1-6 Aug., (Keen).
140. *Sciophila flavohirta* Coq. Winnipeg, June 22, 1908, (Wallis).
144. *Neoglaphyroptera cincta* Coq. Winnipeg, June 22, 1908, (Wallis).
164. *Plecia heteroptera* Say. Winnipeg, Sept. 16, 1908, (Wallis).
172. *Rhyphus alternatus* Say. Treesbank, Man., June, 1908, (Wallis).
174. *Actina viridis* Say. Winnipeg, June 24, 1908, (Wallis).
200. *Tabanus affinis* Kirby. Peachland, B.C., Aug. 7, 1909, (Wallis).
200. *Tabanus ægrotus* O. S. Penticton, B.C., Aug., 1908, (Miss B. Farmer); Peachland, B.C., Aug 18, 1909, (Wallis).
217. *Atherix variegata* Walk. Winnipeg, June 19, 1908, (Wallis).
219. *Pterodontia flavipes* Gray. Callander, Ont., July 19, 1909, (H. A. Wenzel).
225. *Exoprosopa decora* Loew. Lethbridge, Alta., July 9, 1909; Westbourne, Man., Aug. 24, (Wallis).
225. *Exoprosopa caliptera* Say. Lethbridge, Alta., July 7, 1909; Westbourne, Man., Aug. 14, (Wallis).
227. *Dipalta serpentina* O. S. Peachland, B.C., July 31, 1909, (Wallis).
228. *Anthrax alternata* Say. Peachland, B.C., Aug. 6, 1909, (Wallis).
299. *Anthrax catulina* Coq. Peachland, B.C., July 21, 1909, (Wallis).
230. *Anthrax eumenes* O. S. Lethbridge, Alta., July 3, 1909; Victoria, B.C., July 15, 1909, (Wallis).
230. *Anthrax fulviana* Say. Westbourne, Man., Aug. 16, 1908, (Wallis).
232. *Anthrax lucifer* Fab. Winnipeg, Aug. 8, 1908; Westbourne, July 27, 1908, (Wallis).
233. *Anthrax mucorea* Loew. Lethbridge, Alta., July 7, 1909.
234. *Anthrax sinuosa* Wied. Westbourne, Man., Aug., 19, 26, 1908; Lethbridge, Alta, July 9, 1909; Peachland, B.C., July 21, Aug 18, 1909, (Wallis).
234. *Anthrax tegminipennis* Say. Winnipeg, July 21, 1908, (Wallis).
237. *Systœchus candidulus* Loew. Winnipeg, July 21, 1908, (Wallis).
247. *Psilocephala hæmorrhoidalis* Macq. Peachland, B.C., July 29, 1909, (Wallis).
256. *Stenopogon inquinatus* Loew. Peachland, B.C., Aug. 3, 1909, (Wallis).
259. *Cyrtopogon dasyllis* Will. Kaslo, B.C., Sept. 1, 1907, (Cockle).
259. *Cyrtopogon dasylloides* Will. Kaslo, B.C., Sept. 1, (Cockle).
260. *Cyrtopogon præpes* Will. Banff, Alta., (Sanson).
260. *Cyrtopogon rejectus* O. S. Peachland, B.C., July 24, 1909, (Wallis).
269. *Pogonosoma dorsatum* Say. Victoria, B.C., July 1908, (Miss B. Farmer).
272. *Laphria canis* Will. Ottawa, Sept. 1, (Hewitt).
274. *Proctacanthus milbertii* Macq. Peachland, B.C., Aug. 21, 1909, (Wallis).
276. *Erax aridus* Will. Peachland, B.C., Aug. 7, 1909, (Wallis).
281. *Tolmerus callidus* Will. Lethbridge, Alta., July 3, 1909, (Wallis).
283. *Asilus paropus* Walk. Westbourne, Man., Aug. 20, 1908, (Wallis).
300. *Dolichopus brevimanus* Loew. Winnipeg, Man., June 19, 1908, (Wallis).
349. *Pipiza albipilosa* Will. Kaslo, B.C., July 14, 1908, (Cockle).
360. *Melanostoma cœrulescens* Will. Kaslo, B.C., April 12, July 10, (Cockle).
*Syrphus perplexus* Osburn. Kaslo, B.C., July 14, 1908, (Cockle).
368. *Syrphus umbellatarum* Fab. Kaslo, B.C., Oct. 11, 1909, (Cockle).
368. *Allograpta fracta* O.S. Winnipeg, Man., June 29, 1908, (Wallis).

375. *Rhingia nasica* Say. Winnipeg, Man., June 19, 1908, (Wallis).
375. *Hammerschmidtia ferruginea* Fallen. Winnipeg, June 19, 1908, (Wallis).
387. *Eristalis occidentalis* Will. Victoria, B.C., July 17, 1909, (Wallis).
401. *Brachypalpus pulcher* Will. Kaslo, B.C., July 21, 1907, (Cockle).
402. *Criorhina kincaidi* Coq. Kaslo, B.C., May 2, 1904, (Cockle).
408. *Physocephala burgessi* Will. Victoria, B.C., July 17, 1909, (Wallis).
456. *Exorista cheloniæ* Rond. Reared at Ottawa from larva of *Phragmatobia assimilans,* var. *franconia,* from Mr. H. Dawson, of Hymers, Ont., (Gibson).
464. *Frontina setipes* Coq. Aweme, Man., April 21, 1908, (Wallis).
582. *Palloptera jucunda* Loew. Kaslo, B.C., Oct. 27, 1906, (Cockle).
590. *Tritoxa cuneata* Loew. Lethbridge, Alta., July 4, 1909, (Wallis).
615. *Micropeza producta* Walk. Winnipeg, Man., July 6, 1908, (Wallis).
638. *Oscinis decipiens* Loew. Kaslo, B.C., Sept. 1, 1907 (Cockle).

### HYMENOPTERA.

In the Entomological Records for 1907 and 1908, records are given of some Bombi. Since, Dr. H. J. Franklin has determined further material for Canadian collectors, and among these the following species may well be recorded here:

*Bombus flavifrons* Cresson. Metlakatla, B.C., May, (Keen).
*Bombus melanopygus* Mylander. Metlakatla, B.C., May, (Keen).
*Bombus huntii* Greene. Regina, Sask., Sept 17, Oct 3, (Willing).
*Bombus terricola* Kirby. Hampton, P.E.I., Aug 20, 1909, (Gibson).
*Bombus rufocinctus* Cresson. Gull Lake, Alta., Aug. 30, 1908 (Halkett).
*Psithyrus ashtoni* Cresson. Hampton, P.E.I., Aug. 20, 1909, (Gibson).
*Psithyrus laboriosus* Fab. Hampton, P.E.I., Aug. 20, 1909, (Gibson).

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Prof. T. D. A. Cockerell, one of the leading authorities on North American bees very kindly named a small collection from the Northwest. Some of these are extremely interesting and new to Canada. The following may be mentioned:

*Melissodes confusa* Cr. Meota, Sask., July 8, 1906; Prince Albert, Sask., July 28, 1907; Radisson, Sask., July 29, 1907; Macleod, Alta., July 8, 1904, (Willing).

*Osmia novomexicana* Ckll. Medicine Hat, Alta., May 30, 1904, (Willing).
*Halictoides maurus* Cr. Kinistino, Sask., July 26, 1907, (Willing).

*Anthidium tenuifloræ* Ckll. Radisson, Sask., July 29, 1907; Saskatoon, Sask., July 18, (Willing).

*Megachile calogaster* Ckll. Macleod, Alta., July 2, 1904, (Willing).
*Megachile infragilis* Cr. Regina, Sask., July 11, 1909, (Willing).
*Megachile manifesta* Cr. Davidson, Sask., Aug. 21, 1907, (Willing).
*Megachile pugnata* Say. Radisson, Sask., July 29, (Willing).
*Cœlioxys ribis* Ckll. Prince Albert, Sask., July 27, 1907, (Willing).
*Andrena cockerelli* Graen. Lipton, Sask., June 5, 1907, (Willing).
*Halictus trizonatus* Cr. Mortlach, Sask., May 31, 1909, (Willing).
*Halictus lerouxii ruborum* Ckll. Mortlach, Sask., May 31, 1909, (Willing).
*Agapostemon texanus* Cr. Mortlach, Sask., May 31, 1909, (Willing).
*Colletes salicicola geranii* Ckll. Pincher, Alta., July 10, 1904, (Willing).

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*Coleocentrus pettitii* Cr. Hymers, Ont., June 22, (Dawson).

*Arotes amoenus* Cr. Hymers, Ont., June 21, (Dawson).

*Xylonomus stigmapterus* Say. Hymers, Ont., (Dawson).

*Echthrus niger* Cr. Hymers, Ont., June 9, (Dawson).

*Echthrus rufopedibus* Harrington. Hymers, Ont., June 26, (Dawson).

*Telenomus dalmanii* (Ratz) Mayr. Reared in Division of Entomology, Ottawa, from eggs of *Notolophus antiqua,* from Little Bras d'Or, Cape Breton, N. S. Mr. Crawford, who determined the species says: "It is a European species recorded there from the same host, but not previously recorded from America."

*Pachycrepoideus dubius* Ashm. Reared in Division of Entomology, Ottawa, from breeding jar containing puparia of Cabbage Root Maggot; emerged Aug 14.

*Nasonia tortricis* Brues. Baskatong, Que., emerged from pupæ of *Tortrix fumiferana,* Aug. 1909, (Gibson).

*Mematus pinguidorsum* Dyar. Ottawa, larva Sept. 16, (Gibson).

*Pteronus ochreatus* Rohwer. St. John, N.B., July 14, (Leavitt).

*Pontania pumila* Rohwer. St. John, N.B., July 14; Nerepis, N.B., July 22, (Leavitt).

*Pontania leavitti* Rohwer. Nerepis, N.B., July 11, (Leavitt).

*Pristiphora idiotiformis* Rohwer. Nerepis, N.B., Aug. 18; St. John, N.B., Sept. 1, (Leavitt).

*Pristiphora pallicoxa* Rohwer. Nerepis, N.B., July 22, (Leavitt).

*Cryptocampus pallistigmus* Rohwer. St. John, N.B., July 18, (Leavitt).

*Polybates secundus* Rohwer. St. John, N.B., Sept. 1, (Leavitt).

*Parabates leucostomus* Rohwer. St. John, N,B., July 11, (Leavitt).

*Hemitaxonus rufopectus* Rohwer. Nerepis, N.B., Aug. 22, (Leavitt).

*Monsoma maura* Rohwer. Nerepis, N.B., July 18; St. Johns Bay, N.B., July 14, (Leavitt).

*Dimorphopteryx melanognathus* Rohwer. Nerepis, N.B., July 22, (Leavitt).

*Tenthredo diversiceps* Rohwer. Nerepis, N.B., July 22, (Leavitt).

## Hemiptera.

Little systematic work has been done in this order, as far as the writer knows, in Canada, during 1910. Small collections of material gathered in other years have been worked over by Mr. Van Duzee, and of these the following species are of interest. They are entered here in the order in which they were received.

*Apiomerus ventralis* Say. Lethbridge, Alta., July 3, 1909, (Wallis).

*Aradus inornatus* Uhler. Peachland, B.C., Aug. 17, 1909, (Wallis).

*Aradus robustus* Uhler. "North West Territories," (record sent by Mr. Evans).

*Lygus viticollis* Reut. Winnipeg, Man., June 29, 1908, (Wallis).

*Corythuca arcuata* Say. Chelsea, Que., June 20, (Groh).

*Alydus conspersus* Mont. Aylmer, Que., (Fyles).

*Megalotomus quinquespinosus* Say. Aylmer, Que., (Fyles).

*Podisus placidus* Uhler. Co. Hastings, Ont., (Evans).

*Podisus serciventris* Uhler. Co. Hastings, Ont., Aug. 15, 1906, (Evans).

*Peribalus piceus* Dallas. Sudbury, Ont., June 13, 1889, (Evans).

*Crophius bohemani* Stal. "North West Territories," (record sent by Mr. Evans).

*Peritrechus fraternus* Uhler. Belleville, Ont., (Evans).

*Pilophorus walshii* Uhler. Belleville, Ont., (Evans).

*Plinthisus americanus* Van D. Belleville, Ont., (Evans).

*Antillocoris pallidus* Uhler. Belleville, Ont., (Evans).

*Banasa calva* Say. Trenton, Ont., Sept. 21, 1901, (Evans).

*Phimodera torpida* Walk. "North West Territories," (record sent by Mr. Evans).

*Thyreocoris montanus* Van D. "British Columbia, June 10-20, 1905," (record sent by Mr. Evans).

*Aelia americana* Dallas. "North West Territories," (record sent by Mr. Evans). A rare form.

*Zicrona cærulea* Linn. Sudbury, Ont., (Evans).

*Sciocoris microphthalmus* Flor. Sudbury, Ont., 1886; Belleville, Ont., (Evans). When determining these Mr. Van Duzee remarked: "The only specimens from America which I have seen of this species, excepting one taken by Mrs. Slosson in the White Mountains."

*Okanagana novæboracensis* Emmons. Sudbury, Ont., 1892, (Evans).

## Orthoptera.

Dr. E. M. Walker has kindly sent me the notes on the species mentioned below, all of which he thinks are worthy of including here. His papers on "The Orthoptera of Western Canada," which have recently appeared in the *Canadian Entomologist* will undoubtedly lead to much greater attention being paid to these insects by collectors in the West.

*Pycnoscelus surinamensis* Scudd. One immature specimen.

*Periplaneta australasiæ* Brunn. Several immature specimens.

*Nyctobora sericea* Scudd. One mature specimen.

*Panchlora virescens* Sauss. Two mature specimens.

The above four species were found upon bunches of bananas, at Toronto, by Mr. C. W. Nash.

*Chlöealtes conspersa* Harris. Aweme, Man., July 22, 1910, 3 males, (Criddle). This species has been only once before reported from Manitoba, by Scudder, in 1862, (E. M. W.).

*Melanoplus angustipennis coccineipes* Scudd. Fort William, Ont., Aug. 2, 1910, pair in copula, (Walker).

*Nemobius fasciatus abortivus* Caudell. Fort William, Ont., Aug. 9, 1910, (Walker).

## Odonata.

Dr. E. M. Walker, of Toronto, has examined, during the year, much material collected in different parts of Canada. Some of the specimens sent to him are of considerable interest. He has, therefore, been good enough to send me for inclusion here, the following records:

*Lestes congener* Hagen. Peachland, B.C., Aug. 9, 1909, 1 male, 1 female, (Wallis).

*Lestes disjunctus* Selys. Peachland, B.C., Aug. 9, 1909, 1 male, 1 female, (Wallis).

*Nehalennia irene* Hagen. Aweme, Man., July 4, 1909, 1 female (Criddle); Winnipeg Beach, Lake Winnipeg, Man., June 19, 1909, 3 males, 4 females, (Wallis).

*Enallagma cyathigerum* (Charp.). Nepigon, Ont., Aug. 8, (Walker); Lethbridge, Alta., July 5-9, 1909, (Wallis); Peachland, B.C., July 24, 1909, (Wallis).

*Enallagma calverti* Morse. Nepigon, Ont., Aug. 8, 1910, (Walker); Aweme, Man., July 1-24, 1909, (Criddle); Winnipeg Beach, Man., June 19, 1909, (Wallis).

*Ischnura verticalis* (Say). Nepigon, Ont., Aug. 8, 1910, (Walker). This appears to be the most northern record for this species, and the most westerly in Canada, (E. M. W.).

*Ophiogomphus severus* Hagen. Lethbridge, Sask., July 8, 1909, 1 male, (Wallis). First Canadian record, (E. M. W.).

*Ophiogomphus colubrinus* Selys. Nepigon, Ont., Aug. 6, 1 male, 1 female, (Walker). First Ontario record, (E. M. W.).

*Gomphus olivaceus* Selys. Peachland, B.C., Aug. 12, 1909, 1 female. First Canadian record, (E. M. W.).

The last three species were determined by comparison with specimens in the Hagen collection, Museum of Comparative Zoology, Cambridge, Mass., (E. M. W.).

*Aeshna sitchensis* Hagen. Ellis Bay, Anticosti Island, Sept., 12, 1 female, (E. V. Cowdry).

*Aeshna umbrosa* Walk. Ellis Bay, Anticosti Island, Sept. 12, common, (E. V. Cowdry); Winnipeg Beach, Man., Sept. 6, 1909, (Wallis).

*Tetragoneuria canis* Maclachlan. DeGrassi Pt., Lake Simcoe, Ont., June 24, 2 males, (Walker); Sudbury, Ont., June 11, 1892; June 6, 1893, 2 males, (Evans); Hull, Que., 1 male, (Fyles).

*Cordulia shurtleiffi* Scudd. Sudbury, Ont., June 26, 1892, 2 males, (Evans).

*Somatochlora walshii* (Scudd). De Grassi Pt., Lake Simcoe, Ont., July 2, 1 male, (Walker).

*Somatochlora albicincta* (Burm.). Aweme, Man., June 11, 1909, 1 female, (Criddle).

*Libellula pulchella* Drury. Fort William, Ont., Aug. 3, 1 specimen seen, (Walker). This is the most northern record for this species, (E. M. W.).

*Leucorrhinia frigida* Hagen. Sudbury, Ont., June 26, 1892, 1 male, 2 females, (Evans).

*Leucorrhinia hudsonica* (Selys). Sudbury, Ont., June 11, 1893, 1 female, (Evans).

*Leucorrhinia borealis* Hagen. Bird's Hill, Man., June 5, 1909, (Wallis).

### Siphonaptera.

Several hundreds of specimens of fleas were collected by the Rev. J. H. Keen, of Metlakatla, B.C. These were submitted to the Hon. N. Charles Rothschild, who has determined the following species:

*Ceratophyllus agilis.* Specimens taken from Neotoma.
*Ceratophyllus ciliatus.* Specimens taken from Sciurus.
*Ceratophyllus gallinæ.*
*Ceratophyllus charlottensis?*
*Ceratophyllus fasciatus.*
*Hystrichopsylla dippiei.*

## FINANCIAL STATEMENT

For the Year ending October, 1910.

*Receipts.*

| | |
|---|---|
| Balance from 1909 | $373 06 |
| Members' Fees | 350 48 |
| Reports and Back Numbers | 199 07 |
| Advertising | 68 22 |
| Government Grant | 1,000 00 |
| Printing | 71 68 |
| Cork and Pins | 103 02 |
| Expense | 20 00 |
| Interest | 13 89 |
| | $2,199 42 |

*Expenditures.*

| | |
|---|---|
| Subscription (Fletcher Memorial) | $50 00 |
| Annual Report | 123 50 |
| Cork and Pins | 76 95 |
| Salaries | 75 00 |
| Expense, Postage, Etc. | 37 77 |
| Insurance | 26 00 |
| Annual Meeting | 43 25 |
| Printing | 1,002 90 |
| Library | 29 86 |
| Bank Exchange | 4 23 |
| | $1,469 46 |
| Balance | 729 96 |
| | $2,199 42 |

J. E. HOWITT, *Treasurer.*

Examined and found correct.

S. B. McCREADY,<br>J. W. CROW, } *Auditors.*

# INDEX.

# Forty-Second Annual Report

OF THE

# Entomological Society

OF ONTARIO

1911

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1912.

# Forty-Second Annual Report

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# Entomological Society

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TORONTO:
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1912.

Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO.

To His Honour Col. Sir John Morison Gibson, K.C.M.G., etc., etc., etc.,
*Lieutenant-Governor of the Province of Ontario.*

May it Please Your Honour:

The undersigned begs to present herewith, for the consideration of your Honour, the Report of the Entomological Society of Ontario for 1911.

Respectfully submitted,

JAMES S. DUFF,

*Minister of Agriculture.*

Toronto, 1912.

# CONTENTS.

# FORTY-SECOND ANNUAL REPORT

OF THE

# Entomological Society of Ontario

## 1911

*To the Honourable James S. Duff, Minister of Agriculture.*

SIR,—I have the honour to present herewith the Forty-second Annual Report of the Entomological Society of Ontario.

The Forty-eighth Annual Meeting of the Society was held at the Ontario Agricultural College, Guelph, on the 23rd and 24th of November, 1911. The proceedings are given in full in the following pages and include the reports of the various officers and branches of the Society, together with the papers and addresses on entomological topics presented during the meetings.

The "Canadian Entomologist," the monthly organ of the Society, has been issued regularly during the past year and has now completed its forty-third volume. Its wide circulation and value as a scientific publication have been well maintained.

I have the honour to be, Sir,

Your obedient servant,

EDMUND M. WALKER,

*Editor.*

Biological Department,
University of Toronto.

# Entomological Society of Ontario.

OFFICERS FOR 1911-1912.

*President*—Dr. Edmund M. Walker, Lecturer in Zoology, University of Toronto.

*Vice-President*—Dr. C. Gordon Hewitt, Dominion Entomologist, Central Experimental Farm, Ottawa.

*Secretary-Treasurer*—Mr. A. W. Baker, B.S.A., O. A. College, Guelph.

*Curator*—Mr. Lawson Caesar, B.A., B.S.A., Lecturer in Entomology and Plant Diseases, O. A. College, Guelph.

*Directors*—Division No. 1, Mr. Arthur Gibson, Department of Entomology, Central Experimental Farm, Ottawa; Division No. 2, Mr. C. E. Grant, Orillia; Division No. 3, Mr. A. Cosens, Parkdale Collegiate Institute, Toronto; Division No. 4, Mr. C. W. Nash, East Toronto; Division No. 5, Mr. R. S. Duncan, B.S.A., Port Hope; Division No. 6, Mr. R. S. Hamilton, Collegiate Institute, Galt; Division No. 7, Mr. W. A. Ross, B.S.A., Jordan Harbour.

*Directors* (Ex-Presidents of the Society) —Professor Wm. Saunders, C.M.G., LL.D., F.R.S.C., F.L.S., Director of the Experimental Farms of the Dominion of Canada, Ottawa; Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Guelph; W. Hague Harrington, F.R.S.C., Ottawa; Professor John Dearness, Vice-Principal, Normal School, London; Henry H. Lyman, M.A., F.E.S., F.R.G.S., Montreal; Rev. Thomas W. Fyles, D.C.L., F.L.S., Hull, P.Q.; Professor Wm. Lochhead, B.A., M.S., Macdonald College, P.Q.; John D. Evans, C.E., Chief Engineer, Central Ontario Railway, Trenton; Professor Tennyson D. Jarvis, B.S.A., Ontario Agricultural College, Guelph.

*Editor of the "Canadian Entomologist"*—Dr. E. M. Walker, Toronto.

*Delegate to the Royal Society*—Professor J. M. Swaine, Macdonald College, P.Q.

*Auditors*—Professor J. Eaton Howitt, M.S.A., and Mr. W. A. McCubbin, M.A., Ontario Agricultural College, Guelph.

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## FINANCIAL STATEMENT

For the Year Ending October, 1911.

| *Receipts.* | | *Expenditures.* | |
|---|---|---|---|
| Balance for 1910 | $729 96 | Printing | $1,051 51 |
| Members' Fees | 387 61 | Library | 199 11 |
| Government Grant | 1,000 00 | Expense | 86 63 |
| Sale, Reports and Back Numbers | 180 00 | Annual Report | 93 60 |
| Sale, Cork and Pins | 113 72 | Annual Meeting | 48 05 |
| Advertising | 32 75 | Salaries | 100 00 |
| Bank Interest | 35 99 | Cork and Pins | 70 03 |
| | | Bank Exchange | 4 90 |
| | | Balance on hand | 826 20 |
| | $2,480 03 | | $2,480 03 |

(Signed) J. E. Howitt,
*Treasurer.*

Examined and found correct.

(Signed) S. B. McCready, J. W. Crow, } *Auditors.*

# LIST OF CANADIAN MEMBERS.

## PROVINCE OF ONTARIO.

Abbott, Dr. A. R. ........ Toronto.
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Brodie, Miss ............ Toronto.
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Saunders, H. S. ......... Toronto.
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Smith, Arthur............ Toronto.
Tanner, Harold ......... Stratford.
Toogood, W. A. ......... "
Tothill, J. D. ........... Ottawa.
Walker, Dr. E. M. ...... Toronto.
Washington, L. P. ...... Hamilton.
Watson, Dr. A. H. R. .... Port Hope.
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Young, C. H. ........... Ottawa.
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Delisle, A. M. .......... "
Denny, E. ............... "
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Dod, F. H. Wolley ....... Millarville.
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Draper, R. .............. Hillcrest.
Hadwen, Dr. S. ......... Vancouver.
Hanham, A. W. ......... Duncan's Station.
Harvey, R. V. .......... Victoria.
Keen, Rev. J. H. ........ Metlakatla.
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Skinner, E. M. .......... Duncan's Station.
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Director of the Experimental Farms of the Dominion.
Bethune, Rev. C. J. S. ... Guelph.
Professor of Entomology, Ontario Agricultural College.
Reed, E. Baynes ......... Victoria, B.C.
Director of the Meteorological Station.

# The Entomological Society of Ontario

## ANNUAL MEETING

The Forty-eighth Annual Meeting of the Entomological Society of Ontario was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 23rd and 24th. During the day meetings the chair was occupied by the President, Dr. E. M. Walker, and during the evening meeting by President Creelman of the College.

Among those present were Messrs. H. H. Lyman and A. F. Winn, Montreal; Dr. C. Gordon Hewitt and Mr. Arthur Gibson, Ottawa; Prof. J. M. Swaine, Macdonald College, St. Anne's, P.Q.; Mr. J. D. Evans, Trenton; Dr. E. M. Walker and Mr. J. B. Williams, Toronto; President Creelman, Professors C. J. S. Bethune, E. J. Zavitz, H. L. Hutt, T. D. Jarvis, J. E. Howitt, Messrs. L. Cæsar, Morley Pettit, W. A. McCubbin, and A. W. Baker, of the staff, and a number of students of the Ontario Agricultural College.

On Thursday morning a meeting of the Council was held, at which the report of the proceedings of the Society during the past year was drawn up, and various matters of interest to its members were discussed. In acceptance of an invitation from Dr. Hewitt it was decided to hold the next annual meeting at the Central Experimental Farm, Ottawa, the date to be fixed upon a later occasion.

Prof. J. H. Comstock, Cornell University, Ithaca, N.Y., and Dr. E. P. Felt, State Entomologist of New York, were elected honorary members of the Society.

Mr. E. Baynes Reed, Meteorological Station, Victoria, B.C., was elected a life member.

The afternoon meeting was held in the Biological Lecture Room, the proceedings commencing at two o'clock with the reading of the reports of the directors on the insects of the year in their respective districts. No reports were received from Mr. F. J. A. Morris, of Port Hope, representing Division No. 5, nor from Mr. R. S. Hamilton, of Galt, representing Division No. 6.

### REPORTS ON INSECTS OF THE YEAR.

#### Division No. 1, Ottawa District—Arthur Gibson.

Weather conditions in the Ottawa district during the past season were specially favourable for the development of insect life. The latter part of April was very warm for that time, and later in May, from the 20th to the 28th, the temperature was high. The month of June was about normal, but during the first eleven days of July a very hot spell was experienced. On July 3rd the temperature reached 97.8 in the shade, and the maximum temperature from July 1st to 12th was 91.4. Early August, too, was extremely warm, the average maximum temperature for the first eight days being 93.4 in the shade. The season, therefore, was very exceptional and the continued drought seriously affected crops of all kinds.

The following notes cover those insects which were most complained of in the Ottawa district during 1911.

### Attacking Field Crops.

Cutworms. The cutworm which caused most injury in 1911, in the Ottawa district, was the Red-backed Cutworm (*Paragrotis ochrogaster,* Gn.). In May many newly set out cabbages and cauliflowers were cut off and much damage was also done to radishes, peas, beans and other field crops. On June 5th larvæ were found in a field of beans, which varied in size from half an inch to one and a quarter inches in length. Wherever the well-known poison bran remedy was used the attack stopped at once. In the use of this mixture it is important that the bran be noticeably moistened so that the Paris green, when dusted in, will adhere to practically every particle. In one instance, which came to my notice, the bran was insufficiently moistened, and when placed in the field was much too dry and many of the particles had not been poisoned. When the mixture is quite dry the cutworms, of course, are not attracted to it as they are when the bran is moistened.

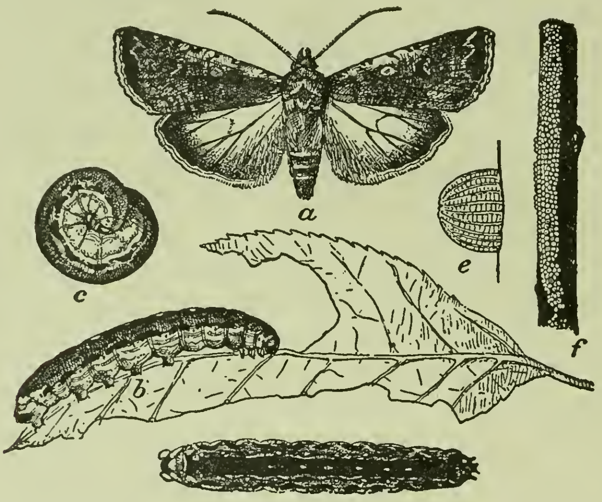


**Fig. 1. Variegated Cutworm—*a*, moth; *b*, *c*, *d*, caterpillars; *e*, egg (magnified); *f* eggs on a stem.**

The mixture should be scattered after sundown, so that it will be in the very best condition to attract the cutworms when they come out at night to feed. One half a pound of Paris green is sufficient to poison fifty pounds of bran, the latter being first moistened with sweetened water. Salt may be used instead of molasses or cheap sugar. If salt is used, half a pound may be dissolved in half a gallon of water and then added to the fifty pounds of bran; 50 to 100 pounds of bran is sufficient for an acre, according to the closeness of the plants.

The Radish, or Cabbage Root Maggot, was again abundant and caused much destruction. On May 26th the first flies were seen, and on May 29th large numbers of eggs were present on the stems of cauliflowers and cabbages, particularly the former. These soon hatched and the maggots at once began their work of destruction. The remedy which we have found most useful during the last two years for radishes is to water the plants once a week from the time they begin to appear until they are ready for the table with a decoction of hellebore, using two ounces to every gallon of water. For cauliflowers and cabbages the best protection can be had from the use of the well-known discs made from tarred building paper.

On the 9th of November of this year puparia and full-grown larvæ were found beneath cabbage plants.

The WHITE CABBAGE BUTTERFLY (*Pontia rapæ*, L.). This well-known pest of the market gardener was more than usually abundant the past season. In the latter half of August it was specially complained of and was doing much injury all through the district.

Another insect which was destructive to cabbages is the DIAMOND-BACK MOTH (*Plutella maculipennis*, Curt.) (Fig. 2). This insect has not occurred at Ottawa in destructive numbers for some years. The nature of the season affects considerably the abundance of this insect. In hot dry seasons, such as that of this year, the outbreak is always more serious. Continued damp weather is, of course, detrimental to this insect. At the end of August its ravages in many market gardens was very noticeable. On September 1st, I examined some cabbages and found the caterpillars in various stages of development from 3 mm. to 8 mm. in length. Many cocoons were also attached to the leaves, and one cocoon was seen from which the moth had evidently just emerged. As a remedy, kerosene emulsion has given good results, but the mixture must be applied as an under-

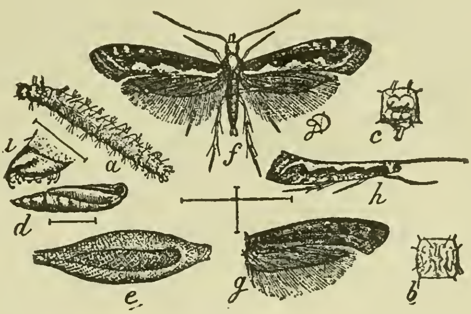


Fig. 2. Diamond-back Moth—*a*, caterpillar; *d*, pupa; *e*, cocoon; *f* and *h*, moth (all much enlarged).

spray. In fields where the insect has been troublesome all leaves and left-overs of cruciferous crops should be gathered up and destroyed so as to reduce as much as possible the over-wintering brood of the insects.

### ATTACKING FRUIT TREES.

Fruit insects were not particularly complained of during the season, but there are a few which require mention.

The AMERICAN TENT CATERPILLAR (*Malacosoma americana*, Harr.) was the most conspicuous insect of the orchard in the Ottawa district during the past season. In orchards where no control measures were adopted many trees were entirely stripped of foliage. Further mention will be made of this insect and the FOREST TENT CATERPILLAR under insects affecting forest and shade trees.

CANKERWORMS were also reported as having been destructive in apple orchards, particularly in the neighbourhood of Hull.

The LESSER APPLE WORM (*Enarmonia prunivora*, Walsh.). I regret to have to report the finding of this insect in an orchard near Ottawa on August 10th. Fortunately the infestation was very slight, only three apples of the variety Lub's

Queen being found with larvæ at work. In orchards which are regularly sprayed for Codling Moth there should be no appreciable loss from the attacks of this insect.

### Greenhouse and Garden Plants.

Last year I mentioned the occurrence of the Greenhouse Leaf-tyer (*Phlyctaenia ferrugalis,* Hbn.) in the house of one of our local florists. During last spring especially the insect did considerable injury to Azalea, Mignonette, Cyclamens and Cannas, particularly the latter. In some of the Montreal greenhouses considerable loss is occasioned by the larvæ of the Black Vine Weevil (*Otiorhynchus sulcatus,* Fab.) infesting the roots of Cyclamens, Gloxinias and Adiantums, but we have had no reports of this insect being present in any of the houses in our district.

Much injury to flowering plants in gardens was done by such regularly occurring pests as Cutworms, Tarnished Plant Bug and Four-lined Leaf Bug. The caterpillars of the White Cabbage Butterfly were also troublesome in beds of Mignonette and Nasturtium. The Grape Vine Leaf Hopper again rendered unsightly the foliage of Virginia Creeper, and in some gardens the Curled Rose Worm and the Destructive Pea Aphis were also present in conspicuous numbers.

### Attacking Forest and Shade Trees.

Tent Caterpillars (*Malacosoma americana,* Harr., and *M. disstria,* Hbn.) These caterpillars were enormously abundant in the Ottawa district during the past season. Not only did they do serious damage to orchard, shade and forest trees, but they caused much annoyance, especially at maturity, by wandering into houses, dropping on to passers-by, etc. Throughout the woods in the district both the American Tent Caterpillar and the Forest Tent Caterpillar could be seen feeding together on the same trees. The larvæ hatched during the first week in May, and before the middle of the month the webs were conspicuous on many trees, particularly wild cherry. In one small clump of cherry trees twenty-six webs of the American Tent Caterpillar were counted on May 13th, and on this date the larvæ were about half an inch in length. In another locality, at Woodruffe, near Ottawa, the nests were numerous, and on May 19th the caterpillars were one inch in length. On May 27th at Chelsea, Que., both species occurred together and were in their last larval stage. Thousands were wandering about along fences, in and around houses, etc. Many trees had been entirely stripped of foliage. On June 5th some cocoons of *M. americana* which had been but recently made were found on apple and the larvae inside were just changing to pupæ. While in the Gatineau district, between Wakefield and Maniwaki, on June 12th to 14th, I saw large areas of poplar and birch which had been entirely defoliated by the Forest Tent Caterpillar. Near St. Joseph village, which is not far from Maniwaki, the caterpillars were so abundant in some of the lakes, that the men who were working on a drive of logs found it almost impossible to dip up water for drinking and cooking purposes without getting some of the larvæ in their pails. Many of the branches of poplar around the edges of these lakes extend out over the water, and I was informed that, during a very heavy rainstorm, the caterpillars were dislodged from the trees, falling into the water by hundreds. Just above North Wakefield and Low, Que., extensive tracts of trees, mostly poplars, were seen to have been entirely denuded of foliage. In early July large numbers of the moths were observed around electric lights in Ottawa, and later in the month very many egg masses were seen on apple and cherry. On one small branch of wild cherry brought into the Division on July 29th there were 42 egg clusters. The egg masses occurred close together; in some instances they were overlapping. During the larval period I did not see a single diseased specimen, nor do the eggs which

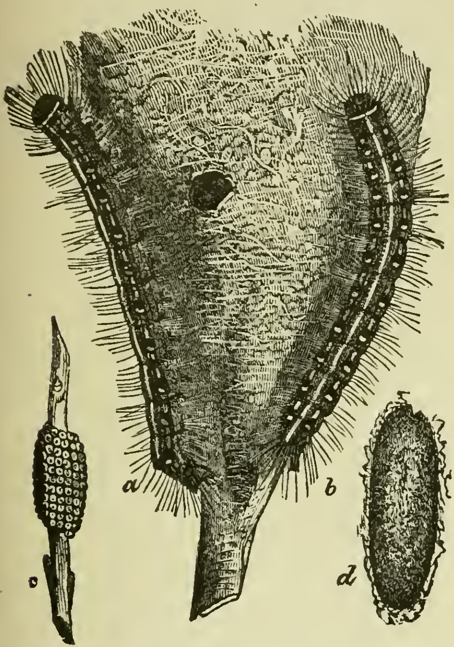


Fig. 3. American Tent Caterpillars on their web; *c.* egg-bracelet; ; *d*, cocoon.

Fig. 4. Tent Caterpillar: Male Moth.

Fig. 5. Female Moth.

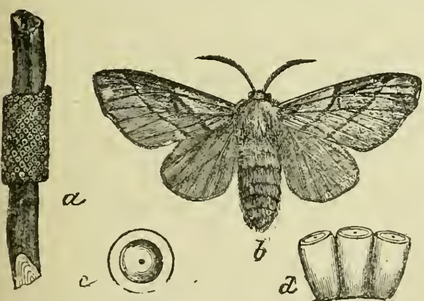


Fig. 6. Forest Tent Caterpillar: moth and eggs.

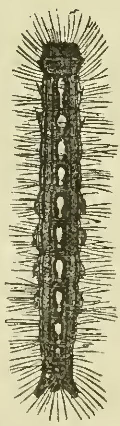

Fig. 7. Forest Tent Caterpillar.

are now on the trees seem to be much parasitized. Mr. Sanders, of the Division, collected in the middle of July many egg masses, but only a very small percentage of these were parasitized by *Telenomus* and *Trichogramma*. The probability is that next year these Tent Caterpillars will again be present in large numbers.

The Spruce Budworm (*Tortrix fumiferana*, Clemens) was again present in considerable numbers in the district. It did not, however, occur over such widespread areas as was the case in 1909 and 1910. The worst infestation which I saw during the past summer was in the neighbourhood of Maniwaki, 83 miles north of Ottawa. Here, in one place, the insects were very abundant and had done much injury to the foliage of spruce. In this particular instance the caterpillars were present all over the trees feeding on the present year's growth, and in such localities the ends of all the twigs had the characteristic reddish appearance which was noted at the tops of the trees in the outbreaks of the two previous years. By June 14th, at Maniwaki, the larvæ had mostly pupated, but there were still many mature caterpillars to be seen. On this date, also, empty chrysalids were found and moths seen flying. On some of the trees the chrysalids were extremely numerous towards the ends of the lower branches, and some were even found attached to the bark of the trunks of the trees. On June 12th many spruce and balsam trees were seen to be attacked along the line of the Canadian Pacific Railway between Venosta and Low, Que. The same trees had been noticeably attacked near Pourpore, Que. At Ottawa, in late May, larvæ were found feeding on tamarack, and from specimens gathered which pupated on 1st June the moths emerged on 16th and 17th June. At Maniwaki it was seen that large numbers of the pupæ were parasitized. Dr. Hewitt, however, will have something to report on our work with the parasites of this insect. In the middle of July large numbers of egg masses were present on trees all through the Gatineau district and around Ottawa. The eggs too were found to be heavily parasitized. On 21st July, on the grounds of the Central Experimental Farm, many egg masses were seen on several kinds of spruces and also on white cedar, all, of course, on the undersides of the leaves.

The MAPLE-LEAF CUTTER. Toward the end of August the Maple-leaf Cutter (*Brackenridgia acerifoliella,* Fitch) was noticed abundantly on the foliage of hard maples throughout the district. The larvæ at this time were in their curious little cases which are formed of four pads cut from the leaves. In 1885 a similar outbreak, but more extensive, occurred at Ottawa, and is mentioned by Fletcher in his annual report for that year. On September 2nd of the present year I saw a row of hard maples, near Ottawa, which showed very conspicuously the work of the larvæ. At this date many of the cases containing the larvæ had fallen from the trees. The winter is passed inside of these little cases and the moths emerge the following spring.

The ELM BARK LOUSE (*Gossyparia spuria,* Modeer) occurred abundantly in some sections of the district. On 23rd of May I observed large numbers of the matured females on the branches of some elms near the city. These females, which are reddish and woolly-covered, are readily seen on the trees in spring and early summer, and it is at this time when the insect is so conspicuous that the trees should be sprayed, if possible, with either kerosene emulsion or whale-oil soap solution.

The RUSTY TUSSOCK MOTH (*Notolophus antiqua,* L.) Towards the end of July the larvæ of this moth were rather numerous at Ottawa, and were especially observed to be doing noticeable injury to spruce trees. Mature larvæ were found on spruce on August 4th, and on this date one cocoon was also collected. These caterpillars, although they occur in the district in more or less numbers every season, are seldom present in numbers sufficient to do very serious damage. The larvæ have a wide range of food plants and may be found on almost any kind of tree or shrub.

LEAF-ROLLER on MAPLE (*Cenopis pettitana,* Rob.). While at Chelsea, Que., on May 27, I noticed that the leaves of many of the hard maples had been rolled and tied by a small green caterpillar with a brownish head and a dark dorsal vessel. When full grown the larva is about half an inch in length. The specimens which I collected pupated on June 2nd, and six moths of the above species emerged on June 19th. The moth is a beautiful little creature, and varies considerably in the colour of the fore-wings, some being of a pure shining white, others decidedly pale yellow. This tortricid also feeds on basswood, oak and rose. In 1899, I reared the species from *Tilia americana*, the moths emerging on the 15th of June.

The FALL CANKERWORM was again abundant in the district, and at Chelsea, Que., basswood trees particularly were attacked. On May 27th the larvæ were almost full-grown. On May 29th the caterpillars were reported to be stripping apple trees near Hull.

### DIVISION NO. 2, ORILLIA DISTRICT—C. E. GRANT.

The season of 1911 was not with me an insect year. It was remarkable for some very hot spells, making in fact a record for heat in this neighbourhood. It was also very dry in spring and early summer, these latter circumstances apparently not being encouraging to most insects.

Among the species most noticeable for their destructiveness were the following:—

JUNE-BUGS (*Lachnosterna fusca*). These insects appeared in enormous numbers in early May, and though their destructive tendencies are practically over in the perfect state the work of their grubs was very noticeable in the lawn.

CUT WORMS were very destructive, the larva of *Peridroma saucia* and *Hadena arctica* and *devastatrix* being most in evidence.

The CODLING MOTH (*Carpocapsa pomonella*) was very destructive, nearly all early apples having been infested with them. This was not a good apple year and 1910 was still worse in this neighbourhood.

The CURRANT WORM (*Nematus ribesii*) has been again very common. Most people will not use Paris green on the bushes, for fear of bad results, but I find a light solution perfectly harmless and very efficacious.

I have not added much to my collection this year on account of the poor season and the pressure of business. I have, however, quite a few unnamed species of *Lepidoptera*, which I should have liked to exhibit to the members, but circumstances will again prevent my being with you.

### DIVISION NO. 3, TORONTO DISTRICT—A. COSENS.

During the past season I have been interested chiefly in the gall-producing species of insects, and other points of entomological interest have been noted only incidentally.

In the year 1906 I found a willow in High Park, Toronto, riddled by the SNOUT BEETLE (*Cryptorhynchus lapathi*, L.). The same season this beetle was reported from Beamsville and Ridgeway by Prof. Zavitz. These were the first Canadian records for the species. Since their introduction these beetles appear to have increased in numbers very rapidly, and have now become a serious menace to our indigenous willows. During the past season a very large percentage of the willows examined were found injured more or less by this beetle. The species of willow most commonly attacked were *Salix nigra* and *cordata*. In a few cases these beetles were found boring in Aspen poplar (*Populus tremuloides*).

In the same park where the work of the willow-boring beetle was first noted clumps of Austrian Pine and Scotch Fir have been planted. These trees are being very much injured by the attacks of the moth *Pinipestis zimmermani,* Grote. These insects were so plentiful during the past season that large masses of resin, exuded from the larva burrows, were to be seen on almost every tree. Since the larvæ pupate in these resin masses it should not be a difficult matter to check the ravages of this pest. So far as my observations go, our native pines appear to be immune from attack.

After the extremely hot week of the past summer the larvæ of the LACE-WINGED FLIES (*Chrysopa*) were unusually abundant. These little creatures forced themselves on my attention first by inserting their mandibles into my neck under the collar. The swellings produced by the wounds were of about the same size as those caused by the stings of mosquitoes, but were more troublesome and of longer duration. It occurred to me on several occasions that the irritation caused by the bites of the lace-wings must just about balance their usefulness as destroyers of injurious insects. An observation, however, made in the grounds of the Normal School inclined me to regard the *Chrysopa* larvæ in a rather more favourable light. The trees in the grounds had been encircled by rings of some sticky substance, producing an effect that might easily create the impression that the Minister of Education and his colleagues had been sugaring for moths on a large scale. Numbers of larvæ and small insects of different species were skirting these impassable

Fig. 9. Lace-wing Fly (*Chrysopa*) and eggs.

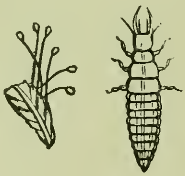


Fig. 10. Larvæ and eggs of *Chrysopa*.

barriers on the trees and among the bewildered masses the Chrysopa larvæ were having good hunting. A Tussock moth larva that was squirming in a rather unusual way was found to have two of these insect snapping-turtles clinging to it; one had secured a firm hold at the front of the head, just above the line of the eyes; while the other had gripped the side of the body near the posterior end. A desire to secure the antagonists as specimens made the combat an undecided one, but the lace-wings certainly appeared to be getting the better of the argument. So firm was the hold of the one that had attached itself to the head that the mandibles did not relax when the combatants were dropped into a beaker containing chloroform. It seems worthy of note that two *Chrysopa* larvæ should attack the same Tussock larva. Did it indicate preconcerted action on the part of the attackers? Or are we to suppose that the mentality of these larvæ has reached the stage where the value they set on anything is in proportion to the extent that it is being sought after by others? Whatever may be the explanation it seems to have a close parallel in the incident related by Sir Ernest Shackleton. He states that a very little experience taught his dogs that a penguin was more than a match for them one at a time and that they must unite their forces. In future attacks, while one dog threatened the bird from the front another would make the real attack from the rear, and after the adoption of these tactics the dogs had to be closely watched to prevent them killing large numbers of the birds. It augurs well for the success of the *Chrysopæ* against the Tussocks that they have adopted the plan of combining their forces. They appear to understand the importance of the "Law of the Jungle," as stated by Kipling. "The strength of the pack is the wolf and the strength of the wolf is the pack."

The galls produced by Sawflies were very plentiful on the willows this season. *Salix cordata* appears to be scarcely ever free from the attacks of *Pontania pomum,* Walsh and *Salix alba* quite as frequently infested by *Pontania hyalina* Norton, while *Salix discolor* can often be with certainty identified from the fact of the leaves almost always carrying the spherical galls of *Pontania pisum.* So close is the restriction of the sawfly gall producers to definite species of willow that this fact is often of assistance to the botanist in identifying doubtful trees. This is especially the case if the species under consideration is not in fruit. There are four undescribed species of sawfly gall producers in this locality, each of which appears to be restricted to a single species of willow. The petioles and midribs of the leaves of *Salix lucida* are frequently enlarged into spindle-shaped fleshy galls, while the petioles of *Salix humilis* bear a similar but much smaller gall. *Salix serissima* is found in only a few stations in the vicinity of Toronto, but wherever found this tree is infested by a new species of *Euura* that produces somewhat spherical shaped

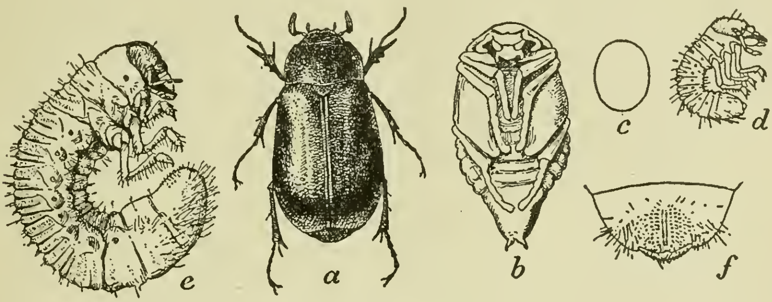


FIG. 11. White-grubs—*a*, beetle; *b*, pupa; *c*, egg; *d*, young grub; *e*, mature grub.

galls on the petioles of the leaves and less frequently on the peduncles of the pistillate catkins. The leaves of *Salix humilis* are scarcely ever free from the attacks of an undescribed *Pontania* that produces a gall somewhat similar to the species *pomum,* but it is smaller, densely pubescent and often found in clusters of from three to five. Specimens of the producers of three of these galls have been sent to S. A. Rohwer, Smithsonian Institution, and will be described by him in a paper soon to be published. Up to the present attempts to rear the producers from the galls on the petioles of *Salix humilis* have been unsuccessful.

DIVISION NO. 4, EAST TORONTO—C. W. NASH.

The early part of the year 1911 was cold and backward, consequently insects were scarce and inactive; butterflies, moths and dragonflies particularly so, until the beginning of July, at which time I saw the first MONARCH of the season, a rather bedraggled specimen, which looked as if it had experienced rough times on its journey from the south. At no time was this butterfly as abundant as usual. The White CABBAGE BUTTERFLY was noticeably scarce in this district, so but little damage was done by its larvæ. Whether the diminution of its numbers was caused by an increase of parasites or unfavourable weather conditions, I am unable to say. I did not, however, notice an unusual number of parasitized chrysalids.

The worst garden pests of the year were the TARNISHED PLANT-BUG and the larvæ of *Gortyna cataphracta,* both of which seem to be increasing; they are exceedingly difficult to check without constant and close attention, so that the production of fine flowers in this neighbourhood is attended with more than the usual difficulty and disappointment. No blossom buds seem to be immune from the attack of the Tarnished Plant-bug and any stalk large enough to hold them affords home and food for the larvæ of *Gortyna.* Pasture fields, lawns and strawberry beds were terribly injured by WHITE GRUBS (*Lachnosterna*). These larvæ have been increasing rapidly during the last few years and will undoubtedly continue to do so as long as favorable breeding grounds are provided for them. The constantly increasing area of land left under sod, affords ideal conditions for the propagation of this species and unless its natural enemies become more numerous than they are at present, or our grass lands are more frequently broken up, the damage inflicted by this grub will be very serious indeed.

MOSQUITOES were both abundant and attentive to their business all through the summer, though most of them examined by me had upon their bodies several parasitic mites (perhaps a species of *Trombidium*). I hope these had the ability to make the mosquitoes as unhappy as the mosquitoes do us. Whatever may be the final effect of the parasite upon its host, it certainly in the meantime causes no discordant note to mar the mosquito's music, nor does it impair its appetite.

FIG. 12 White-marked Tussock Moth, male.

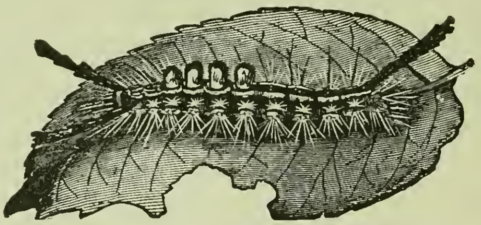
FIG. 13. Larva of Tussock Moth.

THE TUSSOCK MOTH larvæ became fully developed and entered the pupal stage much earlier than usual. On the 21st of July, I found the first completed cluster of eggs and almost daily after that I found others. As in some places the Tussock Moth is said to be double brooded, I gathered a considerable number of these early egg clusters, but none of them hatched. It is just possible, however, that these eggs were not fertilized, for strange to say this season out of over one hundred chrysalids kept by me not one male moth was produced, nor have I seen one anywhere at large. A very large proportion of the larvæ and cocoons gathered were parasitized by TACHINA FLIES of several species, but Ichneumon flies were entirely absent. Previous to this year species of *Pimpla* were the common parasites on the Tussock Moth; in my experience, outnumbering the Tachinids one hundred to one.

It is generally supposed that the Tussock Moth cocoons are always found upon the trunks and branches of trees, or on walls and similar places. I find, however, that on certain small-leaved deciduous trees, such as Birch, the larvæ will fasten a leaf to its twig and spin its cocoon therein. These leaves hang on the trees all through the winter and from them in many cases great numbers of caterpillars were produced. These hanging leaves were overlooked by the people employed to gather cocoons. Several times I found the larvæ of *Chrysopa* feeding upon injured and dying Tussock larvæ, and have often found their pearl-like cocoons in the cocoon of the Tussock Moth.

One of the Soldier Bugs, *Perilloides claudus,* appeared in considerable numbers this year in the potato fields, where it fed upon the larvae of the potato beetle. Early in August I found several of these bugs in the nymph stage feeding on Tussock Moth larvæ. *Claudus* has never been a common insect in Ontario, and why it should have become abundant and so generally distributed this year is a mystery. Any natural enemy of the Potato Beetle will certainly be welcomed in Ontario, and it is to be hoped that having gained a foothold here it will increase and multiply sufficiently to keep in check one of our most expensive and troublesome insect pests.

The only new insect taken by me this year is an Arctian, evidently of the genus *Apantesis.* This I have as yet been unable to identify.

### Division No. 7, Niagara District—R. C. Treherne.

I have the honour to present my second annual report for the Niagara District.

A movement of great importance to the Entomological interests of Ontario has, during this past season, taken place in the Niagara District. Through the courtesy of the Provincial Department of Agriculture for Ontario, the establishment of a field station for Entomological investigation, under the Division of Entomology of the Dominion Department of Agriculture, has been made possible. Office space has been allotted to the Field Officers of the Division of Entomology, at the Provincial Experiment Station, situated at Jordan Harbour, Ontario.

Acting on the instructions of Dr. Hewitt I have had the pleasure of making this office my headquarters for a few months this summer. It is to be hoped, henceforth, that this field station will be the basis for much useful work, for the province of Ontario in particular.

### The Weather.

The weather throughout the Niagara District has been more or less favourable to fruit production, and well suited to insect life. The Spring was especially favourable for blossoming, and fruit set well. Most of the insects common to fruit put in their appearance in advance of the ordinary season. Severe drought and extreme heat were experienced in July. From Meteorological Observations of Jordan Harbour, July 3rd, with a maximum temperature of 103 degrees F. proved the hottest day, while the last day of frost, from the same observations, proved to be May 3rd.

The following dates show the days on which frost was experienced this Spring (1911):—

March 28th—April 3rd, below 32 degrees F; April 4th, 7 a.m. 24 degrees F., 6 p.m., 30 degrees F; April 8th, 7 a.m., 31 degrees F., 6 p.m., 35 degrees F; April 9th, 7 a.m., 31 degrees F., 6 p.m., 37 degrees F; April 11th, 7 a.m., 32 degrees F., 6 p.m., 37 degrees F; April 24th, 7 a.m., 32 degrees F., 6 p.m., 40 degrees F; May 3rd, 7 a.m., 30 degrees F., 6 p.m., 32 degrees F.

The Meteorological Records of the six months (March till August) were as follows:—

| | Average Maximum. | Average Minimum. | Rainfall in Inches. |
|---|---|---|---|
| | F. | F. | |
| March | 32.37 | 25.93 | 2.61 |
| April | *——— | 36.44 | .58 |
| May | 74.77 | 50.32 | 1.97 |
| June | 72.28 | 56.13 | 3.43 |
| July | 82.56 | 63.83 | 2.86 |
| August | 76.02 | 60.63 | 2.10 |

## Attacking Fruit Trees.

San José Scale (*Aspidiotus perniciosus*). While the area of infestation does not appear to have decreased to any extent, it may be supposed that the constant spraying, which process may now be considered the rule and not the exception, among the great majority of fruit growers in the Niagara District, is affecting its numbers. The district south and east of St. Catharines still remains the worst infested. There are a great many old apple orchards in these districts, and they harbour the San José to a very marked extent.

Owing to the extensive and energetic operations of the National Land, Fruit and Packing Company—a Company which in the last year has rented large numbers of apple orchards throughout Ontario, and to a large degree around St. Catharines and in the district south, and which has pruned, reheaded and sprayed these infested orchards, many of which are under their control—we shall no doubt find, in a few years, marked results against the Scale, and, for the good of the district as a whole. We sincerely hope so.

Excellent results, ending with the complete destruction of the Scale have been evidenced this last year by two applications of Commercial Lime Sulphur at the 1-10 strength, before the buds fully burst in the Spring and when the ground was still frozen. Single applications of 1-10 in the early Spring have not given the best results, probably owing entirely to the degree of efficiency in application. A single application of 1-8 or stronger has been recommended, and is now being recommended as efficient, by local Inspectors. But it would appear that the fault does not lie in the strength of the application so much as in the degree of efficiency of application, consequently on a badly infested tree and especially on a large number of trees, I would prefer two applications of 1-10 or even weaker to a single application of 1-8 or stronger.

Codling Moth (*Carpocapsa pomonella*). It has been predicted that owing to the failure of the apple crop of 1910, we would notice a marked decrease in the percentage of "wormy" apples this year—because it was supposed a lessening in food supply would in turn affect the numbers of the moth. I have not seen any direct evidence of this coming about, but it is true I have not sufficient data at hand. I had occasion to be away from the Niagara District at the time when the second brood was in operation, consequently I have no facts to guide me. If the

* The maximum thermometer was broken, and no maximum records were kept from March 20th till May 18th. Consequently the average for March is too low, while the average for May is too high.

prediction has proved to be true, it is curious to note that a provision of nature this Spring helped to restore the balance to which we are more or less accustomed. It can be seen from the Meteorological Records that the Spring was dry and more or less warm, and devoid of late frosts at the time of blossoming. The apples set well, the various varieties blossoming conjointly, and development taking place very rapidly. Just at the time, after blossoming, when the developing fruits are recommended to be sprayed, rain came and continued for a few days, interfering with the process of spraying. It would be fairly estimated that not more than 50 per cent. of the apple growers sprayed during the important week following the fall of the blossoms. The week of May 22nd was the time when the blossoms fell from apples on the average for the whole district.

THE PLUM CURCULIO (*Conotrachelus nenuphar*). This insect was exceedingly prevalent this year. I do not believe that it is given its due consideration by the majority of the fruit growers in the district, as being one of the most satisfactory means of reducing the profits and yield of the various fruits in their orchards. It is well known and very much dreaded by a great many, but from the fact that it causes fruit to drop, its importance is to a large extent lost sight of.

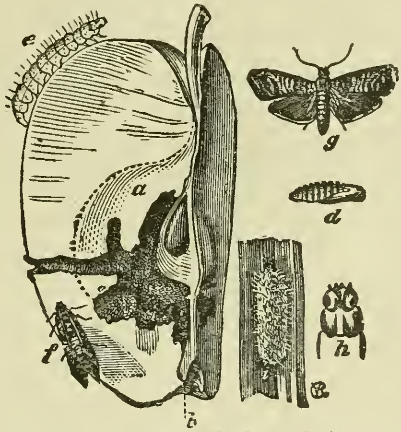


FIG. 14. Codling Moth and its work, showing the different stages.

In the first four days of July of this year I examined a total of 3,300 apples between Jordan and St. Catharines. At this time of year, before the development of the second brood of Codling Moth had taken place, 15.06 per cent. of the apples were infested with Curculio while 7.99 per cent. were attacked by Codling Moth.

In a few days I had occasion to visit the Ridgeway and Fort Erie District, and there examined a total of 3,100 fruits and found that 6.8 per cent. were infested with Curculio as against 7.4 per cent. with Codling Moth.

Summarizing the work in thes two districts, at this time of year,, I found that, estimating from a percentage of fruits from 1,955 trees, with an estimated crop of 1,310 barrels, the Curculio infested fruit would fill 161.25 barrels, that Codling Moth infested fruit would fill 103.25 barrels (i.e., provided that fruit was allowed to mature), while 787.36 barrels would be clean fruit. These figures were obtained from the fruits on the trees at the time of examination. If the fallen fruit had been taken into consideration, the increase in the percentage of Curculio infested fruit would have been most marked, because many fruits had fallen, and the cause of their falling had to some extent been due to Curculio attack. For instance in an orchard examined in Vineland, at the same time as the above, I found that of the fallen apples 38 per cent. were infested with Curculio larvæ, while of the apples adhering to the trees only 16.6 per cent. were infested.

In order to estimate, with a certain degree of accuracy, the percentage of Curculio larvæ that fall to the ground in the early part of the summer with the small fruit from the tree, I endeavoured to keep a record of the "drop" from one particular Burbank Plum tree, with the following results:—

| PLUMS. — Date. | Total Fallen Fruit picked up. | Total fallen from natural reasons. | Total fallen with crescent punctures. |
|---|---|---|---|
| June 20 | 1,027 | 924 | 103 |
| June 25 | 739 | 573 | 166 |
| July 1 | 250 | 113 | 79 |

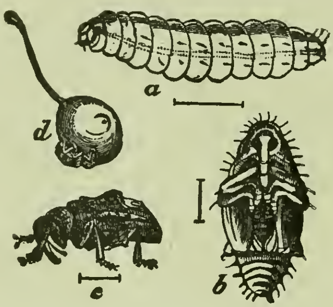


FIG. 15. Plum Curculio—
*a*, larva; *b*, pupa; *c*, beetle;
*d*, young fruit attacked.

From an examination of the plums derived from the final column in the above table, I found that:—

| | No larvae development. | Distinct larvae present. |
|---|---|---|
| Of the 103 plums | 32 | 71 |
| Of the 166 plums | 17 | 149 |
| Of the 79 plums | 21 | 58 |

On July 2nd I examined the fruits remaining on the Burbank Plum tree, the same as upon which the above records were taken, and found on examination of 300 fruits that only 17 showed the presence of Curculio larvæ, a percentage of infestation of 5.66 per cent. We note, therefore, that there is a lessening in percentage of infestation as the season advances, consequently the attack of the Curculio passes unnoticed by the ordinary fruit grower.

The attack causes a certain beneficient degree of natural thinning, it is true, but this manner of accomplishing this important detail in successful horticulture is not correct from economic reasons. As a result of these remarks I do not wish to overrate the importance of the Plum Curculio as compared to the Codling Moth, but what I wish to emphasize is the fact that this former insect is worthy of more detailed study and greater regard by the fruit grower.

SHOT-HOLE BORER (*Eccoptogaster rugulosus*). This year again this borer has caused the fruit growers a great deal of trouble. While the remedy is difficult, the prevention is easy. There is no cause in any attack I have seen which could not be assigned to a pile of lumber, or brush left in close proximity to the trees. From mere general observation it would appear that attacks are more often experienced by fruit growers immediately bordering on the lake. The habit of throwing orchard trimmings over the edge of the cliff into Lake Ontario is a bad one, and no doubt accounts, to a certain degree, for the attack of this particular insect.

BLISTER MITE (*Eriophyes pyri*). This insect has become localized in certain apple orchards south of Vineland and west of St. Catharines, but so far as the Niagara District is concerned it has not become a general orchard pest.

WOOLLY APHIS (*Schizoneura lanigera*). I have noted a probably slight increase in the prevalence of this insect in a few orchards, but so far as the district as a whole is concerned it still remains a general orchard insect of minor importance.

GREEN FRUIT WORMS (*Xylina sp.*) were commonly noted in the Ridgeway and Fort Erie District, and did a considerable amount of damage to young maturing apples.

SPRING CANKER WORM (*Palcacrita vernata*). The work of this insect was brought to my notice on June 8th. It has become localized in several apple orchards south of St. Catharines.


FIG. 16. Peach Tree Borer—1, female; 2, male,

PEACH TREE BORER (*Sanninoidea exitiosa*). This insect is again attracting the attention of progressive fruit growers. At the request of several fruit growers I have had occasion to visit orchards attacked by this insect. In one orchard, in particular, 80 per cent. of young four-year-old peaches were attacked. According to the testimony of Mr. John Read, formerly orchard inspector of the Beamsville District, ten years ago this borer had been considered a most serious pest. In fact, it had been at one time a part of the general farm routine to make examination for, and excavate, the larvæ from the crown of the trees. In more recent years this practice had ceased, owing to the increase in price of adult labour, and the inefficiency of boy labour. It is hoped that a proper watch will be maintained by the fruit growers on this important insect.

According to observations from material at hand this year, the first males emerged on July 12th and the first females on July 14th. It is necessary, therefore, to adopt precautionary measures at this time against the oviposition of this moth.

CHERRY TREE SLUG (*Eriocampoides limacina*). In the early part of the summer it was noticed that this insect was showing evidence of becoming particularly serious this year. Its appearance was very much earlier than usual owing to the extremely hot and dry weather of the spring. Owing to this, the process of spraying an arsenical was interfered with, because the fruit was ripe and ready to pick at the same time as the slug had reached, or nearly reached its full state of growth. For fear of poisoning the fruit, many fruit growers omitted to take measures against the slug, in consequence of which, in some sections, this insect increased to an alarming extent, some trees having their leaves completely stripped of their green portions.

If such a condition recurs in the years to come, where it is inadvisable to spray with arsenicals, it will be found that handfuls of powdered soil and lime will act as a temporary remedy.

The slugs reached their full stage of growth (around Grimsby) about June 29th of this year, and where they were present in extreme numbers caused considerable annoyance to the fruit growers, by adhering to the cherries during picking. By July 2nd the great majority of the slugs had disappeared from the trees and pupated in the ground—a few slugs remained on the trees after this date, and an occasional one could be seen on the leaves at any time till the end of the month. The general emergence from the pupa of the adult and the consequent egg deposition began (around Grimsby) on July 28th and continued until July 31st. Field observations record the second appearance of larvæ on August 10th. At this time many fruit growers sprayed a second time, using lead arsenate at the rate of 2 lbs. to 40 gallons of water, and, according to the observations made on this insect by Mr. W. H. Wright, who carried on the work at Jordan in my absence, it was not strong enough, as the larvæ lived for several days with the leaves well-coated with the arsenate. At the Jordan Harbour Experimental Farm 6 lbs. to 50 gallons was used with good results, but this made spraying rather expensive.

Boring Wasp (*Cemonus inornatus,* Say). This wasp was in evidence again this year, attacking newly-headed Peach, Plum and Cherry trees. No material damage resulted.

### Attacking Small Fruits and Vegetables.

The Cane Borer (*Agrilus ruficollis*) and the Sawfly (*Monophadnus rubi*) were reported as affecting Raspberries this year, the former from the Port Dalhousie District, and the latter from the Stoney Creek District. The Snowy Tree Cricket (*Oecanthus niveus*) has been abundant again on Raspberries.

The two Asparagus Beetles (*Crioceris asparagi* and *C. 12 punctatus*) have also caused annoyance in certain sections.

A predaceous pentatomid (probably *Perillus bioculatus,* Fabr., variety *claudus,* Say), as mentioned by Dr. C. J. S. Bethune in the "Canadian Entomologist" Vol. XLIII., Septr., 1911, page 320) has been very commonly noticed attacking the larvæ of the Colorado Potato Beetle. Its presence has attracted the attention of many farmers, but its control has not been sufficient to allow the abandonment of the usual arsenical spray for the beetle.

The Pea Moth (*Semasia nigricans*) was in evidence this summer, but, in numbers, not to the same extent as some years preceding. It would appear, from general observation, that the late varieties of Peas are the most liable to attack. These are mostly English varieties, such as Yorkshire Hero, Shropshire Hero, Carter's Daisy and Fillbasket. At the Jordan Harbour Experimental Farm the last picking of early Peas took place about June 30th, and the first picking of late Peas about July 8th.

Both the Zebra Caterpillar (*Mamestra picta*) and the worm of *Pieris rapae* were prevalent on the Cabbage this Summer at Jordan, and destroyed a large number of marketable heads. The Root Maggot, also on Cabbages, has been most destructive. Fairly effective treatment has been devised by the use of 4 oz. Carbolic Acid to the gallon of water, and this poured around the plant.

I have to thank Dr. C. Gordon Hewitt, Dominion Entomologist, for kindly allowing me to incorporate these notes, which were obtained under his authority.

Prof. Jarvis: The Curculio and Blister Mite are two pests neglected by the average grower in the Niagara district. Many are now looking after the Codling Moth, but are neglecting these. I think the Blister Mite is more common than Mr. Treherne reports. In nearly every orchard I have been in this year the Blister Mite is very common.

Dr. Hewitt: It is found in Quebec, too.

Mr. Cæsar: I think Mr. Treherne is not correct in his belief that the complete failure of an apple crop in an orchard does not lessen the number of Codling Moth for the next year. I visited a fifty-acre orchard near St. Catharines this fall, and was surprised to find scarcely any Codling Moth, especially as I had pretty good reason to believe that the spraying was not very thorough. I have since been informed that a year ago there was almost a total failure of apples in the orchard. I am expecting next year to hear of some remarkably clean orchards out towards Lake Huron, where there has been a failure of the apple crop last year, and to a considerable extent this year, too.

## SOME OF THE WORK OF THE DIVISION OF ENTOMOLOGY IN 1911.

C. Gordon Hewitt, D.Sc., Dominion Entomologist, Ottawa.

In continuation of the practice which I started last year, it is my intention to describe briefly to you some of the more important aspects of the work of the Division of Entomology during the past year. I know that the members of the Society are interested in the work that we are doing, and a discussion of the problems confronting us cannot but be productive of beneficial results.

First, I should like to briefly refer to the additions to the staff of the Division during the past year. Mr. John D. Tothill, and, more recently, Mr. Wm. A. Ross, both graduates of the Ontario Agricultural College, have been appointed as field officers. Mr. Germain Beaulieu has also been similarly appointed. With such keen and loyal assistance on our staff of field officers as Mr. R. C. Treherne, Mr. Geo. E. Sanders, Mr. John D. Tothill, and Mr. W. A. Ross, all graduates of this college and special students in Entomology, I cannot allow the opportunity to pass without expressing our indebtedness to Dr. Bethune, their teacher, for turning out men with such an excellent training, a training which enables them to tackle problems the solution of which may have a most important bearing on Canadian agriculture or horticulture. I hardly like to think what we should do without the Entomological Department at Guelph for our supply of men. Another appointment of great importance which has been made is that of Professor J. M. Swaine as Assistant Entomologist. Professor Swaine's valuable work on the Scolytidæ is well-known to all of you, and it is my intention that he shall have charge of the forest insect work. The importance of investigations on forest insects in relation to the conservation of our forest in Canada lends great significance to his work and the possibilities of its further development. A beginning has been made of a scheme of establishing field laboratories in different regions according to the requirements of those regions. Through the kindness of the

Ontario Department of Agriculture the Division has been allowed the use of an office in the Jordan Harbour Experiment Station, and during the past summer Mr. R. C. Treherne commenced several investigations on the Plum Curculio and other insects, a brief account of which he gave in his report as Director of Division No. 7. Mr. Treherne has now been transferred to British Columbia to take charge of our work there, and next season Mr. W. A. Ross will continue his work in Ontario, when it is my intention that he shall work on the Apple Maggot, Plum Curculio and such other more serious species as may be determined later. It is proposed to extend this system of field laboratories and to establish one in Nova Scotia, another in New Brunswick, where Mr. Tothill will continue his investigations on Tachinid parasites with especial relations to the Brown-tail Moth. I might mention here that we have started, through the kind co-operation of Dr. Howard, the importation of the European Tachinid, *Compsilura concinnata,* a parasite of the Brown-tail and Gipsy Moths, in the hope that it may become established before the Brown-tail Moth attains any considerable magnitude in New Brunswick. We hope also to have a field laboratory in Quebec, and a fifth in British Columbia, where Mr. Treherne will carry on investigations on the Lesser Apple Worm, Capsid Bugs and certain of the more injurious fruit insects of that Province.

During the past summer one of our chief investigations has been the study of the parasites of the Spruce Budworm, to which work Mr. Sanders has devoted most of his time. Arrangements were made for supplies of infested spruce, balsam, etc., to be sent to the Division from different parts of Quebec and British Columbia, and this material was used in our parasitic studies. In January and February I visited a number of the more severely infested localities in Quebec, such as Lake St. John region and the Rouge River, for the purpose of making field observations. Reports were also obtained during the summer from the lumbermen and others with regard to the depredations of the Spruce Budworm during the past season. As a result of these observations and reports, conjoined with our study of the parasites, we have been able to conclude that the result of the depredations of the insect will not be of so serious a nature as many of the lumbermen and limit-holders were inclined to fear. In fact, in some regions the parasites had effectively gained control of the pest, and it is these parasites and their habits that we have been studying. The most effective parasites would appear to be the egg parasites, the chief of which is *Pentarthron minitum,* which Mr. Sanders has studied specially, and its habits and deadly effect may be gathered from the following examples: In one lot of eggs which he collected at Ottawa he found 77 per cent. of the eggs parasitized by this species, and the eggs contained on an average over two parasites per egg. In 33 egg masses there were 370 eggs, 286 of these eggs were parasitized and produced 639 parasites. Egg masses collected at Maniwaki, P.Q., were similarly heavily infested: 93 egg masses contained 1,192 eggs, of which 902, or 75.6 per cent., were parasitized, 2,167 parasites emerged, or an average of 2.4 parasites per egg. The larger ichneumon and other parasites were also abundant. From insects collected near Esquimault, B.C., the percentage of parasites obtained was 43, and an equally high percentage was found in collections made in Quebec. A species of *Apanteles*, hitherto undescribed, was abundant, both in Quebec and British Columbia.

As a result of these studies we were able to calm the fears of those persons on whose timber limits the depredations were noticed for the first time last year, as the pest appeared to be spreading in an easterly direction and more reports were received from the south side of the St. Lawrence.

Our studies of the parasites of the Larch Sawfly were again continued, and observations on the life-history of the useful Chalcid, *Cœlopisthia nematicida,* Pack., were recently published in "The Canadian Entomologist."

An attempt was made to introduce the useful European parasite *Mesoleius aulicus* which appeared to have been so effective in England. During a visit which I am shortly about to make to England, arrangements will be made, if possible, for the importation of the parasitized cocoons of the Sawfly, with a view to establishing the European parasite in Manitoba, from which Province we have had reports during the past years of serious depredations by this insect, and it appears to be spreading westward.

During the past year the work under the Destructive Insect and Pest Act has increased considerably. At the end of the last importation season, which closed about May, we had inspected over four million plants for the winter nests of the Brown-tail Moth and evidences of the Gipsy Moth. It might be of interest to mention that during the present season we have found dead pupæ of the Gipsy Moth on Azaleas imported by an Ottawa firm from Belgium, showing the possibility of the carriage of these insects in a living condition and the importance of this inspection work. A very systematic inspection of the whole of the territory in Nova Scotia infested by the Brown-tail moth was made last winter, and it was found that the insect occurred in Yarmouth, Digby, Annapolis and Kings counties. A considerable infestation was discovered at Weymouth, where some very large winter nests were found. Mr. Sanders counted over 1,800 caterpillars in one of these nests, which indicates how essential it is to collect even single nests. This large infestation at Weymouth was undoubtedly due to the fact that the insect had been allowed to increase during one or two seasons. In my address to you last year I mentioned to you the fact that a single egg mass of the Brown-tail Moth had been found in New Brunswick, indicating that this insect was at last breeding in that Province. During the last winter season nests were found at Pomeroy Ridge, in Charlotte County, N.B., and a survey of that region was made under Mr. Sanders' direction, when nests were found throughout the south-western section of Charlotte County, indicating that the insect has at last arrived in force in New Brunswick. We are increasing the number of inspectors in both these Provinces during the present winter, when the whole infested area will be carefully scouted.

I have only indicated to you very briefly a few of what I think are the more interesting lines of work which we have been carrying on. Mr Treherne has indicated in his report some of the work which has been carried on in Ontario, and, had time permitted, I might refer more particularly to a number of the more interesting pests which have been reported to us during the past season. But the programme is a long one, and these will be described as usual in my annual report. I might refer, however, in closing to the fact that we have had a combined insectary and work-room erected at Ottawa for experimental work, the insectary being of the open-air type; that is, instead of glass, fine wire screens have been used, by means of which a more even and normal temperature can be obtained.

## INSECTS OF THE SEASON IN ONTARIO.

L. Caesar, B.A., B.S.A., Guelph.

### Orchard Insects.

Codling Moth (*Carpocapsa pomonella*). The Codling Moth has in most districts caused about the usual amount of loss, though in a few localities even unsprayed orchards were very little attacked. Each year more of our fruit-growers learn how to combat this pest successfully. An excellent example of what is possible from thorough spraying right after the blossoms fall was shown in the 40 acre orchard of Mr. Jas. E. Johnson, of Simcoe. Mr. Johnson has sprayed his orchard carefully for several years. This year he had a gasoline power outfit and used lime-sulphur and arsenate of lead. Fully 99.5 per cent. of the apples were free from worms. Some neighboring orchards were almost 80 per cent. wormy. Two orchards at Rockwood, sprayed by Mr. Chas. Good, my assistant, and myself this spring, when visited during apple-picking time this fall, appeared to be about 95 per cent. free from worms, even on Spy trees which in many cases had not more than half a barrel to a tree. These orchards had not been sprayed for at least ten years.

Plum Curculio (*Conotrachelus nenuphar*). I have received fewer complaints of fall injury from Plum Curculio to apples this year than last, though there was considerable in some orchards. It was moderately abundant on plums and cherries.

Oyster-shell Scale (*Lepidosaphes ulmi*). This, our most common scale insect, is being rapidly brought under control by the application of lime-sulphur before the buds burst.

San José Scale (*Aspidiotus perniciosus*). In counties like Kent and Essex, where San José Scale has been very prevalent, and where very promising orchards have been allowed to go uncared for, a renewed interest in spraying has arisen, due chiefly to the splendid results being obtained in many quarters from the care of orchards and to the eagerness of companies to rent or buy them. The presence of district representatives, too, has had a remarkable result in giving owners of apple orchards encouragement and helping them to control the scale and bring back their orchards into good bearing.

Blister Mite (*Eriophyes pyri*). This pest has continued to spread, and owing to the very dry season, injury from it was much more conspicuous this year than usual. From badly attacked trees, even as early as July 1st, the foliage had begun to fall. Excellent results against this mite have been obtained by the use of lime-sulphur shortly before or as the buds are bursting.

Aphids (*Aphis avenae*, chiefly). During May we received numerous letters telling us that these green lice were very thick on the twigs and opening buds and asking for information as to what to do. We replied that they could be killed by sprays of kerosene emulsion, whale-oil soap or Black Leaf 40, but that we had strong hopes that if the weather continued fine they would soon disappear. It was, therefore, with great pleasure that we observed that almost immediately after the very hot weather of the last week of May almost all the Aphids disappeared. This result seemed to have taken place over at least most of the Province, and probably over all of it.

Cigar Case-bearer (*Coleophora fletcherella*). In a large number of orchards this year the Cigar Case-bearer was very abundant and destructive. This is one of the pests fairly easily controlled by spraying just before the blossoms burst.

BUD MOTH (*Tmetocera ocellana*). Like the Cigar Case-bearer, this insect also did much damage. It seems to me that economic entomologists pretty generally feel that it is about time we were devoting more attention to this insect than we have done in the past, as present methods of control seem scarcely satisfactory. I have, however, been surprised this fall to find that, though the Bud Moths were quite abundant in the spring, yet around the College, even on unsprayed trees, there is scarcely a leaf attacked on some of the trees. Probably parasites have been very active. This, however, is not true of the whole province, for in some localities there was much evidence of their presence this fall.

LEAF ROLLERS (*Archips rosaceana*) and at least one other, to me, unknown species were exceptionally common in many orchards, and did much damage by feeding on the young fruit of apples and pears, once this was formed.

PALMER WORM (*Ypsolophus pomotellus*). This insect is very rarely mentioned by Canadian writers and is not well-known to the growers. It has, however, been present in considerable numbers in some orchards for several years. This year it was unusually prevalent, and several complaints were sent in of its feeding upon the fruit. Many of these complaints were correct, but in some cases the injury was done by Tussock Moth caterpillars. The Palmer Worm larvæ this year were doing most damage about a week or ten days after the Codling Moth spray had been applied. We are frequently told that these insects pupate in the leaves. This is rather misleading, for in our experience more than half of them

FIG. 17. Bud Moth and larva.

Wings open. Wings closed.

FIG. 18. Leaf Roller Moth (*Archips rosaceana*).

pupated in the soil and the rest on the leaves. The customary application of a poisoned spray just before and immediately after blossoming should control this insect easily if thoroughly done.

WHITE-MARKED TUSSOCK MOTH (*Hemerocampa leucostigma*). As indicated above, this insect was very common in some orchards this year, and not only destroyed much of the foliage in the centre of the tree, especially on the young water sprouts, but also did much damage to the fruit by eating irregular areas out of it.

CLIMBING CUTWORMS (not identified). In a few localities Climbing Cutworms were troublesome, especially on young apple trees. Sometimes these worms feed on the fruit as well as the foliage.

*Anametis grisea.* This Snout-beetle was again found attacking the foliage in the same apple orchard in Prince Edward county as last year. Very little injury was done.

APPLE MAGGOT (*Rhagoletis pomonella*). We have had one man, Mr. W. A. Ross, a recent graduate of this College, devoting his whole time to the study of this apple pest. A great deal of useful data has been accumulated this year, and, as the work is to be continued next year, we hope to be able next fall to give a comprehensive account of the insect and of the best methods of control.

CAPSIDS. We have this year reared several specimens of Capsids about the size of the Tarnished Plant Bug that have been found attacking the apples when quite small and causing from one to ten ugly scars on each fruit where they punctured it when feeding. So far as we could see all the damage was done by the nymphs. We hope to do some work on this subject next year, as it is one of great interest and no small economic importance.

Pear Psylla (*Psylla pyricola*). We planned out and applied a series of experiments this spring to test the value of lime-sulphur in the control of this tiny but very destructive insect. To our surprise it almost completely disappeared from some unknown cause, so that our experiments were useless. There seems to be no doubt, however, that a very thorough spraying with lime-sulphur just before the blossoms open will hold the insect under thorough control. Professor Parrot, of Geneva, N.Y., has had excellent results from this late application of lime-sulphur.

American Tent-Caterpillar (*Malacosoma americana*). In the eastern counties of Ontario this insect has been rapidly increasing in numbers for the last two years. This year it has done much damage in some unsprayed orchards. At Guelph, too, it is becoming much more numerous than it has been for years, but

Fig. 19. Tarnished Plant Bug—much enlarged.

it is not nearly so common yet as farther east. The probabilities are that we may look for a bad outbreak next year east of Kingston and a great increase in numbers over a large part of the province.

Peach-tree Borer (*Sanninoidea exitiosa*). Most of our peach orchards are fairly free from this borer, but here and there during the course of the season, while examining orchards for Little Peach and Yellows, I came across one where the borer was very destructive, especially to young trees.

Tarnished Plant Bug (*Lygus pratensis*). Some of our nurserymen have complained about an insect that kills the buds of peach trees in the nursery. Examination of the injury seems to indicate that the Tarnished Plant Bug is the offender. There is need, however, of some further investigation on this subject. Another complaint made against this insect this year was that it punctured the tender growing tip of Asparagus plants. I saw these injuries near St. Catharines in August, and think the grower is probably quite correct in his claim that the Tarnished Plant Bug is the offender.

### Bush Plants and Vegetables.

Currant Borer (*Sesia tipuliformis*). This borer is very abundant in many currant plantations. Just how much damage it is doing is difficult to estimate. The last week in June and the first in July this year adults were easily captured on the foliage. The best means of control seems to be to cut out and burn the old canes in early spring when pruning, and allow new canes to take their place. A cane should not be allowed in badly infested plots to remain longer than two or three seasons.

Currant Saw-fly (*Pteronus ribesii*). This very common pest did not seem to be quite so abundant at Guelph as in previous seasons.

Currant Aphis (*Myzus ribis*). This aphis was much less numerous at Guelph than for some years back.

Red Spider (*Tetranychus bimaculatus*). The Red Spider does a great deal of damage to currants and raspberries, but was not so common with us as last year. We have got good results from the use of lime-sulphur against it.

Raspberry Root-borer (*Bembecia marginata*). At Grimsby, August 8th, while examining raspberry roots with the object of discovering the cause of a peculiar curling of the leaves which has been quite common in the district and

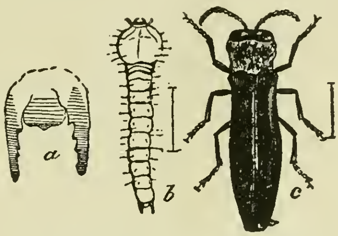


Fig. 20. Red-necked Agrilus—*a*, horns at anal extremity; *b*, grub; *c*, beetle—all magnified.

has preceded the death of the plant, I found that nearly two-thirds of all the roots examined had been injured by this borer. It does not seem to have been the cause of the curling, at any rate in some cases, but was evidently very injurious to the plants. At this date most of the insects were still in the larval stage, but a few had pupated. No adults were yet visible. Such a plantation should clearly be ploughed up either early in spring or late in fall and the roots and canes collected and burned.

Red-necked Agrilus or Gouty Gall Insect (*Agrilus ruficollis*). I have seldom seen many canes attacked by this beetle, but this year, at Port Dalhousie, it was very common on red raspberries. The part of the cane above the gall had in most cases died, just as happens when they are attacked by the Snowy Tree-cricket (*Oecanthus nigricornis*).

Blackberry Leaf-miner (*Metallus*, sp.). This sawfly miner is still quite abundant in at least the Niagara district.

European Fruit Scale (New York Plum Scale) (*Lecanium corni*—*Eulecanium cerasifex*). Blackberry canes were very badly attacked in a few districts by this scale. Thinking that possibly it might not be *Eulecanium cerasifex* I sent it to Washington, and was informed it was the same insect, but that the name *Lecanium corni*, Bouche, was given to it now. This scale a few years ago was very abundant on forest trees, but has not been nearly so much in evidence the last two years.

Cutworms and Army Worms. We have had the ordinary number of complaints of damage from Cutworms. From Monteith, in New Ontario, and also from Port Arthur and Parry Sound came complaints of countless numbers of the Black Army Worm (*Noctua fennica*). The correspondents said that they had destroyed all kinds of vegetation for several miles in extent. According to their reports poisoned bran was useless, as they would not eat it. Rolling the soil destroyed great numbers. I was not informed whether they tried furrows or trenches to check their progress. I had recommended these along with the poisoned bran and rolling.

Black Vine Weevil (*Otiorhynchus sulcatus*). This large weevil has been reported from several parts of Canada, and has been known in a number of instances to feed on Cyclamens in greenhouses, but, so far as I could find out, it has not previously been reported in Ontario as feeding on strawberries, though it has been reported as doing so in Nova Scotia, and frequently attacks them in Europe and also in Tasmania. In the latter country it is reported as being one of the two

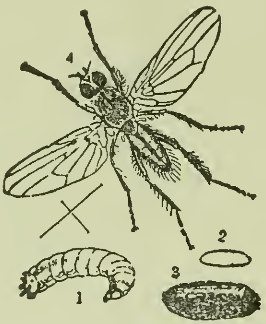


Fig. 21. Cabbage Maggot, puparium and fly—enlarged.

worst strawberry pests. Its attacks in the strawberry plantations on the College farm at Guelph became noticeable about the time the fruit was beginning to ripen and continued until most of the berries had been picked. The injury was done by the larvæ, which bored into the plant and devoured most of the crown, thus causing the plants to die. If one attempted to pull up these plants they always broke off at the injured part. Many of the larvæ, when my attention was called to the injury, were full grown and had worked their way an inch or two into the rich soil. A few had already transformed there into pupæ. In a few weeks those that were put into rearing cages emerged as adults. The larvæ are legless, stout, white to flesh-colored, usually curved, with brown head, body thickened medianly and slightly tapering towards each end. The length when fully grown is about two-fifths of an inch. The insects did not occur in very large numbers, and consequently the number of plants destroyed was probably not more than 100. The attack began on the rows nearest to where an old plantation had been ploughed up the previous year. Usually several plants near together would be attacked.

Root Maggots. As usual the Cabbage Root Maggot (*Pegomya brassicae*) has been very destructive. At Guelph we had also this summer for the first time in several years considerable loss from the Onion Maggot (*Pegomya cepetorum*). The Beet Leaf-miner (*Pegomya vicina*) was also fairly abundant. On the

Cabbage Maggot we tested several different substances, such as Clift's Manurial Insecticide, Apterite, Soft Coal Soot, and also the tarred-felt-paper discs. The latter alone gave satisfactory results, scarcely any plants being killed where the discs were used. We find that most of those who use the discs make one of several mistakes which interfere with good results. First, many use tar-paper instead of thin tarred felt-paper. Second, the discs are not put on soon enough after setting out the plants. They should be put on at once; the delay of a single day may allow the flies to lay their eggs before the discs are in position. Third, the cultivator is often used soon after the discs are put on and earth is thrown over them and against the plant. When this is the case the discs will in many cases not prevent injury. The earth should either be removed with a small whisk or the ground left uncultivated for about two weeks or more after setting out the plants. Fourth, the discs are not fitted neatly and closely around the stem.

SQUASH BUG (*Anasa tristis*). This insect seems to have done very little damage this year. Two years ago it threatened to become very abundant, but climatic conditions seem to have been unfavourable.

*Perillus bioculatus*, var. *claudus*, has been found in many counties this year. Evidently it ranged almost all over the southern and western part of the province, and, at least, as far east as Toronto. In some potato fields it was present in large

Fig. 22.
Perillus circumcinctus.
This insect closely resembles P. bioculatus, var. claudus.

numbers and destroyed many of the adult Colorado beetles and also the larvæ. Apparently it attacked the eggs also, but Mr. Baker and I were not quite sure on this latter point. Some farmers wrote saying that they did not have to spray their potatoes this year to destroy the Colorado beetles, and attributed their decreased numbers to this insect. *P. claudus*, both in the adult and nymph stages, feeds on the potato beetles. We found the insects in all stages: eggs, nymphs and adults. The eggs are black and quite conspicuous and laid in clusters on the leaves. The female adult differs from the male in having white or cream markings instead of red.

At Fonthill I found another Pentatomid feeding in the same way on the beetles and larvæ.

## GRAIN CROPS, ETC.

HESSIAN FLY (*Mayetiola destructor*). In Peel county many fields of wheat were severely attacked by Hessian Fly. I gathered a considerable number of the puparia but only parasites emerged.

CHINCH BUG (*Blissus leucopterus*). It was a surprise to us to find that the Chinch Bug was right in our midst last summer. In June the nymphs were found destroying the grass in a lawn in Guelph. Later on we obtained as many adults as we needed for class purposes from this same lawn. This is the first time

I have known of its being so far north. Two or three years ago, while on Institute work, a few farmers near Welland told me it had done some damage to their timothy. This year it has been reported from several parts of the province.

## FOREST.

*Chalepus rubra* (?). While camping on the Rideau lakes the last week in July my attention was attracted by the appearance of the foliage on the basswood trees (*Tilia americana*). On several of these the leaves were nearly all dead, having been almost skeletonized by the adults of this beetle. They were still present and were so sluggish that I could have gathered thousands of them without a net.

POPLAR BORER (*Saperda calcarata*). In the same district the poplars (*Populus tremuloides*) were severely attacked by the larvæ of this very large Cerambycid. At that date some of the larvæ were apparently full grown, but had not yet pupated; others were only about half the size of these. The largest were right in the pith of the tree and had made large and long tunnels from where they had entered. Many larvæ were only half-grown.

BIRCH BUCCULATRIX (*Bucculatrix canadensisella*). On the college campus and in the neighbouring woods this tiny insect was very abundant on birch foliage.

*Chermes similis*. So far as I can see, almost all these insects have perished this year on the White Spruce trees at Guelph, although very abundant and destructive last year and fairly abundant this spring. I have no clue to the cause. *Chermes abietis* has not been attacked to the same extent if at all.

DR. HEWITT: I should be glad if Mr. Cæsar would tell us more about his work on the insects of this year.

MR. CÆSAR: I might say that, so far as the Codling Moth is concerned, I am more firmly convinced than ever that the recommendations we have been making for a very careful and even a drenching spray after most of the blossoms have fallen is the right way to treat this insect. Here are two illustrations of what can be done by such a spray. Mr. Jas. E. Johnson, of Norfolk County, has a large 40 acre orchard of trees about 40 years of age. Norfolk is one of the warmest counties in Ontario, and there is a lot of injury done there by the second brood of Codling Moth. Many unsprayed orchards will have as high as 80 per cent. of wormy apples. Mr. Johnson has set to work to free his orchard of the Codling Moth by a single thorough spraying immediately after the blossoms drop. He has two gasoline power outfits. So well has he succeeded that this fall he had, when I visited the orchard at packing time, considerably less than 1 per cent. of wormy apples; in fact, you could visit tree after tree without seeing a single wormy apple either on the tree or on the ground. He used lime-sulphur and arsenate of lead. Some of you will be surprised when I tell you that he applied as high as 10 gallons to a single tree that had had plenty of bloom.

DR. HEWITT: Does not a single, very thorough application appear to be giving quite as good results as several lighter ones, and be at the same time more economical?

MR. CÆSAR: I certainly think so, though until the Codling Moths, in warm districts, are brought thoroughly under control I recommend a second application about three weeks or a little more after the blossoms fall. This is merely to make thorough work of the first brood. It is about this time that the worms are really beginning to enter the apples in anything like large numbers.

Mr. Gibson: Why do you recommend fairly high pressure and so heavy spraying? Does the mixture not run off?

Mr. Cæsar: If you watch the spraying of large trees—and most of our trees are large—you will find that the outer leaves often intervene between the spray and the inner fruits and leaves. Now, I find it almost impossible to get at these more hidden parts without great care and considerable loss of spray. It is here that high pressure comes to the aid and forces the outer leaves aside, driving the spray right through the trees and placing it just where you want it. Again, if a tree has had a great abundance of bloom you will be surprised if you examine your work carefully to find out how very difficult it is to see that every calyx is thoroughly covered; in fact, I do not think you can cover them without what is equivalent to a drenching spray. I do not aim at driving the spray into the inner cavity. I like to do so if I can, but I know I often cannot. It is thoroughness I am after. You will find trees that are sprayed in this way will be much freer from Scab than those where you stop spraying as soon as the leaves begin to drip. As for burning we use the lime-sulphur weak, and, by spraying before the blossoms burst, we keep the leaves free from Scab or insect injuries, and such leaves seldom have any burning.

Mr. Gibson: What strength do you use?

Mr. Cæsar: 2 lbs. Arsenate of Lead to 40 gallons of diluted lime-sulphur. We dilute a lime-sulphur of the strength of 1.310 sp. gr. to the proportions of 1 gal. to 40, by which we mean that we add 39 gallons of water to 1 gal. of lime-sulphur.

This year Mr. Chas. Good and I sprayed two orchards that had not been sprayed for fifteen years. We wanted to test a new district. This was a very hard year to get the work done soon enough, as the blossoms dropped much more rapidly than we expected and the calyces closed in about five days. However, we got one orchard pretty well sprayed. For the Codling Moth we only gave the one application. The well sprayed orchard, so far as I could judge, had an average of 95 per cent. of clean fruit, even on trees where there were very few apples. The Spys in the other orchard were equally as clean, as the calyces on this variety closed last, but some of the earlier varieties had, as we expected, a considerable percentage of worms. I could not visit the orchard in time to see these earlier varieties, so I have to rely solely on what I was told. The orchard was situated near Rockwood, about nine miles from Guelph, so that the percentage of second brood would not be so large as in the Niagara District. One would not expect so high a percentage of clean fruit the first year in the warmer parts of the province. Mr. Johnson's splendid record is the result of three seasons' work and not of one.

Prof. Swaine: Did you get any satisfaction from lead arsenate in controlling Plum Curculio?

Mr. Cæsar: I have not myself performed definite experiments on Plum Curculio. I could not speak for certain on it, but the claim is made by men in the United States that about 50 per cent. of the Plum Curculio can be controlled by the spraying with arsenate of lead when the fruit is just forming, and then again two weeks after.

Prof. Swaine: Two or three of our Quebec apple growers sprayed very thoroughly, and it was said this year it was impossible to control it with arsenate of lead.

Mr. Cæsar: Personally, I rely more upon cultivation and the removal of all sorts of rubbish from the orchard and its surroundings than I do upon spraying, though I believe the spraying helps. I have plenty of proof of the value of cultivation and removal of rubbish.

PROF. SWAINE: Have you any evidence that the presence of plum trees about the edges of apple orchards will tend to draw away the Curculio?

MR. CÆSAR: There do seem to be instances where this is the case.

PROF. SWAINE: I have seen some very interesting examples of this near Macdonald College.

## NOTES ON THE SEASON OF 1911.

REV. THOMAS W. FYLES, D.C.L., HULL, QUE.

### SILVANUS SURINAMENSIS, LIN.

Jan. 13th. Specimens of the Saw-toothed Grain Beetle (*Silvanus surinamensis Lin.*) from Ontario were brought to me. These mischievous little creatures belong to the Cucujidæ. The species is said to have been brought to the Centennial Exhibition in straw goods from Italy. (See An. Rep. Ent. Soc. of Ont. for 1876, page 23). The species is now widely distributed. I found it at Levis in the granaries of the late Joshua Thompson, Esq.

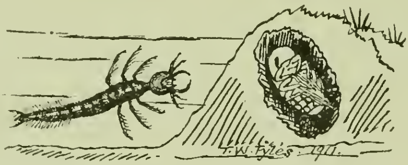

Fig. 23. Larva and pupa of water-beetle (*Dytiscus fasciventris*)—one-half natural size.

### DYTISCUS FASCIVENTRIS, SAY.

May 27th. I caught two larvæ of the Water Beetle (*Dytiscus fasciventris* Say). They were one inch long. When they attained their full growth they were an inch and five-eighths in length. They were sepia-coloured and had a pale dorsal line. The head was large and round and furnished with two formidable nippers 6 millimetres long, and with antennae 10 millimetres. They had a horseshoe-shaped suture on the top of the head. The second segment was small at the neck and enlarged at the base. The three last segments were fringed on either side. The tail was forked and fringed on the inner edges of the prongs. The legs were fringed. The larvæ crept into the earth and assumed the pupal stage on June 12th.

The pupa was an inch long. In colour it was ochreous. The eyes were almond-shaped, black. The legs were free. Two stumpy projections were at the end of the body. The beetles appeared on the 23rd of June.

The Rev. J. G. Wood, in "Insects at Home," Plate III., gives a representation of the full-grown larva of *Dytiscus marginalis*. The Rev. W. Houghton, in "Country Walks of a Naturalist," page 31, represents the same insect in all its stages. Both larva and pupa as represented differ somewhat from those of *D. fasciventris*.

### A Parasite of Datana angusii G. & R.

Last year I found larvæ of *D. angusii* feeding upon hickory. I succeeded in bringing a number of them to perfection. The first of the moths appeared on May 31st last, and others followed; but each of two of the chrysalids produced a lively specimen of *Exochilum mundum* Say. The front of the chrysalis-case broke away to give the parasite exit.

### Basilona imperialis, Drury.

May 31st. An imago of *B. imperialis* appeared in my breeding cage, from a larva obtained in September of last year. Specimens of this fine moth were taken in this locality up to July 11th.

### Phlegethontius cingulata, Fab.

On the 18th of September, a neighbour's son brought me a living specimen of *P. cingulata,* that had been attracted by the electric light at the toll gate, on the Aylmer Road, at the corner of Front Street, Hull.

The specimen was so perfect, so beautifully fresh, that it was hard to believe that it had come from "away down South." And yet, to the best of my knowledge, the larva of the species has never been found in Canada. Indeed, I believe that no capture of the moth has hitherto been recorded in the Province of Quebec.

I am indebted to Mr. A. F. Winn for the following notices of captures of the species which he has found in our Canadian Entomological publications:

"Mr. McIntosh took it at St.John, N.B., Oct. 5, 1902. (See An. Rep. Ent. Soc. of Ont. 1902, page 93.)."

"Mr. Moffat recorded it 30 years ago, from Long Point, Ontario (See Can. Ent. XIII. 256)."

"It was captured at Orono, Maine. (See Can. Ent., XVI, 21) by Mrs. C. H. Fernald."

*P. cingulata* is considered a form or variety of the European *Sphinx convolvuli.* If my memory serves me aright, the European moth has more of a grey or bluish tinge than *P. cingulata.* There is, however, a close resemblance between the two.

In that handsome volume "British and European Butterflies and Moths" by A. W. Kappel and W. Egmont Kirby, on Plate XIII, there is a coloured representation of a larva of *S. convolvuli.* It shows a length of four inches. The dorsal parts of the larva are dark brown; the lower, tawny. The seven oblique side lines are of a darker brown bordered underneath with tawny. The spiracles are black in white rings. The horn is of a dark neutral tint. The larva is represented as feeding upon the small bindweed (*Convolvulus arvensis* L.). Another food plant is said to be *Impatiens noli-me-tangere* (See Stainton's Manual of Butterflies and Moths, page 90).

As food-plants of *P. cingulata* Dr. John B. Smith gives "Morning glory, sweet potato and other *Ipomœa* and *Convolvulus species.*" (Insects of New Jersey, page 387.)

### Another Gelechian.

In the beginning of September, Miss Faith Fyles, B.A., Assistant Botanist for the Department of Agriculture, brought me from a swamp, 25 miles north of Hull, two galls on *Aster junceus* Ait. Each gall was on a stem and was about

6 inches from the ground and 8 inches from the top of the panicle of blossoms. It was fusiform—the length of it was one inch, and the diameter at the widest part half an inch.

The moths from the galls appeared on Sept. 12th and Sept. 15th respectively.

There was not the slightest sign of a web in the galls.

Each chrysalis case was 10 millimetres long, and was of a clear chestnut brown with the four last segments somewhat darker. The wing cases extended to the end of the sixth abdominal segment. The outlines of the antennae and limbs could be plainly traced in the case.

### Description of the Imago.

Expanse of wings 20 millimetres. Length of body 10 millimetres. *Head* brown mottled with grey. *Palpi* recurved (droop in drying) two millimetres long, toothed on the outer edge of the second segment. *Antennae* 6 millimetres in length, filiform, brown. *Thorax* and *abdomen* dark brown—the latter somewhat hoary towards the end. *Forewing* brown—taken through the length, the costal half of the wing is of a warmer brown than the inner half. The end third of the costal half is beautifully streaked with dark brown and rosy grey. *Fringe* of fore wing 3 millimetres deep, has a rosy glow towards the outer angle, and is richly marked with minute brown spots. *Hind wings* dark grey (which dries with a gloss). Fringe light brown, 3½ millimetres long towards the base of the wing. Legs: tibia of the hindmost pair set with long hairs—like circular brushes. Joints of tarsi edged wth grey.

I sent one of my specimens to Mr. W. D. Kearfoot that he might compare it with his moth *G. busckiella,* and he kindly wrote to me: "It is certainly not *busckiella.* In fact, it has no resemblance to it at all, as it is a species with well defined markings, while *busckiella* is rather evenly and finely peppered all over." . . . "I went through the other named species of Gelechidæ, and found nothing that yours can be identified with."

I do not think this moth has been previously described, and I therefore propose for it the name *Gnorimoschema septentrionella.*

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## REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for the year 1910-11.

The forty-seventh annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 3rd and 4th, 1910. There were fourteen members present from a distance as well as a large attendance of the faculty and students connected with the College.

During the first afternoon the reports of the Directors on the insects of the year were read and discussed: papers were read by Mr. L. Caesar on "Insects of the Year in Ontario"; by Dr. C. Gordon Hewitt, on "The More Injurious Insects in Canada in 1910"; by the Rev. Dr. Fyles on "Notes of the Season of 1910"; Mr. H. H. Lyman gave an account of the First International Congress of Entomology which was held at Brussels during the Summer. Reports were read from the Montreal Branch, the Toronto Branch, the Librarian, Curator and delegate to the Royal Society of Canada.

In the evening a large meeting was held in the Massey Hall auditorium, at which there was a good attendance of students and representatives of the College staff as well as of the members of the Society. The chair was taken by Mr. C. C. James, Deputy Minister of the Ontario Department of Agriculture. Prof. James G. Needham, of Cornell University, Ithaca, N.Y., gave an address, illustrated with many beautiful lantern views, on "The Role of Insects in Water Life."

The Society met both morning and afternoon of the following day, when a variety of papers were read and discussed. Officers for the ensuing year were elected, and the Treasurer presented his financial statement. Many specimens of great interest and rarity were exhibited by members. The following are the papers that were read: "Beetles found about Foliage," by Mr. F. J. A. Morris; "The Pool," by Rev. T. W. Fyles; "The Bean Maggot in Ontario in 1910," by Prof. J. E. Howitt; "The Horse-Radish Flea Beetle," by Mr. A. F. Winn; "The Migration of Some Native Locusts," by Mr. Norman Criddle; "The Practical Importance of the Study of Parasitic Insects," by Dr. C. Gordon Hewitt; "The Coccidæ of Canada," and "Aleyrodidae of Ontario," by Prof. T. D. Jarvis; "Some Insects of the Larch," and "Insect Notes from St. Anne's," by Prof. J. M. Swaine; "Basswood or Linden Insects," and "The Entomological Record for 1910," by Mr. Arthur Gibson.

*The Canadian Entomologist,* the monthly magazine of the Society, has been regularly issued at the beginning of each month. The forty-second volume was completed in December last; it consisted of 413 pages, and was illustrated with 8 full-page plates and a number of original drawings. The contributors numbered 67, and included writers in Ontario, Quebec, British Columbia, Manitoba, Alberta, England, many States of the Union, and the Hawaiian Islands.

Meetings of the Society were held during the winter months at the Ontario Agricultural College on alternate Wednesday afternoons. The attendance included several of the more advanced students and much interest was taken in the papers and discussions. The following subjects were taken up during the course of the meetings:

"Aphids," by Mr. A. C. Baker; "Equipment for a Collecting Tour in Europe," by Prof. T. D. Jarvis; "Position of the Mallophaga amongst Insects," by Mr. A. W. Baker; "Sources of our worst insect pests and methods of their distribution," by Mr. L. Caesar; "Woolly Aphids of Ontario," by Mr. Vernon King; "The Saw Flies of Ontario," by Mr. W. A. Ross.

The Council takes pleasure in reporting that the preliminary arrangements for the preparation of a new Catalogue of Canadian Insects have been successfully concluded. The initial steps towards this undertaking were taken at a meeting held on November 4, 1910, and a committee was appointed to take charge of the work of its preparation. The question of publication was taken up by Dr. Hewitt with the Geological Survey and Mr. Brock, with the result that they have consented to publish the list in parts as desired by the committee. Some of these parts are now in the course of preparation.

The members of the council have learned with pleasure of the improved state of health of their esteemed member, the Rev. George W. Taylor, and sincerely hope that he will so continue to improve as to be able again to take up entomological work in the order in which he has earned such a widespread reputation as a student of the Geometridæ.

It is with deep regret that the Council has to record the death of Dr. Samuel Hubbard Scudder, who died at his residence, in Cambridge, Mass., on the 17th of May, 1911, aged 74 years. Dr. Scudder was one of the most distinguished entomologists that America has ever produced, having been the greatest authority of his time on the Orthoptera and on Fossil Insects, and no less eminent as a student of the Diurnal Lepidoptera. He was also a man of the highest culture and refinement of mind, and his lovable, unselfish character attracted to him a great many friends among the leaders of science, art and literature. The high scientific reputation which he enjoyed is abundantly evident from his election to honorary membership in important societies in many European as well as American cities. He was one of the first honorary members of the Entomological Society of Ontario, and a frequent contributor to the pages of the Canadian Entomologist, as well as occasionally to our Annual Reports.

The Council also has to record with sorrow the loss of another distinguished entomologist, Daniel William Coquillett, who died at Atlantic City, on July 8. He was one of our most eminent authorities on the Diptera and in economic entomology held the distinction of having been the first to discover and demonstrate the value of hydrocyanic gas as an insecticide. He was a frequent contributor to the pages of our magazine, and his loss will be keenly felt by all students of Diptera in North America.

Respectfully submitted,

E. M. WALKER,

*President.*

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## ANNUAL REPORT OF THE MONTREAL BRANCH.

The 320th regular and 38th annual meeting were held at the residence of Mr. Henry H. Lyman, 74 McTavish Street, on May 13th, ten members being in attendance.

The Secretary read the following report for the season:

### THIRTY-EIGHTH ANNUAL REPORT OF THE COUNCIL.

Nine regular meetings have been held during the season of 1910-11, the average attendance being eight. One council meeting was held in October to plan a programme for the year.

At the June meeting, we had the pleasure of meeting Miss Hutchinson, of Leominster, England, who gave an interesting account, and showed a brood of larvæ of a European Geometrid moth which have been inbred for 36 years; Prof. Lochhead, of Macdonald College, attended our February meeting and presented a paper on Adaptations between Plants and Insects; and Mr. Arthur Gibson, of Ottawa, was present at the March one, reading a paper on some of the Ceruras, or Puss Moths. We should be glad to have visiting entomologists at our little gatherings even more frequently.

The following list of papers shows in diversity of Branch subjects and in numbers one of the best programmes the Branch has had. It is a pleasure to note that two of these papers are on botanical subjects. Entomology and botany are so closely bound together that we hope for a continuation of references to plants.

President's Annual Address, Henry H. Lyman.
Galgulidae, or Toad-Shaped Bugs, Geo. A. Moore.
A Quest and What Came of It, Henry H. Lyman.
The Borers in the Cat-tail Stems, Albert F. Winn.
Eupithecia consignata, Miss Hutchinson.
A White Variety of the Pitcher Plant, L. Gibb.
Hemiptera Taken at St. Hilaire, May 20, Geo. A. Moore.
The Horse-radish Flea-beetle, A. F. Winn.
Flies at Sugar at Night, A. F. Winn.
On the Genus Grapholitha, Henry H. Lyman.
A Trip to Cobalt, G. A. Southee.
Note on Symmerista albifrons, A. F. Winn.
Hemaris gracilis, A. F. Winn.
Preparation of Noctuid Genitalia, G. Chagnon.
Notes on a few Lepidoptera from Newfoundland, A. F. Winn.
Collecting in the White Mountains, Henry H. Lyman.
Plume Moths of the Province of Quebec, A. F. Winn.
The Nabidæ, or Damsel Bugs, Geo. H. Moore.
Preliminary Notes on Genitalia of Leucania, G. Chagnon.
The Genus Calephelis, Henry H. Lyman.
Parallelia bistiaris, A. F. Winn.
Adaptations between Plants and Insects, Prof. W. Lochhead.
Notes on Life History of Estigmene Prima, A. F. Winn.
Notes on E. Prima, Henry H. Lyman.
The Small Spittle Insects, G. H. Moore.
Entomology and Evolution, Henry H. Lyman.
Notes on Cerura Multiscripta, Arthur Gibson.
Chrysophanus Thoe, L. Gibb.
Exchanges, A. F. Winn.
The Proposed Catalogue of Canadian Insects, Henry H. Lyman.

The plan adopted a few years ago of selecting certain genera for comparison of specimens and study has been continued. The genera Pheocyma, Phyciodes, Colias, Cerura, Calephelis and the family Pterophoridæ have been taken up, and in most cases a good representation of the various species was made from the members' cabinets. Mr. J. W. Cockle of Kaslo, B.C., very kindly sent us his collection of Colias to aid, or perplex us, in this difficult genus.

The donation by Mr. Dwight Brainerd of a number of entomological magazines and pamphlets has added considerably to our library. The set of the Canadian Entomologist is now complete and bound in uniform style. Several other periodicals await binding, and our librarian will soon be asking for another section for the book case.

A field day was held on May 24th at Hudson, Que., but the weather was cool and the grass, etc., wet, so that comparatively little was taken.

The report of the Treasurer shows a balance on hand of $69.83.

Respectfully submitted, on behalf of the Council.

ALBERT F. WINN, *Sec.-Treas.*

Mr. Lyman then delivered his annual address as President, reviewing the work of the Branch during the past two years.

The election of officers was proceeded with, resulting as follows: President, G. A. Southee; Vice-Pres., G. Chagnon; Sec.-Treas. A. F. Winn, Librarian, L. Gibb; Council, H. H. Lyman, G. A. Moore, E. C. Barwick.

Mr. Lyman exhibited a number of boxes of tropical butterflies, particularly from India and Africa, among which were many strikingly beautiful and curious pieces.

## ANNUAL REPORT OF THE TORONTO BRANCH.

The 160th regular and 15th annual meeting of the Toronto Branch was held in the Biological Building on Thursday, Oct. 19, 1911, the president, Dr. Walker, in the chair.

The minutes of the previous meeting were read and approved. The annual report of the Secretary-Treasurer was read and approved also. In the course of the year eight meetings were held. The average attendance was seven. Two new members were added to the membership. The collections of insects belonging to the Branch have been transferred to and are now a part of the University Biological Museum.

The following papers were read:

**Oct. 20.—Dr. Walker, "The Egg-laying habits of the Odonata."**
**Nov. 10.—Paul Hahn, "Fight against Tussock Moth in Toronto."**
**Dec. 8.—A. Cosens, "Some Curious Habits of Lepidoptera."**
**Jan. 12.—J. B. Williams, "The Insect House in Zoological Gardens, Regent's Park."**
**Feb. 16.—C. W. Nash, "Wild Life in Town Gardens."**
**Mar. 9.—Dr. A. R. Abbott, "Protective Resemblance in Insects."**
**Dr. Walker, "Mating Habits of Odonata."**
**April 20.—Dr. Walker, "Some Injurious Forest Insects at De Grassi Point in 1910."**
**Dr. Walker, "The Proposed Catalogue of Canadian Insects."**
**May 11.—J. B. Williams, "Mimicry in Insects."**

The officers elected for the year 1911-12 were as follows:

President, Dr. Walker; Vice-Pres., Mr. A. Cosens; Sec.-Treas., Arthur Smith; Librarian, J. B. Williams; Council, Dr. Abbott and Messrs. Hahn, Craigie and Morris.

Respectfully submitted,

ARTHUR SMITH, *Secretary.*

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## CURATOR'S REPORT.

During the year the Society's collections have been increased by the gift of eighty-two good mounted specimens of Orthoptera by our President, Dr. Walker. This order was poorly represented so that Dr. Walker's kindness will be much appreciated by the members.

As we have very few Diptera and are still in need of many Hemiptera, any member of the Society who can spare named specimens of either of these orders would be conferring a favour on the Society and help to fill a long felt want.

During the year several members of the Society have visited Guelph solely to examine the collections as an aid in investigations they were making. The Entomological staff and Senior Biological students of the College also frequently refer to them for identification purposes.

The cases have all been examined from time to time during the year and precautions taken to prevent injury from museum pests or other causes.

Respectfully submitted,

L. CAESAR, *Curator.*

## THE REPORT OF THE LIBRARIAN.

During the year ending October 31st, 1911, eight-eight bound volumes have been added to the Library, making the total number on the register 2106. This is a much larger number of additions than in any previous year for a long time. The Treasurer had more funds available for the purposes of the Library this year than usual and we were, therefore, enabled to purchase some valuable and expensive works, as well as to bind a considerable number of periodicals.

During the year a card catalogue as regards authors has been made of the bound volumes and will be found useful to those who wish to consult the library. It will be necessary, however, to make a similar card index to subjects to make the means of reference complete.

A further improvement has been made by sorting out and arranging a large number of bulletins and periodicals in pamphlet cases; 150 were procured and now the publications of experimental stations have been arranged according to states and countries. This will facilitate reference very much.

Among the additions made may be mentioned the following works:

Sir George Hampson's "Catalogue of the Lepidoptera Phalaenae in the British Museum," Vol. IX.
Kirkaldy's "Catalogue of Hemiptera—Heteroptera," Vol. I.
Blatchley's "Coleoptera of Indiana."
Gray's "Nomenclature of Coleoptera in the British Museum."
Gray's "Catalogue of Longicorn Coleoptera in the British Museum."
Douglas & Scott's "British Hemiptera—Heteroptera."
Kirby's "Synonymic Catalogue of Orthoptera."
Theobald's "Monograph of the Culicidae of the World."
Cameron's "Monograph of British Phytophagous Hymenoptera," 4 vols.
Buckton's "Monograph of British Aphides," 4 vols.
Sir John Lubbock's "Monograph of the Collembola and Thysanura."
Michael's "British Oribatidae and British Tyroglyphidae."
Also a Series of the Proceedings of the Entomological Society of Washington, 12 vols.

The library is constantly made use of by the senior students and members of the staff of the Ontario Agricultural College, and is of the utmost assistance to them in their entomological work.

Respectfully submitted,

CHARLES J. S. BETHUNE, *Librarian.*

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## REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

PROF. J. M. SWAINE, MACDONALD COLLEGE, QUE.

As a delegate from the Entomological Society of Ontario, I have the honour of presenting this report.

In general the Society has had a very successful year. There appears to be a decrease in the membership of one or two of the Branch Societies, but it is hoped that young members may be obtained to carry on the work so well done by the older men, now gradually dropping out.

The field offered by our immense territory for scientific research in Entomology, and for practical application of knowledge so acquired is almost unlimited. The great number of our insects, the ease with which they may be everywhere collected, their rare beauty of form and colouring, their complicated structures, interesting modifications, and remarkable metamorphoses which have thrown so many sidelights on problems in evolution make the study of entomology as fascinating as any upon which the young zoologist can enter. The great destruction wrought by so many of our insect pests renders the studies of the Economic Entomologist absolutely necessary. Along both these lines the Society is doing active work.

I am glad to report that the library and collections of the Society are gradually increasing in value.

The forty-seventh annual meeting was held at Guelph on November 3rd and 4th, with a good attendance of the active members. An account of the papers read, and of the discussions, will be found in the Annual Report of the Society, to appear in a few days. The following items from the programme of the meeting will indicate the nature of the work presented.

"The spread of Diseases among Plants, Animals and Man, by Acarids," by Professor Jarvis; "Leaf-eating Beetles," by F. J. A. Morris; "Collecting in the White Mountains," by H. H. Lyman; "The Bean Maggot in Ontario in 1910," by J. E. Howitt; "Notes on some Insects of 1910," and a paper on "The Pool," by Dr. T. W. Fyles; "The Horse-radish Flea-beetle," by A. F. Winn; "Further Notes on Basswood Insects," and "The Entomological Record for 1910," by A. Gibson; "Some Observations on the Practical Importance of Parasitic Insects"; "Parthenogenesis among Bees," by Dr. Hewitt; "Notes on the Breeding of Tropidopria conica," by G. E. Sanders, of Ottawa; "Scolytid Beetles attacking the Larch," by J. M. Swaine; "The Migration of some Native Locusts in Manitoba," by N. Criddle.

The annual lecture was given by Professor Needham of Cornell University. He discussed "The Role of Insects in Water Life." In an eloquent and instructive address, illustrated by lantern slides, Professor Needham explained to the Society the work in an entirely new field of economic research now being carried on at Cornell under his direction. The dry lands of the west are being reclaimed by irrigation. Before their canals are finished, Professor Needham's work will have shown the way to the utilization of great tracts of marsh and swamp, now utterly useless.

The Society's publication, the Canadian Entomologist, has appeared regularly, and continues to be one of the most valuable of Entomologic journals. Dr. E. M. Walker, the present editor, is maintaining the high standard set by his predecessor, Professor Bethune. The forty-second volume, which closed in December, 1910, contained over 400 pages, eight full-page plates, besides text figures, and nearly 100 articles.

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## THE BRITISH COLUMBIA ENTOMOLOGICAL SOCIETY.

I take pleasure in recording this year's proceedings of the British Columbia Entomological Society. The meeting was held in the Aberdeen School, Vancouver, on December 9th, 1911. Mr. Wilson acted as chairman and an interesting programme was rendered. The following were the papers presented:

Report from the Okanagan District, E. P. Venables.
Report from the Kootenay District, G. W. Cockle.
Report from the Vancouver District, A. H. Bush.
Insects of the Year in B. C., T. Cunningham.
Life History of the Narcissus Fly, P. Norman and E. A. Wallace.
Extract from Annual Report of Dr. C. Gordon Hewitt, Dominion Entomologist, Relative to the Narcissus Fly.
Insects Imported into B.C. on Nursery Stock, W. H. Lyne.
Bombycia improvisa Edw. and its Congeners, G. O. Day.
Climatic Influences at Work in the Province Affecting Plant and Insect Life, T. Wilson.

The evening closed with an excellent illustrated lecture by Dr. S. Hadwen, Dominion Veterinarian, "Agassiz on the Life History of the Ixodoidea."

Some of the more important features brought out at the meeting were as follows:

The Diamond Backed Moth is rapidly becoming a serious enemy to cabbage-growing in the Okanagan District. This year it was parasitized by a species of Ichneumon.

In the Kootenay District the Black Cherry Aphis was very prevalent, but in reality proved a blessing in disguise in that the excessive growth which is usually necessary to remove by pruning had been checked without injuring the condition of the trees.

Root maggots caused considerable loss to the market gardener in the Kootenay, as they did on the lower mainland.

Mr. Cockle reported a remarkable outbreak of cutworms in June and early July. Many species were in evidence, the most common being *Mamestra canadensis.*

Mr. Cunningham contended that the Oyster Shell Bark Louse—*Lepidosaphes ulmi*—was the worst pest the orchardist has to fight. He advocated the general destruction of wild crab apple trees as a means of effectually combating this insect. The fruit growers of British Columbia are particularly blessed by an absence of any very serious orchard insect, the Oyster Shell Scale being by far the worst.

The Narcissus Fly is a very serious pest to commercial bulb growing on Vancouver Island. Its presence is not so much noted on the mainland. This is another insect imported from Europe and it was contended that the life history in British Columbia, in several vital ways, differs markedly from its habits in Holland The "recurvus" and "barii conspicuus" types of narcissi are most subject to attack.

The following insects have been recorded as being imported into British Columbia on nursery stock:

*Aspidiotus perniciosus.*
*Aspidiotus ostreaformis.*
*Aspidiotus ancylus.*
*Aspidiotus forbesi.*
*Aspidiotus rapax.*
*Aspidiotus aurantii.*
*Aspidiotus citricola.*
*Aulacaspis roseæ.*
*Chionaspis furfura.*
*Lepidosaphes ulmi.*
*Mytilaspis citricola.*
*Saissetia oleæ.*
*Lecanium armeniacum.*
*Icerya purchasi.*
*Pulvinaria innumerabilis.*
*Pseudococcus citri.*
*Pseudococcus longispinus.*
*Schizoneura lanigera.*
*Aphis persicæ niger.*
*Aphis mali* (eggs).
*Hyalopterus pruni* (eggs).
*Mysus cerasi* (eggs).
*Ceresa bubalus* (eggs).
*Notolophus antiqua* (eggs).
*Alsophila pometaria* (eggs).
*Sanninoidea exitiosa.*
*Anarsia lineatella.*
*Thyridopteryx ephemeræformis.*
*Euproctis chrysorrhœa.*
*Porthetria dispar* (1 egg cluster).
*Sitotroga cereallela.*
*Chrysobothris femorata.*
*Saperda candida.*
*Agrilus sinuatus.*
*Agrilus ruficollis.*
*Schistoceras hamatus.*
*Prionus laticollis.*
*Tenebrio molitor.*
*Calandra sp.*
*Scolytus rugulosus.*
*Xylocrius agassizii.*
*Bembecia marginata.*
*Diastrophus nebulosus.*
*Bryobia pratensis* (eggs).
*Eriophyes pyri.*

Mr. Day extended the conviction that *Bombycia improvisa* and *B. fasciata*, at first thought to be varieties of one moth, are two distinct species.

Mr. Wilson presented an interesting paper on the Distribution of Plant and Insect Life. His paper, together with that of Dr. Hadwen, will appear in the publication on the proceedings now in process of being printed. Copies of the proceedings can be had on application to the Secretary (25c.)

The following officers were elected:

Hon. President, G. W. Taylor; President, T. Wilson; Vice-President, E. O. Day; Secretary, R. C. Treherne, 1105 Broadway W., Vancouver, B.C.; Advisory Board, Messrs. Wilson, Day, Treherne, W. H. Lyne, R. S. Sherman, J. R. Anderson.

Respectfully submitted,

R. C. TREHERNE, *Secretary.*

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## EVENING SESSION—THURSDAY, NOV. 23rd, 1910.

A public meeting was held at 8 o'clock, p.m., in the Massey Hall Auditorium, which considering the inclemency of the weather was fairly well attended by members of the Society, students of the College, and Macdonald Institute, and visitors from the town. The chair was occupied by President Creelman, who opened the meeting with a short address of welcome in his usual cordial manner. Dr. WILLIAM RILEY, who was to have been the speaker of the evening was unfortunately prevented by illness from being present, but his place was ably filled by Dr. Hewitt, whose interesting address on "Insect Scourges of Mankind" was illustrated by many excellent lantern slides.

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## INSECT SCOURGES OF MANKIND.

[An Abstract from the popular lecture by C. GORDON HEWITT, D.Sc., Dominion Entomologist, Ottawa.]

Most of us are accustomed to consider insects in their relation to man, as affecting his crops, forests and other natural products. The last few years, however, have witnessed a most remarkable development in the study of insects as affecting man himself. Few people realize that it was not the hostility of native tribes nor the impassable nature of tropical forests that prevented the opening up of Africa to the white man, but the presence of a few species of insects, which we now know to be the carriers of the causative organisms of certain diseases fatal to the white intruder. The presence of the disease-bearing mosquito played a more important part in preventing the construction of the Panama Canal by the French than the lack of financial support. It is safe to say that the discovery of the important relationship of insects to man has been more responsible in compelling people, especially statesmen, to entertain a true conception of the importance and value of entomological knowledge than any other aspect of economic entomology. When we see in a country such as India over a million people dying annually from Malaria, and in a portion of Uganda over one hundred thousand natives killed in three years by the Sleeping Sickness, even indifferent men are compelled to agree that entomological knowledge plays a serious part in the welfare of mankind. The ultimate destiny of man, I take it, is the overcoming of the antagonistic forces of nature and of these forces, as we all know, insects constitute an important section. In spreading over the world, the white man has proceeded in a blundering fashion, obsessed by the idea of his own ability to overcome all obstacles, and he has been compelled to pay a heavy price for his pride. Finally, he is forced to tread the thorny path of knowledge, and to learn only by diligent inquiry the means whereby he can rectify the errors of the past and prevent their recurrence in the future. Time will not permit more than a brief account of two diseases which have had a most profound influence on mankind. These are the Sleeping Sickness and Malaria.

Before describing the nature and cause of the Sleeping Sickness, it is necessary to discuss another disease, the discovery of the cause of which led up to the discovery of the causative organism of the Sleeping Sickness.

African travellers for years have been well acquainted with a certain fly known as Tse-tse Fly, which occurs in certain parts of Africa in districts known as "Fly Belts." The presence of this fly rendered impossible the use of horses as beasts of burden, and its bite was also known to be fatal to cattle and dogs. It was not until 1895 that Col. Bruce, by means of series of patient investigations, discovered that the deadly nature of this fly was due to the fact that it was the carrier of a microscopic parasitic organism to which the name of "Trypanosome" was given. He showed that "Nagana," as this disease of cattle is called, was due to the inoculation of the animal by the fly with a species of Trypanosome.

Although domestic animals are highly susceptible to the disease, he found that the native big game such as buffaloes, antelopes, etc., normally carried these parasitic organisms in their blood without experiencing any ill effects as they, by long selection, had become immune and they served as reservoirs from which flies obtained the organisms. In 1901, the dread disease of Sleeping Sickness was first noticed in Uganda, and the severity of the disease is indicated by the fact that in a single island, Buvuma, the population was reduced from twenty-two thousand to eight thousand in a very short time, and in Busoga the deaths in one year from the disease numbered twenty thousand. A disease of this character was bound to attract the attention of the responsible governments, and investigations were immediately initiated. Col. Bruce was sent to Uganda, and he found in the cerebro-spinal fluid of natives suffering from the disease a species of Trypanosome. His previous work on Nagana led him to the belief of a possible relationship of a biting fly to the disease, and he immediately had collections of biting flies made throughout the entire region north of Lake Victoria Nyanza. He also mapped out the localities in which the disease occurred. As a result he found that the incidence of the disease corresponded with the distribution of a certain species of Tse-tse Fly (*Glossina palpalis*). The species which was the carrier of the causative organism of the cattle disease, Nagana, was *Glossina morsitans,* and these Tse-tse Flies of the genus *Glossina* are nearly related to our own Stable Fly, *Stomoxys calcitrans.* Col. Bruce was able to show by a series of experiments that the Tse-tse Fly was able to transmit the disease to healthy monkeys. The Trypanosome was found in the blood of natives, but did not appear to do much harm until it reached the cerebro-spinal canal, where it gave rise to the disease, Sleeping Sickness. The initial stages of the disease were accompanied by a strong disinclination to work on the part of the natives. The lymphatic glands became swollen, and in the end the patient sank into a state of deep lethargy and absolute helplessness and died. Since Col. Bruce made his discovery a continuous series of investigations have been carried on in Uganda, with a view to discovering the habits of the fly and the nature of the disease. The chief preventive measure which so far has been adopted is the removal of the natives from the shore of the Lake and the islands, and the clearing of the bush around the shore of the lake. It was found that these were the localities most frequented by the fly.

The other disease, Malaria, is far more widely spread than Sleeping Sickness, and is responsible for a far greater mortality. There is no doubt that of all diseases it is the most serious, and has had the greatest effect on the distribution of the white man. The disease and its symptoms have been known for over two thousand years, but it was not until 1895, through the researches of Ross, that it was discovered how the disease was carried. In 1880, a French army surgeon, Laveran, when examining the blood of a soldier suffering from Malaria in Algiers, discovered the microscopic organism inside the red blood corpuscles which proved to be the causative organism of this disease. This small organism belongs to some of the lowest types of animal life known as *Hæmamœba,* but notwithstanding its low organization it was found to have a marvellous life-history. It was not until fifteen years after its discovery that the rest of its life-history and the means by which it was carried from man to man was discovered by Ross in India, and by others subsequent to his discovery. The idea that the mosquito might take a part in the transmission of the disease, however, was not unknown, and had been previously suggested by King in the United States and Manson in England. Briefly stated, the life-history of the parasitic organism is as follows: When the malaria mosquito, which has previously sucked the blood of a malarial person, punctures the skin of a new person, it injects a number of microscopic needle-like organisms or spores which penetrate the red blood corpuscles, and there lose their needle-like shape and change into *Amœbulæ.* These organisms feed on the interior of the red corpuscles and destroy the same. In doing so they increase in size until they almost fill the cell or corpuscle, and then break up into a large number of spores which are cast into the blood to reinfect other red corpuscles. When they are cast out, a certain amount of pigmented matter known as melanin is cast into the blood and gives malarial patients their characteristic colour. This breaking up of the malarial organism to form spores induces the fever, as all the spores of one lot of *Amœbulæ* are cast into the blood fluid at the same time. In the different types of fever this breaking up into spores or sporulation takes place at different periods. In Tertian fever it occurs every forty-eight hours, and consequently the feverish attack manifests itself every second day. In Quartan fever the feverish attack takes place every third day. If some of the blood of a person suffering from Malaria is taken up by a mosquito the malarial organism now passes through a complicated series of changes. Instead of breaking up into spores in the normal way the *Amœbulæ* assume a dimorphic character, one kind containing a single nuclear body and corresponding to the female cell and the other containing several nuclear bodies and corresponding to the male cells. On the surface of the male cells long filaments are formed into which the nuclei pass. These filaments, corresponding to spermatozoa, break off and unite with the female cells to form a single cell known as the Zygote. This process takes place inside the stomach of the mosquito, but now the Zygote becomes motile and bores its way through the wall of the mosquito's stomach on the outside of which it forms a cyst. This cyst gradually increases in size, and the growth in size is due to the remarkable changes taking place inside, where the nucleus of the Zygote divides and a number of smaller bodies are formed. From these, still smaller bodies are formed which become needle-shaped in character, until at length the whole cyst is filled with a mass of needle-shaped bodies which are spores. The cyst then bursts and these spores are liberated into the body cavity of the mosquito, which, of course, is a blood cavity. The minute needle-shaped spores are carried on to the salivary glands and bore into the salivary ducts, with the result that, when the mosquito bites another person, large numbers of the small spores of the malarial organism are pumped, together with the salivary fluid, into the puncture, and thus enter the blood system of another person, who, in consequence, may develop the fever. The natives in malarial countries are usually immune to the effects of the malarial organism, and may be compared to the big game which are carriers of the organism of Nagana. It has been found that babies and infants act very largely as carriers of the organism, and the percentage of children infected decreases as they grow older, until after twelve years of age they may be rarely infected. Such infected children, of course, will serve as reservoirs of the disease.

With the discovery that the mosquito was the carrier of the causative organism of the disease, the question of the prevention and eradication of malaria resolved itself into the problem of the eradication of the mosquito, and this, in turn, practically implied the destruction of the breeding-places of the mosquito. The mosquito, as is well-known, has an aquatic larval stage. The larvæ living in the water on microscopic organisms are compelled to come to the surface to breathe. By covering the surface of the water with a thin film of oil, such as kerosene, the breathing of the mosquito larvæ is prevented, and consequently they are killed. The chief means, therefore, which are generally adopted for destroying the mosquito are the draining of marshes and other places where water collects and serves as breeding places, and also the treatment of permanent standing water with kerosene or crude oil. In addition, human habitations are screened to prevent the entrance of the mature mosquitoes. Standing water around houses, however small it may be in quantity, has to be treated, as the mosquitoes breed in most unlikely places. The success which has followed the adoption of anti-mosquito measures is remarkable.

In Havana, which at one time was a "white man's grave," Yellow Fever, which is carried by a species of *Stegomyia*, has been eradicated since the United States authorities commenced in 1898 a campaign against the mosquito. The United States Government is now able to construct the Panama Canal, owing to the mosquito control measures which they have adopted, and the same tale of the reduction in the number of cases of Malaria is told wherever preventive measures have been adopted.

To my mind, these facts indicate, among other things, how important a bearing a very small entomological fact may have on the welfare of man. How little did he, who first discovered the way in which the mosquito larva breathes, think that millions of lives would be saved through taking advantage of the phenomenon he observed, and this fact illustrates how great significance may be attached to an entomological observation, though it may have appeared small when it was made. The investigations on Sleeping Sickness and Malaria have demonstrated most strongly the necessity of complete studies with regard to the life-histories and bionomics of insects, and have given a foremost place to entomological investigation among those sciences upon which we shall have to depend for our future welfare.

In conclusion, I would commend the following passage written by that foremost English scientist, Sir Ray Lankester:

"The defiant, desperate battle which civilized man wages with nature must go on. But man's suffering and loss in the struggle—the delay of his ultimate triumph—depends solely on how much or how little the great civilized communities of the world seek for increased knowledge of nature as the basis of their practical administration and government."

At the close of the lecture, which was listened to with great interest and attention by those present, the Chairman (President Creelman) expressed the thanks of the audience to Dr. Hewitt for his instructive address in a warm and hearty manner, which was emphasized by the applause that followed. He spoke of the respect he felt for the type of man who is content to spend his life quietly and patiently carrying on scientific investigations, such as those described by Dr. Hewitt, and, though unobserved and unappreciated by the general public, yet doing a work of inestimable value to humanity.

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## SECOND DAY'S SESSION—FRIDAY, NOVEMBER 24th, 1911.

At about 9.30 a.m. the members of the Society met in the Museum of the Biological Department and spent a pleasant hour in the examination of the many interesting specimens which they had brought for exhibition.

Mr. Gibson, in illustration of his paper on Blister Beetles, exhibited a case containing representatives of the different species which occur in Canada. These are described in his paper in this report. He also showed some interesting lepidoptera, viz., *Gonodontis warneri*, Harv., from Humboldt, Sask., *Hydriomena ruberata*, from Saskatoon, Sask., and *Sciagraphia atrofasciata*, *Sciagraphia continuata* and *Macaria labradoriata* from Ottawa.

Mr. Swaine exhibited a collection of Ipidæ, including the adults and work of our more interesting species from Eastern Canada. Among the species represented were *Chramesus icoriæ*, Lec.; *Crypturgus atomus*, Lec.; *Dendroctonus simplex, Lec.; D. valens, Lec.; D. piceaperda*, Hopk.; *Dryocœtes affaber*, Mannh.; *D. autographus*, Ratz.; *D. eichhoffi*, Hopk.; *Dryocœtes*, n. sp., from larch; *Eccoptogaster piceæ*, Swaine; *Gnathotrichus materiarius*, Fitch; *Hylastinus obscurus*, March; *Hylesinus aculeatus*, Say; *Hylesinus*, n. sp., from basswood; *Hylurgops pinifex*, Fitch; *Ips balsameus*, Lec.; *I. cœlatus*, Eich.; *I. calligraphus*, Ger.; *I. grandicollis*, Eich.; *I. pini*, Say; *I. borealis*, Swaine; *Phlœsinus dentatus*, Say; *Phlœotribus liminaris*, Harris; *P. piceæ*, Swaine; *Pityogenes*, n. sp., from pine; *Pityophthorus capiniceps*, Lec.; *P. consimilis*, Lec.; *P. lautus*, Eich.; *P. opaculus*, Lec.; *P. minutissimus*, Zimm.; *Polygraphus rufipennis*, Kirby; *Pterocyclon fasciatus*, Say; *P. mali*, Fitch; *Hylastus salebrosus*, Eich,; *Trypodendron betulæ*, Swaine; *T. politus*, Say; *T. retusus*, Lec.; *Xyleborus dispar*, Fabr.; *Xyleborus serratus*, Swaine.

Mr. Winn exhibited a number of interesting Lepidoptera, as follows:—

*Incisalia eryphon*, from Hymers, Ontario; *Falcaria bilineata*, from Dawson City, Y.T.; *Xylina amanda, hemiria, thaxteri* and *baileyi*, from Hymers, Ont.; *Autographa rectangulum*, from East Bolton, Que.; *A. surena*, from St. George's, Newfoundland; a series of 25 specimens of *Cenopis pettitana*, showing range of variation of fore wings from immaculate white, through yellow, spotted and banded, to reddish brown; a male *Colias philodice*, with the right hind wing only about one quarter the size of its mate, but not creased or crumpled in any way; and another male of this species, taken on August 25th, at St. Hilaire, Que., expanding only 1⅛ inches.

Mr. Cæsar exhibited the following: Six species of borers from recently fallen white spruce; some parasites and predaceous foes of the same; a species of *Chalepus*, apparently *C. rubra*, found attacking the foliage of the bass wood; *Perillus bioculatus*, var. *claudus*, taken at Guelph; the Black Vine Weevil (*Otiorhynchus sulcatus*), taken at Guelph, on Strawberry; the Apple Curculio (*Anthonomus quadrigibbus*), taken on haws at Grimsby; an undetermined Buprestid from galls on the American Aspen (*Populus tremuloides*); *Cryptorhynchus lapathi*, taken at Guelph; specimens of the Palmer Worm (*Ypsolophus pomotellus*) reared at Guelph; the Gartered Plume Moth of the Grape (*Oxyptilus periscelidactylus*) taken at Stoney Creek; and some tineids reared from the Cat-tail Flag (*Typha latifolia*).

Mr. Evans exhibited 102 specimens of Lepidoptera, about 70 of which were micros, the remainder about equally divided between the Noctuidæ and the Geometridae. Of the specimens belonging to the latter two families, the names of those that are of special interest are included in the Entomological Record. Mr. Evans also showed a specimen of the curious "Stem-eyed Fly," or "Hammer-headed Fly" (*Sphyracephala brevicornis*, Say).

Dr. Walker exhibited a number of specimens of wood-boring larvæ and their work, in illustration of his paper on "Some Forest Insects from De Grassi Point, Lake Simcoe."

At about 10.30 o'clock the members withdrew to the Biological Lecture Hall, where, after the reading of the Presidential Address, the election of officers for 1911-1912 took place. A list of these has been given on page 6. The remainder of the forenoon and the afternoon were devoted to the reading of the papers which appear in the following pages.

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## ANNUAL ADDRESS OF THE PRESIDENT.

Edmund M. Walker, University of Toronto.

I have the honour of welcoming you to-day to the forty-eighth annual meeting of the Entomological Society of Ontario. Forty-eight years is a very respectable age for a learned society in a young country such as ours, and when we look back upon its vigorous history and steady growth, it is no wonder if feelings of pride arise within us. Let those of us of the younger generation, however, not permit such feelings of pride in the achievement of our society become feelings of self-satisfaction; let us always remember that the success which is the portion of our Society to-day, and the status that it occupies in the entomological world are mainly due to the struggles and patient toil of our pioneers, Dr. Bethune and Dr. Saunders, and to such of their fellow-workers as Dr. Fyles and Mr. Lyman, and to the tireless energies of our late lamented friend, Dr. Fletcher. With the wealth of facilities for the study of our science which we are privileged to enjoy at the present time, we are too apt to forget the difficulties and discouragements that were the lot of the earlier entomologists in Canada.

It is, however, not so much the past history of our Society, nor the progress of Canadian Entomology that I wish to consider to-day as the possibilities of the future development of our science in Canada. In other words what is the nature and scope of the field for entomological work in Canada at the present time?

In dealing with such a broad question as this we have to bear in mind not only the work that has been and is being done by entomologists in Canada, but also that of our neighbours to the south, whose assistance has always been most freely and generously given, and to whom a very large part of our success is due.

In the United States entomology has gained greatly in prestige of late years, and is now an important subject in the curricula of many of the Universities as well as the Agricultural Colleges. There are now in the United States, together with Hawaii and Porto Rico, no fewer than sixty-one Agricultural Colleges and experiment stations, at forty-seven of which investigations in applied entomology are being carried on. In Washington, the appropriations made for the current fiscal year for all the different phases of work of the Bureau of Entomology, amounted to $601,920.00; the scientific employees of the Bureau number 185 and besides these there are nearly 400 non-scientific employees, particularly in connection with the Gipsy-moth work.

Of course we cannot expect to see anything comparable to this in Canada for many years to come, but there is no doubt that, with the present rapid growth of population in our West, and the ever-increasing area of cultivated land, correspondingly greater facilities will be needed for the teaching and dissemination of the most advanced methods in agriculture and horticulture, and hence in the control of the insect pests of the farm, the orchard and the garden.

When our land is more fully occupied and farming methods have become more intensive, more attention will doubtless be given by the average farmer to such problems as the control of insect pests, but it is the duty of the economic entomologist to do all in his power to spread abroad his knowledge of such subjects before it is demanded of him. Excellent work, as we all know, has already been accomplished along these lines by the staff of the Division of Entomology at Ottawa, the Ontario Agricultural College, through our own Annual Reports and the various agricultural and horticultural journals, as well as through the Nature Study movement in our schools; but we need more well-trained workers and there is a great field for useful work in this branch of entomology for all who are willing and able to give their time and energies to it. It is, in fact, this branch of entomology that is most closely identified with our every-day lives and will appeal to the largest section of the public, and it is therefore the one that will always be, in a sense, the leading branch in an agricultural country like Canada.

But there is another branch of economic entomology, that has as yet received comparatively little attention in Canada, but which is scarcely of less importance than the preceding. I refer to forest entomology.

We have only recently become fully alive to the fact that our forests are not inexhaustible, and we are now hearing from authoritative sources that our forest wealth has been grossly exaggerated. We hear a great deal about the reckless waste of our timber resources through improvident methods of lumbering that utterly disregard the needs of future generations, and we are tired of hearing of the disastrous fires which follow in the wake of the lumberman's axe, and frequently destroy as many as twenty trees for every one that is felled by the lumberman.

Few realize, however, the important part played by insects in the destruction of our forests, and the close relationship that exists between forest fires and injurious outbreaks of insects. Dr. Hopkins, of the United States Bureau of Forestry, our leading authority on Forest Entomology, has shown that not only do many species of wood-boring beetles appear in large numbers after forest fires, killing many trees that would otherwise recover, and rendering others unmarketable by their excavations and hastening decay by permitting the entrance of wood-destroying fungi; but that fires are often secondary to outbreaks of insects, which leave the dying or dead trees in a favourable condition for the spread of fire. Many square miles of burned-over areas in the Rocky Mountains were primarily the result of the attacks of wood-boring beetles.

In his admirable bulletin on the genus *Dendroctonus,* which includes the most injurious enemies of our coniferous forests, Dr. Hopkins has also shown that while many species at times attack living trees when present in unusually large numbers, certain forms, notably the Black Hills Beetle (*Dendroctonus ponderosæ,* Hopk.), actually prefer healthy to weakly trees and may be the cause of the destruction of the best timber over many square miles of territory. He has further demonstrated that outbreaks of this kind may be prevented or brought under control if prompt measures of the proper kind be taken. The methods employed, however, vary according to the particular species involved, so that it is necessary to have a precise knowledge of the species in question, and of its habits and life-history. It is information of this kind that is lacking respecting most of our forest insects in Canada. We want accurate knowledge of the characteristics of each species, in order that nearly allied species, of perhaps very different habits and economic importance, may not be confused; we want to know their complete life-histories, their seasonal and geographical distribution, the number of broods, their enemies, the species of trees they attack and the effects they produce thereon; in fact all we can learn about them. Only in this way can the best methods for their control be determined.

Surely there is a splendid field here for the young entomologist, who is anxious to take up a useful as well as attractive subject as his specialty. The study is not an easy one. Nearly allied species in some of the groups such as the bark-beetles (*Scolytidæ*) are often exceedingly difficult to separate; life histories are often difficult to follow out and material sometimes hard to obtain; nevertheless, the patient, accurate worker in this field will certainly be rewarded with results that are well worth the labour spent upon them and may, perhaps, be of much benefit to the community.

Fortunately, we are not entirely without workers in this field in Canada. Prof. Swaine, of Macdonald College, is well known for the excellent work he has accomplished in the study of our bark-beetles (*Scolytidae*). He has published a number of valuable papers in the Canadian Entomologist, and our Annual Reports, and we feel sure there are many more forthcoming. Much credit is also due to the staff of the Division of Entomology at Ottawa for their work on the parasites of the Larch Saw-fly and Spruce Bud-worm, two of the most serious defoliaters of forest-trees in Canada. Dr. Hewitt's work in importing and distributing *Mesoleius aulicus,* a European parasite of the Larch Saw-fly, is of a very important character, whether the experiment is successful or not, for our only hope of getting control of this terrible pest is through the agency of its natural enemies. The Division also deserves credit for the vigorous campaign it is pursuing against the spread of the Brown-tail moth, which has, unfortunately, now become firmly established in New Brunswick and Nova Scotia, whence it has spread from the adjoining New England States. The ravages of this moth and the Gypsy-moth (*Porthetria dispar*) are too well known to need mention here. Both have been introduced from Europe without their natural enemies to keep their numbers in check, and though their ravages have been the cause of the loss of hundreds of thousands of dollars to the State of Massachusetts alone, and at the present time no effort is being spared by the United States Bureau of Entomology to bring the pests under control. We in Canada have had the benefit of their experience in dealing with this great problem, and it is gratifying to know that the knowledge thus gained is being so vigorously put into practice by our friends at Ottawa.

While thus emphasizing the importance of applied entomology, we must not lose sight of the value of the systematist's work. The economic entomologist deals with insects irrespective of the orders to which they belong and as it is no longer possible for anyone to have an intimate systematic knowledge of all the orders, it becomes necessary for the economic entomologist to depend in large measure upon the systematists in the various orders for the determination of the species with which he has to deal, although it is, of course, true that in many cases the investigator must have first hand information from both standpoints.

On the other hand, the systematic student should be more than a mere classifier of genera and species. Nothing in entomology, except nomenclatural disputes, can be drier than the grinding out of new species and varieties by the man who knows them only by their dead carcasses. The good systematist is a good deal more than a mere separator of genera and species. He is interested in the ecology of the forms he studies, their distribution and the significance thereof, and he keeps the phylogenetic standpoint ever before him in his work of determining specific and group characters. The whole aim of classification being the expression of the natural affinities of organisms, he who fails to observe this point in classifying genera and species has altogether missed the mark.

In Canada there is an immense field for the systematic entomologist in all orders. Some of the orders have been fairly well marked in certain localities of limited area, and a good deal of information on the distribution of species is gradually being accumulated by the Entomological Record, which was first established by the late Dr. Fletcher in the Annual Report of our Society for 1901, and is now conducted by Mr. Gibson. Most of the smaller orders, however, such as the Neuroptera, Plecoptera, Ephemerida and Trichoptera, have been almost wholly neglected by Canadian entomologists, and the scant knowledge we possess of their occurrence and distribution in Canada is chiefly the result of casual captures made by general collectors and determined by specialists in the United States. Among these smaller orders, the Neuropteroid orders as they are collectively termed, are some such as the Ephemerida and Trichoptera that are not only exceedingly interesting in their habits but are of considerable economic importance in furnishing food for fish, a fact that will be appreciated by those of us who had the pleasure of hearing Prof. Needham's address here last year. He showed us how much of the waters of our large swampy areas might be utilized for fish-culture and their productivity increased by the introduction and propagation of suitable species of may-flies. The importance of our inland fisheries and the growing need of exact knowledge of the feeding habits of our fresh-water fishes are urgent reasons why these groups of aquatic insects should receive more attention in Canada than they have done heretofore.

There are still other branches of applied entomology that offer plenty of problems to the entomologist in Canada. The relation of insects to public health is a subject of importance in every civilized community and the great benefit to humanity that has been gained by such discoveries as that of the relation that the mosquito bears to malaria and yellow fever and the house-fly to typhoid fever and summer diarrhœa of children is now a matter of common knowledge. Fortunately our northern climate renders us comparatively free from the parasitic diseases that are habitually transmitted by insects, but we have the house-fly question ever before us and our domestic animals are all more or less subject to diseases caused or carried by insects, mites and ticks, and there is much to be learned about the life-histories and methods of control of such forms.

Finally, we should at least mention that important aspect of entomology which regards the study of insects not for its own sake nor in its relation to the material needs of mankind, but in relation to the broader science of biology. Insects have contributed some of the most striking illustrations of many of the phenomena that have served to establish the truth of the theory of descent, and have furnished useful material in the investigation of the problems of heredity and the causes of variation and in the analysis of sex. But though these questions are from the standpoint of pure science, vastly more important than any of those we have been considering, they belong rather to the domain of general biology than to entomology, so that we may dismiss them, merely with the comment that they represent an immense field for investigation, full of possibilities of important discovery.

The thought of all there is to do in Canada in entomology, and the comparative ease with which new discoveries can be made here should act as a stimulus to the young student. I say "comparatively" advisedly, for it must not be thought that any good entomological work can be done easily. It is just as difficult, nay more so, to do really good work in a virgin field, as in one that has been long and carefully investigated. The new field has only the advantage of opportunity. The field in entomology in Canada, from the scientific, if not yet from the financial standpoint, is full of opportunity, and we believe that the next decade will witness a steady increase in the demand for the services of well-trained, practical investigators.

Much, we believe, will be done to encourage Canadian Entomology by the publication of the new Catalogue of Canadian insects, which is now in the course of preparation. Now that the question of publication is settled—and the thanks of all of us are due to Dr. Hewitt for bringing this about—it is to be hoped that each and every one of the collaborators will do his utmost to make the catalogue a success and that every collector in Canada may do something to help in making it as complete as possible. In this way we can all do a little for the advancement of entomology in Canada.

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## SOME INJURIOUS FOREST INSECTS AT DE GRASSI POINT, LAKE SIMCOE.

E. M. Walker, Toronto, Ont.

During the past three years I have spent a part of each summer at De Grassi Point, Lake Simcoe, Ont., where I have been gathering part of the nucleus of a collection of forest insects and their work for the Museum of the Faculty of Forestry in the University of Toronto.

During the season of 1911 this work was greatly accelerated by what was in all other respects a most unfortunate calamity. On June 11 the Point was visited by a terrific windstorm, which wrought great havoc in the woods in this neighbourhood, uprooting and snapping off many hundreds of trees. Woods of second growth poplar were knocked over like ninepins, and trees of all kinds suffered greatly; even sound red oak, over a foot in diameter, being laid low by the terrible force of the elements.

Many of the fallen trees were already weakened by the attacks of insects, among which the Carpenter Ant was most conspicuous, while others, previously sound, now offered favourable conditions for the entrance of various species of wood-boring beetles.

My remarks here, however, will not be confined to such species as were concerned in the effects of the storm, but will include any forms that have been conspicuous for their numbers or the injuries they have caused to forest trees in this locality.

De Grassi Point is a summer resort on the west shore of Lake Simcoe, about three miles from its upper or southern end. It comprises an area of about 350 acres, and has an almost rectangular shore-line, about a mile in length, of which about one-half forms the northern, the other half the eastern boundary. A considerable portion of this area, including the apex of the point, is somewhat higher than the surrounding land, and is composed of a mass of till or glacial clay, well covered with soil and plentifully strewn with boulders, mostly of Laurentian Gneiss. On this clay area is a beautiful grove of tall red oaks, forming next the shore a broad belt among which the summer cottages stand.

Back from this grove there are pastures with scattered trees and bushes, and also much densely wooded land. Owing to the peculiar topography of the place a great variety of forest types are represented in a very limited area.

Extending southward, nearly parallel with the east shore, is a low sand-covered ridge, from which the land slopes gently on each side. The predominant trees on this ridge are white pine and red oak, both of which at one time grew to magnificent dimensions here. There are still a few hoary giants of the latter species, upwards of three hundred years old and still alive, though long past their prime.

On the east side, where the ridge is but a few hundred yards from the shore, the slope is comparatively rapid, the land being thus fairly well drained and supporting for the most part a typical hardwood forest. The prevailing trees here are sugar maple, elm, basswood, red oak, white ash, large-toothed aspen, balsam fir, hemlock and a few beech, yellow and white birch, black cherry and ironwood, and in the spring the rich black soil is starred with magnificent trilliums, adders-tongue, hepaticas, squirrel-corn, etc.

On the other side of the ridge the land is almost level and the forest-types of a very different character, and one which changes gradually as one strikes through the woods to the north shore, the change indicating an increasingly wetter soil. Balsam poplar, aspen, white birch, white cedar, balsam fir, tamarack, white spruce and white pine are the prevailing trees. The higher parts were burned over many years ago, and poplar, birch, cedar and balsam are now the chief trees here, though vigorous young white spruce and some young pine are also coming up.

As we approach the shore tamarack becomes more abundant and black spruce appears, and then we enter a belt of tamaracks among which very few other trees grow. Near the western boundary of this swamp a sluggish creek makes its way to the lake, and its presence brings about other changes in the vegetation. As we near the creek the tamaracks thin out and become smaller, small willows and various shrubs appear, and then we traverse a dense zone of ericaceous shrubs (Cassandra and Andromeda) before coming out upon the broad open marsh which borders the creek near its mouth. The deposits from the creek at its mouth and the action of the winter ice have formed a patch of drier land here, which is continued along the shore as a narrow marginal ridge. Here the trees are different from those in the swamp behind, being mostly cedar, balsam, white spruce, silver maple, black and green ash, with large willows about the margin of the creek.

These woods have been, on the whole, very free from serious attacks by insects for many years past. The only insect that has been responsible for the killing of trees in large numbers is the Larch Saw-fly (*Lygaeonematus erichsonii* Hartgn.). which has been with us for about twelve years. Well do I remember its first appearance at De Grassi Point, although I am not sure as to the exact year. It was either 1898 or 1899, though they may have been present in small numbers a year or two earlier. Up till this time, part of the tamarack swamp was one of

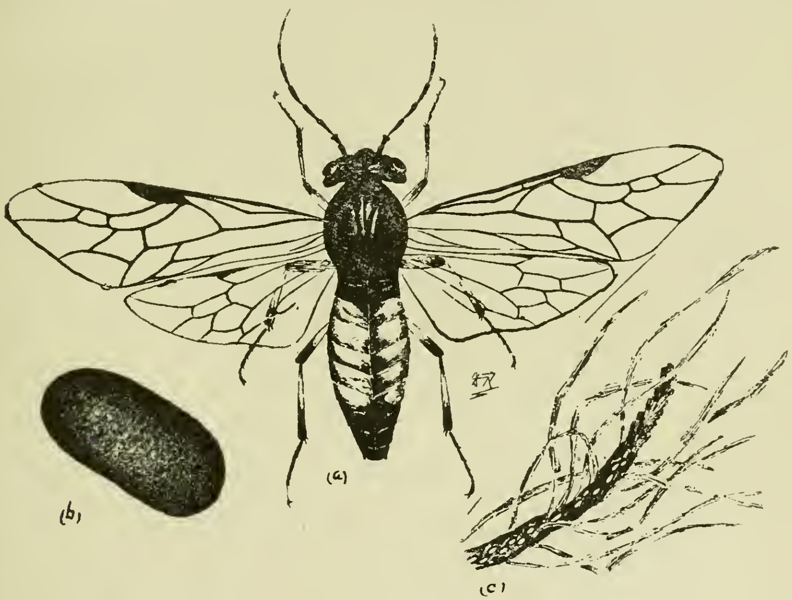


FIG. 24. Larch Saw-fly—*a*, adult; *b*, cocoon; *c*, terminal twig of larch, showing eggs in slits made by the female saw-fly.—*a* and *b* much enlarged.

the loveliest spots I have ever seen. This was a part near the creek where the trees, though not large, grew fairly closely together, but offered glimpses of beautiful vistas between their grey trunks and soft feathery green foliage. No fallen trunks obstructed one's way and the ground was carpeted with deep sphagnum moss and soft grasses, among which pitcher-plants, clumps of the Showy Lady's-Slipper, the beautiful Calapogon and the fragrant Pogonia, besides a number of other orchids, grew in profusion.

In the summer of 1898 (if this year be correct) I visited the swamp, as I do every year, and found to my horror that most of the trees were nearly bare and infested with myriads of greenish-grey false caterpillars, the larvæ of the Larch Saw-fly. The scattered trees in the pastures were but little affected, many of them untouched, but next year the attack was more severe and the trees were everywhere more or less infested, and ever since then until last year there has been no perceptible decline in the numbers of the pest. Every year the trees were stripped nearly bare and the mature ones, of which there were quite a number, soon began to die. I began to despair of the situation until 1910, when I noted a considerable improvement in the condition of the trees although the larvæ were still disgustingly abundant.

This year (1911) I was delighted to find that they had practically disappeared. Once more the tamaracks retained their beautiful soft foliage throughout the season.

Another saw-fly that has been troublesome of late, though in no way comparable to the Larch Sawfly, is Leconte's Saw-fly (*Lophyrus lecontei*, Fitch). (Fig. 25 is a closely related species.) I first noticed it in 1909 in a grove of young pines about 10 to 18 years old, which have grown up in a part of the pasture that had been fenced in for a few years, thus protecting the seedlings from the cattle a sufficient length of time to give them a start in life. They were confined to a very few trees growing near together, and although one or two very young trees

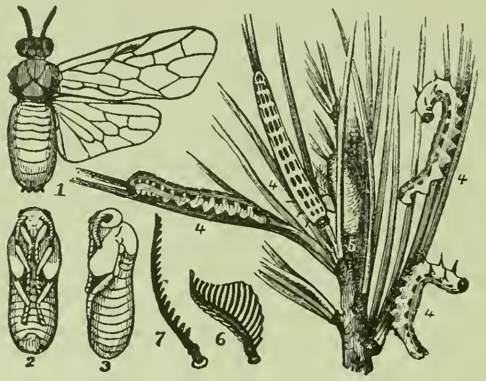

**Fig. 25.—Abbott's Saw-Fly** (*Lophyrus abbottii*).

were nearly stripped very little other damage was done. In 1910 they appeared again at the same spot but in larger numbers, and affecting more trees. We removed every larva we could find, but on another group of pines about one hundred yards away, which had also been attacked, most of the larvæ were out of reach. As a result there were very few larvæ found in 1911 in the first spot, but on the other one several fairly large red pines were bady defoliated. They occur on both species of pine, but seem to prefer the red.

In 1909 I confined a number of the larvæ but obtained only half a dozen cocoons, which were spun among the pine needles, although the normal habit is to spin underneath leaves and rubbish near the surface of the ground. Although I did a good deal of searching for cocoons under the affected trees I found but two, one of which had been parasitized. Nothing emerged from the bred cocoons, probably because they had been kept too long indoors.

The same grove of young pines in which Leconte's Saw-fly was first found has also been abundantly attacked by the White Pine Weevil (*Pissodes strobi*, Peck). For the last three years I have removed all the infested shoots I could reach with a long pruning hook, but no apparent good resulted as most of the work was done in August, when a large percentage of the beetles had already escaped, and as no provision was made for the liberation of parasites. This season they were rather more abundant than usual, about one-third of all the trees in the grove bearing at least one infested shoot and many having two or three.

This insect particularly affects young bushy trees growing in the open, and the female ovipositing in the spring always selects one of the terminal shoots of the previous season's growth, generally the leading one. The new shoots grow to a certain extent, varying according to the number of larvæ present. I have sometimes found shoots apparently containing only one or two individuals, whose subsequent growth had not been noticeably retarded, but as a rule they droop and die long before they have attained their full length.

I have never seen a red pine affected by this insect, but this summer I found a young white spruce, whose terminal shoot had been killed, apparently by this weevil. It was growing among the pines of the same grove in which the weevil was so common.

Another insect that was more abundant than usual in white pines in the season of 1911 is the Pine-bark Aphid (*Chermes pinicorticis*, Fitch). In 1910 I noticed a single tree about eight inches in diameter, the bark of whose trunk was almost covered on one side by the white flocculent material secreted by this aphid. One other tree near by was also affected, though to a much less degree, but no others were seen on which this insect was present to any noticeable extent. This year the

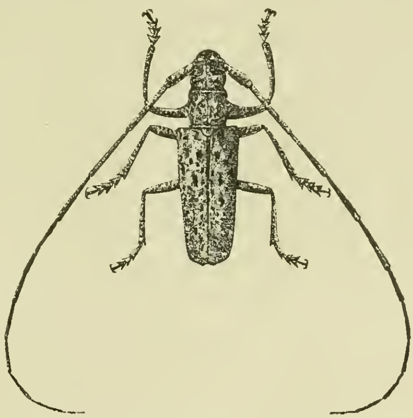

Fig. 26.—*Monohammus confusor*—Male.

*Chermes* was found on quite a number of trees on the ridge, but it is still rather local. It seems to prefer the smooth bark of the trunk but also occurs on the branches and may attack saplings two or three feet high, as well as larger trees. One side, apparently the most sheltered, is generally more thickly covered than the rest.

When I first saw the diseased trees about the end of July the aphids had already disappeared, but as the flocculent material is left upon the bark their former presence is readily detected. No apparent effects in the vigour of these trees could be detected, and in fact the white pine is on the whole a very healthy tree at De Grassi Point. A number of young trees were affected by a twig blight in 1910, but this did not reappear to any extent in 1911, and the unusual number of spittle insects in the former season also failed to assert themselves during the summer of 1911.

As a result of the windstorm, however, a number of fine white pine were uprooted or had their tops or even the upper half snapped off. When I first went to the Point, near the end of July, these fallen trees already harboured hosts of bark beetles and *Monohammus* larvæ. The bark beetles were chiefly *Ips pini*, Say, and *Pityogenes sp.*, a very common, though as yet undescribed, species. The former was extremely abundant in all fallen trees, occurring along the entire length of the trunks and in branches down to about two inches in diameter. The largest trunk in which they were found were about eighteen inches in diameter, though the bark was not very thick and the trees probably not more than about 80 years old. No pitch tubes were present in any of the trees, in fact there was nothing to indicate that any of them had been attacked before the storm occurred.

The first work of this species that I saw was on July 29. On this date the majorty of the mines contained larvæ that were mature or nearly so, but pupæ and young adults were also numerous. On the other hand a few of the galleries contained very young larvæ, just beginning their mines, and there were still a few female adults running their primary galleries. On Aug 8 and 12 mature larvæ, pupæ and pale young adults were all abundant, but there were still a few adults of the first generation about. By the end of the month most of the beetles had emerged but they were still quite numerous under the bark.

A few specimens of *Ips caelatus,* Zimm., were associated with *I. pini* in some of the trees, but no signs were noted of the presence of *I. calligraphus,* Germ., a species that is very abundant at Toronto, where the pines are all dying about the city, though not as a direct result of their attacks. This was probably simply due to the fact that no very old trees were blown over in the storm, and it is the thick bark of old trees that is chiefly affected by *I. calligraphus.*

The little *Pityogenes sp.* was extremely abundant in recently dead branches and upper parts of the trunk of white pine at De Grassi Point. I found a prostrate pine about eight inches in diameter near the base, the inner bark of which was a perfect network of galleries of this species along its entire length. It was associated except in the smaller branches with *Ips pini* which was almost equally abundant. The galleries are very regular and the primary ones unlike those of the *pini* are run transversely to the axis of the stem, the lateral mines being for the most part straight and perpendicular to the primary galleries. The species is of little or no economic importance on account of its attacking only the smaller dead trunks and branches.

Resembling this species considerably in size and general appearance and in the character of its work is *Ips balsameus,* which is found in considerable numbers in the trunk of a balsam fir which had fallen in the storm. This tree had been a very vigorous one and was nearing its prime when its life was thus suddenly cut off. Larvæ, pupæ and imagoes were found throughout August and were still present when I left early in September. This was the only balsam in which I found this bark beetle. Several other fallen treees were examined, but the only borers found were larvæ of *Monohammus* which were universally present.

These were also abundant in all of the fallen pines, but were for the most part small, doubtless having hatched from eggs deposited the same season. In one of the large trunks, however, many large larvæ were found which must have entered the trunk during an earlier season. Some of them were found in large excavations under the bark, but others had penetrated deep into the wood. No adults or pupæ were seen.

The only other injurious insect that has been noticeably abundant in late years upon the conifers at De Grassi Point is the Spruce Gall Aphid (*Chermes similis,* Gill.). The loose twisted galls of this aphid are exceedingly common on white spruce at Lake Simcoe, especially on sickly stunted trees. Whether they are in some measure the cause of the unthrifty condition of such trees or simply prefer trees of poor vitality I am uncertain, but they are often abundant also in otherwise vigorous-looking spruce. The affected twigs are generally killed but sometimes recover, leaving only a twist in the branch.

In the season of 1910 the galls were very numerous on some of the scattered trees on the sandy ridge, but some seemed quite free from them. The black spruce in the swamp near the creek were also heavily infested with galls, which I took to be the same but which may be *C. floccus,* Patch, as I have not seen the adult aphids. In 1911 scarcely a gall was to be found on either white or black spruce.

In 1910 I came across *Chermes abietis,* L., for the first time in this district. In Toronto the two species *similis* and *abietis* are almost peculiar to the white and Norway spruce respectively, and I had never seen *abietis* on any other spruce. I found it, however, in considerable numbers on a single, large white spruce, grow-


FIG. 27. *Chermes similis*—*a*, nymph; *b*, gall on spruce.

ing in the open on the sandy ridge at De Grassi Point, and although many other trees were near at hand I could not find a single gall of *abietis* on any one of them. On the other hand, *C. similis* was present on the other trees but not on the one which bore the galls of *abietis.* In 1911 a few galls of *abietis* were taken from two or three white spruce widely separated from one another.

Fallen spruce were as yet very little injured by borers. The common spruce borer *Polygraphus rufipennis,* Kirby, was taken but once. Perhaps next season will yield a larger number of wood-boring beetles.

Of the insect enemies of deciduous trees at De Grassi Point, the only species that has been very conspicuous for its injuries during the past few years is the Birch-leaf Skeletonizer (*Bucculatrix canadensisella,* Chamb.). This insect was particularly abundant in 1910 and 1911, when practically every birch leaf was the home of several of the little caterpillars. About the end of July, this season, I first began to notice the work of the young caterpillars, and by the end of August the birch leaves were pretty well skeletonized and many of the larvæ were spinning their curious elongated ribbed cocoons. Caterpillars were constantly falling from a birch overhanging the cottage verandah and spinning their cocoons upon the floor, and in the cracks between the boards. The birch leaves turned yellow and fell very early this season, possibly as a result of the attacks of these larvæ.

Birch and several other trees were also attacked this year by large numbers of lace-bugs (*Corythuca arcuata,* Say). These insects puncture the leaves chiefly about the midrib and larger veins on the underside, thus rendering them pale and patchy in appearance.

Of wood-boring insects the one whose work was by far the most conspicuous is the large black carpenter ant (*Campontus herculeanus,* L.). A good many trees that were blown over by the storm were more or less weakened

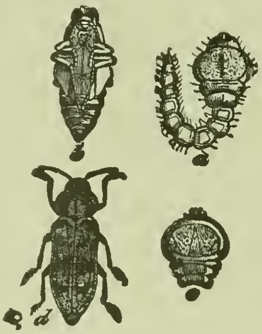

**Fig. 28. Flat-headed Borer—larva, pupa and beetle.**

by the work of this insect. It does not attack the living wood but excavates irregular galleries in the dead heart wood, thus weakening the tree and rendering it unmarketable. Pines, balsams, poplar and red oak were all conspicuously attacked by this ant, particularly the trees on the wooded part of the sandy ridge, where most of the pines and many other trees showed basal wounds, the result of ground fires many years ago. Some of these wounds had been completely closed by the new growth of tissue, but the dead wood beneath was, in all cases examined, honeycombed by carpenter ants.

Fallen oaks were not yet attacked to any extent by borers. A few young cerambycid larvæ of an undetermined species were found under the bark of one sound tree, only recently dead, but, with this exception and that of the ants, the only wood-eating insects found in the oaks were a number of larvæ, one pupæ and several imagoes of the small stag-beetle (*Ceruchus piceus,* Web.). These were taken from the rotten and partly decayed heart-wood of a large tree which was still alive when it was blown over in the storm.

In several fallen balsam poplars were found a considerable number of larvæ of a *Chrysobothris,* which I take to be the common flat-headed borer (*C. femorata,* Fabr.), many of which were too large to have entered the trees during the same season. Most of the grubs were found about the end of August in their flat irregular excavations in the inner bark and superficial layer of the wood, but some had begun to extend their galleries deeper into the wood .

Occurring with the *Chrysobothris* in the balsam poplar and also in the large-toothed aspen were a good many specimens of a very long, slender Agrilus-like Buprestid larva, which I have not yet had determined. The galleries of the larva were likewise slender and extended regularly with the growth of the grub. They generally followed an exceedingly tortuous course. The grubs were fully as numerous where found as the *Chrysobothris.* Many young specimens of the latter were also taken from a small elm, which had been uprooted in the storm.

Of the larger trees none suffered in the storm so severely as the basswood. The few remaining trees of the original forest were practically all laid low. Many of these were rotten at the centre and some weakened by carpenter ants, but, except in one tree, I found scarcely any evidence of the recent work of borers. In one fairly large tree, however, I found many half grown cerambycid larvæ, possibly those of the linden borer (*Saperda vestita,* Say), and two scolytid mines, containing larvæ, and one of them a single adult. This was submitted to Prof. Swaine, who reports it to be a new species of *Hylesinus,* related to the western *H. aspericollis.*

In conclusion I wish to express my sincere thanks to Prof. Swaine for his kindness in determining for me the species of Scolytidæ mentioned in this paper.

## THRIPS AFFECTING OATS.

C. Gordon Hewitt, D.Sc., Dominion Entomologist, Ottawa.

Reference was made by me at our last annual meeting to the injuries caused to oats by some species of Thrips and as further observation have been made during the past season concerning the injuries of these insects, it seemed to me that a useful purpose might be served if this subject were discussed a little more fully.

During the last year or two we have received frequent inquiries regarding the "blighted" appearance of the heads of oats and a number of specimens were received, in one or two of which dead Thrips were found, but it was impossible to determine the species with certainty. The injuries were reported from various provinces from Nova Scotia in the east to British Columbia in the west. A correspondent on Vancouver Island stated that over 50 per cent of a fourteen-acre field of oats were attacked. On some heads of oats received from Saskatchewan, from 50 to 70 per cent. of the ears were destroyed, and generally it would appear that the injuries are on the increase. During a visit to Washington early in the year Mr. F. M. Webster, of the Bureau of Entomology, showed me a single record of Thrips attacking oats, the species being *Anaphothrips striatus,* Osborn. An investigation into these injuries was begun during the present summer, my attention being confined to the oats grown in the seed plots at the Central Experimental Farm at Ottawa, where it was found that the species commonly occurring and obviously responsible for the injury was the Grass Thrips, *A. striatus;* Dr. W. E. Hinds very kindly confirmed my identification. A second species, *Euthrips nervosus,* Uzel, was also found in small numbers. The Grass Thrips commonly attacks Kentucky Blue Grass (*Poa pratensis*), and Dr. Fletcher has recorded in 1882 and 1892 the occurrence of the "white top," produced by this insect's injuries, in *P. pratensis* and also in one or two other grasses such as Timothy (*Phleum pratense*) and Couch Grass (*Triticum repens*). The investigations showed that the blighted appearance was caused by the fact that the insect injuries produced sterility in the ears and the young and adult insects were found feeding on the flowers, especially on the ovaries which, of course, produce the grain. It was further found that these injuries take place while the inflorescence is enclosed in the leaf sheath, and on this account the lower ears of the inflorescence are usually the ones to be injured and rendered sterile, as they remain longer in the leaf sheath. In further support of this it was found that where the top of an inflorescence has been held by the leaf sheath, as is sometimes the case, the apical ears may be sterile. Specimens of both these types of injury will be seen in the cases which I am passing around. With a view to ascertaining the extent of these injuries, stalks of different varieties of oats were collected and the number of sterile and perfect ears on each stalk were carefully counted. It may be remarked that in order to eliminate a cause of error resulting from the unintentional selection of stalks unusually affected, an equal number of stalks were collected by one who was ignorant of the purpose for which the oats were required. It is not intended to give here the complete results of this statistical study, but the following facts may be of interest.

The most severely injured variety of oats on the average was "Banner M," 19 heads of which variety had an average of 36.3 per cent. of sterile ears. The least attacked was "Abundance, Garton's Regenerated," 11 heads of which gave

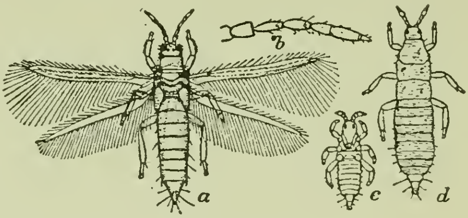

Fig. 29.—Thrips.

an average of 17.3 per cent. sterile ears. The maximum percentage of sterile ears in all the heads examined was 56.8 per cent. in a head of "Banner M." The minimum percentage of sterile heads was found in a head of "Banner H," of which 3.5 per cent. were sterile.

From these figures it will be realized what a serious effect the injuries caused by these insects may have on the yield and to what extent their injuries may reduce the number of bushels produced, as no other cause of the sterility of the ears could be discovered.

The Grass Thrips *Anaphothrips striatus,* is a very small insect measuring about 1-16th of an inch in length and of a yellowish, or brownish-yellow colour. The adults are provided with four narrow wings which are fringed with hairs, hence the name of the group *Thysanoptera.* They are also called *Physopoda,* on account of their possession of bladder-like feet, from which they derive their German name "Blasenfüsse." Their nourishment consists of the juices of the flowers and plants and their mouth parts are very peculiar in that they are adapted for both sucking and biting. The life history of this species has been previously worked out by Hinds. The females will continue to deposit eggs and young larvæ may emerge up to the time the snow falls, when the adults hibernate. Their resistance to a low temperature appears to be very great, as they can withstand an exposure of minus 21 degrees F. In the spring, soon after the snow disappears, the females, which have passed the winter in the leaf sheaths of young plants, become active and begin to deposit their eggs. In the spring the eggs hatch in ten to fifteen days; in the summer they will hatch from four to seven days after deposition. The larvæ are similar in general form and appearance to the adult except in the possession of wings. They become full-grown in the spring in about two weeks but in the hot days of summer the larval stage may be completed in four days. The whole life cycle occupies from 12 to 30 days. The first winged adults usually appear in May or June. An interesting point in connection with this species is that it is parthenogenetic, that is, the eggs will produce young without fertilization; Hinds has examined thousands of specimens of the species and has been unable to discover the male. The ability of the female to deposit eggs which will develop into young without the necessity of fertilization by the male increases the reproductive power of the species enormously and we have in this insect a similar phenomenon to that with which you are already acquainted in the case of the Aphides, whose extraordinary fecundity is due, in a large part, to the parthenogenetic character of the female.

Feeding as this species does on wild grasses of various species, which flourish in abundance everywhere, it will be readily understood that its control will be a matter of considerable difficulty, as the Thrips migrate from one species of a plant to another. The only method of control which will ever give any appreciable results on a large scale are methods of cultivation and farm practice. The destruction of weeds, especially those belonging to the family Gramineæ, is essential. The Thrips appear to hibernate in places where they have been feeding, such as the stems of grain which have died down, in crevices of the ground or under rubbish, and the best method of attacking the insect in the hibernating stage is by burning over the grass or stubble in the fall or the deep ploughing of the soil. These two methods may be employed conjointly. Korolikoff, who has been studying the different species of Thrips injurious to cereals and grasses in Russia, near Moscow, recommends the sowing of strips of such crops as rye or oats round the field under cultivation. These "bait" crops, as they might be termed, are sown about a fortnight before the time of the sowing of the winter cereals in order that they will be the first to attract the Thrips and afford them shelter while the crops are growing. They are afterwards cut and their removal results in the removal of a large proportion of the Thrips.

As I remarked, however, at the outset, this investigation has only just begun and my statements are only in the nature of a report on progress in the hope of enlisting the assistance of any of the members, should an opportunity occur to them of supplying us with information which might be useful.

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## THE STREAM.

Rev. Thomas W. Fyles, D.C.L., Hull, Que.

Come, track with me this little vagrant rill,
Wandering its wild course from the mountain's breast;
Now with a brink fantastic, heather-drest,
And playing with the stooping flowers at will;
Now moving scarce, with noiseless step and still;
Anon it seems to weary of its rest,
And hurries on, leaping with sparkling zest
Adown the ledges of the broken hill.

So let us live. Is not the life well spent
Which loves the lot that kindly Nature weaves
For all inheriting, or adorning, earth ?
Which shows light pleasure over true content,
Blossoms with fruitage, flowers as well as leaves,
And sweetens wisdom with a taste of mirth ?
—*Thomas Doubleday.*

It was "a land of brooks of water, of fountains and depths that spring out of valleys and hills."

In one of the brooks I had a particular interest, for it ran through my own meadow, and under my windows, and bounded two sides of my garden. A quarter of a mile beyond, it "turned a mill."

I had in those days what the poet Samuel Rogers desired when he wrote:—

"Mine be a cot beside a hill;
A bee-hive's hum shall soothe mine ear;
A willowy brook that turns a mill,
With many a fall shall murmur near."


Fig. 30. Cray-fish.

One day I resolved to trace the stream to its source. I found that it was not the discharge of a mountain tarn, as many a brook in that part of the country is. Like the River Thames, in England, it took its rise in a spring, and increased in volume from the outflow of other springs, and from the surface drainage of the hill-sides.

One of the tributary springs was near my house. It had been "cleaned out" and a bottomless half-barrel inserted; and this was always full, and running over, with pure, translucent water. The movement of the sand at the bottom of it could be seen as the water bubbled up.

One day, on looking in, I noticed two creatures crawling over the sandy bottom of the spring; they were Cray-fish. I fished them out and placed them in a vessel of water, that I might observe them closely. What strange creatures they were! They had nippers like the scorpion; stalk-eyes like the chameleon, antennæ like an insect, and fan-tails like the birds. They seemed a freak of Nature.

It was interesting to watch the backward movement of the cray-fish to escape a threatening object—it was made by an undersweep of the tail. Meanwhile, the creature never came into collision with anything behind it. It kept one eye on the point of danger, and turned the other upon its way of retreat. The eyes played in grooves which served as squints.

After the brook became a feature of the landscape it passed through a small beaver-meadow. The beavers had long since been exterminated, and their dam broke down, but the remains of it could be traced. This meadow was a valuable possession, for here the owner cut the winter fodder for his few cows. The Blue-joint Grass (*Calamagrostis canadensis,* Beauv.) grew in it; and it is not bad "feed."

The farmer returning to his home, through the meadow, on a dark night, saw what he took to be a tree-stump a short distance from him. He crossed the stream and reached his dwelling. There the thought struck him,—*Why, there is no stump there.* In the morning he went down to see. There *was* no stump; but, in the soft ground near the brook, he found the foot-prints of a large bear which had followed him so far.

On a certain occasion, sitting by the brook in an idle mood, I wrote these lines:

See, where the rippling rill with many a bound—
    Restless, as is a lambkin in its play,
    Amid the verdant meadows winds its way—
A band of ribbon on a velvet ground.
Now glancing gaily o'er the pebbled shallows,
    Now, in a deeper channel, slowly gliding—
    Fondly lingering, but ne'er abiding.
        It may not stay.
Where yellow-lilies made its mimic waves their pillows,
    And arrow-heads its bosom pierce.
        Now 'tis hiding
Amid the meadow-sweet, and flags, and willows,
    And now, with current fierce,
        It breaks away.

In those days the little stream abounded with Brook-trout (*Salvelinus fontinalis*). The speckled beauties lay hid in every eddy, and under shelter of every stone. I often rose at daybreak and caught a dish of them for breakfast.

It is said that the Black Fly is an enemy to the fish; certainly it is not a friend to the fisherman. *It* will bite, and bite freely, whether the fish will do so, or not.

Harris, in "Insects Injurious to Vegetation," page 601, describes our Canadian Black Flies under the name of *Simulium molestum.* Baron Osten Sacken, in the "American Entomologist and Botanist," page 229, gives an interesting account of their "Transformations," and Oskar Augustus Johannsen, in part 6, of Bulletin 68, "published under direction of Ephraim Porter Felt" in 1903, well describes many kinds of these blood-thirsty little creatures. There is a host of them We are quite satisfied with those that favour us—we have no desire to witness additions to their numbers.

After leaving the mill that I have mentioned, the stream passed through an "intervale" of considerable dimensions. This was a grand place both for plants and insects. In it grew the Queen of all our Orchids,—*Orchis spectabile,* L., glorious with its large scroll-like blossoms washed with carmine. The Marsh Marigold (*Caltha palustris,* L.), the Purple Loosestrife (*Nesæa verticellata,* H.B.K.), the Field Lily (*Lilium canadense,* L.), the Large Blue Flag (*Iris versicolor, L.*), the Larger Bur Marigold (*Bidens chrysanthemoides,* Mich.), all common, but all showy, did their best—each in its season—to

"Make so gay the solitary place."

On a day in July, when passing through the intervale, I saw a good-sized dark caterpillar scuttling away before me. I captured it, and in a day or two it turned to a chrysalis. Early in August there came from it the rare and beautiful moth, *Darapsa versicolor,* Harris. The specimen is now in the Provincial Museum at Quebec. The food-plant of *D. versicolor* is the Button Bush (*Cephalanthus occidentalis,* L.). The late Rev. Dr. George D. Hulst bred this species from the egg, and described it in all its stages. (See Can. Ent., Vol. X., p. 64.)

That beautiful butterfly, the Baltimore Fritillary (*Euphydryas Phaeton,* Drury) was found there. Its larvæ are gregarious and hibernate in a web. Their food-plant is the "Turtle Head" (*Chelone glabra,* L.).

Looking down upon this intervale, from one of the neighbouring hills, one calm summer night, I witnessed a wonderful spectacle: spread out, as it were, over the valley, was an undulating sheet of fire. Myriads of the beetle *Photinus coruscus,* L., were sporting at a height of a few yards from the ground, and so multitudinous were they that their flashes seemed continuous.

Passing along the banks of the stream in its broader reaches, the water plants took one's attention.

There was that remarkable diœcious stemless plant the *Vallisneria spiralis,* L., with leaves like green ribbons growing under water. Its inconspicuous female blossoms are attached to stalks sometimes three or four feet long. They rise to the surface and open. The clustered male blossoms are held in conical spathes below. In due time they break away from these and surround the female blossoms. When the latter are pollinated, their stalks coil up like a spring, and draw them under, that the seed may be ripened beneath the surface.

Favourite plants with the landscape painter are the Arrowhead (*Sagittaria variabilis,* Engelm.) and the Yellow-lily (*Nuphar advena.* Ait). The clean-cut upright leaves of the former, and the large oval leaves of the latter, show well in a river scene.

Another fine plant is the Wild Calla or Water Arum (*Calla palustris,* L.). Its white spathe throws out its spadix, which is thickly set with small greenish blossoms; and its heart-shaped shining leaves and generally trim appearance are very attractive.

After passing through the intervale, the stream ran through two or three farms, and then discharged into a beautiful lake which was about a mile long, and was embosomed in the hills.

At the mouth of the stream there was a growth of alders rooted in the shallows of the lake, and in these shrubs the handsome Red-winged Blackbird (*Agelaius phœniceus*) built its nest.

Amongst the alders was a small island. Landing upon this, one day I nearly trod upon two eggs of the great Northern Diver (*Gavia imber*), which were laid upon the bare ground. They were fine eggs, four inches long, two and five-eighths inches broad, of a brownish green hue blotched with dark brown.

Of the feathered ichthyophagists that frequented the stream and lake, two were pre-eminent, monarchs of the waters—the Great Blue Heron (*Ardea herodias*) and the Northern Diver (*Garia imber*). Their methods of fishing were very different, and there appeared to be no rivalry between them. The Diver was all activity. Its trim form, its close plumage, its strong limbs set well back, its large webbed feet, bespoke the powerful swimmer and diver; and woe to the fish that came within its ken. The Heron, on the other hand, was a model of dignified repose. It seemed to rely upon the principle—"Everything comes to those who wait." It took its position in some shallow near the bank, raised itself to its full height, rested its dagger-like bill on it breast, and *waited.* The Summer breeze agitated the bulrushes growing near, but did not move the stately bird. By and by a frog plunged into the water from the bank, or an eel wriggled out from the roots of the flags; and then—that sharp bill descended with lightning rapidity and transfixed the intruder.

A pair of Belted Kingfishers frequented the mill-pond up the stream. They had their nest in a hole in the bank, under the roots of a tree. While the female sat upon her batch of white eggs, the male fished for her support. He took his perch on a branch of a tree overhanging the pond, and watched. Soon a silvery gleam showed where a minnow was at play; and then, like an arrow from a bow, the bird darted down into the depths in pursuit.

The kingfisher swallows its prey whole, and afterwards disgorges the bones in pellets. The brooding kingfisher does this. and so its nest becomes matted with fish-bones, which serve to keep its young from the cold earth.

There is an English bird whose aquatic feats excel those of the Northern Diver and the Belted Kingfisher—it is the Water Ousel (*Hydrobata cinclus*). I have watched this bird running at the bottom of a clear Yorkshire stream, seemingly as much at ease as the Wagtails that run along the bank.

A high and sandy part of one of the banks of the stream was much frequented by the Spotted Sandpiper. One or two pairs usually raised their young not far from my home. They were graceful birds. In colour they were olive-brown above, prettily barred with black. Beneath, they were white and much speckled. They seemed to be so delicately balanced upon their long legs, that they were constantly pitching forward. This habit gained for them the common name of "Tip-up."

This name reminds me of one of my neighbours, who entertained some peculiar ideas. He believed that every successive generation of men was "wiser and weaker" than that preceding it. When asked what he could show in support of this notion, he said, "We read* that the king of Rabbah wore a crown that weighed a talent of gold (117 lbs., 19 dwts., 16 grs.). Fancy old Billy yonder"—pointing to a diminutive specimen of humanity—"with a hundredweight of headgear. *Why he'd go bobbing round like a tip-up.*"

One early morning I was gratified with an unusual sight: I surprised a pair of mink as they were sporting on the brink of the stream. When they caught sight of me they quickly disappeared.

The Stoat (*Putorious noveboracensis*) was more frequently seen, whether in its summer coat, or its winter ermine. Walking along a lane that crossed the brook, on an Autumn day, I heard a rustling in the dry leaves by the wayside. I stood still. Presently a field-mouse (*Microtus pennsylvanicus*), and then another, dashed into the road, and away, up the opposite bank. In a moment or two I heard a more stealthy tread, and then out came a stoat with its nose to the ground, following the exact course of the fugitives. It was tracking them by the scent, as a hound tracks a fox. How could a mouse escape such a foe?

Another interesting creature that frequented the stream was the Painted Turtle (*Chrysemys picta*). This reptile was very gay, with rose-coloured bands and stripes along its sides, and under the edge of its carapace. It was fond of sunning itself on a stone or log. It deposited its eggs in the sandy banks of the stream, and left them to hatch of themselves. The young ones readily found their way to the water.

*1 Chron., ch. xx, 1st and 2nd verses.

I have told of some of the natural objects that engaged my attention during my residence in a retired country-place. There were many others that I may not tell of now. In searching them out, and studying them, I was never at a loss for amusement; and the remembrance of them gives me pleasure still. I would say to every head of a family, who is in a position to follow the advice: Take your wife and children to the country every summer for change and relaxation, and that they may follow Nature Studies at first hand. They will soon feel, as Shakespeare felt when he penned the words that have been so often quoted, but are so beautiful that they cannot become hackneyed—

"This our life, exempt from public haunt,
Finds tongues in trees, books in the running brooks,
Sermons in stones, and good in everything."
—*As You Like It*, Act II., Sc. 1

## A HYMENOPTEROUS PARASITE OF HEPIALUS THULE.

ALBERT F. WINN, WESTMOUNT, QUE.

The late Dr. H. G. Knaggs in his "Lepidopterists' Guide," says that the grand secret of successful insect collecting lies in one little word—*Why?* The statement is so very true that it is rather a wonder that the word has not been adopted as a motto for some Entomological Society; perhaps, however, it is best left as common property for all.

In studying up the habits and history of our special Montreal insect *Hepialus thule*, we have been confronted with many questions, but we now know and have published sufficient particulars to show that instead of being an exceedingly rare insect it occurs in its own peculiar localities in vast numbers, and its life history is known except the larva from after the first moult till it becomes about five-eighths of an inch long.

One question that has bothered us for many years in connection with this moth is—Why should the Hepialidæ lay so many eggs? Most moths lay about 300, but the ghost moths lay over 2,000, which on the average must mean that 1,998 fail to produce imagos out of the 2,000. What enemies have they more than their relatives that makes this provision necessary? Before their habits were known, it was thought that they bored in the trunks of some of the large trees, much as do the Cossidæ or goat moths, and the woodpeckers were suggested as doing more than their share of destroying the larvæ. But down below or at the surface of the ground the caterpillars in the stems and roots of the swamp willows are perfectly safe from woodpeckers.

It seems quite possible that the largest loss of life occurs in the tiny larvæ freshly hatched from the egg failing to find a suitable supply of food, for Mrs. Ghost Moth is apparently an improvidential mother, and does not as most moths and butterflies do, namely, deposit the eggs on the particular plant whereon the larvæ feed. The Hepialid females fly about dropping the eggs to the ground as they go, resting a few moments and starting off again in great arcs of a circle. Whether the little larvæ can sustain life by nibbling at such food as may come in their way till they strike a willow root we do not know. neither do we know whether any creature makes a meal of the minute eggs so carelessly scattered, but a great many larvæ do find their way into suitable quarters as is evidenced by the labyrinth of tunnels found when a clump of willows is dug up and split open.

The next source of high mortality seemed to be in the imago state, as numbers of separate wings of the moths have been found lying on the ground, suggestive of the work of bats; night hawks have also been seen flying about the swamps, but neither bat nor bird has been caught in the act of gobbling a Hepialus. Two years ago we found that many of the wings lying about the bushes were quite soft and not fully expanded, showing the moths had been devoured between 5.30 and 7 p.m., while they were drying their wings preparatory to their first flight, and some small animal is doubtless well supplied with dainties for the few days annually that the moth flies. In our digging operations a few larvæ and pupæ were found attacked by a fungous disease—a species of Cordyceps, specimens of which were exhibited at our 1909 annual meeting, but till this year no insect parasite has been met with, nor do I know of any record of a parasite of any North American species.

On June 23rd, Prof. Swaine and myself spent a couple of hours in a swamp at St. Anne de Bellevue, digging among the willows, resulting in our finding a good many larvæ and a few pupæ. Owing to our not having all the necessary implements with us we managed to chop in half a great many more of both than we secured intact. Two pupæ that I kept looked particularly healthy, and were kept in a roomy cage with plenty of leaf mould and moths were looked for with a degree of certainty. The larvæ were put in a tin box filled with the leaf mould and were only taken home for inflation for cabinet specimens, as they evidently would not produce moths till 1912, and no attention was paid to them. Early in July I opened the box, expecting to find the larvæ shrivelled up and dead, but instead found the mass healthy and active as ever. The cage with the pupæ was looked at daily, but no moths appeared, and although still flexible at the joints it became evident that it was too late for them to produce moths this year. The larvæ continued to prosper on their starvation diet, and on July 14th, as I was leaving town for my holidays the following day, I sent the larvæ and one pupa to Mr. H. Dawson, Hymers, Ont., to whom I am indebted for much information and many specimens from that locality, telling him that the pupa apparently would not live, and the larvæ on the contrary refused to die. The larvæ lived till August, some five weeks, without a bite of willow wood, and the pupa produced a fine Ichneumon which Mr. Gibson has kindly had identified by Mr. W. H. Harrington as *I. decinctor* Say. My pupa also produced an Ichneumon during my absence but escaped in some way. So we now know that there is at least one Hymenopterous parasite, and are confronted with the question of how does it manage to get at the larva to attack it? Two methods seem possible; first, by stinging the larva when it is engaged in cutting the exit hole for the moth to escape through, or second, by finding the freshly cut hole and entering bodily and following the tunnel down to where the mature larva or freshly formed pupa is. Another species of Ichneumon. *I. subdolus,* has been found to be parasitic on a boring moth larva, *Gortyna immanis,* but the stems of the hop vine do not seem as secure a hiding place as the roots of the willow.

While it is often a great disappointment to a collector who has spent time feeding and caring for larvæ to have them produce Ichneumons or other parasites instead of moths, one is often compensated by the fine condition the pupæ or chrysalids are left in for cabinet specimens, besides what is learned of the relationships between the destroyer and the destroyed. As well as the pupa of *Hepialus thule* you will notice in the box a chrysalis of *Papilio asterias.* In both cases the parasite escaped through neat holes in the sides instead of bursting the shell completely as the moths and butterflies do in the natural course of events.

## INJURIOUS INSECTS OF THE YEAR, MACDONALD COLLEGE, QUE.

J. M. Swaine, Macdonald College, Que.

*Saperda candida, and Chrysobothris femorata,* the Apple tree borers, have not been so numerous in this region as formerly.

*Schizoneura lanigera,* the Apple Woolly Aphis, has been quite common, and on some young trees distinctly injurious. Many scars were formed on the smaller branches. I have no record of the occurrence in Quebec of the root form of this insect.

*Lepidosaphes ulmi,* the Oyster Shell Scale, is very common in Quebec orchards, and too often neglected entirely. The spring spray with lime-sulphur holds it in check. This is, so far, our only orchard scale of importance.

*Oberea tripunctata,* the Apple-twig Oberea, has been recorded in large numbers from various parts of New Brunswick, and it may become a troublesome pest. It is not yet recorded from Quebec. Its work in the apple twigs resembles that of *O. bimaculata* in raspberry canes.

*Malacosoma americana* and *M. disstria,* the Apple and Forest Tent Caterpillars, were extremely common this season, and injurious in unsprayed orchards. Their egg masses are to be found now in great numbers.

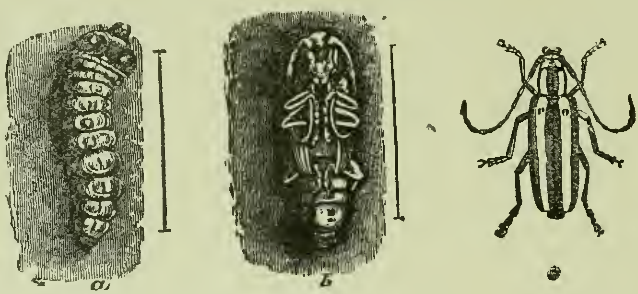

Fig. 31.—Round-head Apple-tree Borer—*a*, larva; *b*, pupa; *c*, beetle.

There was not much injury from Bud Moth or Case-bearers in our locality; and canker worms were rarely seen.

The Pear Blister Mite has not yet troubled our Quebec orchards, though possibly we shall need to control it later.

*Rhagoletis pomonella,* the Apple Maggot. This insect has been recorded this season from many parts of Quebec Province, and is in some districts very injurious. It is very evident that the pest is becoming widely distributed, and that it should be neglected no longer.

So far as known at present the only practical method of control is the careful gathering of the fallen fruit. Through the first part of the season these fallen fruits should be rigidly gathered and destroyed—boiled and fed to stock—every day, or every second day.

It would be interesting to know to what extent this insect breeds in the fruit of the hawthorne. It is recorded several times as breeding in haws. This season we found the haws about the Macdonald College badly infested with maggots. From them we bred flies that I cannot distinguish from those bred from apples. The hawthorne bushes are numerous in the neighborhood of the College; but we are not troubled as yet with the Apple Maggot. The subject is interesting.*

* Since writing the above, the specimens bred from haws have been determined by Prof. J. M. Aldrich as *R. pomonella* Walsh.

*Conotrachelus nenuphar*, the Plum Curculio. This insect has been more than usually destructive to apples in the Eastern Townships this season. In many districts it is our most destructive apple fruit insect.

Poison sprays are only partly effective in its control, and need to be supplemented by careful destruction of the fallen fruit, particularly the small fruits which drop early in the season. In controlling this insect lead arsenate should be used, three to four pounds per barrel for the first two summer sprays.

Cultivated orchards are less seriously affected than those in sod. Surface cultivation in July and August, pruning and spraying all tend to keep the beetle in check. Haws and wild plums, in which the Curculio breeds, and neglected orchards, serve as centres for breeding and distribution of this as well as other apple-fruit pests. Nearby orchards, no matter how well cared for, may be seriously infested.

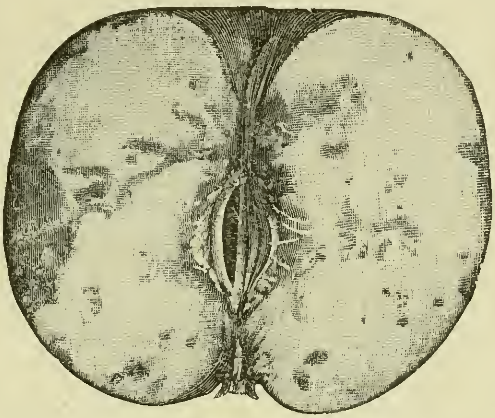

Fig. 32.—Fruit injured by the Apple Maggot.

*Anthonomous quadrigibbus*, the Apple Curculio. We have the Apple Curculio in injurious numbers in the region about Covey Hill.

*Carpocapsa pomonella*, the Codling Moth. We have heard less of the Codling moth in Quebec orchards this season, probably because the Maggot and Curculio attracted so much attention. Spraying, which so readily controls the Codling Moth, is also being more widely practised.

*Cymatophora ribearia*, the Currant Span-worm, and *Pteronus ribesii*, the Currant Saw-fly, were present in unusual numbers. The former is quite common on Montreal Island.

*Sesia tipuliformis*, the Currant Borer, is destructive locally; but controlled by careful pruning.

*Oberea bimaculata*, the Raspberry Cane-borer, has not been so numerous this season. It is readily controlled by careful pruning.

We find an Oberea larva rather common in rose stems. It is possibly *basalis*, which has been collected from rose bushes.

The worst enemy of the raspberry, in this district, is the Red Spider. In dry seasons it lessens the crop very materially. Several sprayings with kerosene emulsion or fish-oil soap or frequent sprayings with water hold it in check.

There were few complaints of strawberry insects this season. Our chief insect enemy of the strawberry is the White Grub; and it is seldom destructive when the strawberries come at the end of a long rotation.

*Psila rosae,* the Carrot Rust Fly, was injurious at several places on Montreal Island. It also occurs at Ottawa and in Eastern Quebec, and is probably found throughout the Province.

Cabbage insects are reported in their usual numbers. The cutworms and maggots were perhaps less abundant.

Onion Maggots and Cutworms, quite common here some years, were hardly noticed this season.

*Crioceris* 12-*punctata,* the 12-Spotted Asparagus Beetle, is rather common late in the season. *C. asparagi* is rarely seen in this neighborhood.

Grasshoppers were not noticeably destructive with us this season.

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## INSECT MIGRATION AT AWEME, MANITOBA.

Norman Criddle, Treesbank, Man.

It is common knowledge that most birds migrate, and much has been written relating to the cause and origin of their movements. But with the exception of locust flights, commonly, though erroneously, considered to be due to lack of food, and the well-known movements of the Monarch butterfly, few of us recognize that practically all insects migrate at some time of their lives. Such, however, is the case. Nor is the desire to travel confined to birds and insects. The buffalo was known to move periodically south or north according to the season. So it is to-day with the cariboo and several other mammals. We also have the autumn "flights" of spiders, which, having no wings, spin themselves aerial conveyances which carry them many miles. These are the well-known "fair-weather webs" we see floating in countless numbers during fine September and October days. In the West they are said to be a sign of fine weather, and as the spiders only spin them when it is fine there is, after all, some truth in the assertion. And as wasps were our first paper manufacturers, so spiders could probably claim to be the first animals, without wings, to master the air. There is another wingless class, however, being unable either to fly or build apparatus for the purpose, that still manages to travel in the air. These are the tramps among the smaller animals who steal rides by attaching themselves to such as can fly. As an example we have the well-known cases of water snails clinging to ducks; and many other such as leeches, and even cray fish are distributed in the same way. And this is the reason why every piece of water is stocked with the life adapted to live in it.

To return to insects: I have already related how there is a periodic movement of locusts commencing in late July and continuing well into August.* This, however, relates only to those destructive kinds belonging to the genus *Melanoplus.* There are many others that move in the same way; in fact I am convinced that all winged *Orthoptera* migrate, or in other words, fly high into the air, and taking advantage of the wind, travel long distances in search of new homes. My own eyes have shown me that *Tettix* does so; also *Hippiscus, Spharagemon, Dissosteira, Arphia* and *Scudderia,* and why have some crickets long wings unless for just such a purpose?

Among the Lepidoptera we have, as I before mentioned, the Monarchs' well-known movements south in autumn and return greatly reduced in numbers the following spring. The movements of these butterflies are most interesting. They

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* Annual Report Ent. Soc. of Ont., 1911. Also Ott. Nat.

have a habit of flying before thunder storms, no matter which way the wind is blowing; but as soon as the rain commences they alight and it is then that occasionally a wonderful sight is seen. Thousands congregate upon a bush and open and shut their wings so much in unison that one moment the trees look green, the next reddish. Such a sight was seen by my brother Stuart last year in August, and I have twice observed a somewhat similar scene. No one seems to have made notes upon the migratory movements of these butterflies, though it would be well worth while to do so, and thus get an insight into the daily rate of travel. So far as first arrivals are concerned, these of course depend largely upon the weather or prevailing winds. I have two records of the first noted, June 10th, 1910, and May 16, 1911, while my latest are September 7, 1910 and September 20, 1911.

Another butterfly that migrates regularly is the painted lady, *Pyrameis cardui.* I have known them to come up from the south by hundreds with a hot southerly wind in June, while in other seasons they have been almost entirely lacking, due, at least in part, to unfavourable breezes. These are, so far as I know, the only regular migrants who go south to escape our winter and return to breed like birds, but the numbers that move from place to place as a means of distribution are almost endless. Occasionally there will be a general movement when all kinds including butterflies of several species such as *Colias, Pontia, Anosia, Pyrameis,* etc., also dragon flies, embracing several types, are all flying together as if having a single object in view. These flights, however, occur but rarely.

Moths also migrate, although as they usually fly at night their movements are overlooked, unless they appear suddenly in a district, as did the Snow-white Linden Moth at Ottawa in 1908.

Beetles nearly all have their restless moods, which occur at any time during the summer months, but their more regular movements are in spring and fall, when they appear to be returning from winter quarters or in search of them. Here also we have the day fliers and night fliers, but, strange to relate, those beetles that are generally most constant in their habits of only coming out in the sunshine will suddenly change them and appear on the darkest nights to fly long distances. Thus we have diurnal denizens such as tiger-beetles and lady-birds flying in company with hosts of other beetles, bugs, stone-flies, caddis-flies, lace-winged flies, tree-crickets, mosquitoes and many more. These have all been collected around lights. Of course some are regular night fliers, especially those commonly called water-beetles.

Presumably the reason why day beetles sometimes fly at night is the greater protection darkness affords them from birds. During the present year there was a remarkable flight of a small native beetle known as the willow leaf beetle, *Galerucella decora,* a very destructive insect. These beetles suddenly appeared in swarms soon after the trees came into leaf. Where they came from is unknown to me, though their flight seemed to be from an easterly direction. They appeared in millions, and soon turned many of the aspen poplars a dirty brown colour by skeletonizing the leaves. The willows likewise suffered, eventually more so, as they are the natural food plant. Judging from the fact that the beetles came suddenly and did not attack the intervening trees, we might suppose that they had been flying at a considerable height, especially as they seemed exceedingly hungry when they came to earth as if from a long journey. It is not an uncommon event, however, for willow leaf-beetles to migrate. Other *Chrysomelidae* do the same thing, though seldom in such large numbers.

A great many insects unquestionably fly in search of food. The potato-beetle is an example of this, and several others can readily be called to mind, but the kind of flight I have more particularly in view is that relating to distribution rather than food supply. At such times insects seem to prepare for a more sustained flight. They also often abandon their usual habits like the tiger-beetles, flying at night.

Towards late autumn there is a continued movement in search of winter quarters, a restlessness that we might suspect to be similar to the original impulse that later turned to regular migration among certain animals. Especially as this restlessness is not confined to insects, but is noticeable in several other groups particularly among spiders, many of which, as I have already related, spin sufficient web to suspend them in the air, while others spin from stem to stem so that at times almost every plant is covered with those tiny strings, indicating the line of travel traversed by those small animals.

Among our autumn insects one is particularly noticeable on account of its abundance. I refer to *Aphodius scabriceps.* This beetle appears in late August from unknown breeding grounds, and by September, on fine sunny days, may be observed in countless millions—at times so numerous, indeed, that looking towards the sun when it is low, the whole air seems to be glistening haze, caused by the myriads of moving wings as the beetles fly to and fro. This flight goes on intermittently until frost commences to harden the ground, and at times is continued all night. What the object of it is I do not know, nor where the beetles go to, but they vanish at this time to be seen no more until the following autumn. They are also taken in Colorado, but, so far as I know, have not been seen over the intervening country. Perhaps some day they may be found breeding in the neighbourhood. Indeed, the chances are they will, but at present they are one of the little mysteries that confront the local entomologist.

Other species of *Aphodius* are also common fliers at this time, particularly *inquinatus,* but their food is known and they appear again in the spring. They are seen on all bright days, with countless other insects—winged ants, aphids, bugs, and many beetles—all seeking winter homes; and that their tastes are often similar is shown by the fact that the latter at least are constantly found huddled together as if seeking comfort, or warmth, in numbers.

Such is a summary of the flight of insects as viewed at Aweme. In addition, we have also the movements of mosquitoes, whose coming we can foretell by the direction of the wind. There are also the annual excursions of dragon flies, and occasionally the marchings of caterpillars, such as the army worm, etc. The primary reasons for these movements seem to be threefold. Firstly, distribution: the instinctive desire common to all creation to spread over and occupy as large an area as possible. Secondly, food supply: the scarcity of food in a given locality making it necesary for them to go elsewhere in search of it; and thirdly: sexual advantages. It is well known that nearly all life derives a benefit from the union of well separated individuals, and is injured in vitality by in-breeding. Consequently, the movements of insects to seek their mates elsewhere is of decided benefit to the race as a whole.

*Note.*—Since writing the above the mystery of *Aphodius scabriceps* has been partly cleared up. The mature insects have been found emerging and burrowing into ploughed fields in considerable numbers, while odd individuals were discovered in a partly decomposed tomato. There is, therefore, every reason to suspect that these beetles feed upon the decayed vegetation covered over by the plow. If this is so, they may be of decided benefit to agriculture.

## CATALOGUE OF CANADIAN INSECTS.

C. Gordon Hewitt, D.Sc., Dominion Entomologist, Ottawa.

It is well known to all the members present how the idea of a catalogue of the insects of Canada originated and the reason for its genesis, and I have attempted in a recent number of the *Canadian Entomologist,* which I have no doubt most of the members have read, to give some idea of the agreement to which the committee which was formed came to with regard to the scope of this catalogue. My object, therefore, in speaking on the subject this afternoon is not to discuss what has already been accomplished, as that is set forth in the short article mentioned, but to discuss any points which members of the society or those who are assisting in the preparation of this catalogue, wish to discuss. I am very pleased to tell you, as you may have seen from the short note at the end of the article, that I took up the question of publication with the Geological Survey and Mr. Brock also took it up with the Minister, with the result that they have consented to publish the list in parts as we desire. I think the best thing we can do now, and which I had intended, is to publish the different groups as they are ready. For example, some groups such as the Noctuidæ would form a fairly large volume, I suppose, so that such a group would be published in a single volume. On the other hand, a number of the groups and families are quite small and they will not be published separately; they will be held over until all the sub-families are prepared, and then the family will be published in a complete manner.

There is one question which I wanted to discuss with you and that is the question of nomenclature. It is extremely desirable and it is necessary that we have some uniformity in this matter, that we should act thoroughly in accordance with the modern rules and usages of nomenclature. There is a small matter on which there should be some consensus of opinion, and that is as to the use of initial capital letters in specific names. Take the Larch Sawfly, for example, which is

*Lygaeonematus erichsonii.*

The old naturalists and still many of those who are accustomed to use these proper names, write the specific name *erichsonii* with a capital E, and we should decide whether in such cases a capital or a small letter is to be used.

With a view to obtaining the official opinion I wrote to Dr. Stiles, who is Secretary of the International Commission on Zoological Nomenclature, which decides all questions of nomenclature, and he replied as follows:—

Washington, D.C.,
October 9th, 1911.

Dr. C. Gordon Hewitt,
Dominion Entomologist,
Ottawa. Ont.

Dear Doctor,

Replying to your letter of October 3rd, I would say that Article 13 of the International Code on Zoological Nomenclature, reads as follows:—

"While specific substantive names derived from names of persons may be written with a capital letter, all other specific names are to be written with a small initial letter. Examples: *Rhizostoma Cuvieri*, or *R. cuvieri; Francolinus Lucani*, or *F. lucani; Hypoderma Diana*, or *H. diana; Laophonte Mohammed*, or *L. mohammed; Oestrus ovis; Corvus corax.*"

Under "Discussion" of Article 13 is the following paragraph:—

"Formerly all substantive specific names were capitalized, while most adjectival names were written with a small initial letter. Then the custom relative to specific names changed to confining the capital to names derived from proper names. Later, the capitals were restricted to names derived from names of persons, and, finally, the use of capitals in specific names was entirely rejected, except that names derived from names of persons *may* be written with a capital. The use of the capital is a convenience in distinguishing between a specific name, like *Gobii*, based upon the surname *Gobi*, and a specific name, like *gobii*, based upon the generic name *Gobius*. There is now a decided tendency to reject the use of capitals in specific names."

Very respectfully,

(Signed) C. W. Stiles,
*Secretary, International Commission on Zoological Nomenclature.*

I think, therefore, in view of that we shall be justified in our decision not to use capital letters in the case of specific names, but adopt the method which is most generally employed and use the small letter.

There are a number of other points, too, but I would rather the members of the Society would ask them in the form of questions.

Mr. Caesar: I suppose every specimen will be supposed to have the date and locality as far as possible?

Dr. Hewitt: We shall not record any species of insect in any of the collections which does not possess a locality label.

Mr. Caesar: How about dates?

Dr. Hewitt: Dates are desirable. In the case of the commoner insects we shall not include dates. In the various collections we shall find a large number of insects which do not possess locality labels and I do not think it would be advisable to include these species in this list.

Dr. Bethune: There is another point. I notice in some publications that after the specific name and before the author's the comma is omitted. If the scientific name is in italics the author's name is in Roman letters; of course you see at once the difference. But where they are all in the same type it looks to me as if it might be part of the specific name, so that I think there ought to be some decision in regard to that.

Dr. Hewitt: That is a point which I have also had under consideration and I agree with you that there should be some distinction, but as I think the author's name really forms part of the insect's name—although I should like to have the opinion of the Committee—the omission of the comma and the printing the author's name in Roman letters might be preferable.

Dr. Walker: The scientific name is written, almost always, in italics, or black-faced type, and I think it always should be, and in the catalogue certainly it would look very badly if the scientific names were not distinct.

Dr. Walker: One point which I should like to know is whether we should include in the references the original description as well as a reference to some good description. I think it was agreed in the original plan not to include the original description, but only a reference to some well known and easily accessible good description. It seems to me that it would be highly desirable to have references to the original descriptions.

Dr. Hewitt: I agree with that idea, but at the same time, in addition to giving a good general description of the insect and its life-history you should give a good specific description. Accordingly we might have three references. There would be the reference to the original description, the second to a good specific description, if the original description were considered inadequate, and a third description giving, if possible, the life-history and the habits of the insect.

Mr. Winn: I have been practically through all the original Geometrid descriptions, and the original descriptions are very short, rarely half a page; the life-history takes sometimes as much as a page and a half. We might indicate the latter by some kind of initials.

Dr. Hewitt: In many cases it is indicated by using heavier type. I am glad you have mentioned that. I believe it would be a good thing to indicate the good general description of the insect. It might be indicated by the use of the abbreviation (Biol.) or (L.H.) The former would be preferable.

Prof. Swaine: Is each section of an order to be described as the work of one man? If there are four men responsible for the order, would it be convenient for all four to work in unison, or in the Catalogue will each one of them be credited with doing a certain amount?

Dr. Hewitt: In case four men are responsible for the Noctuidæ (I take this for an example) and all are working at that group, it will be published under the four men's names. But should four men take four separate divisions of a single order, they would be each responsible for the division apportioned and the divisions would be published under their respective names.

Prof Swaine: Would it be desirable to have the method of preparation in the Diptera as in the Coleoptera?

Dr. Hewitt: Yes, I think so. I am endeavoring to leave the preparation and apportioning of the work of the orders to certain sub-committees and it is for them to arrange who should take the separate sections. In the Coleoptera you might arrange that each of you would work at the whole order and then the four would be responsible for the order.

Dr. Hewitt. I think it would be advisable to append the account of the preparation of the list to our discussion. Before closing the discussion I may say that we are under a great obligation to a number of our scientific friends in the United States who are assisting us in the preparation of the catalogue. Dr. Wheeler has promised to be responsible for the Ants, Professor Cockerell for the Bees and Dr. MacGillivray is cataloging the Sawflies. In addition other entomologists are lending valuable assistance, which we deeply appreciate, in the submitting of records and lists, etc.

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## THE PREPARATION OF A CATALOGUE OF THE INSECTS OF CANADA.

C. Gordon Hewitt, D.Sc. Dominion Entomologist, Ottawa.

(From "The Canadian Entomologist," vol. xliii., p. 3-5.)

At a meeting of the Executive Committee of the Entomological Society of Ontario, held at Guelph, Ont., on November 4th, 1910, it was unanimously agreed that the preparation of a catalogue of Canadian insects was desirable, and that such a list should be dedicated to Dr. C. J. S. Bethune, in recognition of his long and valuable services to Canadian entomology as editor of *The Canadian Entomologist*. A special committee of the society was appointed to arrange for and take charge of the work of preparing the proposed catalogue.

The following members constitute the committee: Dr. E. M. Walker (Pres.), Dr. C. Gordon Hewitt (Vice-Pres.), Messrs. G. Chagnon, N. Criddle, J. D. Evans, Arthur Gibson, W. H. Harrington, T. D. Jarvis, H. H. Lyman, G. A. Moore, G. E. Sanders, J. M. Swaine, A. F. Winn, F. H. Wolley-Dod, and Prof. T. D. A. Cockerell.

Suggestions as to the form and scope of the catalogue, and the method of preparation, were drawn up and submitted to the members in a circular, issued on March 10th, 1911, with a request that it should be considered, and that further suggestions should be submitted.

Opinions on the suggestions which were submitted and further suggestions on the part of members of the committee have resulted in the formation of the following scheme, which will be adopted in the preparation of the catalogue, as they represent the views of a majority of the members.

1. The list will be entitled, " A Catalogue of the Insects of Canada and Newfoundland," and it will include all species known to occur in Canada (including Labrador) and Newfoundland, whether previously recorded or not. Alaskan species will not be included, but may be published as an appendix.

2. The various species will be classified under the orders, sub-orders, families, sub-families, and genera, in ascending order wherever possible. The arrangement of the genera will be systematic and, so far as is possible, the species also.

3. The names will be given of the authors of all generic and specific names mentioned, with the date (year) in the case of each genus.

4. Under each species will be given:

(*a*) A reference to one or two good descriptions of the insect, not necessarily the original one; these will be descriptions which are as accessible as possible. If possible reference will be given to a good published figure, and if such is contained in one of the references it will be indicated by the addition of (fig.) after the reference.

(*b*) The geographical distribution within Canada and Newfoundland; this will be indicated, as a rule, by Provinces, in order from East to West, e. g., N. S., Ont., B. C., etc. The characteristic faunal zones inhabited by the species will be indicated, so far as it may be possible, by abbreviations; thus: Ar.—Arctic, H.—Hudsonian, C.—Canadian, T.—Transition. Where a species is known from a few localities only, the names of these will be given with the name of the captor in cases where the species recorded is of great rarity.

(*c*) If the type locality of a species is Canadian it will be given, and the places where type specimens of Canadian species are deposited will also be given when possible.

(*d*) The Latin name of the chief food plants will be given in the case of the Lepidoptera, Cecidomyidæ, Aphidæ, Coccidæ, phytophagous Hymenoptera and Coleoptera. (Gray's New Manual of Botany, 1908, will be used throughout for the names of the food plants).

(*e*) In the case of parasitic species the name of the host or chief hosts will be given wherever known.

5. Recent important changes in synonymy will be noticed.

6. In the case of new and previously unpublished records the collector's name will be given in every case.

7. No species of which there is no trustworthy record or specimen available is to be included.

8. Fossil species will be included, and also introduced species, including greenhouse species, but the fact that they have been introduced will be indicated in those cases in which the fact is known.

The work of preparing the catalogue will be divided among the members, approximately, as follows:

Aptera, Orthoptera and Neuropteroid Orders.—Dr. E. M. Walker.

Hymenoptera.—Messrs. W. H. Harrington, G. E. Sanders, and Prof. T. D. A. Cockerell.

Coleoptera.—Messrs. J. M. Swaine, G. Chagnon, N. Criddle, and J. D. Evans.

Lepidoptera.—Messrs. Arthur Gibson, H. H. Lyman, A. F. Winn, and F. H. Wolley-Dod.

Diptera and Aphaniptera.—Mr. C. Gordon Hewitt.

Hemiptera.—Prof. T. D. Jarvis, and Mr. G. A. Moore.

These members will be responsible for the lists prepared by them, and such lists will be published under their names. In the preparation of such lists it will be necessary to seek the co-operation and assistance of other specialists and all such assistance will be fully acknowledged.

The division of the work in the different orders will be systematic rather than according to the geographical regions in which the members may be located; this will necessitate the co-operation of workers in different regions.

In the compilation of the catalogue it is intended to index the species on the regular card, catalogue cards 5 in. x 3 in., which will be supplied to the members. A single species will be listed on each card. The card will thus contain the information which it is intended to include in the catalogue. For example, the Spruce Budworm, *Tortrix fumiferana* Clemens, would be indexed and listed as follows:

*T. fumiferana* Clemens.

Proc. Ent. Soc., Phila., v 139, 1865.

U. S. Ent. Comm., 5th Rep., pp. 830-838 (Packard), 1890.

*Dist.*: Eastern Can., Man., B. C.

*Food Plants*: Abies, Picea, Pseudotsuga

The catalogue will be published, under the editorship of the writer, by the Geological Survey of Canada, by arrangement with and the consent of the Minister of Mines and the Director of the Survey. It will appear in parts as the different orders, or families, in the case of large families, are completed, and its publication will necessarily extend over a number of years.

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## SOME NOTES ON HEPIALUS HYPERBOREUS.

HORACE DAWSON, HYMERS, P. Q.

This season I have had splendid opportunities for watching these interesting moths as not only have they been breeding all around me but some have actually emerged from under my new house and some were taken inside, on windows, etc. A freshly emerged female found clinging to a screen door trying to attract a mate held on so tightly that the opening and closing of the door quite hard several times did not disturb her. I also found, within three feet of the house, two females, just emerged, the wings being not fully expanded, and give the following notes on them:

Aug. 19th. Two fresh females found, and a glance revealed an empty but evidently freshly vacated pupa-case. A further search resulted in a large number of others being found, mostly older ones. Some were lying flat on the ground, but the greater number were projecting about one-half of their length from perpendicular silk tubes that came almost, if not quite, to the surface of the leaf mould which covered the ground to the depth of several inches. The moths were caged and remained perfectly quiet until about 7.30 p.m., when they began their endeavours to attract the males. The fore-wings were moved very rapidly, the vibrations producing a slight hammering sound; the hind-wings are held close to the body. and motionless. Many others noticed drumming behaved in exactly the same manner. Six males were taken at the cage; others were seen, but escaped.

Aug. 20.—Trapped one male, which was admitted to the cage, and soon mated, and eggs were dropped during the night. Several other males were attracted.

Aug. 21.—Two or three males were attracted, but I was unable to trap one; the night was windy.

Aug. 22.—None attracted, one seen on the wing; night cold.

Aug. 23.—Another fresh female was secured and put in the same cage and the door opened at 7.30. A male was attracted and mated; the other did not attract.

Aug. 24.—A fresh male was netted, and on being put in the cage soon mated with the old but hitherto unpaired female, and eggs were dropped the same night.

Aug. 25.—A few more eggs dropped.

Aug. 26.—The female died this morning.

A good way to take the species is to watch for the flight about 7 p.m., and as soon as dark enough take a lantern and search for them. They are then found in pairs, clinging to grass and other low plants usually some six or eight inches from the ground, or clinging to the side of the house. The time of flight varies, probably being a little earlier on a clear than a cloudy evening, but they are seldom on the wing before seven o'clock, and almost never after eight o'clock.

## BLISTER BEETLES.

Arthur Gibson, Chief Assistant Entomologist, Central Experimental Farm, Ottawa.

In the Family Meloidæ there are several beetles, known popularly as Blister Beetles, some of which almost every year in Canada cause considerable anxiety to farmers and gardeners, from their habit of appearing suddenly and often much reducing the crop which they happen to attack. These blister beetles differ much in size and appearance, but all are soft-bodied insects, and in shape slender and cylindrical. Being gregarious in habit, they congregate in great numbers, and when they appear suddenly and attack a crop, the plants are often entirely ruined in two or three days. Fortunately, however, they oftentimes disappear from a locality as suddenly as they came.

As is well-known, blister beetles derived their popular name from their possessing powerful vesicating properties. Many cantharids have this property, but the species which has been used most extensively in medicine is the Spanish Beetle (*Cantharis vesicatoria*). Our common North American species, the Striped Blister Beetle (*Epicauta vittata*) has been found to be fully equal to the Spanish Beetle as a vesicant.

In their life-history, blister beetles differ remarkably from other coleoptera. Chittenden, in the United States Department of Agriculture Year Book, 1898, states:

"The blister beetle eggs are laid on plants or upon the ground. From each hatches a small long-legged larva, called a 'triungulin,' which runs actively about in search of a grasshopper egg-pod, which it enters and feeds upon. After a time it casts its skin and assumes what is called the 'carabidoid' larval stage, and when it next moults it resembles a white grub, 'the scarabæidoid' larval stage. When a larva has finished its quota of locusts' eggs, it undergoes a third moult and forms within its own skin what is known as the 'coarctate' larval stage or 'pseudopupa,' and in this condition usually passes the winter. In the spring the fourth and ultimate larval moult takes place, and with the fifth moult the insect enters upon the true pupal stage, and in due time transforms to a beetle."

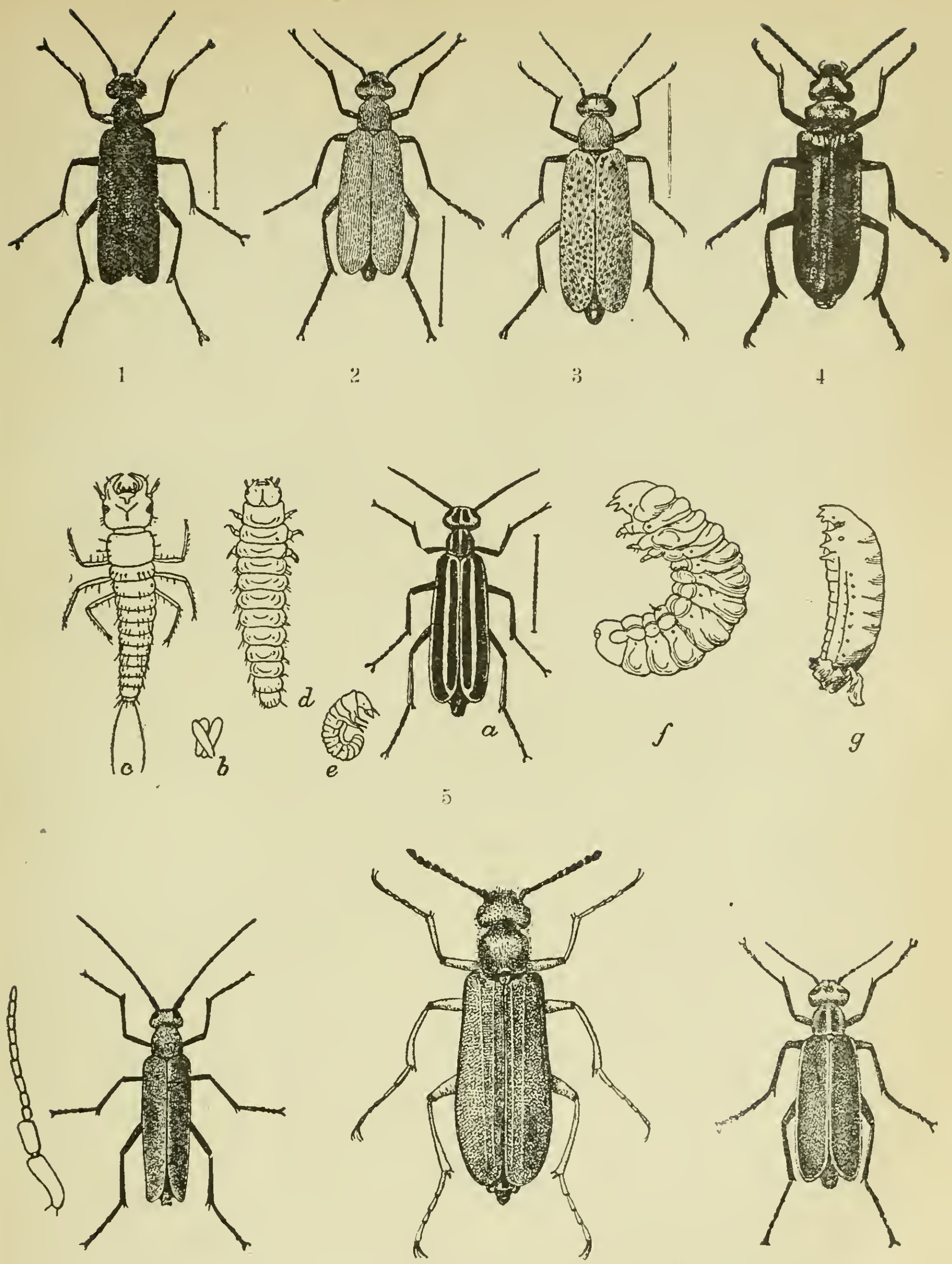
The Black Blister Beetle (*Epicauta pennsylvanica*, DeG.) (Fig. 1, on plate). This species is the one which, in Canada, has been most complained of. It occurs particularly in Ontario and the Eastern Provinces, but instances are on record of its appearing in destructive numbers in Manitoba, Saskatchewan and British Columbia. In colour, as its popular name implies, it is uniformly dull black, and in length varies from a little more than a quarter to slightly more than half an inch. This beetle has a very wide range of food plants. It is particularly destructive to the potato, and is mostly complained of as a pest of that plant. Mangels, beets, carrots, cabbages, tomatoes, corn and windsor beans are also freely attacked, and even such plants as mustard, asters, clematis, zinnia and other garden plants. Prof. E. W. Claypole has recorded the species as "devouring the flowers of the Great Rag-weed (*Ambrosia trifida*)." The species commonly occurs in August on the leaves and blossoms of golden rod and thoroughwort, and has also been found on amaranth and ironweed. At Ottawa, we have found the beetles defoliating clematis and plants of the genus *Thalictrum*, the latter growing in the perennial border at the Central Experimental Farm. At Aweme, Man., Mr. Norman Criddle finds the species wherever the Wild Pea (*Lathyrus venosus*) is plentiful. The beetles may be found in Ontario any time from the latter part of June to the end of September.

The Ash-gray Blister Beetle (*Macrobasis unicolor*, Kirby). (Fig. 6, on plate). This also is an abundant species, particularly in the east. It is larger than the Black Blister Beetle and in colour is of a uniform ash-gray. In size it varies from slightly less than half an inch to five-eighths of an inch. In New Brunswick the beetles have been very numerous during the month of July, eating the leaves of horse beans. In Quebec, the insect has attacked potatoes and beans. In Ontario the chief injury has also been to potatoes and beans. Other plants are often attacked by these beetles, such as peas, beets, tomato, sweet potato, clover, basswood, honey locust, lupine, astragalus, wild indigo, anemone, chrysanthemum, caragana, aralia, clematis, ironweed and thalictrum. At Ottawa the beetles have been frequently found upon the Tall Meadow Rue (*Thalictrum cornuti*). In the district we have found the adults from the beginning of the last week of June to the first week of August.

The Western Blister Beetle (Fig. 4, on plate), or, as it is also called, Nuttall's Blister Beetle (*Cantharis nuttalli*, Say), occurs throughout the west and is some years decidedly destructive to leguminous crops, particularly windsor broad beans. It is a handsome species and in length is from three-quarters to one inch. The wing-covers are variable in colour, some being purple, others greenish or of a coppery appearance. The head, thorax and body are metallic green, with a golden sheen. The time of the appearance of this blister beetle in destructive numbers varies considerably. During the past season the beetles appeared in large numbers in Saskatchewan from about the 25th July till the middle of August. Other years they appeared in swarms about July 1st and in 1893 at Saskatoon, Sask., they occurred as early as June 19th. Besides beans, the beetles have been found injuring young oats, barley, cultivated tares and leguminous wild plants such as *Vicia americana* and the astragali or milk vetches.

The Gray Blister Beetle (*Epicauta cinerea* Forst) (Fig. 2, on plate), has some years been destructive in Ontario and Quebec to potatoes, beans, vetch and alfalfa. It is also recorded as destructive to honey locust and even to the foliage of apple and the young fruit. It does not, however, occur nearly so destructively in Canada as some of the other species. In colour it is black, uniformly clothed with grey pubescence, and is from about three-eighths to five-eighths of an inch in length. The beetles occur in July and August.

The Margined Blister Beetle (*Epicauta marginata* Fab.). (Fig. 8, on plate.) The only Canadian specimens I have seen of this species are three which were taken at London, Ont., and which are in the collection of the Entomological Society of Ontario. This insect is very abundant in the United States and is recorded as being particularly partial to beets. It appears in July and August, and besides beets is known to have attacked beans, potatoes, tomatoes, asters, clematis, etc. In colour it is black, the head and sides of the thorax being clothed with gray pubescence, as are also the margins of the wing-covers. When at rest the inner gray borders of the wing-covers appear as a band down the centre of the back.




BLISTER BEETLES

1—Black Blister Beetle.
2—Gray Blister Beetle.
3—Spotted Blister Beetle.
4—Nuttall's Blister Beetle.
5—Striped Blister Beetle.
6—Ash-gray Blister Beetle.
7—Say's Blister Beetle.
8—Margined Blister Beetle.

(Figs. 1, 2, 3, 4, 5, 6, 8, after Chittenden, Bull. No. 43, Div. of Ent., U. S. Dept- Agr.)
(Fig. 7 after Chittenden, Bull. No. 38, N S., Div. of Ent., U. S. Dept. Agr.)

THE STRIPED BLISTER BEETLE (*Epicauta vittata* Fab.). (Fig. 5, on plate.) This species, which is about half an inch in length with blackish wing-covers, each of which is bordered with yellow and has a yellow stripe down the centre, has not as yet been complained of as a serious pest in Canada. In 1901, it was reported as injuring potatoes, tomatoes, mangels and beets in a few places in western Ontario, during the last week of July and the first week of August. Provancher records the species from St. Hyacinthe, Que. In the United States this beetle has long been known, particularly in the eastern States, as one of the most destructive pests of the potato. Besides the above-mentioned crops it has also been found doing injury to turnips, beans, peas, radishes, melons, corn, clover and alfalfa.

THE SPOTTED BLISTER BEETLE (*Epicauta maculata* Say.). (Fig. 3, on plate.) In British Columbia and some of the other western provinces this blister bleetle has been frequently complained of. In colour it is gray, or rather the black body is covered with fine gray hairs, excepting small areas on the wing covers which show up as black spots. The beetles appear any time from about the middle of May till the middle of August. Injury by this species has been done particularly to potatoes, but it has also done considerable damage to beets, cabbages, spinach, beans and clover. It is also known to feed in Montana upon the Grease-wood, *Sarcobatus vermiculatus*.

SAY'S BLISTER BEETLE (*Pomphopoea sayi* Lec.) (Fig. 7, on plate.) This species has not yet been recorded as an important pest in Canada. It, unlike the above-mentioned species, is arboreal, feeding on the blossoms of certain trees. At Toronto, Mr. C. W. Nash has reported that the beetles did considerable damage to the blossoms of plum, in May. During the past season the adults were present in some numbers on June 4th at Hull, Que., where Mr. W. Metcalfe found them feeding on the blossoms of elder. Mr. F. J. A. Morris collected the species on July 1st, in Muskoka, Ont., upon Nannyberry (*Viburnum lentago*). Mr. J. D. Evans has taken the beetles at Sudbury. Ont., on May 14th, Mr. A. W. Hanham has found the species at Quebec, Que., and Mr. A. F. Winn has collected the beetle at Shawbridge, Que., on June 4th. Mr. Winn informs me that he has also found specimens at other points in the Laurentian Mountain district, in the blossoms of cherry, plum, etc. This is a handsome species measuring about seven-eighths of an inch in length. In colour it is of a dark metallic blue, the first two joints of the legs being reddish-yellow.

THE GREEN BLISTER BEETLE, *Cantharis cyanipennis* Say. Few instances are on record of this species occurring in destructive numbers in Canada. In 1900 the beetles were found injuring pea vines in an orchard at Ducks, B.C.. and in 1904 specimens were sent to the Division with the statement that they were destroying beans and peas. No further record of injury by them has since been received. "At several places in Western Assiniboia and Southern Alberta", the beetles have been found by Fletcher feeding on the wild American vetch. This species is a large one, some individuals being three-quarters of an inch in length; in colour it varies from an intense green to almost a deep blue with metallic reflections.

Other species of cantharids which occur in Canada but which so far have not appeared in injurious numbers, are the following:

Epicauta sericans Lec. This species, some years, occurs in large numbers in Manitoba. Mr. N. Criddle states that at Aweme, Man., where it is present on the dry prairies, that it is in no way injurious, but that, on the contrary, it is beneficial, as it seems to confine itself almost entirely to lambs' quarters. The native food plant is apparently the Crocus Anemone, *Anemone nuttalliana*, on which Mr. Criddle has frequently found the adults feeding. This is a small grayish species about three-eighths of an inch in length.

Epicauta puncticollis Mann. In British Columbia this species is sometimes fairly abundant. Rev. G. W. Taylor has found the beetles on Vancouver Island, and Mr. A. J. Hill has collected specimens at New Westminster.

Epicauta fissilabus Lec. This species has been collected on June 6, at Saskatoon, Sask., by Mr. T. N. Willing.

Epicauta trichus Pall. Mr. Norman Criddle has collected this species at Aweme, Man., (June 19, 21).

Cantharis viridana Lec. Fletcher has taken this species at Aweme, Man., in the middle of July, at Rudy, Sask., in the same month, and also at Medicine Hat, Alta., on June 20th. This species measures about half an inch in length. It is of a green or bluish-green colour, the head and thorax having a metallic coppery reflection.

Cantharis sphæricollis Say. This blister beetle is some years rather abundant in British Columbia. We have had it sent in, in fair numbers, from near Kamloops, B.C. (July 31), and also from Vernon, B.C. It is greenish-blue in colour and in length about half an inch.

Cantharis cooperi Lec. A series of this beetle was sent to the Division some years ago, from Indian Head, Sask. It is very distinct from any of the above species, the wing covers being black and the head and thorax reddish-yellow.

### REMEDIES.

In the older provinces, where potatoes are so largely grown, little injury from the attacks of blister beetles should result if the vines are sprayed regularly with the ordinary poisoned Bordeaux mixture* so widely used for fungi and leaf-eating insects. In the western provinces, however, where fortunately the Colorado Potato Beetle does not yet occur in very destructive numbers, no regular treatment of potato fields is practised, and consequently when these beetles appear suddenly in large swarms, the damage is done, in many instances before the farmer knows that the insects are upon his crop. As is well known, blister beetles, in their larval state,

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* Bordeaux mixture is made as follows:—

| | |
|---|---|
| Copper sulphate (blue-stone) ............ | 4 lbs. |
| Lime (fresh) ............ | 4 lbs. |
| Paris green ............ | 4 oz |
| Water (1 barrel) ............ | 40 gallons |

Dissolve the copper sulphate (by suspending it inside a wooden or earthen vessel containing 4 or 5 or more gallons of water). Slake the lime in another vessel. If the lime, when slaked is lumpy or granular, it should be strained through coarse sacking or a fine sieve. Pour the copper sulphate solution into a barrel, or it may be dissolved in this in the first place; half fill the barrel with water, add the slaked lime, fill the barrel with water and stir thoroughly. It is then ready for use.

A stock solution of copper sulphate and milk of lime may be prepared and kept in separate covered barrels throughout the spraying season. The quantities of copper sulphate, lime and water should be carefully noted.

are predaceous on the eggs of grasshoppers. It is well, therefore that the farmer should realize this and watch for the appearance of blister beetles in years following excessive outbreaks of grasshoppers. Whenever these latter insects appear in destructive numbeers, the now well-known Criddle mixture† should be applied. This has given excellent results particularly in Manitoba and the west. When the grasshoppers are destroyed in this manner, the chances are, of course, that blister beetles will not be present in numbers to do very serious damage the following year. When spraying crops with an arsenical mixture for the destruction of blister beetles it is important that the mixture be applied immediately their presence is detected, on account of the voracious habits of these insects. Paris green, the insecticide which has been mostly used, can be applied either as a spray, using one ounce to every ten gallons of water, to which has been added an equal quantity of freshly-slaked lime, or as a dry application mixed with from 10 to 20 parts of flour, land plaster or slaked lime. Plants with such coarse foliage as the potato will stand double the above strengths of Paris green. In some outbreaks it may be necessary to repeat the application, as the beetles which are killed are soon replaced by others.

Blister beetles are very easily disturbed and for this reason a remedy which has often been very successfully employed is for two or three boys, or more if necessary, to walk through an infested field and wave from side to side boughs of spruce, or other branches. Such an operation will drive the beetles ahead of them and when the insects come to the edge of the crop they will disperse and seldom return. This method has given excellent results in outbreaks of the Western Blister Beetle. This latter species is particularly ravenous and is capable of destroying a crop in a very short time, even in a day according to some reports. In such instances, of course, spraying would be of little avail. In the United States the beetles are often driven in the above manner into a windrow of hay or straw which is immediately set on fire, and thousands of the insects are thus destroyed.

In gardens many of these beetles may be killed by beating them from the plants into pans containing water with a little coal oil on the surface. If any of the species which feed on the blossoms of fruit or other trees should occur in injurious numbers, many no doubt could be jarred from the trees into an inverted umbrella, or other contrivance, and then put into a vessel containing coal oil and water.

On account of the good habits of the larvæ of blister beetles in feeding upon the eggs of grasshoppers, it is often undesirable to destroy them, but, of course, when they occur in destructive numbers, it is well that one of the above measures be taken as soon as possible for the protection of the crop.

†The Criddle mixture is made by mixing one pound of Paris green with five ordinary pailfuls of horse droppings, which have been moistened with about half a pailful of water in which two pounds of salt has been dissolved. It is simply scattered among the crop which is being attacked, or along the edge of a crop towards which the young grasshoppers are working.

## THE ENTOMOLOGICAL RECORD, 1911.

Arthur Gibson, Chief Assistant Entomologist, C. E. F., Ottawa.

In *The Entomological Record,* which has been published every year since 1901, students of the several orders of insects have, in a readily accessible form, considerable information on the distribution, etc., of many species occurring in Canada. This information will be of special value now in view of the List of the Insects of Canada and Newfoundland which is being prepared by members of our Society. In the *Record* for this year I have endeavoured to include all references to new species described from Canada in 1911, in the literature to which I have had access.

The season of 1911 in Canada was a favourable one for the collection of insects. Although some collectors have reported the season to have been a poor one in their particular districts, on the whole, I judge that in most localities much material was present, and large collections were made by some students. During the night of June 28th, 470 moths were caught in a lantern trap at Trenton, Ont. This number represented many different species, and Mr. J. D. Evans informed me that he never had such success before. Large catches were made on many other nights.

We have again to gratefully acknowledge the invaluable help received from recognized authorities in the United States and elsewhere. Particular acknowledgment is due to Dr. L. O. Howard and his expert associates, Dr. Dyar, Dr. Banks, Messrs. Busck, Viereck, Rohwer, and Crawford; Dr. J. B. Smith, of New Brunswick, N. J.; Sir George Hampson, of the British Museum; Mr. W. D. Kearfott, of Montclair, N. J.; Prof. H. F. Wickham, of Iowa City, Iowa; Mr. E. P. Van Duzee, of Buffalo, N.Y.; Mr. W. Beutenmuller and Mr. J. A. Grossbeck, of New York, N.Y.; Dr. Henry Skinner, of Philadelphia, Pa., Dr. E. M. Walker, of Toronto, Ont.; Col. Thos. L. Casey, of Washington, D.C.; Mr. Chas. Liebeck, of Philadelphia, Pa.; Mr. J. D. Evans, of Trenton, Ont.; Mr. F. H. Wolley-Dod, of Millarville, Alta., and Prof. Cockerell, of Boulder, Col.

### Literature.

Among the many valuable publications which have been received during the past year, and which are of interest to Canadian students, mention may be made of the following:—

Beutenmuller, Wm. The North American species of Dryophanta and their Galls: American Museum of Natural History, New York, separates issued December 30, 1911. This paper is the tenth instalment of a series of articles on North American Cynipidæ and their galls. Six beautiful plates accompany the article, five of which are from the drawings of Mrs. Beutenmuller.

Casey, Thos. L. Memoirs on the Coleoptera, II; New Era Printing Co., Lancaster, Pa.; issued Aug. 15, 1911. In 1910, we were glad to receive Memoir No. 1, and now Memoir No. 2 has recently appeared. This latter is a larger contribution than Memoir 1, being of 259 pages. It also is divided into 2 parts, viz.—I. New American Species of Aleocharinæ and Myllaeninæ; II. Notes on the Coccinellidæ with some General Remarks and Synonymy. Of the 397 species described as new, in part I., 50 are from Canada; 36 of these are from British Columbia, (mostly collected by Rev. J. H. Keen); 10 from Manitoba, (N. Criddle), and 4 from Ontario, 3 of which were collected at Ottawa, (W. H. Harrington).

Gahan, A. B. Aphidiinæ of North America: Bulletin No. 152, Maryland Agricultural Experiment Station, College Park, Md., March 11, 1911, pp. 147-200. The study of parasitic insects is every year becoming more important and such results as are published in the above Bulletin are extremely useful. The author treats of 48 species of this subfamily of the Braconidæ. Five new species are described and in order to point out characters, correct errors in former descriptions, obviate the confusion in certain cases resulting from the numerous descriptions of the same species under different names, as well as to bring the descriptions all together in a convenient form for reference, a redescription is included of all the established species of which authentic specimens could be obtained. Eight species are stated to occur in Canada.

Hampson, Sir George F. (Bart.). Catalogue of the Lepidoptera Phalænæ in the British Museum, Vol. X, Noctuidæ, 1910, 829 pp., plates CXLVIII—CLXXIII; volume received 27th January, 1911, plates received 7th June, 1911. In this large volume 1,222 species belonging to 136 genera of the subfamily Erastrianæ, are classified. "The subfamily is homogeneous in appearance but is not very well defined structurally, being intermediate in characters between the Trifid and Quadrifid sections of the Noctuidæ, and having very close affinities on the one hand with the Acronyctinæ, and on the other hand with the Acontianæ, Noctuinæ, and Hypeninæ." The moths of the subfamily Erastrianæ are confined, to a large extent, to the tropical and warmer temperate regions. Records of only sixteen species which occur in Canada are given, but in the volume are several other species which are to be found within the Dominion. The beautiful plates which accompany this volume are of the usual high character.

Hopkins, A. D. Contributions Toward a Monograph of the Bark-weevils of the genus Pissodes; U. S. Dept. Agric., Bureau of Entomology, Technical Series, No. 20, Part I; issued January 7, 1911. This further contribution to our knowledge of forest insects is very welcome. These bark-weevils are important enemies of pine, spruce, and fir trees, and such information as is given in this part is of much economic value. The results of the anatomical studies, as given in detail, are of much interest. Thirty species are recognized from North America; twenty-three of these are described as new, six of which are from Canada.

Moulton, Dudley. Synopsis, Catalogue and Bibliography of North American Thysanoptera, with descriptions of new Species; Technical Series No. 21, U. S. Dept. of Agriculture, Bureau of Entomology, pp. 56; issued June 13, 1911. This synopsis and catalogue of the Thysanoptera will be found of much value to students of these insects; 118 species are listed, 10 of which are described as new. Six full page plates appear in the Bulletin.

Skinner, Henry. The Larger Boreal American Hesperidæ, including Eudamus, Erycides, Pyrrhopyge, and Megathymus. Reprint from Transactions of the American Entomological Society; Vol. XXXVII, No. 3, issued August 18, 1911; pp. 169-209, with one colour plate. This most useful paper will be much consulted by students of diurnal lepidoptera. The original description of each species is given, together with notes on distribution, etc., and where known, the food plants of the larvæ, descriptions of caterpillar and chrysalis, together with critical notes which will help the student to determine the species. Canadian records are included of three of the species. An interesting note at the end of the paper is that referring to *Eudamus electra* Lint., which was described from a specimen collected at Hamilton, Ont. It now seems as if this specimen of *electra* is the male of

*Ephyriades zephodes,* which has also been placed in the genus *Nisoniades.* The plate in colours accompanying the paper is an exceptionally good one. We hope to see many more such contributions from this well-known authority.

THEOBALD, F. V. A Monograph of the Culicidæ, or Mosquitoes, Vol. V; British Museum, 1910; received Feb. 24, 1911; pp. 646; plates I to VI. Since the previous volume was published, 392 species have been described, or old descriptions found. Of these the author is responsible for 106, 80 of which are described in this volume. Synoptic tables of the genera and the species in each genus in the Anophelinæ, Megarhininæ, Culicinæ, Heptaphlebomyinæ and Uranotaeninæ have been worked out. Numerous text figures occur throughout the volume.

WHEELER, W. M. A List of the Type Species of the Genera and Subgenera of Formicidæ; Annals of the New York Academy of Sciences, Vol. xxi. pp. 157-175; separates dated 17th October, 1911. This contribution from such a high authority will be most welcome to students of the Formicidæ. The list includes the genera and the subgenera, both living and fossil, up till June, 1911.

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The following is a list of the names and addresses of collectors heard from during 1911:—

Anderson, E. M., Provincial Museum, Victoria, B.C.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Beaulieu, G., Experimental Farm, Ottawa.
Beaulne, J. I., Experimental Farm, Ottawa.
Bethune, Rev. Prof., O. A. C., Guelph.
Bolton, A. R. M., Quebec, Que.
Brittain, W., Seed Branch, Dept. of Agr., Ottawa.
Bush, A. H., 1105 Ninth Ave., Vancouver, B.C.
Carr, F. S., Edmonton, Alta.
Chagnon, Gus., Box 521, Montreal.
Chagnon, W., St. John's, Que.
Cockle, J. W., Kaslo, B.C.
Crew, R. J., 561 Carlaw Ave., Toronto.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Dod, F. H. Wolley, Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fyles, Rev. T. W., Hull, Que.
Gibson, Arthur, Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Haight, D. H., Sudbury, Ont.
Hanham, A. W., Duncans, B.C.
Harms, J. F., Treesbank, Man.
Harrington, W. H., P.O. Department, Ottawa.
Heath, E. F., Cartwright, Man.
Hewitt, Dr. C. Gordon, Experimental Farm, Ottawa.
Hudson, A. F., Millarville, Alta.
Keen, Rev. J. H., Metlakatla, B.C.
Leavitt, A. G., St. John, N.B.

Lyman, H. H., 74 McTavish Street, Montreal.
McIntosh, W., St. John, N.B.
Metcalfe, W., 20 Lisgar St., Ottawa.
Moore, G. A., 850 St. Hubert St., Montreal.
Moore, W. H., Scotch Lake, N.B.
Metcalfe, W., 284 Lisgar St., Ottawa.
Nelles, Douglas H., Dept. Interior, Ottawa.
Nicholls, Arch., Sault Ste. Marie, Ont.
Perrin, Jos., McNab's Island, Halifax, N.S.
Rowland, Alton, Windsor Mills, Que.
Sanders, G. E., Experimental Farm, Ottawa.
Sanson, N. B., Banff, Alta.
Simpson, W., Dominion Observatory, Ottawa.
Southee, G. R., Sherbrooke, Que.
Swaine, J. M., Experimental Farm, Ottawa.
Taylor, Rev. G. W., Departure Bay, B.C.
Tothill, J. D., Experimental Farm, Ottawa.
Treherne, R. C., Vancouver, B.C.
Walker, Dr. E. M., Biological Department, University of Toronto.
Wallis, J. B., Machray St., Winnipeg, Man.
Willing, Prof. T. N., Saskatoon, Sask.
Winn, A. F., 32 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.

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## NOTES OF CAPTURES.

(Species described during 1911 are preceded by an asterisk.)

### Lepidoptera.

(Arranged according to Dyar's List of North American Lepidoptera, U.S. N.M. Bull. No. 52).

(Dyar's number).

65. *Eurymus eurytheme* Bdv. Mayo, Que., Aug. 26, (A. E. Richard).
92. *Euptoieta claudia* Cram. Toronto, Sept. 10, 1910, (P. Hahn). The third specimen taken at Toronto.
112. *Argynnis behrensii* Edw. Victoria, B.C., (Taylor).
113. *Argynnis halcyone* Edw. Peachland, B.C., July 18, 1907, (Wallis).
* *Argynnis sakuntala* Skinner. Ainsworth, B.C., Aug. 13, 1903, (Rev. G. H. Findlay); Kaslo, B.C., July 7, 1890, (Cockle); Laggan, Alta., (T. E. Bean); Entomological News, March, 1911, p. 108.
138. *Brenthis freija* Thunb. Mer Bleue near Ottawa, June 6, (Young). The first record for the Ottawa district.
207. *Polygonia satyrus* Edw. Hymers, Ont., May 9, (Dawson).
216. *Eugonia californica* Bdv. Saskatoon, Sask., Oct. 7, Only record I know of for the Province (Willing).
223. *Junonia coenia* Hbn. London, Ont., Sept. 24. (Morden); Sudbury, Ont., (Haight).

268. *Erebia discoidalis* Kirby. Roland, Man., June, 1909, (Record sent by Mr. Wallis).
270. *Erebia disa* Thunb. a. *mancinus* D. & H., Hymers, Ont., (Dawson).
345. *Thecla edwardsii* Saund. Treesbank, Man., July 18, 1910, (Wallis).
378. *Incisalia niphon* Hbn. Hymers, Ont., May 6, (Dawson).
419. *Nomiades couperii* Grt. Hymers, Ont., May 9, (Dawson).
463. *Amblyscirtes samoset* Scudd. Stony Mountain, Man., June 11, 1910. (Wallis).
529a. *Euphyes vestris* Bdv., a. *metacomet* Harr. Husavick, Man., July 3, 1910, (Wallis).
602. *Thorybes electra* Lint. In a letter dated July 27, 1911, Dr. Henry Skinner says: "I have discovered that *Eudamus electra* Lint., described many years ago, and taken at Hamilton, Ont., is an exotic species. It probably came to Canada as larva or pupa on fruit. See also Trans. Amer. Ent. Soc. Vol xxxvii., p. 208."
657. *Lepisesia flavofasciata* Walk. Meach Lake, Que., May 27, flying in bright sunshine, (Young).
678. *Pholus pandorus* Hbn. Toronto, (Centre Island Breakwater), July 30, (P. Hahn).
699. *Phlegethontius convolvuli* L. a *cingulata* Fab. Hull, Que., fresh specimen, Sept. 1, (Fyles).
708. *Sphinx pinastri* L. A specimen taken at Waghorn, Alta., is in the collection of Dr. William Barnes. (Psyche xvii., 197, 1910).
817. *Clemensia albata* Pack. East Bolton, Que., on tree trunks in maple grove, July, (Winn).
943. *Androloma mac-cullochii* Kirby. St. Johns, Que., June 21, on lilac bloom, (W. Chagnon).
* *Demas electa* Sm. Winnipeg, Man., May 31, 1909, (Wallis); Jour. N.Y. Ent. Soc., Sept., 1911, p. 134.
981. *Apatela cretata* Sm. Winnipeg, Man., June 14, (Wallis).
* *Acronycta tristis* Sm. "Canada, viii.,5"; Ent. News, July, 1911, p. 316.
1047. *Aphareta pyralis* Sm. Banff, Alta., July 14, Aug. 28, 29, (Sanson); Cranbrook, B.C., Oct., 10, 1903, (C. G. Garrett). The latter is a new record for British Columbia. The date seems very late, if correct, (Dod).
1050. *Meroloncha lupini* Grt. Banff, Alta., June 12, 1910, (Sanson). New to Alberta, (Dod).

*Bryophila avirida* Sm. Humbolt, Sask., June 13, 1910, (E. Androchovitz).

*Moma geminata* Sm. Winnipeg, Man., June 10, 1910, (Wallis).

*Hadenella subjuncta* Sm. Saskatoon, Sask., July 13, (Willing).

*Hadena commoda* Walk. (Hampson, vii., p. 199). Hymers, Ont., June 21-28, 1910 and 1911, (Dawson). The name should be used as prior to *alberta* Sm. *Satina* Streck. is probably the same species. I have three from Hymers, all of which are like specimens from Calgary; also one from Sudbury, Ont., (Dod).

*Hadena bonilla* Barnes. This was recorded last year from Metlakatla, B.C. The name is merely a manuscript one, chosen years ago but never published. I believe it to be the same as *multicolor* Dyar, described from Victoria, B.C., though specimens stand under both names in the Washington Museum. It is an ally of *vultuosa*, (Dod).

1151. *Hadena violacea* Grt. Banff, Alta, Sept. 20, 1909, (Sanson); new to Alberta (Dod).

1223. *Hadena morna* Streck. The record of this species from Duncans, B. C., is probably an error due to a misunderstanding of a note given by me. I have never seen genuine *morna* from anywhere but Colorado, and very few from there, (Dod).

*Hadena albiserrata* Sm. Duncans, B.C., Sept. and part of October, abundant; usually a rare species, (Hanham).

* *Polia hanhami* Barnes and McDunnough. Duncans, B.C., (Hanham). Jour. N.Y. Ent. Soc., Sept., 1911, p. 155.

1281. *Hyppa brunneicrista* Sm. Banff, Alta., June 5-9, (Sanson).

*Feralia columbiana* Sm. Winnipeg, Man., May 28, 1909, (Wallis).

*Setagrotis dolens* Sm. Banff, Alta., July 25, (Sanson); rather more reddish than any hitherto seen. *Euxoa quinta* Smith appears to me to be the same species, (Dod).

*Setagrotis filiis* Sm. Banff, Alta., Aug. 14, Sept. 11, about a dozen specimens, (Sanson). Apparently not the same as *infimatis* Grt., as I suggested in last year's Record, though I rather expect to find another prior name for it, (Dod).

1455. *Agrotis geniculata* G. & R. Aweme, Man., (Criddle); Trenton, Ont., Aug. 22, (Evans).

1464. *Peridroma astricta* Morr. Stony Mountain, Man., July, 1910, (Wallis).

1506. *Noctua substrigata* Sm. Cartwright, Man., July 18, (Heath).

1541. *Feltia pectinicornis* Sm. Trenton, Ont., Aug. 3, 22, (Evans).

*Porosagrotis delorata* Sm. High River, Alta., Sept. 1, (Baird). The type was from Mr. Baird. I received it seven years ago from Regina, Sask. It is very likely a dark form of *orthogonia,* which is not uncommon in Colorado and Utah, (Dod). The larvæ of this moth were abundant at Lethbridge, Monarch, and other places in Southern Alberta during the past season, causing serious damage to fodder plants, etc. Moths emerged at Ottawa on Aug 14 and 20, (A.G.).

1693. *Paragrotis mollis* Walk. Banff, Alta., July 8, (Sanson).

*Euxoa cocklei* Sm. Dawson, Y.T., 1909, (Day).

* *Euxoa rubiata* Sm. Calgary, Aug. 29, (Dod); Trans. Amer. Ent. Soc. xxxvi., 255.

* *Euxoa cervinea* Sm. Vancouver, B.C., July 16; Banff, Alta., Aug. 10; Calgary, Alta., Aug. 30. Trans. Amer. Ent. Soc., xxxvi., 262.

* *Euxoa indensa* Sm. Cartwright, Man., Aug. 19, (Heath); Brandon, Man., July 14, (Hanham); Trans. Amer. Ent. Soc., xxxvi., 263.

*Mamestra carbonifera* Hamp. Banff, Alta., July 25, 2 males, (Sanson). Described from 2 females taken in the Alberta Rockies, by Mrs. Nicholl. I have a female taken here (Pine Creek) on July 4, 1904. It is a broad-winged species nearest *imbrifera,* of which I, at first, thought it might be a melanic form. Sir George Hampson described it as *Miselia carbonifera,* though the genus is not in his catalogue, (Dod).

1795. *Mamestra nevadae* Grt. Saskatoon, Sask., June 21, (Willing).

*Mamestra morana* Sm. Banff, Aug. 18, one male, (Sanson). This is "*trifolii* var. *oregonica*" of both Alberta and Kootenai lists and its description as new appears to have been quite justified. It also occurs in Colorado, Wyoming and Washington, (Dod).

* *Mamestra chunka* Sm. Aweme, Man., May 13, 20, 22, (Criddle); Trans. Amer. Ent. Soc. xxxvi., p. 265. High River, Alta., May 4, 1910, (Baird). This is a close ally of *crotchii* Grt., and bears some resemblance to *obesula* and *farnhami,* (Dod).

1920. *Ulolonche orbiculata* Sm. Aweme, Man., May 3, 1910, one female, (Criddle). I believe this to be a small obscure form of this species, which seems rather common in Colorado and Utah, though it may prove distinct. I know of no previous record for Canada, (Dod).

2024. *Graphiphora furfurata* Grt. Trenton, Ont., July 6, (Evans).

* *Stretchia algula* Sm. "Arrow Lake, Brit. Col." Jour. N.Y. Ent. Soc., Sept., 1911, p. 148.

* *Fishia instruta* Sm. De Clair, Man., Sept. 3-15, Trans. Amer. Ent. Soc., xxxvi., 264. Regarding this species Mr. Dod writes: "I have not identified it with certainty, but it appears to be very like the species wrongly listed as *yosemitæ* in the Alberta list."

2083. Xylinia longior Sm. Cartwright, Man., Oct. 12, one specimen, first taken here, (Heath).

2123. *Cucullia montanæ* Grt. Aweme. Man., July 20, (Criddle); Regina, Sask., July 3, 1910, (Willing).

* *Papaipema moeseri* Bird. Montreal, Que., Can. Ent., Feb'y, 1911, p. 42.

2200. *Xanthia pulchella* Sm. Duncans, B.C., not uncommon in Sept. and Oct., (Hanham).

2205. *Conservula anodonta* Gn. Trenton, Ont., July 12, not taken here previously, (Evans).

2231. *Orthosia lutosa* Andrews. Aweme, Man., June 24, (Criddle).

*Agroperina lineosa* Sm. Described from thirty specimens from Calgary, Alta., and several localities in Manitoba. It is the "*Orthosia conradi*" of my Alberta list, and may really be a race of that species. It has often been, quite erroneously, confused with *Hadena morna* Strk., (Dod).

*Agroperina pendina* Smith. Has the same range as *lineosa* and has already been looked upon by me as a red variety of it, to which opinion I shall adhere, though slight genitalia differences are claimed, (Dod).

2280. *Pippona bimatris* Harvey. Aweme, Man., July 29, 1910, (Criddle). Previously taken by the late Dr. Fletcher at Aweme.

2289. *Copablepharon grandis* Streck. Aweme, Man., July 4-14, (Criddle). Previously recorded as *absidum*. This latter has not been taken here, according to Dod.

2290. *Copablepharon longipenne* Grt. Aweme, Man., Aug. 19. 1910, one female, (Criddle). This specimen now in my collection agrees with Hampson's figure and my notes on the type. New record for Canada, (Dod).

2492. *Autographa californica* Speyer. Cartwright, Man., May 23, for the first time, at currant bloom; was previously recorded from Winnipeg by Hanham, (Heath).

2493. *Autographa ou* Gn. Aweme, Man., Sept. 27, 1909, one female, (Criddle). I believe this to be the first record for Canada. The species closely resembles *californica* but is darker and less brightly marked. There are slight, though constant, differences in markings. Structurally *ou* has hind tibiae strongly spined, whilst *californica* has not, (Dod).

2494. *Autographa rubidus* Ottol. Aweme, Man., June 15, 1910, (Criddle).

2555. *Alabama argillacea* Hbn. Conspicuous flights of this southern Cotton Moth occurred in Western Ontario in Sept., 1911. At Sarnia and St. Thomas they were extremely abundant. (See Ottawa Naturalist xxv., Dec., 1911, p. 129). Mr. Winn has also reported that the moths were abundant "at light" in Montreal, in the middle of September, (A. G.).

2730. *Melanomma auricinctaria* Grt. Montreal, June, (Chagnon).

2799. *Syneda hudsonica* G & R. Aweme, Man., July 4, 1907, (Criddle).

2847. *Catocola semirelicta* Grt. Hymers, Ont., (Dawson). This specimen was compared with type in British Museum by Sir George Hampson and Mr. H. H. Lyman.

2948. *Anticarsia gemmatilis* Hbn. Winnipeg, Man., Oct. 5, 1909, (Wallis).

3010. *Epizeuxis nigellus* Streck. St. Johns, Que., July, (Chagnon).

3064. *Bomolocha manalis* Walk. Trenton, Ont., 2 sp., July 20, 29; new record for district, (Evans).

3151. *Schizura unicornis* S. & A. High River, Alta., July 29, (Baird).

3181. *Euthyatira semicircularis* Grt. Duncans, B.C., (Hanham).

*Bombycia fasciata* Barnes & McDonnough. Described in 1910 from Duncans, V.I., (Hanham). It is the species figured by Holland on Plate XL., fig. 27, as *tearlii* Hy. Edw.; *provisa* Hy. Edw. is a third species. (Dod).

* *Olene styx* Barnes and McDunnough. Duncans, B.C., (Hanham); Psyche, Oct., 1911, p. 159.

3272. *Eupithecia palpata* Pack. Hudson, Que., June 11, (Chagnon). A rare species and wrongly placed as a synonym of *luteata* Pack. (L. W. Swett).

3276. *Eupithecia ornata* Hulst. "Ottawa, April 24, May 4, 1906, (Young)". *Ottawa Naturalist,* xxv., p. 106. Regarding this record, Mr. Grossbeck says: "I doubt the occurrence of this species in Eastern Canada; more likely the specimens are worn examples of *E. palpata* Pack." These specimens of Mr. Young's were named *ornata* by the Rev. G. W. Taylor, and as far as I can remember were fresh and therefore in good condition, (A.G.).

3281. *Euchoeca inornata* Hulst. Sherbrooke, Que., July 1, 1910, (Chagnon).

* *Eupithecia chagnoni* Swett. Montreal, Que., June 22, 1907. Can. Ent., July, 1911, p. 255.

3288. *Eupithecia plumbaria* Hulst. "Ottawa, May 24, 1906, (Taylor)," *Ottawa Naturalist* xxv., p. 106. Pearsall makes this a synonym of *E. miserulata* Grt., (J. A. G.).

3295. *Eupithecia fumosa* Hulst. Described from Brockport, N.Y., and S. Abington, Mass. Pearsall says the latter is *coagulata* Gn. "and so the name must be dropped from our lists." The Brockport type still remains to be discovered, however, and until this is examined the name must remain in our catalogue. (J. A. G.). A specimen taken at Ottawa, June 3, 1904, was named *fumosa?* by Rev. G. W. Taylor, (A. G.).

3319. *Eupithecia raveocostaliata* Pack. Trenton, Ont., May 8, (Evans).

*Eupithecia meritata* Pears. Trenton, Ont., Aug. 1-23, (Evans).

*Eupithecia youngata* Tayl. Bancroft, Ont., June 11, 1906, (Evans).

3353. *Eustroma nubilata* Pack. St. Johns, Que., July 15. (Chagnon).

3494. *Xystrota hepaticaria* Gn. Trenton, Ont., 2 sp., Aug. 1, 3, (Evans).

3657. *Sciagraphia neptaria* Gn. Saskatoon, Sask., July 3, (Willing).

3662. *Sciagraphia continuata* Walk. Mt. St. Hilaire, Que., May 29, 1910, (Chagnon).

3671. *Macaria labradoriata* Moesch. Ottawa, Aug. 12, 1904, (Fletcher). See *Ottawa Naturalist,* Oct.-Nov., 1911.

3689. *Cymatophora virginalis* Hulst. Trenton, Ont., July 21, (Evans).

*Caripeta criminosa* Swett. Hymers, Ont., July 2, (Dawson).

3782. *Nepytia phantasmaria* Streck. Duncans, B.C., Oct. 9, only specimen taken, (Hanham).

3793. *Alcis guttata* Hulst. Ottawa, June 20, 1894, (Fletcher). See *Ottawa Naturalist*, Oct.-Nov., 1911, p. 110.
3804. *Spodolepis substriataria* Hulst. Hymers, Ont., April 28, July 9, (Dawson).
* *Selidosema manitoba* Grossbeck. Winnipeg, Man., May 25 to June 2, 1909, (Wallis). Can. Ent., July, 1911, p. 225.
3855. *Cleora larvaria* Gn. Windsor Mills, Que., June 10, (Rowland); Saskatoon, Sask., June 23, (Willing).
3942. *Gonodontis warneri* Harv. Humbolt, Sask., (E. Androchovitz).
4043. *Callizzia amorata* Pack. East Bolton, Que., July 20, (Winn).
4175. *Memythrus tricinctus* Harr. Ottawa, larvæ found in willow, April 23, 2 moths emerged, June 2, 8, (Beaulne).
4556. *Raphiptera argillaceella* Pack. Trenton, Ont., July 11, 12, (Evans).
4583. *Crambus myellus* Hbn. Peachland, B.C., Aug. 21, (Wallis).
4599. *Crambus oregonicus* Grt. Peachland, B.C., Aug. 19, (Wallis).
*Crambus dorsipunctellus* Kearf. Penticton, B.C., Aug. 11, (Wallis).
* *Dioryctria xanthœnobares* Dyar. Kaslo, B.C., Aug. 20, 1905, (Cockle); Proc. Wash. Ent. Soc., xiii., 81.
4723. *Glyptocera consobrinella* Zell. Mt. St. Hilaire, Que., June, (Chagnon).
4767. *Salebria basilaris* Zell. St. Johns, Que., July, (Chagnon).
4835. *Euzophera ochrifrontella* Zell. Mt. St. Hilaire, Que., July, (Chagnon).
4838. *Vitula edmandsii* Pack. Mt. St. Hilaire, Que., July, (Chagnon).
4843. *Canarsia ulmiarrosorella* Clem. Mt. St. Hilaire, Que., July, (Chagnon); Montreal, July, (Winn).
4849. *Hulstea undulatella* Clem. Montreal, July, (Winn).
4940. *Platyptilia edwardsii* Fish. Mt. St. Hilaire, Que., May, (Winn).
4964. *Pterophorus elliottii* Fern. Montreal, July, (Winn).
4983. *Pterophorus eupatorii* Fern. Montreal, July, (Winn).
5023. *Exartema exoletum* Zell. Montreal, June 30, 1909, (Winn).
5073. *Olethreutes impudens* Wlsm. Montreal, July 1, 1909, (Winn).
*Eucosma confluana* Kearf. Montreal, July 4, 1908, (Winn).
*Eucosma bilinearia* Kearf. Cartwright, Man., June 25, (Heath).
*Eucosma pergandeana* Fern. Trenton, Ont., June 3, 12, (Evans).
5222. *Epinotia lagopana* Wlsm. Mt. St. Hilaire, Que., May 20, 1910, (Winn).
*Peronea manitobana* Kearf. Winnipeg, Man., Oct. 5, (Wallis).
*Peronea chalybeana* Fern. Winnipeg, Man., Oct. 1, (Wallis).
*Peronea heindelana* Fern. Montreal, June, (Chagnon).
*Sparganothis vocaridorsana* Kearf. Lethbridge, Alta., July 3, (Wallis).
*Pandemis canadana* Kearf. Cartwright, Man., June 23, (Heath).
* *Gnorimoschema septentrionella* Fyles. North Wakefield, Que., (Miss Fyles); Can. Ent., Dec. 1911, p. 422.
5671. *Trichotaphe fernaldella* Busck. Peachland, B.C., Aug. 17, (Wallis).
*Gelechia alternatella* Kearf. Peachland, B.C., Aug. 17, (Wallis).
5894. *Semioscopsis allenella* Wlsm. Montreal, June, (Chagnon); McNab's Island, Halifax, N.S., July 19, (Perrin).
*Holcocera nigristriata* Wlsm. Penticton, B.C., Aug. 18, (Wallis)
6166. *Mompha subiridescens* Wlsm. Montreal, June 30, 1909, (Winn).
6372. *Gracilaria alchimiella* Scop. Montreal, July 10, 1909, (Winn).

## Coleoptera.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico).

25b. *Cicindela graminea* Schaupp. Calgary, Alta., April 16, (Criddle).
25e. *Cicindela limbalis* Lec. Calgary, Alta., April 16, (Criddle).
106. *Cychrus tuberculatus* Harr. Duncans, B.C., rare, (Hanham).
109. *Cychrus angulatus* Harr. Duncans, B.C., rare, (Hanham).
122. *Carabus limbatus* Say. Edmonton, Alta., June 30, 1910, (Carr).
123. *Carabus vinctus* Web. Edmonton, Alta., (Carr).
224. *Dyschirius integer* Lec. Toronto, 1 specimen, Oct. 1, 1908; somewhat smaller but otherwise identical with specimens which I have from Texas, (Crew).
232. *Dyschirius globulosus* Say. Bannockburn, Ont., June 20, (Evans).
271. *Clivina cordata* Putz. Trenton, Ont., July 10; not taken heretofore, (Evans).
320. *Bembidium chalceum* Dej. Treesbank, Man., July 29, 1910, (Wallis).
330. *Bembidium complanulum* Mann. Peachland, B.C., July 27, 1909, (Wallis).
364. *Bembidium dyschirinum* Lec. Winnipeg, Man., April 9, 1909, (Wallis).
366. *Bembidium cordatum* Lec. Toronto, Nov. 9, 1908, (Crew).
413. *Bembidium cautum* Lec. Trenton, Ont., 2 specimens, May 21, 23; not taken here previously, (Evans).
483. *Trechus chalybeus* Mann. Toronto, April 3, 1908, (Crew).
545. *Pterostichus coracinus* Newm. Treesbank, Man., July 26, 1910, (Wallis).
674. *Amara obesa* Say. Treesbank, Man., July 28, 1910, (Wallis).
784. *Platynus pusillus* Lec. Winnipeg, Man., May 5, 1910, (Wallis).
822. *Platynus quadripunctatus* De G. Winnipeg, Man.. April 7, 1910, (Wallis).
836. *Platynus nigriceps* Lec. Aweme, Man., June 9, 1910, (Criddle).
889. *Lebia ornata* Say. Winnipeg, Man., June 17, 1910, (Wallis).
941. *Cymindis planipennis* Lec. Treesbank, Man., Aug. 3, 1910, (Wallis).
1061. *Agonoderus pallipes* Fab., var. Winnipeg, Man., April 13, 1909, (Wallis).
1104. *Harpalus rufimanus* Lec. Winnipeg, Man., May 18, 1909, (Wallis)
1110. *Harpalus funestus* Lec. Winnipeg, Man., May 20, 1909, (Wallis).
1145. *Stenolophus ochropezus* Say. Winnipeg, Man., May 8, 1909, (Wallis).
1150. *Acupalpus carus* Lec. Winnipeg, Man., April 15, 1909, (Wallis).
1181. *Anisodactylus carbonarius* Say. Trenton, Ont., May 29, (Evans).
1198. *Anisodactylus verticalis* Lec. Winnipeg, Man., May 7, 1910, (Wallis).
1222. *Haliplus borealis* Lec. Selkirk, Man., May 5; Winnipeg, Man., Oct. 14, (Wallis).
1447. *Agabus gagates* Aube. Edmonton, Alta., May 24, (Carr).
1490. *Dytiscus dauricus* Gebl. Alaska; found at the crossing of the Old Crow River by the 141st meridian, July 20, (F. Lambart).
1675. *Cercyon prætextatum* Say. Winnipeg, Man., April 13, 1909, (Wallis).
1699. *Necrophorus obscurus* Kirby. Edmonton, Alta., April 15, 1910, (Carr).
1786. *Liodes obsoleta* Horn. Toronto, Oct. 9, 1908,( Crew).
*Scydmænus clavipes* Say. Toronto, March and April, (Crew).
1820. *Scydmænus perforatus* Schaum. Toronto, 2 specimens found under stones, March and April, (Crew).
*Pilopius saginatus* Casey. Port Credit, Ont., Nov. 9, 1908, (Crew).
1889. *Decarthron longulum* Brend. Toronto, April 23, 1907, (Crew).
2304. *Stenus colon* Say. Toronto, on wet sand along bank of stream, June 6, 1908, (Crew).
* *Baryodma rubricalis* Csy. Metlakatla, B.C., (Keen).
* *Baryodma concurrens* Csy. Metlakatla, B.C., (Keen).

* *Emplenota longiceps* Csy. Metlakatla, B.C., (Keen).
* *Oxypoda demissa* Csy. "Canada, (probably southern Ontario)."
* *Oxypoda manitobæ* Csy. Aweme, Man., (Criddle).
* *Oxypoda hiemalis* Csy. Ottawa, Ont., (Harrington).
* *Oxypoda optiva* Csy. Victoria, B.C.
* *Oxypoda lassula* Csy. Stikine River, B.C., (Wickham).
* *Oxypoda egestosa* Csy. Victoria, B.C., (Wickham).
* *Oxypoda famula* Csy. Massett, Q. C. I., (Keen).
* *Oxypoda regressa* Csy. Victoria, B.C., (Wickham).
* *Myrmedonia criddlei* Csy. Aweme, Man., (Criddle).
* *Trichiusa columbica* Csy. Metlakatla, B.C., (Keen).
* *Athetá manitobæ* Csy. Aweme, Man., (Criddle).
* *Atheta achromata* Csy. Metlakatla, B.C., (Keen).
* *Atheta profecta* Csy. Metlakatla, B.C., (Keen).
* *Atheta concessa* Csy. Metlakatla, B.C., (Keen).
* *Atheta postulans* Csy. Metlakatla, B.C., (Keen).
* *Atheta apposita* Csy. Metlakatla, B.C., (Keen).
* *Atheta sumpta* Csy. Metlakatla, B.C., (Keen).
* *Atheta relicta* Csy. Metlakatla, B.C., (Keen).
* *Atheta districta* Csy. Metlakatla, B.C., (Keen).
* *Atheta rurigena* Csy. Yale, B.C., (Wickham).
* *Atheta mordax* Csy. Stickine River, B.C., (Wickham).
* *Atheta tenuicula* Csy. Aweme, Man., (Criddle).
* *Metaxya awemeana* Csy. Aweme, Man., (Criddle).
* *Metaxya prognata* Csy. Metlakatla, B.C., (Keen).
* *Metaxya erudita* Csy. Aweme, Man., (Criddle).
* *Metaxya surrufa* Csy. Aweme, Man., (Criddle).
* *Metaxya varula* Csy. Aweme, Man., (Criddle).
* *Metaxya criddlei* Csy. Aweme, Man., (Criddle).
* *Pseudota vana* Csy. Massett, Q. C. I., (Keen).
* *Pseudota cornicula* Csy. Metlakatla, B.C., (Keen).
* *Pseudota nanulina* Csy. Metlakatla, B.C., (Keen).
* *Pseudota formalis* Csy. Metlakatla, B.C., (Keen).
* *Moluciba grandipennis* Csy. Metlakatla, B.C., (Keen).
* *Pontomalota luctuosa* Csy. Massett, Q. C. I., (Keen).
* *Autalia truncatula* Csy. Massett, Q. C. I., (Keen).
* *Autalia brevicornis* Csy. Metlakatla, B.C., (Keen).
* *Stictalia carlottæ* Csy. Massett, Q. C. I., (Keen).
* *Gyrophæna criddlei* Csy. Aweme, Man., (Criddle).
* *Gyrophæna keeni* Csy. Metlakatla, B.C., (Keen).
* *Placusa turbata* Csy. Metlakatla, B.C., (Keen).
* *Amblopusa pallida* Csy. Victoria, B.C., (Wickham).
* *Thinusa divergens* Csy. Metlakatla, B.C., (Keen).
* *Thinusa nigra* Csy. Metlakatla, B.C., (Keen).
* *Thinusa robustula* Csy. Metlakatla, B.C., (Keen).
* *Deinopsis harringtoni* Csy. Ottawa, Ont., (Harrington).
* *Myllæna immunda* Csy. Ottawa, Ont., (Harrington).
* *Myllæna scobinella* Csy. Metlakatla, B.C., (Keen).

The above new species of Aleocharinæ and Myllæninæ were described in Memoirs on the Coleoptera, II., by Thos. L. Casey, issued Aug. 15, 1911.

2559. *Lithocharis corticina* Grav. Trenton, Ont., May 23, (Evans).
2719. *Bledius fumatus* Lec. Trenton, Ont., June 20, (Evans).
2736. *Bledius tau* Lec. Trenton, Ont., May 23; not taken heretofore, (Evans).
3069. *Harmonia picta* Rand. Aweme, Man., June 10, 1909, (Criddle).
*Hyperaspis binotata* Say. Aweme, Man., July, 6., 1905, (Criddle).
3156. *Scymnus tenebrosus* Muls. Toronto, under mullein leaves, March and April, (Crew).
3198. *Endomychus biguttatus* Say. Westbourne, Man., Aug. 27, 1908, (Wallis).
3353. *Telephanus velox* Hald. Port Credit, Ont., Nov. 9, 1908, (Crew).
*Cryptophagus laticlavus* Casey. Trenton, Ont., Sept. 1; not taken heretofore, (Evans).
3381. *Atomaria distincta* Casey. Winnipeg, Man., May 15, 1909, (Wallis). Described from District of Columbia.
3477. *Hister harrisii* Kirby. Edmonton, Alta, (Carr).
3520. *Hister lecontei* Mars. Aweme, Man., June 20, (Criddle.
3678. *Carpophilus niger* Say. Aweme, Man., June 9, 1910, (Criddle).
3689b. *Colastus limbatus* Lec. Aweme, Man., June, 9, 1910, (Criddle).
3728. *Omositá discoidea* Fab. Winnipeg, Man., May 18, 1910, (Wallis).
3746. *Cyllodes biplagiatus* Lec. Aweme, Man., July 4, 1910, (Criddle).
3772. *Rhizophagus remotus* Lec. Aweme, Man., June 9, 1910, (Criddle).
4234. *Elater luctuosus* Lec. Near Shelburne, N.S., July 12, (Gibson).
4384. *Athous brightwelli* Kirby. Near Shelburne, N.S., July 12, (Gibson).
4385. *Athous acanthus* Say. Trenton, Ont., 2 specimens, June 27, July 30, (Evans).
4486. *Corymbites æripennis* Kirby. Near Shelburne, N.S., July 12, (Gibson).
4494. *Corymbites arátus* Lec. Near Shelburne, N.S., July 12, (Gibson).
4583. *Dicerca tenebrosa* Kirby. Aweme, Man., Aug. 11, 1903, (Criddle).
4620. *Melanophila atropurpurea* Say. Winnipeg, Man., June 20, 1909, (Wallis).
4630. *Anthaxia viridifrons* Lap. Aweme, Man., June 21, 1909, (Criddle).
*Chrysobothris mali* Horn. Aweme, Man., June 22, 1910, (Criddle).
4639b. *Chrysobothris 4-impressa* Lap. & Gory. Aweme, Man., July 2, 28, 1910. (Criddle).
4699. *Acmæodera pulchella* Hbst. Aweme, Man., July 10, 1910, (Criddle).
4755. *Taphrocerus gracilis* Say. Aweme, Man., July 22, 1910, (Criddle).
4762. *Brachys æruginosa* Gory. Aweme, Man., Aug. 10, 1908, (Criddle).
4780. *Caenia dimidiata* Fab. Winnipeg Beach, Man., July 11, 1910, (Wallis).
4810. *Lucidota atra* Fab. Aweme, Man., June 19, 1905, (Criddle).
4815. *Ellychina corrusca* L., var. *lacustris* Lec. Winnipeg, Man., May 21, 1909, (Wallis).
4829. *Photinus ardens* Lec. Winnipeg Beach, Man., July 2, 1910, (Wallis).
*Telephorus impressus* Lec. Trenton, Ont., June 4, not taken heretofore, (Evans).
4947. *Telephorus rotundicollis* Say. Near Shelburne, N.S., July 12, (Gibson).
4966. *Polemius laticornis* Say. Trenton, Ont., May 29, (Evans).
5022. *Malachius æneus* L. Trenton, Ont., June 9, not taken heretofore, (Evans).
5185. *Thanasimus undulatus* Say. Winnipeg, Man., June 10, 1909, (Wallis).
5206. *Hydnocera longicollis* Ziegl. Aweme, Man., Aug. 3, 1903, (Criddle).
5493. *Atænius stercorator* Fab. Trenton, Ont., 3 specimens, May 21-23, (Evans).
5600. *Geotrupes egeriei* Germ. Ste Therese, Que., (Mignault).
5627. *Trox æqualis* Say. Aweme, Man., April 25, 1910, (Criddle).
5630. *Trox atrox* Lec. Aweme, Man., May 8, 1908, (Criddle).

5699. *Diplotaxis sordida* Say. Trenton, Ont., May 27, (Evans).
5767. *Lachnosterna fraterna* Harr. Trenton, Ont., May 6, June 5; not taken heretofore, (Evans).
5774. *Lachnosterna rugosa* Melsh. Trenton, Ont., May 2-June 9, not taken heretofore, (Evans).
5982. *Tetropium cinnamopterum* Kirby. Winnipeg, Man., June 5, 1909, (Wallis).
5992. *Hylotrupes ligneus* Fab. Winnipeg, Man., May 4, 1910, (Wallis).
6279. *Bellamira scalaris* Say. Winnipeg Beach, Man., July 6, 1910, (Wallis).
6354. *Leptura pubera* Say. Winnipeg, June 25, 1910, (Wallis).
6389. *Monohammus marmorator* Kirby. Ste Therese, Que., (Mignault); Ste. Anne de Bellevue, Que., (Chagnon and Swaine).
6418. *Leptostylus biustus* Lec. Trenton, Ont., July 9, (Evans).
6424. *Liopus variegatus* Hald. Trenton, Ont., July 4, (Evans).
6480. *Saperda candida* Fab. Edmonton, Alta., June 17, (Carr).
6485. *Saperda tridentata* Oliv. Edmonton, Alta., June, 1910, (Carr).
6532. *Donacia hirticollis* Kirby. Winnipeg Beach, Man., Aug. 13, 1910, (Wallis).
6534. *Donacia proxima* Kirby. Aweme, Man., July 27, 1910, (Criddle).
6549. *Hæmonia nigricornis* Kirby. Selkirk, Man., May 24. (Wallis).
6697. *Pachybrachys hepaticus* Melsh. Aweme, Man., Aug. 2, 1909, (Criddle).
6720. *Xanthonia 10-notata* Say. Aweme, Man., May 26; Aug. 31, 1910, (Criddle).
6747b. *Paria 4-notata* Say. Aweme, Man., June 10, 1909, (Criddle).
6786. *Prasocuris vittata* Oliv. Winnipeg, Man., May 15, 1909, (Wallis).
*Chrysomela staphylea* Linné. McNab's Island, Halifax, N.S., (Perrin). See Entomological News, July, 1911, p. 306.
6832. *Gastroidea cyanea* Melsh. Edmonton, Alta, May 12, July 1, 1910, (Carr).
6848. *Phyllobrotica discoidea* Fab., rare form, Trenton, Ont., June 25, (Evans).
6895. *Trirhabda convergens* Lec. Aweme, Man., June 25,; Aug. 2, 1909, (Criddle).
6932a. *Oedionychis scripticollis* Say. Edmonton, Alta., May 29, 1910, (Carr).
6933. *Oedionychis lugens* Lec. Aweme, Man., May 14; Oct. 6, 1904, (Criddle).
6948. *Disonycha alternata* Ill. Edmonton, Alta., Aug. 23, 1909, (Carr).
7042. *Chætocnema protensa* Lec. Aweme, Man., April 20, 1905, (Criddle).
7102. *Coptocycla aurichalcea* Fab. Winnipeg, Man., Sept. 4, 1909, (Wallis).
*Coptocycla bicolor* Fab. Edmonton, Alta., May 29, (Carr).
7401. *Upis ceramboides* Linn. Rampart House, at the crossing of the Porcupine River by the 141st Meridian; elevation 1400 ft., July 20, (Nelles). A very northern record.
7528. *Scaphidema æneolum* Lec. Aweme, Man., June 7, 1909, (Criddle).
7651. *Synchroa punctata* Newm. Near Shelburne, N. S., July 12, (Gibson).
*Eustrophus repandus* Horn. Aweme, Man., June 20, 1910, (Criddle).
7710. *Pytho americanus* Kirby. Winnipeg, Man., June 9, 1910, (Wallis).
7757. *Cephaloon lepturides* Newm. Near Shelburne, N.S., July 12, (Gibson).
7886. *Corphyra elegans* Hentz. Winnipeg, Man., June 17, 1910, (Wallis).
7970. *Anthicus pubescens* Lec. Trenton, Ont., May 1. Not taken here previously, (Evans).
7997. *Dendroides ephemeroides* Mann. Winnipeg Beach, July 6, 1910, (Wallis).
8079. *Epicauta trichus* Pall. Aweme, Man., June 19, 21, 1910, (Criddle).
8236. *Barynotus schœnherri* Zett. Near Shelburne, N.S., July 12, (Gibson). Only Canadian record that I know of.

8487. *Lexius rubellus* Rand. Bannockburn, Ont., June 20; never took it before, (Evans).

8563. *Phyllotrox nubifer* Lec. Aweme, Man., June 2, 1908, (Criddle).

*Cryptorhynchus lapathi* L. Trenton, Ont., Aug. 27; never taken here previously, (Evans). Mr. John Dearness, of London, Ont., reported that he had received a specimen from New Brunswick.

* *Pissodes utahensis* Hopk. British Columbia, Bear Lake, (London Hill Mine); Tech. Series, 20, part 1, p. 45, U. S. Bureau of Entomology.

* *Pissodes approximatus* Hopk. Guelph, Ont.; Tech. Series 20, part 1, p. 49, U. S. Bureau of Entomology.

* *Pissodes schwarzi* Hopk. Banff, Alta.; Tech. series 20, part 1, p. 50, U. S. Bureau of Entomology.

* *Pissodes canadensis* Hopk. Winnipeg, Man., (Hanham); Tech. series 20, part 1, p. 51, U. S. Bureau of Entomology.

* *Pissodes piperi* Hopk. Glacier, B.C., Tech. series 20, part 1, p. 62, U. S. Bureau of Entomology.

* *Pissodes curriei* Hopk. Kaslo, B.C., (R. P. Currie); Tech. series 20, part 1, p. 65, U. S. Bureau of Entomology.

9071. *Pityophthorus cariniceps* Lec. Ste. Anne de Bellevue, Que.; Ste. Hilaire, Que.; Howick, Que., (Swaine).

9087. *Pityophthorus opaculus* Lec. Hudson, Que., Ste. Anne de Bellevue, Que., Lake Durnford, Que., in *Pinus, Picea* and *Larix,* (Swaine).

* *Trypodendron betulæ* Swaine. Ste. Anne de Bellevue, Que.; Can. Ent., July, 1911, p. 216.

9092. *Typodendron retusus* Lec. Isle Perrot, Que., (Swaine); Aweme, Man., (Criddle).

9099. *Cryphalus striatulus* Mann. Ste. Anne de Bellevue, Que.; Hudson, Que., Memphramagog, Que., (Swaine); Montebello, Que., (Brittain). In *abies,* (J. M. S.).

*Dryocœtes eichhoffi* Hopk. St. Anne de Bellevue, Que., in *Betula lutea,* (Swaine); St. Anthony, Newfoundland, (C. M. Spencer).

*Eccoptogaster piceæ* Swaine. St. Anne de Bellevue, Que.; in *Abies balsamea,* (Swaine).

* *Phlœotribus piceæ* Swaine. Ste. Anne de Bellevue, Que.; Can. Ent. July, 1911, p. 220.

9159. *Phlœotribus liminaris* Harr. Isle Perrot, Que.; found only in wild cherry, (Swaine).

* *Ips borealis* Swaine. St. Anthony, Nfd., (C. M. Spencer); Can. Ent., July, 1911, p. 213.

*Crypturgus pusillus* Gyll. Hudson, Que. (Swaine); Weymouth, N.S. (Treherne and Sanders); in *Pinus, Picea, Abies* (J. M. S.).

*Dendroctonus englemanni* Hopk. Edmonton, Alta., (Carr).

9204. *Eurymycter fasciatus* Oliv. Stony Mountain, Man., June 11, 1910, (Wallis).

DIPTERA.

(Arranged according to a Catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI, No. 1, 144. The numbers refer to the pages in the catalogue.)

Recently I have had an opportunity of examining a portion of the collection of diptera made at Montreal by Mr. G. Beaulieu, and as there are a number of the species which have not as yet been recorded from Quebec province, I am including here those of which I have notes. Some of these are well known species, but it is thought well to include them, as they are new additions to the Quebec list. During the past year, as far as I know, no extensive collections of diptera were made in any part of Canada, but a number of specimens collected in previous years have been studied in 1911, and records of some of these are also given.

112. *Chironomus dorsalis* Meign. Rigaud, Que., June 25, 1906, (Beaulieu). New to Quebec province list.

127. *Culex canadensis* Theob. East Bolton, Que., July 22, (Winn). The only Canadian record given by Aldrich is "Lake Simcoe, Ont."

* *Dasyneura gibsoni* Felt. Ottawa, reared from flower heads of Canada thistle, (Gibson); Jour. Econ. Ent., Oct. 1911, p. 479.

164. *Plecia heteroptera* Say. Regina, Sask., Sept. 3-10, 1905, (Willing).

190. *Nemotelus unicolor* Loew. Montreal, June 3, 1906, (Beaulieu). New to Quebec province list.

196. *Chrysops cuclux* Whitney. Rigaud, Que., June 26, 1906, (Beaulieu). Not previously recorded from Quebec province.

198. *Chrysops sackeni* Hine. Montreal, June 24, 1905, (Beaulieu). New to Quebec province list.

217. *Symphoromyia pachyceras* Will. Lake House, Alta., July 15, (Record received from Mr. C. W. Johnson).

247. *Psilocephala melanoprocta* Loew. Aweme, Man., June 1, (Criddle).

247. *Psilocephala platancala* Loew. Aweme, Man., June 24, (Criddle). The only locality record given in Aldrich's catalogue is Texas.

254. *Leptogaster favillaceus* Loew. Rigaud, Que., June, 1906, (Beaulieu). New to Quebec province list.

259. *Cyrtopogon dasyllis* Will. Kaslo, B.C., Sept. 1, 1907, (Cockle). Recorded from Colorado.

259. *Cyrtopogon dasylloides* Will. Kaslo, B.C., Sept. 1, 1907, (Cockle). Recorded from Washington State.

261. *Holopogon guttula* Wied. Rigaud, Que., June 25, 1906, (Beaulieu). New to Quebec province list.

272. *Laphyria œatus* Walk. Montreal, June 7, (Beaulieu). New to Quebec province list.

284. *Psilopodinus caudatus* Wied. Rigaud. Que., June 25, 1906, (Beaulieu). New to Quebec province list.

286. *Psilopodinus scobinator* Loew. Montreal, July 16, 1906, (Beaulieu). New to Quebec province list.

289. *Chrysotus obliquus* Loew. Montreal, July 16, 1906, (Beaulieu). New to Quebec province list.

290. *Chrysotus wisconsinensis* Wheeler. Montreal, July 16, 1906, (Beaulieu). New to Quebec province list.

290. *Campsicnemus hirtipes* Loew. Montreal, July 22, 1906. (Beaulieu). New to Quebec province list.

291. *Argyra calceata* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.

293. *Sympycnus lineatus* Loew. Montreal, July 10, 1906, (Beaulieu). New to Quebec province list.

* *Hydrophorus phoca* Aldrich. Corfield, Vanc. Island, B.C., Aug. 7, 1896, (Rev. Mr. Livingston); Psyche, April, 1911, p. 63.

* *Hydrophorus extrarius* Aldrich. St. Johns, Que., Aug. 8, 1901, (Beaulieu); Psyche, April, 1911, p. 66.

300. *Dolichopus brevimanus* Loew. Montreal, July 16, 1906, (Beaulieu). New to Quebec province list.

301. *Dolichopus dakotensis* Aldrich. Montreal, June 14, 1906, (Beaulieu). New to Quebec province list.

301. *Dolichopus detersus* Loew. Montreal, July 22, 1906, (Beaulieu). New to Quebec province list.

302. *Dolichopus latipes* Loew. Montreal, Aug. 14, 1906, (Beaulieu). New to Quebec province list.

303. *Dolichopus ovatus* Loew. Montreal, July 10, 1906, (Beaulieu). New to Quebec province list.

305. *Gymnopternus barbatulus* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.

305. *Gymnopternus crassicauda* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.

305. *Gymnopternus difficilis* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.

306. *Gymnopternus ventralis* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.

309. *Pelastoneurus vagans* Loew. Montreal, July 22, 1906, (Beaulieu). New to Quebec province list.

311. *Platypalpus æqualis* Loew. Montreal, July 16, 1906, (Beaulieu). New to Quebec province list.

312. *Platypalpus crassifemoris* Fitch. Montreal, June 17, 1906, (Beaulieu). New to Quebec province list.

312. *Platypalpus hastatus* Melander. Montreal, June 17, 1906, (Beaulieu). New to Quebec province list.

312. *Platypalpus trivialis* Loew. Montreal, Aug. 18, 1906, (Beaulieu). New to Quebec province list.

318. *Syndyas polita* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.

319. *Hybos slossonæ* Coq. St. Johns, Que., Aug. 1, (Beaulieu). New to Quebec province list.

319. *Leptopeza compta* Coq. Montreal, July 14, 1906, (Beaulieu). New to Quebec province list.

325. *Hilara femorata* Loew. Rigaud, Que., June, 1906, (Beaulieu). New to Quebec province list.

326. *Hilara tristis* Loew. St. Johns, Que., July 1, (Beaulieu). New to Quebec province list.

329. *Cyrtoma longipes* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.

331. *Rhamphomyia longicauda* Loew. Montreal, June 7, 1906, (Beaulieu). New to Quebec province list.

332. *Rhamphomyia mutabilis* Loew. Montreal, June 10, 1906, (Beaulieu). New to Quebec province list.

350. *Pipiza calcarata* Loew. Montreal, June 3, 1906, (Beaulieu). New to Quebec province list.

350. *Pipiza pulchella* Will. Rigaud, Que., June 27, 1906, (Beaulieu). New to Quebec province list.

358. *Pyrophæna granditarsus* Forst. Ottawa, June 2, 1908, (J. A. Letourneau).

359. *Platychirus chætopodus* Will. Montreal, (Beaulieu); Mr. Chagnon has also seen the species from Sherbrooke, Que. New to Quebec province list.

359. *Platychirus peltatus* Meig. Montreal, June 17, 1906 (Beaulieu); Rigaud, Que., (Record sent by Mr. Chagnon). New to Quebec province list.

362. *Eupeodes volucris* O. S. High River, Alta., (Baird); Regina, Sask., Sept. 2, 1907, (Willing).

369. *Xanthogramma emarginata* Say. Montreal, July 16, 1906, (Beaulieu). New to Quebec province list.

373. *Sphaerophoria scripta* Linne. Montreal, Aug. 16, 1906, (Beaulieu). Mr. Chagnon informs me that the species which he has recorded as *cylindrica* is probably *scripta*, (A. G.).

383. *Pyritis montigena* Hunter. Innisfail, Alta., April 16, 1905, (Willing).

394. *Helophilus porcus* Walk. Montreal, June 10, 1906, (Beaulieu). New to Quebec province list.

401. *Brachypalpus rileyi* Will. St. Hilaire, Que., May 24, 1906, (Beaulieu). New to Quebec province list.

412. *Oncomyia loraria* Loew. Montreal, Aug. 19, 1906, (Beaulieu). New to Quebec province list.

423. *Alophora diversa* Coq. Montreal, Sept. 16, 1906, (Beaulieu). New to Quebec province list.

*Alophora magnipennis* John. St. Hilaire, Que., May 24, 1906, (Beaulieu). New to Quebec province list.

451. *Ocyptera dosiades* Walk. Aweme, Man., Aug. 17, (Criddle).

* *Linnæmyia anthracina* Thomp. Hymers, Ont., reared at Ottawa from larvæ of *Hyphoraia parthenos*, received from Mr. H. Dawson, (Gibson); Can. Ent., Aug., 1911, p. 266.

452. *Linnæmyia picta* Meig. Rigaud, Que., June 25, 1906, (Beaulieu). New to Quebec province list.

465. *Sturmia nigrita* Townsend. Rigaud, Que., June 25, 1906, (Beaulieu). New to Quebec province list.

484. *Peleteria ænea* Stæger. Calgary, Alta., July 10, 1903, (Willing).

488. *Echinomyia decisa* Walk. Saskatoon, Sask., Sept. 3, (Willing).

507. *Thelaira leucozona* Panzer. Montreal, Aug. 19, 1906, (Beaulieu). New to Quebec province list.

538. *Homalomyia flavibasis* Stein. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.

538. *Homalomyia incisurata* Zett. Montreal, Aug. 16, 1906. (Beaulieu). New to Quebec province list.

540. *Hyetodesia deleta* Stein. East Bolton, Que., July 28, (Winn). New to Quebec province list.

545. *Spilogaster obscurinervis* Stein. Montreal, June 14, 1906, (Beaulieu). New to Quebec province list.

549. *Anthomyia latitarsus* Zett. Montreal. Aug. 10, 1906, (Beaulieu). New to Quebec province list.

553. *Eustalomyia brixia* Walk. Montreal, (Beaulieu). New to Quebec province list.

553. *Eustalomyia vittipes* Zett. Montreal, June 3, 1906, (Beaulieu). New to Quebec province list.

560. *Cœnosia calopyga* Loew. East Bolton, Que., July 22, (Winn). New to Quebec province list.
563. *Schoenomyza chrysostoma* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.
570. *Heteroneura melanostoma* Loew. Montreal, June 14, 1906, (Beaulieu). New to Quebec province list.
578. *Sciomyza obtusa* Fallen. Montreal, Aug. 18, 1906, (Beaulieu). New to Quebec province list.
581. *Sepedon fuscipennis* Loew. Montreal, July 22, 1906, (Beaulieu). New to Quebec province list.
581. *Sepedon pusillus* Loew. Montreal, April, 1906, (Beaulieu). New to Quebec province list.
582. *Lonchœa rufitarsus* Macq. Montreal, June 7, 1906, (Beaulieu). New to Quebec province list.
582. *Palloptera jucunda* Loew. Kaslo, B.C., Oct. 27, 1906; (Cockle).
585. *Sapromyza fraterna* Loew. Montreal, Aug. 16, 1906, (Beaulieu). New to Quebec province list.
585. *Sapromyza lupulina* Fab. Montreal, July 20, 1906, (Beaulieu). New to Quebec province list.
587. *Sapromyza vulgaris* Fitch. Montreal, July 16, 1906, (Beaulieu). New to Quebec province list.
597. *Chætopsis œnea* Wied. Aweme, Man., June 27-July 9, (Criddle).
616. *Calobata antennipes* Say. St. Johns, Que., July 1, 1907. (Beaulieu). New to Quebec province list.
619. *Nemopoda minuta* Wied. Montreal, Aug. 21, 1906, (Beaulieu). New to Quebec province list.
621. *Loxocera collaris* Loew. Montreal, Aug. 14, 1906, (Beaulieu). New to Quebec province list.
632. *Chlorops* (*Anthracophaga*) *sanguinolenta* Loew. Rouville, Que., May 24, 1906, (Beaulieu). New to Quebec province list.
633. *Chlorops melanocera* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.
635. *Eurina exilis* Coq. Montreal, July 14, 1906, (Beaulieu). New to Quebec province list.
637. *Oscinis decipiens* Loew. Kaslo, B.C., Sept. 1, 1907, (Cockle). The only locality record in Aldrich's catalogue is Sitka.
640. *Phortica leucostoma* Loew. Montreal, July 7, 1906, (Beaulieu). New to Quebec province list.
641. *Drosophila amœna* Loew. Montreal, Aug. 5, 1906, (Beaulieu). New to Quebec province list.
642. *Drosophila funebris* Fab. Montreal, Oct. 1, 1905, (Beaulieu). New to Quebec province list.
643. *Drosophila quinaria* Loew. Rigaud, Que., June 27, 1906, (Beaulieu). New to Quebec province list.
651. *Milichia indecora* Loew. Rigaud, Que., June 25, 1906, (Beaulieu). New to Quebec province list.
656. *Pseudolfersia maculata* Coq. St. Therese, Que., (Mignault). New to Quebec province list.

## Hymenoptera.

In this Order, unfortunately, little definite work seems to have been done in Canada in 1911. Small collections made in previous years have been determined, and data regarding some of these are now included here. Dr. Wheeler has determined a number of different species of ants, records of some of which are also given.

*Spalangera nigra* Latr. Ottawa, Sept. 23, (Sanders).

*Stenamma brevicorne* Mayr. Weymouth, N.S., (Sanders).

*Leptothoran curvispinosus* Mayr. Weymouth, N.S., (Sanders).

*Polichoderus plagiata* Mayr. Grand Manan, N.B, (Sanders); Aweme, Man., 1907, (J. Fletcher).

*Brachymyrmex heeri depilis* Emery. Weymouth, N.S., (Sanders).

*Lasius niger* L., var *neoniger* Emery. Grand Manan, N.B.; Ottawa, (Sanders).

*Lasius brevicornis* Emery. Ottawa, (Sanders).

*Lasius umbratus* Nyl., subsp. *mixtus* Nyl. var. *aphidicola* Walsh. Ottawa, (Sanders).

*Lasius umbratus* Nyl., subsp. *subumbratus* Viereck. Beaver Lake and Olds, Alta., 1907, (Willing).

*Formica sanguinea* Latr. subsq. *subintegra* Emery. St. Stephen, N.B.; Ottawa, (Sanders).

*Formica fusca* L. var. *subsericea* Say. St. Stephen, N.B.; Ottawa, (Sanders).

*Formica fusca* L. var. *neoclara* Emery. Chilliwack Valley, B.C., (J. Macoun).

*Formica lasioides* Emery, var. *picea* Emery. Ottawa, (Sanders).

*Formica subpolita* Mayr. var.*neogagates* Emery. Ottawa, (Sanders).

*Tiphia relativa* Vier. Peachland, B.C., Aug. 2, 1909, (Wallis).

*Specodes arroyanus* Ckll. Lethbridge, Alta., (Wallis). Known from New Mexico and Colorado, (T.D.C.).

* *Tetralonia medicata* Ckll. Medicine Hat, Alta., May 30, 1904, (Willing); Can. Ent., Jan. 1911, p. 34.

* *Anthrophora bomboides willingi* Ckll., n. subsp. Prince Albert, Sask., June 18, 1905, (Willing).

* *Prosopis potens* Metz. Montreal, June 10, 1906; Trans. Amer. Ent. Soc. xxxvii, 104.

*Osmia coloradensis* Cress. Peachland, B.C., Aug. 2, 6, 1909, (Wallis).

*Atanycolus montivagus* Cress. Penticton, B.C., Aug. 12, 1909, (Wallis).

* *Pterochilus leucotaenius* Rohwer. Lethbridge, Alta., July 4, 9, 1909, (Wallis); Proc. U. S. N. M., vol. 40, p. 554.

* *Diodontus bidentatus* Rohwer. Nerepis, N.B., Aug. 20, (Leavitt). Proc. U. S. N. M., vol. 40, p. 561.

* *Hoplocampa xantha* Rohwer. Ottawa; Tech. series No. 20, part IV., U. S. Bureau of Entomology, p. 144.

* *Dimorphopteryx abnormis* Rohwer. Ottawa, 1900; Proc. U. S. N. M., vol. 41, p. 406.

*Parnopes hageni* Vier. Peachland, B.C., Aug. 23, 1909, (Wallis).

*Bombus occidentalis* Green. Fort Selkirk, Y.T., 1908, (Miss Seymour).

*Psithyrus ashtoni* Cress. Kenora, Ont., Sept. 9, 1909.

* *Psithyrus fernaldæ* Franklin. Kaslo, B.C.; Metlakatla.; Trans. Amer. Ent. Soc., xxxvii, 165.

* *Psithyrus tricolor* Franklin. Banff, Alta.; Metlakatla, B.C., (Keen); Weymouth, N.S., (P. G. Bolster); Trans. Amer. Ent. Soc. xxxvii, 167.

### Order Hemiptera.

Unfortunately, as yet, we have few workers in Canada in this order. During the year Mr. J. B. Wallis, of Winnipeg, Man., and Mr. J. D. Evans, of Trenton, Ont., have had collections determined by Mr. Van Duzee, and some of these, together with some interesting species taken at Danville, Que., between July 20 to 30, 1911, and at North Hatley, Que., between July 17 to 24, 1909, by Mr. G. A. Moore, are included here. Miss Edith Patch, of the Agricultural Experiment Station, Orona, Maine, is now working on Psyllidæ and would be glad to receive any material from Canada. Below are also included definite records of a few of these latter insects which have been determined by Miss Patch.

*Stictocephala inermis* Fab. Treesbank, Man., July 18, 1910, (Wallis).

*Telamona ampelopsidis* Harr. Danville, Que., July, (Moore).

*Cyrtobolus maculifrontis* Emmons. Co. Hastings, Ont., July 2, (Evans).

*Publilia modesta* Uhler. Westbourne, Man., Sept. 4, 1910, (Wallis).

*Cixius basalis* Van D. Trenton, Ont., July 13, (Evans).

*Laccocera vittipennis* Van D. Danville, Que., July, (Moore).

*Bruchmorpha tristis* Stal. Treesbank, Man., July 21, 1910, (Wallis).

*Aphelonema simplex* Uhler. Treesbank, Man., July 21, 1910, (Wallis).

*Pissonotus marginatus* Van D. Danville, Que., July, (Moore).

*Pissonotus ater* Van D. Ottawa, July 17, 1904, (Metcalfe).

*Liburnia campestris* Van D. Danville, Que., July, (Moore).

*Liburnia pellucida* Fabr. Trenton, Ont., June 6; Aug. 6, (Evans).

*Lepyronia gibbosa* Ball. Treesbank. Man., July 21, 1910, (Wallis).

*Aphrophora signoretti* Fitch. Treesbank, Man., July 20, 1910, (Wallis); Meach Lake, Que., July 20, 1905, (Gibson).

*Philaronia bilineata* Say. Lethbridge, Alta., July 5, 1909; Treesbank, July 20, 1910, (Wallis).

*Proconia costalis* Fab. Treesbank, Man., April 17, 1908; Winnipeg, Man., May 18, 1909, (Wallis).

*Dræculacephala manitobiana* Ball. Husavick, Aug. 23, 1910, (Wallis).

*Gypona cana* Burm. Peachland, B.C., July 26, 1909, (Wallis).

*Pediopsis basalis* Van D. Co. Hastings, Ont., June 20, (Evans).

*Idiocerus snowi* G. & B. Treesbank, Man., July 21, 1910 (Wallis).

*Athysanus lineola* Fall. Trenton, Ont., June 20, (Evans).

*Phlepsius nebulosus* Van D. Husavick, Man., July 6, 1910, (Wallis).

*Phlepsius decorus* O. & B. Husavick, Man., Aug. 27, 1910, (Wallis).

*Cicadula lineatifrons* Stal. Husavick, Man., Aug. 23, 1910, (Wallis).

*Empoasca atrolabes* Gill. Co. Hastings, Ont., June 20, (Evans).

*Livia vernalis* Fitch. Aylmer, Que., May 31, 1903, (Metcalfe).

*Livia maculipennis* Fitch. Brockville, Ont., Sept. 20, 1903, (Metcalfe).

*Aphalara metzaria* Crawford. Aylmer, Que., May 31, 1903, (Metcalfe).

*Aphalara veaziei* Patch. Hull, Que., July 26, 1903, (Metcalfe).

*Psylla floccosa* Patch. Ottawa, July 12, 1903; Hull, Que., Aug. 1, 1904, (Metcalfe).

*Psylla galeaformis* Patch. Ottawa, July 12, 1903; Aug. 2, 24, 1904; June 26, 1904; Hull, Que., Aug. 1, 1904, (Metcalfe.)

*Psylla striata* Patch. Ottawa, on ironwood, Aug. 25, 1907; on basswood, July 1, 1904; Hull, Que., on maple, Aug. 1, 1904, (Metcalfe).

*Trioza obtusa* Patch. Brockville, Ont., Oct. 11, 25, 1903, (Metcalfe).

*Banasa sordida* Uhler. Co. Hastings, Ont., Aug. 27, (Evans).

*Thyreocoris nitiduloides* Wolff. North Hatley, Que., July, 1909, (Moore).

*Aradus quadrilineatus* Say. Winnipeg, Man., May 18, 1909, (Wallis).

*Sphragisticus nebulosus* Fall. Winnipeg, Man., May 17, 1909, (Wallis).

*Emblethis vicarius* Horv. Treesbank, Man., July 26, 1910 (Wallis).

*Scolopostethus atlanticus* Horv. Winnipeg, Man., May 13, 1909, (Wallis).

*Corynocoris distinctus* Dallas. Grimsby, Ont., Sept. 16, 1894, (Metcalfe).

*Megalotomus quinquespinosus* Say. Aylmer, Que., Aug. 21, 1910, (Metcalfe).

*Corizus crassicornis* L. Treesbank, Man., July 21, 1910, (Wallis).

*Leptoypha mutica* Say. North Hatley, Que., July, 1909, (Moore).

*Pagasa fusca* Stein. Winnipeg Beach, Man., Aug. 25, 1910, (Wallis).

*Reduviolus propinquus* Reut. Husavick, Man., July 11, 1910, (Wallis).

*Nœogeus burmeisteri* L. & S. Treesbank, Man., July 25, 1910, (Wallis).

*Mesovelia mulsanti* White. Husavick, Man., July 12, 1910, (Wallis).

*Triphleps tristicolor* B. White. Peachland, B.C., July 24, 1909, (Wallis).

*Anthocoris borealis* Dallas. North Hatley, Que., July, (Moore).

*Anthocoris melanocerus* Reut. Peachland, B.C., July 24, 1909, (Wallis).

*Anthocoris musculus* Say. Danville, Que., July, (Moore).

*Orthotylus congrex* Uhler. Co. Hastings, Ont., June 14, 20, (Evans).

*Orthotylus marginatus* Uhler. Co. Hastings, Ont., June 20, (Evans).

*Dicyphus californicus* Stal. Trenton, Ont., Aug. 20, (Evans).

*Fulvius brunneus* Prov. Trenton, Aug. 10, (Evans).

*Stenotus binotatus* Fabr. Trenton, Ont., June 26, (Evans).

*Hadronema picta* Uhler. Lethbridge, Alta., June 6, 1909, (Wallis).

*Resthenia insignis* Say. Danville, Que., July, (Moore).

*Dichrooscytus suspectus* Reut. Husavick, Man., July 10, 1910, (Wallis).

*Lygus plagiatus* Uhler. Winnipeg, Man., Sept. 4, 1909, (Wallis).

*Tropidosteptes commissuralis* Reut. Hull, Que., Aug. 14, 1904, (Metcalfe).

*Tropidosteptes amœmus* Uhler. Husavick, Man., July 11, 1910, (Wallis).

*Camptobrochis validus* Reut. Peachland, B.C., Aug. 5, 1909, (Wallis).

*Horcias dislocatus* Say, var. *affinis* Reut. Ottawa, May 13, (Metcalfe).

*Mimiceps gracilis* Uhler. Carlsbad Springs, Ont., June 26, 1904, macropterous form, (Metcalfe).

*Salda interstitialis* Say. Winnipeg, Man., May 20, 1910, (Wallis); North Hatley, Que., July, 1909, (Moore).

*Salda littoralis* L. Husavick, Man., July 3, 1910, (Wallis).

### Neuropteroid Insects (Except Odonata).

(Arranged according to a catalogue of the Neuropteroid Insects, (Except Odonata), of the United States, by Nathan Banks; American Entomological Society, 1907. The numbers refer to the pages of the catalogue).

All of the species mentioned below have been determined by Dr. Banks. Some, it will be noticed, are of not uncommon occurrence and even widespread distribution, but it has been thought advisable to include them all here as our knowledge of the distribution of these neuropteroid insects is very limited and almost any definite record is of value. With but few exceptions none of the species here mentioned have been recorded in the RECORD. The few previously mentioned are from widely separated localities.

### ORDER ARCHIPTERA.

13. *Isoperla bilineata* Say. Winnipeg, Man., May 29, 1908, (Wallis).
16. *Ephemera decora* Walk. Husavick, Man., July 10, 1910, (Wallis).
16. *Ephemera simulans* Walk. Go Home Bay, Ont., late June and early July, (Walker).
17. *Cœnis dimuta* Walk. Go Home Bay, Ont., July 4—Aug. 10, 1908, (Walker).
18. *Callibœtis ferrugineus* Walsh. Husavick, Man., Aug. 16, 1910, (Wallis).
20. *Heptagenia canadensis* Walk. Husavick, Man., July 2, 1910, (Wallis).
20. *Heptagenia flavescens* Walsh. Peachland, B.C., Aug. 23, 1909, (Wallis).
20. *Heptagenia interpunctata* Say. Go Home Bay. Ont., June 29, 1908, (Walker).
20. *Heptagenia luridipennis* Burm. Go Home Bay, Ont., June 26—Aug., 1908, (Walker).
20. *Bœtisca obesa* Say. Go Home Bay, Ont., June 27, 1907, (Walker).

### ORDER NEUROPTERA.

21. *Chauliodes serricornis* Say. Ottawa, Aug. 1910, (Bro. Germain).
27. *Chrysopa majuscula* Banks. Penticton, B.C., Aug. 12, 1909, (Wallis).
27. *Chrysopa nigricornis* Burm. Husavick, Man., Aug. 16, 1910, (Wallis).
28. *Chrysopa ypsilon* Fitch. Winnipeg, Man., June 10, 1910, (Wallis).
* *Chrysopa canadensis* Banks. Go Home Bay, Ont., July 12, (Walker); Trans. Amer. Ent. Soc., xxxvii, 340.
30. *Brachynemurus abdominalis* Say. Aweme, Man., July 18, 1910, (Wallis); Go Home Bay, Ont., July 31, 1907, (Walker).
31. *Brachynemurus brunneus* Currie. Aweme, Man., July 20, 1910, (Wallis).
31. *Brachynemurus nigrilabris* Hagen. Aweme, Man., July 20, 1910, (Wallis).
32. *Cyrptoleon nebulosum* Oliv. Giant's Tomb Island, Georgian Bay, July 7-30, 1907, (Walker).

### ORDER TRICHOPTERA.

35. *Phryganea cinerea* Walk. Go Home Bay, Ont., (Walker).
35. *Neuronia postica* Walk. Go Home Bay, Ont., (Walker).
35. *Neuronia pardalis* Walk. Hymers, Ont., June 16, 1910, (Dawson).
35. *Agrypnia straminea* Hagen. Winnipeg, Man., June 1, 1908, (Wallis).
36. *Limnephilus externus* Hagen. Winnipeg, Man., Sept. 13, 1910, (Wallis).
36. *Limnephilus indivisus* Walk. Temagami, Sept. 14, 1908, (Walker).
*. *Rhyacophila grandis* Banks. Vernon, B.C., and Bon Accord, B.C., June 14, (Russell); Trans. Amer. Ent. Soc., xxxvii. 351.
42. *Brachycentrus incanus* Hagen. Winnipeg, Man., May 31, 1910, (Wallis).
43. *Helicopsyché borealis* Hagen. Husavick, Man., Aug. 4, 1910, (Wallis).
*Lepidostoma wisconsinensis* Vorhies. Husavick, Man., July 2, 1910, (Wallis).

45. *Molanna cinerea* Hagen. Go Home Bay, Ont., June 28-July 12, 1908, (Walker).
45. *Molanna rufa* Hagen. Husavick, Man., July 2, 1910, (Wallis).
45. *Leptocerus resurgens* Walk. Go Home Bay, Ont., July 4, 12, 1907, (Walker).
45. *Triænodes borealis* Banks. Husavick. Man., July 2, 1910, (Willis).
45. *Triænodes ignita* Walk. Treesbank, Man., July 29, 1910, (Willis).
45. *Leptocella albida* Walk. Winnipeg, Man., June 29, 1909, (Wallis).
46. *Leptocella uwarowii* Kolen. Husavick, Man., Aug. 23, 1910, (Wallis).
46. *Œcetina incerta* Walk. Husavick, Man., July 4, 1910, (Wallis); Go Home Bay, Ont., July 12, 22, 1908, (Walker).
47. *Macronema zebrata* Hagen. Sandy Gray Falls, Musquash River, Ont., July 24, 1907, (Walker).
47. *Hydropsyche alternans* Walk. Winnipeg, Man., June 3, 1910, (Wallis).
47. *Plectrocnemia confusus* Hagen. Go Home Bay, Ont., June 27-July 5, 1907, (Walker).
*. *Polycentropus remotus* Banks. Peachland, B.C., July 23, (Wallis); Trans. Amer. Ent. Soc. xxxvii, 359.
48. *Nyctiophylax affinis* Banks. Go Home Bay, Ont., July 5-22, 1907. (Walker).
*. *Nyctiophylax moestus* Banks. Peachland, B.C., Aug. 19, (Wallis); Trans. Amer. Ent. Soc., xxxvii, 359.

## Odonata.

Dr. E. M. Walker of Toronto, has sent to me the following interesting records which I am glad to include.

*Amphiagrion saucium* Burm. Aweme, Man., June, 1911, I female, teneral, (Wallis). First Manitoba record.

*Hagenius brevistylus* Selys. Mississauga River, Parry Sound Dist., Aug. 2, 1911, 1 male, (Hahn).

*Ophiogomphus rupinsulensis* Walsh. Shawniga River, Parry Sound Dist., Ont., Aug. 10, 1910, (Hahn). At the same locality Mr. Hahn also obtained a number of exuviæ of an *Ophiogomphus*, probably belonging to the same species.

*Ophiogomphus severus* Hag. Aweme, Man., July 19, 1910, (Wallis). Two females, probably of this species.

*Gomphus externus* Hag. Winnipeg, Man., June 25, 1910, 3 males, 1 female, (Wallis).

*Gomphus lividus* Selys. Shawniga River, Parry Sound Dist., Aug. 10, 1910. A number of exuviæ, (Hahn).

*Gomphus scudderi* Selys. Mississauga River, Parry Sound Dist., Aug. 2, 1911. 1 male, (Hahn).

*Dromogomphus spinosus* Selys. Mississauga River, Parry Sound Dist., Aug. 2, 1911, 1 male, (Hahn).

*Basiaeschna janata* Say. Shawniga River, Parry Sound Dist., Aug. 10, 1911. Several exuviæ, (Hahn).

*Boyeria vinosa* Say. Shawniga River, Aug. 10, 1911, 1 male, 1 female, (Hahn).

A number of *Boyeria* exuviæ were also taken at this locality, and are separable into two slightly differing forms, one of which is identical with the exuvia of *B. grafiana,* so that the other doubtless belongs to *vinosa.*

*Aeshna eremita* Scudd. Shawniga River, Aug. 10, 1911, 2 exuviæ, (Hahn).

*Aeshna interrupta* Walk. Mississauga River, Aug. 2, 1911, 3 males, 1 female, (Hahn).

*Neurocordulia yamaskanensis* Prov. Shawniga River, Aug. 10, 1911, numerous exuviæ, (Hahn).

*Helocordulia uhleri* Selys. Shawniga River, Aug. 10, 1911, 1 exuvia, (Hahn).

*Somatochlora macrotona* Wmsn. Winnipeg, June 10-19, 1910; 3 males, 2 females; Husavick, Man., Aug. 17, 1910, 1 female, (Wallis).

*Libellula pulchella* Drury. Husavick, Man., July 11, 1910, (Wallis). Most northwesterly record.

*Pantala hymenæa* Say. Husavick, Man., July 11, 1910, 1 male, (Wallis). First Canadian Record.

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