

ANNUAL REPORT  
OF THE  
ENTOMOLOGICAL SOCIETY  
OF  
ONTARIO,  
FOR THE YEAR 1877.

INCLUDING REPORTS ON SOME OF THE NOXIOUS, BENEFICIAL  
AND OTHER INSECTS OF THE PROVINCE OF ONTARIO.

PREPARED FOR THE HONOURABLE THE COMMISSIONER OF AGRICULTURE, ON  
BEHALF OF THE SOCIETY

BY

WILLIAM SAUNDERS,

*President of the Entomological Society of Ontario; Editor of Canadian Entomologist.*

REV. C. J. S. BETHUNE, M. A.,

*Head Master of Trinity College School, Port Hope.*

B. GOTT,

*Arkona, Ontario,*

AND

JOSEPH WILLIAMS,

*London, Ontario.*

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REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, FOR THE  
YEAR 1877.

*To the Honourable the Commissioner of Agriculture:*

SIR,—In accordance with the provisions of our statute of incorporation, I have the honour to submit for your consideration the Report of the Entomological Society of Ontario, for the year 1877, in which you will find a detailed statement of the receipts and disbursements of the year, all of which are duly audited.



## Disbursements.

By CANADIAN ENTOMOLOGIST, printing, &c .....	347 75
“ Paper for .....	102 76
“ Printing labels .....	11 75
“ Mail list and stamping.....	13 50
“ Travelling expenses to Annual Meeting .....	6 00
“ Sundry small expenses.....	50 70
“ Postage, express and duties .....	46 82
“ Library.....	77 52
“ Engravings.....	20 04
“ Merchandise, pins and cork.....	89 00
“ Insurance .....	10 63
“ Editor's salary .....	100 00
“ Secretary-Treasurer's salary .....	50 00
“ Expenses of Annual Report .....	68 00
“ Balance.....	236 85
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We certify the above as a correct statement of accounts for the year ending September 26th 1877, as shown by the Treasurer's books, and with vouchers for the same.

JOHN M. DENTON, }  
CHARLES CHAPMAN. } *Auditors.*

## REPORT OF THE COUNCIL, 1877.

In presenting the seventh annual report, the Council feel highly gratified at the success that has attended the labours of the Society during the past year.

We are happy to note the return of the Society's Centennial collection of insects, which reached London in good condition shortly after the close of the International Exhibition. This collection, which was noticed in your last annual report, is now placed in the Rooms, where it will in future be available for reference. As this beautiful collection was made up largely from the cabinets of individual members of the Society, who generously loaned the insects for the purpose of exhibition, it was thought that if the immediate return of the loaned specimens was insisted on, the value of the series would be greatly impaired; but we are happy to state that the parties concerned have in most cases given their consent to allow the specimens to remain on deposit in the Society's Rooms, so that we still retain the Centennial Collection of Canadian Insects almost intact, a monument to the zeal and industry of those members of the Society who were actively engaged in this work.

We may add that this collection was placed on exhibition at the Rooms on several occasions after its return, when some of the members were present to assist visitors, and from the interest manifested then by the public in the matter, we would recommend that the Rooms be thrown open occasionally to all who may desire to visit them, and that public notice be given of the same.

The CANADIAN ENTOMOLOGIST has almost completed its ninth volume, and fully maintains its reputation as a record of the latest investigations and discoveries in scientific and practical Entomology. We would return our heartiest thanks to all those who have so kindly contributed to the pages of the ENTOMOLOGIST, and request that they will continue to favour the Editor with the results of their observations and experiments. Although we have reason to feel gratified at the efforts of the Society to excite in the general public an interest in Entomology, yet we would respectfully suggest that our successors may be able in some measure to improve on the means adopted in the past to render the ENTOMOLOGIST even more useful to beginners in this interesting science, either by more frequent descriptions and illustrations of our common insects, and perhaps by referring to the insects that are likely to appear in each month of the summer, and the manner of their capture and preservation, or in any other method that may appear suitable.

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We are happy to note a steady increase in the number of members. The Branch Societies, especially in London and Montreal, are progressing favourably.

The funds of the Society are in a gratifying state; by economical management we have been enabled to sustain and successfully carry out all the operations we have undertaken; for details we refer to the report of the Secretary-Treasurer.

The Library has been enriched by a number of valuable scientific works, and others of more general interest, but which bear on Entomological subjects. Among the additions we may mention the *Encyclopedia Britannica*, as far as at present published, which will prove invaluable as a means of reference. Our stock of engravings and electrotypes has been slightly increased, but in this line we are greatly restricted by want of means, and are obliged generally to content ourselves with electrotypes of other illustrations. We believe that a much larger sum than is annually given for this purpose might be profitably expended in procuring original illustrations.

Submitted on behalf of the Council by

JOSEPH WILLIAMS,  
*Secretary-Treasurer.*

The President read his annual address, which received a vote of thanks. Rev. R. Burnet, in seconding the motion of vote of thanks, took occasion to speak highly of the value of the labours of Mr. Saunders, and suggested that his address appear in the daily papers as well as in the Annual Report, which was approved of.

#### ANNUAL ADDRESS OF PRESIDENT.

GENTLEMEN,—At the close of another year it is my duty and privilege to offer you a few remarks relating to our progress as a Society, and also to the general advancement of that department of natural science in which we all feel so deep an interest.

The progress of the Entomological Society of Ontario during the past year has been steady and continuous. Every season witnesses an infusion of new blood into our ranks, mainly from among the young, who, when entering on the pursuit of this charming study, bring with them all the enthusiasm and ardour of youth. Our membership is thus gradually increasing, and our influence and sphere of usefulness yearly extending. The importance of the study of Entomology is gradually becoming more deeply impressed upon the public mind. The Entomologist needs no longer to apologize for the trivial character of his pursuits, for small and apparently insignificant as the operations of the individual destructive insect may appear, yet when multiplied, as they usually are, by millions, their work is so disastrous and so desolating that the study of their life and history, with the view of combatting more effectually their enormous increase, becomes of the most vital importance.

We have to note the prevalence during the past year of several insect pests. <sup>*M. disstigma*</sup> Early in June our gardens, orchards, and even our forests in the western portion of Ontario were frightfully devastated with the Forest Tent Caterpillar, *Obiocrampa sylvatica*. There were millions upon millions of them, and so enormous were their numbers, and so persistent their attacks, that after fighting them bravely for a week or two, many gave up the contest in despair, weary of the slaughter. Many an orchard was rendered bare and leafless, and in some instances the woods were so void of foliage as to remind one of winter. This was particularly the case about London, and our orchards and gardens here were saved from destruction only by the most persistent effort. For several weeks caterpillars were swarming everywhere, so that the timid scarcely dared venture out under the shade of trees for fear of bringing them home on their clothing or persons. By the end of June they had nearly all become chrysalids, and it was interesting to observe the strange looking deformities they occasioned among ornamental shrubs and flowers by twisting the leaves into suitable forms in which to enclose their cocoons. On the trees the few fragments of leaves remaining were put to a similar purpose, and thus sewed up and hanging pendant with the weight of sometimes two or three cocoons huddled together, they looked very odd.

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On examining a number of these chrysalids, a large proportion of them were found to be infested with parasites, which materially lessens the chances of their being so very numerous again next year; still we fear that enough of them passed safely through all their preparatory stages to give us some trouble another season.

The Cabbage Butterfly, *Pieris rapæ*, is still progressing westward. This year it has extended its domain as far as Chicago, where a few of the advance guard have been captured. In the neighbourhood of London their larvæ have been very destructive this summer, so disfiguring and destroying the cabbages in many instances as to render them entirely worthless. The history of the introduction of this pretty little pest forms an interesting chapter in our Entomological annals. During the time of the Trent difficulty in 1861, a quantity of fresh vegetables were sent along with other stores to Quebec for the sustenance of the gallant little army which was despatched to our shores. As the Cabbage Butterfly is said to have made its appearance shortly after this period, it is presumed that it was accidentally introduced with the stores for the troops. In 1863 specimens were sent to us from this district for determination, which was the first intimation we had of their existence in this country. By 1866 the butterfly had spread further west than Montreal, and east as far as the Saguenay River. In 1869 it was reported as common in New Jersey, and by 1871 it had travelled east as far as Halifax, Nova Scotia, and west to the middle of the State of New York. It now embraces an area bounded by the shores of the Atlantic from the River St. Lawrence to Virginia, and has overrun the whole country westward as far as Chicago. A few days since, while on a visit to the Muskoka District, I was surprised to find them plentiful, in company with the Colorado Potato Beetle, as far north as the head of Lake Rosseau. 1877

The wonderful manner in which this insect has adapted itself to the varying climatic characteristics embraced within this wide area, is a matter of astonishment. It seems to thrive alike in the cold north and sunny south, and in every place where it established itself it has multiplied so rapidly as to become in a very short time the commonest of all butterflies. The little parasite, *Pteromalus puparum*, which has also fortunately been introduced from Europe, and which is finally destined to keep this pest within reasonable bounds, is on the increase here, but is not yet sufficiently numerous to fulfil its mission as successfully as we could wish.

The Colorado Potato Beetle, as predicted, has at last found its way across the Atlantic, and founded colonies on the Continent and in the British Isles. Their arrival and settlement has caused a commotion almost as great as would the approach of a hostile army. According to newspaper accounts, large patches of ground where the enemy has been seen lurking have been saturated with benzine and fired, while in the search, the whole surface has been turned over with the spade and shovel as carefully as if each specimen were a nugget of gold or a diamond. cargoes of all sorts in which it was suspected the intruders could find a hiding place have been submitted to the most rigid examination by government officials, and various edicts were promulgated, with a view to strangle this evil in its infancy; but the beetle is heedless of enactments, however prohibitory, and we fear that no vigilance, no matter how persistent, will prevail in preventing the spread of this little intruder, and that before long the potato grower in Europe will be obliged to regularly adopt measures for poisoning this pest similar to those so successfully carried out by our own people.

Since I was last privileged to address you, the Congress of the United States, in view of the enormous losses yearly inflicted on agriculture by destructive insects, have appointed an Entomological Commission composed of eminent Entomologists, who shall devote their whole time for several years to a study of the habits of the various insect pests, and the thorough testing of the efficiency of such remedies as have been or may be devised for their destruction, and to report progress from time to time. A liberal appropriation to defray the expense of this work has been made, and the labourers are now actively engaged in the field.

Early in the year, your President was requested by the Chief of this Commission, Prof. C. V. Riley, to bring this important matter before our Government and ask their influence towards furthering the objects in view. Accordingly, at a meeting of the Council of Agriculture, held in June last, the writer introduced a resolution urging the co-operation of our Government with that of the United States in this undertaking, which was unanimously adopted by the Board and transmitted to the proper authorities. I am pleased to be able to state that the Minister of Agriculture, in his reply, assured us that this subject had already

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engaged their serious attention, and that every effort would be made to aid the Commission in its work. This season is being spent by these savans in especially studying the habits and breeding places of the destructive Locusts of the West, and already they have made extended observations, not only in the western territories of the United States, but also in some of the adjoining portions of our Dominion.

The Entomological Club of the American Association for the Advancement of Science held its annual meeting in Nashville, Tenn., commencing on the 30th of August, when many interesting subjects were discussed. An important paper was read by A. R. Grote, Esq., of Buffalo, N. Y., on a new insect, destructive to the red and white pine trees, the sources of our valuable lumber trade. From the details given of the work of this insect we fear it may prove a formidable foe to the future growth of our pine forests. Our Society has usually been represented at these annual gatherings, but on this occasion, owing to other pressing and unavoidable engagements, those of us who have usually attended were prevented from being present.

We cannot better illustrate the recent progress made in Entomological science than by referring to one department, namely, that of the study of our night-flying moths. This has been greatly stimulated by the general practice of sugaring, by which immense numbers of these insects have been attracted, and their capture in good condition made an easy matter. This practice in America was but little followed until 1874, when an English Entomologist, Mr. George Norman, visited Canada, and, after having faithfully carried out the process of sugaring for a season, he published the result of his labours and his mode of operating, in our journal. His success was so unprecedented, and so many rare, or hitherto unknown species captured, that collectors everywhere were induced to imitate his example, and in the short time that has since elapsed an immense number has been added to the list of known species, and our collections have been enriched by this means with an extensive series of hitherto rare specimens.

Our monthly journal, the CANADIAN ENTOMOLOGIST, is still well sustained, its pages being regularly filled with interesting and original contributions. Did time permit, I might have occupied your attention at considerable length by referring to the many valuable points brought out in these papers. I cannot, however, refrain from adverting to the contributions of Mr. W. H. Edwards, of West Virginia, on the life history of some of our butterflies, in which it has been shown that not a few of our so-called species are merely dimorphic forms of other species, and attention drawn to the important influence of cold in modifying these forms. By exposing the chrysalids to the influence of this agency by laying them for varying periods on ice, or placing them in an ice house, some of these dimorphic forms have been produced at will, thus throwing much light on the causes of variation in species.

I would also call your attention to the many recent valuable additions to Entomological literature in America, especially to the beautifully illustrated work of Dr. A. S. Parkard, on the Geometrids of North America; to the continuation of Edwards' magnificent work on North American Butterflies; to the learned and elaborate treatise on the Rhynchophora of America north of Mexico, by Drs. LeConte and Horn; to the excellent works of Prof. Townend Glover, of Washington, on American Diptera, Orthoptera, and Hemiptera; to the valuable reports of the State Entomologist of Missouri, and many other excellent works. But I must not trespass longer on your patience. Thanking you for your kind partiality in honouring me as you have done,

I have the honour to be,

Yours very sincerely,

WM. SAUNDERS.

London, Ontario, September 25th, 1877.

The election of officers then took place, with the following result:—

*President.*—W. Saunders, London.

*Vice-President.*—E. Baynes Reed, London.

*Secretary-Treasurer.*—J. Williams, London.

*Council.*—Wm. Couper, Montreal; Rev. C. J. S. Bethune, Port Hope; J. Pettit,

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Grimsby ; J. M. Denton, London ; Rev. R. Burnet, London ; R. V. Rogers, Kingston ; Ja. Fletcher, Ottawa.

*Editor of Canadian Entomologist.*—W. Saunders, London.

*Editing Committee.*—Rev. C. J. S. Bethune, Port Hope ; E. B. Reed, London ; and G. J. Bowles, Montreal.

*Library Committee.*—The President, Vice-President, Secretary-Treasurer, and J. M. Denton.

*Auditors.*—Chas. Chapman and A. Puddicombe, of London.

During the time allotted for miscellaneous business, Mr. D. W. Beadle, of St. Catharines, spoke of the ravages of the Cabbage Butterfly, *Pieris rapae*, and of the great benefit that would be conferred on gardeners by the discovery of some remedy which might be safely used for this pest. He also referred at length to the great success which had attended the labours of the Entomological Society, and of the high reputation it had acquired in America and foreign countries.

The President, in reply, referred to the rapid increase of the small parasite *Pteromalus puparum*, which preys on this species, and the gratifying prospect of a speedy diminution in numbers of the cabbage butterfly from this cause.

Mr. P. C. Dempsey, of Albury, stated that hot water had been successfully used in his neighbourhood to destroy the *Pieris* larva ; that experiment had shown that the cabbage would bear the application of water heated to 200° Fahrenheit, without injury, while water at a somewhat lower temperature than this would effectually destroy the larva. The hot water may be applied through a rose sprinkler, or by the use of a dipper. He also stated that a cold infusion of Quassia, in the proportion of two or three pounds to a barrel of water, had been found effectual in destroying the worm, and more convenient in its application than hot water. This solution may give a slightly bitter taste to the vegetable, unless thoroughly washed, but it is perfectly harmless to the human system.

Mr. Chas. Arnold, of Paris, referred to the increasing ravages of the Codling worm (*Carpocapsa pomonella*), and stated that he had scarcely a sound apple in his orchard this year. This was, doubtless, partially due to the small crop, and he hoped that the scarcity of apples this season would so far starve out this insect that we might enjoy some immunity from its attacks for a year or two.

Rev. Dr. Burnet, President of the Fruit Growers' Association, expressed his pleasure at being present, and his high appreciation of the labours of the active members of the Society, and referred to the great benefits which fruit growers had derived from the publication of the results of their investigations on noxious insects injurious to fruits.

Prof. Buckland, of the Department of Agriculture, Toronto, spoke of the great utility of the work carried on by the Society in diffusing information in reference to the various insect pests which afflict the farmer and fruit grower, and of the flattering notices he had seen in foreign journals concerning the CANADIAN ENTOMOLOGIST. He believed the Society well deserved the cordial support of all those interested in agriculture.

The President, in confirmation of these remarks, alluded to the fact that the CANADIAN ENTOMOLOGIST numbers on its exchange list many periodicals of the highest standing, English, American, French and German.

#### ANNUAL MEETING OF THE LONDON BRANCH

The Annual Meeting of the London Branch of the Entomological Society of Ontario, was held on January 23rd, 1877, at the rooms of the Society.

The following officers were elected for the year 1877 :—

*President.*—Chas. Chapman.

*Vice-President.*—J. M. Denton.

*Secretary-Treasurer.*—J. Williams.

*Curator.*—A. Puddicombe.

*Council.*—Messrs. H. P. Bock, W. Saunders, and J. Williams.

The Annual Report of the Secretary-Treasurer was read and adopted ; it showed that a small balance remained after all expenses had been met.

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 REPORT OF THE COUNCIL.
 

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The Council of the London Branch of the Entomological Society of Ontario, beg to submit the following:—

The prospects of the Branch are very good; the meetings have been well attended, excepting during the heat of the summer, and many valuable additions have been made to our collections.

The experiment of placing the Centennial Collection on exhibition at the rooms was so favourably received by the public, that it has been decided to take steps to the more frequent admittance of non-members, and in this way it is hoped and believed something may be done to create a wider and deeper interest in our favourite branch of science. This is a matter of great importance, and we have no doubt our members will acquit themselves creditably in it.

Submitted on behalf of the Council, by

JOSEPH WILLIAMS,  
Secretary-Treasurer.

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 MONTREAL BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.
 

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The Fourth Annual General Meeting of this Branch was held on Tuesday, 1st of May at 8 o'clock p.m., at the residence of H. H. Lyman, Esq., the President, in the chair.

The following report was read and adopted:

## REPORT.

Your Council beg to present the Fourth Annual Report of the Society's operations.

They would refer with pleasure to the satisfactory progress of the Society in the study of our science, evinced by the steadiness with which the monthly meetings have been kept up, and the interesting and valuable papers read at these meetings. Solid progress has been made in the identification and classification of the insects of Montreal, and much preliminary work has been accomplished, the value of which will appear hereafter. The only cause for regret is that our number continues so small, but the zeal and perseverance of the present members go far to compensate for their paucity in number. Your Council entertain the hope that at no distant day our membership will be augmented by the addition of at least a few more students of our useful and interesting branch of natural history.

Twelve meetings were held during this year, at which the following papers were read and presented to the Society:

G. J. Bowles—"List of Eggs and Larvæ Described in the Seven Volumes of the CANADIAN ENTOMOLOGIST."

H. H. Lyman—"Notes on the Occurrence of *Ar, gynnus idalia*."

F. B. Caulfield—"List of the Geometridæ of Montreal."

W. Couper—"On *Phyciodes tharos*."

H. H. Lyman—"List of some of the Geometridæ of Montreal."

F. B. Caulfield—"Notes on some Species of *Chrysolimelidæ* Occurring on the Island of Montreal."

F. B. Caulfield—"Notes on the Species of *Meloe* in Canada."

H. H. Lyman—"Entomological Rambles, Including Notes on Entomology at the Centennial Exhibition."

G. J. Bowles—"The Noctuidæ of Quebec."

G. J. Bowles—"Notes on D'Urban's Paper in the *Canadian Naturalist*, Vol. v., with Identifications of the Species."

Some progress has been made during the year in the compilation of the "Montreal Catalogue," and the names of 790 identified species are now entered on the list, comprising 385 Lepidoptera, 367 Coleoptera, 4 Diptera, 15 Orthoptera, 16 Hymenoptera and 3 Hemiptera. The earnest co-operation of the members is requested by your Council in this work. There is no doubt but that it will be of immense value to future students and will form a lasting memorial of our labours.

The finances of the Society have engaged the earnest attention of your Council. They

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would recommend that the cash on hand be expended in books for our Library, under the direction of the new Council.

The whole respectfully submitted.

GEO. JNO. BOWLES,  
President.

Montreal, 1st May, 1877.

The following were then elected to office for the ensuing year :

G. J. Bowles, President, (re-elected) ; H. H. Lyman, Vice-President ; G. B. Pearson, jr., Secretary and Treasurer (re-elected) ; C. W. Pearson Curator (re-elected) ; Council—F. B. Caulfield, Robert Jack, W. Hibbins, jr.

After a pleasant conversation on Entomological subjects, and the examination of numerous specimens, the meeting adjourned.

G. B. PEARSON, Jun.,  
Secretary.

#### EXPERIMENTS ON THE COLORADO POTATO BEETLE.

By W. Brodie, Toronto.

The following interesting paper giving details of experiments on the Potato Beetle was read at a recent meeting of the Toronto Entomological Society :—

GENTLEMEN,—I herewith submit for your consideration a synopsis of a series of experiments, conducted by myself, intended to determine certain facts in the life-history of *Doryphora 10 lineata*, about which there is a good deal of popular misconception.

The experiments were made in cages, where the natural conditions of temperature, light, and moisture were maintained as nearly as possible ; the same cages in which I had successfully reared larvæ of *Papilio troilus* and other delicate lepidoptera.

To secure greater accuracy nearly every experiment was repeated, or two or more conducted simultaneously, and the results carefully compared and recorded.

The more important propositions supported by these experiments are :

First.—The potato is the only plant in Ontario on which the beetle can feed so as to become very numerous.

Second.—Food is necessary to the imago, in order to develop the reproductive functions.

Third.—If not supplied with food the imago will die in a short time—perhaps never exceeding two weeks.

Fourth.—The advent in Toronto of *Lydella doryphora*, by far the most reliable and valuable of all the enemies of *D. 10 lineata*.

It is so generally conceded that *D. 10 lineata* will not feed on the leaves of any of our forest trees neither on any of our grasses, nor cyperaceous plants ; that proofs of this need not be submitted nor discussed. The plants experimented upon, you will see, are mainly those which have been named as food plants by newspaper men, farmers and others.

Experiment 1.—Thirty mature beetles, after being kept without food for twenty-four hours, were supplied with leaves of carrot, parsnip, beet, pumpkin, lettuce, sunflower, sage, *Panicum crus galli*, and cabbage, for eight hours ; none eaten ; when supplied with potato leaves, all ate freely.

Experiment 2.—Thirty mature beetles, after being kept without food for thirty-two hours, were supplied for sixteen hours,—in addition to the plants named in experiment 1.—with red root, (*Amarantus hybridus*), sheepbur, (*Cynoglossum officinale*), burdock, (*Lappa officinalis*), small bur, (*Echinosperrnum lappula*), sour dock, (*Rumex crispus*), *Labelia siphilitica* and *L. inflata*, lambs quarter, (*Chenopodium album*), mullein, (*Verbascum thapsus*) ; none eaten ; when supplied with potato leaves all ate freely. This experiment was also repeated three times, with uniform result.

Experiment 3.—Thirty mature beetles, after being kept eleven days without food, were, in addition to the plants used in the second experiment, supplied with leaves of milk weed (*Asclepias cornuti*), arrow head (*Sagittaria variabilis*), Canada thistle (*Cirsium avvense*)

water parsnip (*Sium lineare*), golden rod (*Solidago nemoralis*), fleabane (*Erigeron Canadense*), cat mint (*Nepeta Cataria*), common plantain, (*Plantago major*), *Apocynum androsaemifolium*. None were eaten. When supplied with potato leaves, all ate freely.. This experiment was repeated three times with unvarying results.

The solanaceous plants found in Ontario, outside of cultivation, on which it is generally admitted *Doryphora* will feed are the *Hyoscyamus niger*, *Physalis viscosa*, *Nicandra physaloides*, *Solanum niyrum*, *Solanum dulcamara*, *Datura stramonium*. It is very doubtful if *Doryphora*, either in the larvæ or imago state, will feed on the last two named. They are, however, all late plants, and would afford no food in the spring season, and so scarce that they would not feed the July brood for one hour.

Experiment 4.—Aug. 8. Took in fifty mature D. 10 lineata larvæ, forty-five of which had changed to beetles on Aug. 26, while five had died in the pupating stage. These forty-five beetles were kept without food; four died on the fourth day, thirty-seven were dead on the fifth day, thirty-nine on the eighth day, forty-two on the tenth day, forty-five on the eleventh day. Over 75 per cent. died within five days, the males dying first. No pairing took place, no ova were deposited, and no disposition to hibernate was evinced.. This is the average of three cases conducted simultaneously, and which varied but little.

Experiment 5.—Aug. 8. Took in thirty mature beetles all of which had partaken of food, and kept them without food. Two were dead in fourteen days; eight in nineteen days; thirteen in twenty-three days; sixteen in twenty-seven days; twenty-four in forty-seven days. Twenty per cent. survived forty-seven days' fasting; pairing occurred, and ova were deposited to a small extent during the first ten days. This is the average of three cases conducted simultaneously.

There is a very marked difference between this result and that of Experiment 4, where the beetles had never partaken of food.

Experiment 6.—Aug. 15. Twenty pairs *Doryphora*, after being well fed were kept in a dry situation; thirty two were dead in twelve days; all dead in twenty-two days; the males died first; a few ova were deposited during the first week. This experiment was repeated three times.

Experiment 7.—As to the rate of feeding, five experiments were tried. The beetles numbered fourteen to twenty-one, and the times from  $3\frac{1}{2}$  to 168 hours; the average of the five trials was, one beetle will eat one square inch of potato leaves in thirty hours; the maximum rate was ten hours, minimum was thirty-seven hours. It may be stated that one beetle during its imago life will defoliate one plant of potatoes.

Experiment 8.—Aug. 20. Took in fifty beetles which had been well fed; eleven immediately buried themselves in the sand. September 6. All dead above ground; turned out the sand and found the eleven alive; replaced sand, also beetles; eight at once buried themselves. September 15. Three remaining on surface dead. September 20. Found all on surface of sand, which I found quite dry; on wetting sand all went down, are now alive October 16.

Experiment 9.—September 1. Took 100 *Doryphora* larvæ, some immature, fed them on potato. Sept. 10, all pupating. Sept. 20, 15 beetles out. Oct. 1, beetles all dead. On turning out the sand found that none had hibernated. This agrees with the results of seven experiments, and shows that there was no disposition to hibernate until after the middle of August, and then only by beetles which had fed.

The date of hibernation will vary according as the season is warm or cold, but I think it pretty certain that beetles which have not fed will not survive the winter.

A result of experiment 4 was the finding of a pupa case of *Lydella doryphora* under conditions which were fully narrated to you at our September meeting, and which you all agreed were conclusive as to the advent of this farmers' friend in Toronto.

It is hoped the publication of this will elicit evidence of its occurrence in other counties in Ontario, but it must be borne in mind that the very general use of Paris green by potato growers, has hitherto prevented the increase of this as well as other natural enemies of D. 10 lineata; has, in fact, rendered their existence almost impossible.

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PROCEEDINGS OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Room 56, Maxwell House, NASHVILLE, TENN., Aug. 31, 1877.

Mr. Grote was called to the chair, and congratulated the meeting that there were found members from the South interested in the science of Entomology, and regretted the absence of the President of the Club and other officers. A letter was read from President LeConte as follows :

PHILADELPHIA, AUG. 24TH, 1877.

*Secretary of the Entom. Club Am. Assoc. Adv. Sci. Nashville, Tenn. :*

DEAR SIR,—I beg that you will express to the Entomological Club of the Association my great regret that I am not able to attend the meeting at Nashville. It was my intention to be present, but I find now at the last moment that it will be extremely inconvenient for me to leave this city. I greatly wished to take part in the discussion on nomenclature, but I have already expressed myself so strongly as against such changes as are produced by the rehabilitation of forgotten or disused names, that I think my opinions are fully understood by my colleagues.

Very truly yours,  
JOHN L. LECONTE.

The Secretary's report of last year's meeting was received and adopted.

The chair drew the attention of the Club to the report of Capt. Dall on the subject of Zoological Nomenclature made at this meeting, and deprecated any separate action on the part of the Club.

The following resolutions were then passed :

*Resolved*—That since the Association has under consideration the subject of Nomenclature, the present Committee of the Club on that subject, consisting of LeConte, Riley, Saunders, Scudder and Grote, be continued to report at next meeting.

*Resolved*—That a request be made on the part of the Club to the Standing Committee of the Association, that copies of Capt. Dall's report on Zoological Nomenclature be printed and distributed to all active members of the Club before the issuance of the Nashville volume, so that the matter may be duly considered before the next meeting of the Club.

The meeting then entered into an election for officers for the next meeting, with the following result :

*President* : James A. Linter, of Albany, N. Y.

*Vice-President* : Wm. Saunders, of London, Ontario.

*Secretary* : B. Pickman Mann, of Cambridge, Mass.

Mr. Grote exhibited specimens in all stages of the New Pine Moth, *Nephoteryx Zimmermani*. He referred to Mr. Meehan's remarks after the reading of the paper before the Association on Thursday last, that this was probably the insect so destructive to the Scotch Pine about Philadelphia.

Prof. Nicholson stated that he thought from Mr. Grote's description and specimens that this insect was the one noticed as attacking the Scotch Pine near Knoxville. The trees had been imported from the north.

Mr. Grote alluded to the migratory habits of the Cotton Worm, and stated that in his original paper (Hartford Meeting) he had shown that the moth hibernated, but died before it could find cotton on which it could oviposit the ensuing year. Where the moth state was not reached the chrysalis perished in cold winters over the cotton belt. The broods were irregular, occurring in the same locality some years as early as June, some years as late as September.

Prof. Stubbs stated that in the main Mr. Grote's theory of a progression from south to north was, he was satisfied, correct. At the same time he called attention to occasions

where the moth appeared in small areas, and thought it possible that in some cases the insect might succeed in holding over.

Mr. Grote stated that he thought that in localities where the circumstances were favourable, Southern Florida and along the coast of Georgia, that this might occur. He had in his original paper alluded to this, and he thought it more likely that the irregular patches on the cotton belt were partial colonizations from the southward or from the sea coast of Florida or Georgia. The first brood was more irregular in distribution. He further said that Prof. Tutwiler, of Ala., had told him that the observations made in his locality were to the effect that the south wind brought the worm; in the present year the prevailing winds were from the north and they had been free from the worm in Northern Alabama. Mr. Grote concluded by urging the creation of a scientific commission to look into the facts of the case. It was one that was most important to the agricultural interests of the South.

Prof. Nicholson stated that he had observed a few specimens of the Colorado Beetle near Knoxville; the seed had been brought from the north.

Judge Bell stated that this year he had seen the Potato Beetle at Exeter, New Hampshire.

Mr. Grote exhibited some rare Coleoptera collected at Buffalo, N. Y., by Mr. Ottomar Reinecke. Adjourned.

(Signed)

A. G. WETHERBY,  
*Secretary, pro. tem.*

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## A NEW LEPIDOPTEROUS INSECT INJURIOUS TO VEGETATION.

BY A. R. GROTE, BUFFALO, N. Y.

(Read before the Am. Asso. Adv. Sci., August 30, 1877.)

In the months of June and July the Red Pine (*Pinus resinosa*) and the White Pine (*Pinus Strobus*), show by the exuding pitch that they are suffering from the attacks of an insect. The wounds occur on the main stem below the insertion of the branch. On cutting into the bark the injury is found to be caused by a small larva, which, when full grown, measures 16 to 18 millimetres. The head is shining chestnut brown with black mandibles. The body is livid or blackish green, naked, with series of black dots, each dot giving rise to a single, rather stout, bristle. The prothoracic shield is blackish. The larva has three pair of thoracic or true jointed feet, and four abdominal or false feet, besides anal claspers. This larva, eating on the inner side of the bark, and making furrows in the wood, causes the bleeding which, when the depletion is excessive or continuous, and especially in the case of young trees, has proved fatal.

In July the worm spins a whitish, thin, papery cocoon in the mass of exuding pitch, which seems to act as a protection to both the larva and the chrysalis. The chrysalis contained in the cocoon is cylindrical, smooth, narrow, blackish-brown, about 16 millimetres in length. The head is pointed, there being a pronounced clypeal protuberance; the segments are unarmed; the anal plate is provided with a row of four spines, and two others, more slender, on either side of the mesial line, below the first. It gives the moth in ten to fourteen days. The perfect insect expands on an average 30 millimetres. An examination of the veins of the wing show that vein 7 of the primaries is wanting, while vein 1 is simple. On the hind wing the cell is closed or very nearly so. It belongs thus to the *Phycidæ*, a sub-family of the *Pyralidæ*. The male antennæ are bent a little at the base, the joints inconspicuous; the maxillary palpi in the same sex are not brush-like, and the hind wings are 8 and not 7 veined. We may refer the moth, then, to the genus *Nephopteryx*. Veins 3, 4 and 5 spring nearly together from the outer extremity of cell of the hind wings (though 5 seems to be nearly independent while running close to 4); vein 2 is not far removed from 3. On the primaries veins 4 and 5 spring from a common stalk, so that we must refer the moth to the sub-genus *Diorctria* of Zeller. In colour the moth is blackish gray, shaded with reddish on the basal and terminal fields of the fore wings. There are patches or lines of raised scales on the basal field and on the anterior and darker portion of the medium space. The median lines are prominent, consisting of double black lines enclosing pale bands. The inner line at basal third is perpendicular, W-shaped or dentate. The outer line at apical fourth is once more strongly indented below costa. The black component lines do not seem to be more distinct on one side than on the other of the pale included bands or spaces. The median field is blackish, becoming pale towards the outer line, it shows a pale, sometimes whitish cellular spot, surmounted with raised scales. It can be seen that these raised scales (easily lost in setting the insect) accompany the median lines as well as forming the discal mark and the linear patch on the basal field. The terminal edge of the wing is again pale or ruddy before the terminal black line. The fringes are blackish. The hind wings are pale yellowish white, shaded with fuscous on costal region and more or less terminally before the blackish terminal black line; the fringes are dusky. Beneath the fore wings are blackish, marked with pale on costa; hind wings as on upper surface. Body blackish gray, with often a reddish cast on thorax above and on the vertex. The eyes are naked, the labial palpi long, ascending with moderate terminal joint. Tongue rather long. The gray abdomen is annulated with dirty white, the legs are pale dotted. The species differ from the European *abietella* by the raised

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Red Beetle near  
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New York, pro. tem.

scale tufts on the wings, and Prof. P. C. Zeller, who has kindly compared examples for me, declares it to be quite distinct from any European species. The pupa seems to differ from that of *abietella* by the clypeal prominence, which appears entirely absent in the European species, judging from Ratzburg's excellent figures. The larvæ is found to attack also various imported conifers; for this reason I supposed it might be an imported parasite. It has been noticed on the Scotch, Austrian and Russian Pine, and it will be found, I fear, a grave enemy to the cultivation of this genus of trees.

Since the insect is not noticed yet in any scientific publication, I propose to name it *Nephoteryx (Dioryctria) Zimmermani*, after Charles D. Zimmerman, of Buffalo, who has made many excellent observations on our noxious insects, and to whom I am greatly indebted for help in getting the present facts with relation to the species. He has kindly spent much time in climbing large trees and cutting out pupæ and larvæ and rearing the perfect insect.

The larvæ *abietella* is described by Ratzburg as living in the cones chiefly of various species of *Pinus*. Nevertheless he speaks of one instance in which it is found under similar circumstances to those which are usual with *Zimmermani*, which latter I have not yet noticed attacking the fruit. The European species is said to winter in pupa state. In the vicinity of Buffalo our species seems to be single brooded. I have not yet ascertained the winter state. Ratzburg recommends cutting off infested branches, but especially on small trees. I find the larvæ of *Zimmermani* usually infesting the *main* stem at the insertion of the branches. From the fact that the pitch of the trees offers a protection, I do not think that any washes would reach the insect. The knife, then, seems the only remedy.

Our species has a natural enemy in a small hymenopterous parasite with which I have found certain of the chrysalids to be filled.

#### THE UNITED STATES ENTOMOLOGICAL COMMISSION.

The enormous losses occurring yearly to agriculture in America from destructive insects are gradually awakening public attention in this direction, and also to the necessity of careful observations on the habits of these pests, with a view to their destruction or limitation. We were much gratified to learn that the late Congress of the United States, recognizing the importance of this subject, made a liberal appropriation to provide for the appointment of a commission of practical Entomologists to investigate and study the habits and life history of these insect pests, and thoroughly test such measures as have been or may be suggested with a view of lessening their ravages, the investigations to be carried on for several consecutive years. The Government has been particularly fortunate in securing the services of three eminently practical Entomologists to undertake this work, Prof. Riley, State Entomologist of Missouri, Dr. A. S. Packard, of Salem, Mass., and Prof. Thomas, State Entomologist of Illinois. Prof. Riley has been designated Chief; Dr. Packard, Secretary, and Prof. Thomas, disbursing agent. While the destructive Rocky Mountain Locust, *Caloptenus spretus*, will specially engage the attention of the Commission during this year, careful observations will at the same time be made on other destructive pests. We desire to call particular attention to Dr. Packard's request in this present issue, for specimens in all stages of the Hessian Fly, Joint Worm and Wheat Midge, and trust that all our members will endeavour to aid the Commission in their labours in every possible way.

The headquarters of the Commission will be at St. Louis, Mo.; there will also be an office, with a clerk to attend to certain routine business, at the rooms of the Geological and Geographical Survey of the Territories, at Washington, D. C., Dr. F. V. Hayden in charge.

The locust area assigned to each Commissioner the present year is as follows:—

1. Prof. Riley takes for his field the region east of the mountains and south of the 40th parallel, the west half of Iowa, and, conjointly with Dr. Packard, British America west of the 94th meridian, where the principal source of the devastating swarms will probably be found.

2. Dr. Packard will take for his field West Wyoming, Montana, Utah, Idaho, and the Pacific Coast.

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3. Prof. Thomas takes all the region east of the mountains not enumerated, including Nebraska, Minnesota, etc.

The publications will consist of circulars, bulletins, memoirs, and the annual report of doings and results of the work of the Commission.

To Prof. Riley are assigned more particularly the following divisions of the subject : Biology, or Natural History ; Insect Enemies and Parasites ; Remedies and Devices for Destruction.

To Dr. Packard : Anatomy and Embryology.

To Dr. Packard and Prof. Thomas, conjointly : Meteorological Bearings and Migrations.

To Prof. Thomas : Geographical Distribution, Enemies not Entomological, Agricultural Bearings of the Subject.

The Commission expects to secure co-operation with the United States Signal Bureau in affording meteorological data in connection with a study of the migrations of the locust ; also, hopes to secure the aid of the Canadian Government in co-operating with it in its investigation in British America.

It is the determination of the Commission to confine its operations more particularly to the practical bearings of the subject, with a view to ascertain all possible remedies against these destructive insects. All else will be made subservient to the great object for which the appropriation was made, to wit :—

1. The best means of fighting the plague as it occurs in the States to which it migrates, but in which it is not indigenous.

2. The thorough investigation into its habits in its native home, with a view of preventing, if possible, its migrations therefrom.

The following are the topics on which data are requested from observers in all parts in reference to the destructive locust :—

1. Date, and time of day of the arrival of swarms.

1a. Direction and force of the wind at the time.

1b. Temperature and character of the weather at the time (clear or cloudy).

1c. Direction of the flight, density, height and extent of the swarms.

2. Date and time of day of the departure of the swarms.

2a. Direction and force of the wind at the time.

2b. Temperature and character of the weather at the time.

2c. Direction of the flight, density and extent of the swarms.

3. Date when the first eggs, if any, were deposited the present year.

4. Date when the eggs were most numerous hatching the present year.

5. Date when the eggs were most numerous hatching in previous years.

6. Proportion of eggs that failed to hatch the present year, and probable causes of such failure.

7. Nature of the soil and situations in which the eggs were most largely deposited.

8. Nature of the soil and situations in which the young were most numerous hatched.

9. Date at which the first insect acquired full wings.

10. Date when the winged insects first began to migrate.

11. Estimate the injury done in your County and State.

12. Crops which suffered most.

13. Crops most easily protected.

14. Crops which suffered least.

15. The prevailing direction in which the young insects travelled, and any other facts in relation to the marching of the young.

16. The means employed in your section for the destruction of the unfledged insects, or to protect crops from their ravages, and how far these have proved satisfactory.

17. The means employed in your section for the destruction of the winged insects, or to protect crops from their ravages, and how far these have proved satisfactory.

18. Description, and, if possible, figures of such mechanical contrivances as have proved useful in your locality for the destruction of either the young or the winged insects.

19. If your section was not visited in 1876, please state this fact.

20. If visited any previous year, please give the dates.

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21. To what extent have birds, domestic fowls, and other animals, domestic or wild, been useful in destroying these insects?

As the successful prosecution of this work is as deeply important to the western portions of our Dominion (where immense damage is often inflicted by this destructive foe) as to any part of the United States, it is hoped that our Government will render all possible aid to the work of this Commission, either by instructions to parties engaged in surveys and other Government work in the western regions, to make the necessary observations, or otherwise by appointing suitable co-operating agencies to aid in the work.

No official report of the results of the labours of this important Commission has yet appeared, but the following telegraphic summary of the work of the season has lately been printed in the public newspapers:—

#### U. S. ENTOMOLOGICAL COMMISSION.

##### REPORT OF ITS LABOURS IN THE NORTH-WEST.

##### *The Rocky Mountain Locust—His Parasites and Winged Enemies.*

##### HOW THE GRASSHOPPER PLAGUE MAY BE STOPPED.

ST. LOUIS, Nov. 12.—The labours of the United States Entomological Commission, appointed by Secretary Shurz last spring, to investigate the grasshopper plague, are drawing toward a conclusion. The Commission consists of Prof. C. V. Riley, State Entomologist of Missouri; Cyrus Thomas, State Entomologist of Illinois; and Prof. A. S. Packard, Jr., a Professor in the Peabody Academy of Science, of Salem, Mass.

The commissioners were appointed on the 20th of March, and a couple of weeks later the three members were out on their exploring tour. Prof. Riley took the States of Texas, Kansas, Iowa, and Colorado, and the British possessions as far north as the Saskatchewan Valley, and his investigations were to be directed more particularly to the biology of the grasshopper, generally called Rocky Mountain locust by entomologists, its entomological enemies and parasites, and remedies and devices for the prevention of the grasshopper plague. Prof. Packard's field was Montana, Utah, Idaho, the Western part of Wyoming, and the Pacific Coast, and he made a study of the anatomy and embryology of the grasshopper. The territory assigned to Prof. Thomas, embraced Minnesota, Nebraska, the eastern part of Wyoming, and all the other states and territories west of the Mississippi not taken by Profs. Riley and Packard; and the special subjects assigned to him were the geographical range of the grasshopper, his enemies not entomological, and the agricultural bearings of the subject. The original bill prevailed for a commission of five, and an appropriation of \$25,000. Congress cut the money down to \$18,000, and reduced the number of commissioners to three. Prof. Riley says all the commissioners met with unexpected success in their investigations. They met with the most cordial receptions among the people of the west and south-west everywhere, and were furnished by the farmers with a vast amount of valuable information which they never could have obtained if the informants had not felt themselves personally interested in the work of the commission. The U. S. signal bureau also aided the commissioners materially in furnishing them with accurate meteorological data, very necessary in the study of the migrations of the grasshoppers and their ova-deposits, as also the effect which climatic changes have upon them. Prof. Riley spent six weeks in the country in which the principal armies of grasshoppers are hatched, and which they leave as soon as the short, dry grass of the country, on which they principally subsist, is gone. The country is very thinly settled, but the professor was afforded every possible assistance in his investigations by the authorities of the Canadian Government, including Governor Morris and the Ministers of Agriculture and the Interior. Remaining in the British possessions about six weeks, Professor Riley closed his investigations and returned to Chicago, where he again met his fellow commissioners, Profs. Packard and Thomas, just returned from the districts visited by them. Notes were again compared, views interchanged, and statistical and other matter exchanged, and the commissioners separated once more, returning this time to their respective homes to write up the results of their investigations. Prof. Riley has been at home now five or six weeks, and has been engaged on the report ever since his return. He expects to complete the report by

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the middle of next month, and Profs. Packard and Thomas are to have theirs completed about the same time, when the commission will convene again and submit their labours as one work to the Government.

The result of the investigation of the commission has verified previous reports of Prof. Riley's individual investigations, and the commissioners are all of the opinion that a recurrence of the grasshopper plague can be prevented. They have found the native home of the insects; they know on what they feed, and when and under what conditions they migrate, the direction they take, and the distance they go, and the length of time they remain before they commence their homeward flight again. They know, also, the fatal effect that heavy rains and sudden changes of weather have on them, and that smoke will kill them as quickly as fire. They know, too, the parasites which live on the grasshoppers, and the birds—particularly the grackle and the English rook—that feed upon them. Knowing all this, they believe that the migration from British America can be, in a great measure, stopped, and that in case they do visit the fields of Missouri, Kansas, and other States of the union, the farmers can be forewarned in time to prepare for them with fire and water. The commission will recommend measures to Congress, looking to a Governmental treatment of this plague at its next recurrence.

#### NOTES ON LARVÆ—FONDNESS FOR WATER—HINTS TO BEGINNERS.

BY C. G. SIEWERS, NEWPORT, KY.

(From the *Canadian Entomologist*.)

Last spring, while collecting beetles under the bark of decayed logs, I met with numbers of the larvæ of *Arctia isabella* (hairs brown in the middle, black at each end of larva), about to spin up. Not knowing their hibernating habits, they had always baffled me, and under the impression that they would require another season to mature, had been turned loose. I collected some twenty, put them into a box with cotton and paper scrap, and they at once spun up, all but four. These wandered up and down for a week, having some want, and wasting away. It struck me they might want water. Wetting a sable, I proffered a drink. They all drank greedily, grasping the brush with their fore-legs, and even following it around. I watered them two or three days, but tired of this and threw them out. The same day they were found spinning up on the fence. This spring I collected another lot, and gave them some curved bark to spin in. About one-half refused to spin. I soused them with water. Two remained contumacious, but another wetting brought them to terms. The black larva of the Great Leopard Moth, *Ecpantheria*, hibernates also, spins up about the first of June, and emerges about the 15th with us. Feeds on Poke-berry plant, and will eat cabbage. I failed to winter some twenty this season. Either they dry up in the house, or mould in the cellar. They should be wintered out-doors, in a box without bottom placed on the ground and half filled with leaves and brush, exposed to the weather, but having proper drainage. They come out of the leaves in the spring distended by moisture. Whether they feed before spinning is uncertain. I collect them in the fall at the foot of willow trees, when digging up the pupa of *Smerinthus geminatus*.

It is generally claimed that moist leaves will induce scouring in the *Bombix mori*, but out-door larvæ get abundance of rain and dew, and may require it. In confinement they fail to get their full growth. Their food should be sprinkled daily. The great difficulty of keeping the food fresh deters many from rearing larvæ. To such I would say, try tin boxes or glass jars. Clean daily and keep moist. Two or three drops of water are sufficient. I have had a lot of empty fruit cans capped, and have kept food fresh in them for ten days. When the nearest food plant is three miles distant this is some object. I find that they do not require light, and but little air. When they cease feeding, remove to spinning or ground boxes. The ground must be kept moist, or the larva will be unable to remove the skin around the thorax, and strangle. If they find it too dry they will come out and try to escape. Many wander about for a day or two before burying themselves. Covering the ground with sod often expedites matters. When ten days have passed they may be sifted out to give place for others, and laid out in another ground box on top, as it is preferable to have

them in sight, an account of vermin. Never pull larvæ from their food, especially when moulting in changing food. Clip the old food off around them, and they will change themselves. Placing some hungry *Apatura clytons* three inches from fresh food, they struck a bee line for it.

Raising larvæ is by far the most instructive feature of Entomology, and very interesting. Entirely too little attention is paid to it. We want the whole life. How utterly ignorant we are, for instance, about the larvæ of *Catocala*? Let all faulty females be confined, and they may lay impregnated eggs; try the young on willow, walnut or oak leaves. The female is known by the heavy body tapering to a point; the male terminates in a pair of claspers. Some species are readily determined by their antennæ, the males being more broadly pectinated than the females.

The larvæ of wood-boring beetles can be raised in tin or glass on wet saw-dust (not pine); any mixed hardwood or poplar will do. I have kept them so six and eight months, changing the saw-dust once a month. But they are very tiresome, as one may have to keep them a year or two.

### HOW TO DESTROY CABINET PESTS.

BY PROF. JAMES T. BELL, BELLEVILLE, ONT

*From the Canadian Entomologist.*

There is nothing more annoying to the experienced, or more discouraging to the young collector, than to have his specimens destroyed by mites, by the *Anthrenus*, or by the larvæ of *Dermestes*. Against the ravages of these enemies there is no security. Paste and paper fail to exclude them; camphor is only a partial protector; and the only safeguard of our cabinets is constant vigilance, and the instant destruction of the offenders when observed.

For this purpose many methods have been suggested—saturation with turpentine, immersion in alcohol or benzine, exposure to a heat of 210 degrees in a drying closet or oven, &c.; but most of these ways are apt to injure, or even destroy, the specimens, while the last is often ineffective. Having, however, found a certain and rapid method of dealing with these intruders, I desire, through your pages, to make it known to my brother naturalists.

Some two years ago I had a magnificent female *Platysamia (Saturnia) cecropia*, measuring  $6\frac{1}{2}$  inches across the wings when set out, which came out of a chrysalis in my breeding box. I succeeded in killing and stretching it without damage, and when dry, transferred it to my interim box, which hung against the wall. In about a fortnight I was annoyed to see its antennæ cut off, the head and thorax denuded of most of their down, and some large holes made in the abdomen. After some consideration, I placed a gallipot, containing about 25 grains of cyanide of potassa roughly bruised, with a very little water, in the bottom of the case. I then introduced six drops of sulphuric acid, and let down the glass. In less than a minute I had the satisfaction of seeing a fine, stout *Dermestes* larva writhing in the death agony on the bottom of the box. Since that time I have tried the same several times, and always with the same success. It is equally applicable to the destruction of moths, &c., in stuffed birds and quadrupeds, as no animate being can inhale this gas and live.

JAMES T. BELL,  
Belleville, Ont.

[NOTE.—Great caution would be necessary in using this remedy, not to inhale any of the highly poisonous gas which, by the use of the ingredients named, would be rapidly generated.—ED. C. E.]

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## RECENT ENTOMOLOGICAL WORKS.

The following brief notices of some of the most valuable Entomological publications which have appeared during the past year, are from the pages of the *Canadian Entomologist* :—

Economic Entomology, by Andrew Murray, F.L.S., London, England. Aptera, 8vo., pp. 433, profusely illustrated with wood-cuts.

This useful volume is the first of a series of hand-books which are intended to serve as guides to the different departments of the collection of Economic Entomology in process of formation at the Bethnal Green branch of the South Kensington Museum, and also as practical treatises for the use of the public generally. In order the better to serve its primary purpose of guide to the collection, the contents of the several cases are described in this volume in the order in which they present themselves to the visitor, containing in some instances other specimens than insects. The work opens with a short chapter on Crustaceans likely to be mistaken for insects; for example, species of *Oniscus*, *Porcellio*, and *Armadillo*. Next in order are the Myriapods—Julidae and Scolopendridae; then Scorpions and their allies; Spiders, Mites, Lice, Thysanura (Spring-tails) and Lepismidae. Three new genera and thirteen new species are described in this volume.

The descriptions are briefly and plainly written, and the habits and life history of the species are delineated in a pleasing and popular manner. The work is well printed in good, clear type, and most of the illustrations are excellent. Already we have found it very useful, giving in a condensed form a vast amount of information not otherwise readily obtainable. We heartily commend this work to our readers, and trust that the talented author may be spared to complete the series proposed, which will appear in the following order :— 2nd vol. Bugs; 3rd, Locusts, Grasshoppers, Cockroaches, and Earwigs; 4th, Two-winged Flies; 5th, Bees, Wasps, &c.; 6th, The Dragon Flies and May Flies; 7th, Butterflies and Moths, and lastly, the Beetles.

Ninth Annual Report of the Noxious, Beneficial and other Insects of the State of Missouri. By Chas. V. Riley, State Entomologist, March, 1877; 8vo., pp. 129 with 33 illustrations.

We welcome the ninth of this series of valuable reports with much pleasure. The following are the subjects treated of in the order in which they appear: The Gooseberry Span Worm; the Imported Currant Worm; the Native Currant Worm; the Strawberry Worm; Abbott's White Pine Worm; LeConte's Pine Worm; the Colorado Potato Beetle; the Army Worm; the Rocky Mountain Locust; the Hellgrammite Fly, and the Yucca Borer. The bulk of the report, sixty-seven pages in all, is occupied with details in reference to that terrible scourge of the West, the Rocky Mountain Locust, *Caloptenus spretus*, the other and less important subjects being much more briefly treated of. These reports contain an immense fund of valuable information, and have done much to popularize Entomology in America.

## CATALOGUE OF THE LEPIDOPTERA OF AMERICA NORTH OF MEXICO.

By W. H. EDWARDS.

PART I—*Diurnals*. (Published by the American Entomological Society, Philadelphia, 8vo. pp. 68 Price \$1; interleaved for additions, \$1.30.)

This work of Mr. Edward's is conservative in its character, and as such is most refreshing; after having tried in vain to fathom the innovations with which we have for the past few years been perplexed, this excellent catalogue comes to our rescue, and will, we feel sure, be appreciated by all who do not believe in the excessive multiplication of genera and their establishment on minute and often variable characters. Here the dear old familiar names are nearly all in their places again, and we go back to the time-honoured method of heading our collections with *Papilio*, and embracing in it some 22 species.

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For ourselves, we have for some time past been literally at sea in reference to names for butterflies, wandering about without chart or compass to direct us; we scarcely knew the name of any species, and didn't expect ever to have the time or disposition to master the new names proposed, and hence we have been so discouraged that we have done really nothing to our collection of butterflies for a long time past. We are not disposed to object to changes in nomenclature where it can be made to appear that a *necessity* for such modifications exists, but we have been unable to see any good reason for adopting the wholesale changes which have been proposed, and we believe that the great bulk of working Entomologists hold the same view. With a catalogue now more to our mind, sufficiently progressive, and, at the same time, a most convenient help, we shall be able to classify our species under genera we can comprehend, and go to work with a will again.

In the general arrangement the author, while adopting and incorporating some of the work of later systematists, adheres mainly to the order of Doubleday and his associates in the "Genera of Diurnal Lepidoptera," and where the genera have numerous species, as in *Colias*, *Argynnis*, *Thecla*, *Lycaena*, *Pamphila*, &c., they are for the sake of convenience divided into sections. In crediting genera the author strictly follows the rules adopted by American Entomologists at the recent meeting in Buffalo, and appends the name of the party who first gave the genus a proper definition. For this reason Hübner's genera are excluded and two of the genera made by Mr. Scudder in the Hesperidae, *Amblyscirtes* and *Photiosora*, have been credited to Dr. Speyer because his definition of them is the first published. With regard to Mr. Scudder, genera, we think he should have had credit for them. We all know what pains-taking and unsparing effort he has bestowed in labouring to introduce what he conscientiously believes to be needed reforms in Entomological nomenclature, and although the present generation of Entomologists is not disposed to adopt such wholesale reform as he proposes, he is undoubtedly *deserving of full credit* for any of his material which may be used. His work on New England Butterflies, in which all these genera are minutely defined, has long been written, but its expensive character has been an obstacle in the way of its publication. Under these circumstances, *which are very exceptional*, we regret that Dr. Speyer's references of these genera to Scudder have not been followed.

There are 506 species enumerated in this list, embraced in 64 genera. There are also references by the use of a system of special signs to all writers who have treated of the preparatory stages of our butterflies, no matter how briefly; we regard this as an excellent and valuable feature in the work. The catalogue is in every way well got up, and we hope all our readers will procure a copy of it, and if, after they have given it a careful perusal, they think as well of it as we do, they will set to work and arrange their collections in accordance with it, feeling profoundly thankful to the author for the timely relief he has afforded.

The Rhyncophora of America, north of Mexico, by John L. LeConte, assisted by George H. Horn. From the Proceedings of the American Philosophical Society, Vol. 15.

This work, which fills a volume of 455 pages, is probably the most important contribution which has been made to the Entomology of America for many years. Its production must have been attended with immense labour and long and careful study. In addition to the work of classifying this numerous and difficult group of insects, a very large number of new species are described. We tender our sincere thanks to the authors for their kindness in sending us a copy of this useful and long-needed memoir.

Manuscript Notes from my Journal, or Illustrations of Insects Native and Foreign; Order Hemiptera, sub-order Heteroptera. By Townsend Glover, Washington, D. C.

In the 12th No. of Vol. vi., we called the attention of our readers to the issue of a valuable work by the same author on Diptera. The volume now at hand on the Hemiptera is published in similar form and style, quarto, on heavy paper, printed on one side only, and the text a fac-simile of the author's handwriting. In this volume there are ten excellent plates, nine of which are devoted to the illustration of the species to which the notes refer, and one to the figuring of those portions of the insects on which their classification is based. There are figures of 238 species, many of the smaller ones in duplicate, one showing the insect magnified, the other of the natural size. In addition to the plates and their explanatory matter, there are 134 pages of text, 2 explanatory, 17 devoted to the classification of the Hemiptera, and the remainder to notes on the insects themselves, their habits, the animal and

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vegetable substances they injure, the remedies used for destroying them, &c., all being referred to in alphabetical order.

This work is another evidence of the indomitable perseverance of this energetic Entomologist, and will be a valuable aid to those who desire to study this hitherto much neglected order. The author has again placed us under deep obligation for his kind remembrance of us.

The Rocky Mountain Locust; being report of proceedings of a conference of the Governors of several western States and Territories, together with several other gentlemen, held at Omaha, Oct., 1876, 8vo., pp. 58.

We are indebted to our esteemed friend, C. V. Riley, for a copy of the above pamphlet, which contains much valuable information on the habits of this destructive pest, as well as a summary of the best means yet known for counteracting its ravages.

Packard's Half Hours with Insects, Boston, published by Estes & Lauriat, 1877, 12 mo., pp. 384, illustrated, \$2.50, which was originally issued in twelve numbers, has lately been published in book form. We desire to correct some typographical and other errors of importance. Page 187, in explanation of Fig. 187, for Bucculatrix read Bucculatrix; page 289, line 23, for *Disippus* read *Archippus*, and in line 25, for *Archippus* read *Disippus*; page 305, line 13, for sumac, read cottonwood, and on page 306, in explanation of Fig. 236, for sumac gall read vagabond gall. We cheerfully commend this useful work to our readers.

Report upon the Orthoptera collected by the Wheeler Expedition, by Samuel H. Scudder; 8vo., 17 p. In this paper the author gives much valuable information in relation to the Orthoptera occurring on the eastern slope of the Rocky Mountains; 17 new species are described, and definitions of 8 new genera given. Report of the Hayden Expedition, from the Department of the Interior, containing Brief Synopsis of North American Ear-wigs, with an appendix of the fossil species; 8vo., 12 p. List of Orthoptera collected by Dr. A. S. Packard, in Colorado, &c., during 1875; 8vo., 7 p. Notice of a small collection of Butterflies made by Dr. Packard in Colorado and Utah. All by Samuel H. Scudder. We tender our best thanks to the author for copies of these papers.

*Harpalus caliginosus* from Nature, by Franklin C. Hill; two plates. We are indebted to Mr. Franklin C. Hill, of Princeton College, N. J., for copies of these excellent plates, recently published. They are beautifully finished and conveniently mounted on cards, 5 x 8, with all the organs and divisions both of the under and upper surface, distinctly named. They will prove a valuable help to beginners, and indeed to all who are not already familiar with the names of the different portions of the body of Coleopterous insects.

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# A FEW COMMON WOOD-BORING BEETLES.

BY THE REV. C. J. S. BETHUNE, M.A., PORT HOPE, ONT.

## EXPLANATION OF THE PLATE.

- Fig. 1. *Monohammus scutellatus* Say.—A Pine-tree Borer.  
 Fig. 2. *Clytus speciosus* Say.—The Maple-tree Borer.  
 Fig. 3. *Orthosoma cylindricum* Fab.—A Pine-tree Borer.  
 Fig. 4. *Clytus robiniae* Forst.—The Locust-tree Borer.  
 Fig. 5. *Chrysobothris femorata* Fab.—The Buprestis Apple-tree Borer.  
 Fig. 6. *Saperda candida* Fab.—The White-lined Apple-tree Borer.  
 Fig. 7. *Monohammus confusor* Kirby.—A Pine-tree Borer.  
 Fig. 8. *Oberca tripunctata* Fab.—The Raspberry Twig Girdler.

Our Canadian wood-boring beetles, with the exception of a few somewhat minute species, belong to the two great families of Buprestidæ and Cerambycidæ. These include an immense number of different genera and species; in Crotch's List of the Coleoptera of North America (north of Mexico), there are enumerated the names of no less than 169 species of the former family and 552 of the latter; about one-third of these are found in this country. It is evident, then, that to give a bare list of all our Canadian species of wood-borers would occupy no little space, while a detailed description of them, if one were competent for the task, would fill many issues of this Report. We propose, therefore, on the present occasion to merely give a brief account of the eight species depicted on the accompanying plate. These we have selected on account of their frequent occurrence in almost all parts of the country, and the consequent familiarity of their appearance even to non-Entomologists. Our readers will, we are sure, be pleased with the beauty of the figures, which have been admirably drawn upon stone by Mr. L. Trouvelot, of Cambridge, Massachusetts.

Taking the species in the order in which they are numbered on the plate, we come first to

### I. MONOHAMMUS SCUTELLATUS SAY—A PINE-TREE BORER.

This beetle, which derives its specific name from its conspicuously white scutellum, is of a shining black colour on both the upper and under surfaces, thickly punctured with irregular impressions; on the wing-cases there are, as shown in the figure, a number of scattered whitish spots of various shapes and sizes; these, on close inspection, are found to be composed of dense short white hairs, which often become rubbed off and disappear; the thorax is armed on each side with a thick triangular spine; the antennæ are many-jointed, and about the same length as the body in the male, while in the female they are about twice that proportion. The size of the beetle varies from less than half an inch in the male to over three-quarters of an inch (exclusive of the antennæ) in the female. The larva is a large thick white grub, destitute of legs, divided into a number of well-marked segments; the head armed with a strong pair of jaws. The larva infests the pine, after the timber has been cut or newly fallen, and often causes serious injury to it by boring large oval-shaped holes which extend for long distances through the interior of the log. The perfect insects appear in June, and are sometimes very abundant; we have occasionally found them swarming in great numbers on fallen pine trees. The insect is common throughout Canada and the neighbouring States.

The following general account of the larvæ of the family (*Cerambycidæ*), to which this beetle belongs, taken from Harris's Injurious Insects, page 93-4, will be of interest, and will enable the reader the more readily to understand the structures and habits of these borers in their earlier stages. "The larvæ hatched from the eggs—which are laid by the parent beetle in holes and chinks of the bark—are long, whitish, fleshy grubs, with the transverse incisions of the body very deeply marked, so that the rings are very convex or hunched above and below. The body tapers a little behind, and is blunt-pointed. The head is much smaller than the first ring, slightly bent downwards, of a horny consistence, and is provided with short but very powerful jaws, by means whereof the insect can bore, as with

*Monohammus*

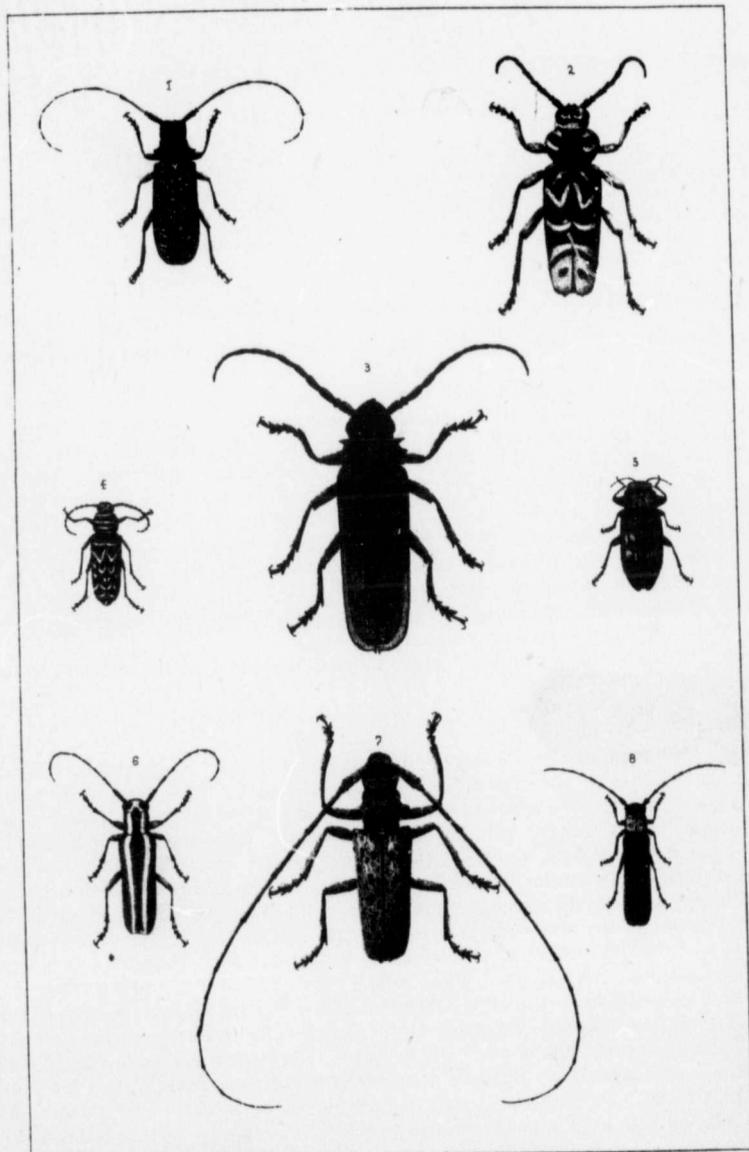
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\* A full account  
Society for 1872.

a centre-bit, a cylindrical passage through the most solid wood. Some of these borers have six very small legs, namely, one pair under each of the first three rings, but most of them want even these short and imperfect limbs, and move through their burrows by alternate extension and contraction of their bodies, on each or on most of the rings of which, both above and below, there is an oval space covered with little elevations, somewhat like the teeth of a fine rasp; and these little oval rasps, which are designed to aid the grubs in their motions, fully make up to them the want of proper feet.

"Some of these borers always keep one end of their burrows open, out of which, from time to time, they cast their chips, resembling coarse sawdust; others, as fast as they proceed, fill up the passages behind them with their castings, well known by the name of 'powder post.' These borers live from one year to three or perhaps four years before they come to their growth. They undergo their transformations at the furthest extremity of their burrows, many of them previously gnawing a passage through the wood to the inside of the bark, for their future escape. The pupa is at first soft and whitish, and it exhibits all the parts of the future beetle under a filmy veil which enwraps every limb. The wings and legs are folded upon the breast, the long antennæ are turned back against the sides of the body, and then bent forwards between the legs. When the beetle has thrown off its pupa skin, it gnaws away the thin coat of bark that covers the mouth of its burrow, and comes out of its dark and confined retreat, to breathe the fresh air, and to enjoy for the first time the pleasure of sight, and the use of the legs and wings with which it is provided." This account of the larval and pupal state of the long-horned beetles, applies more or less closely to all the insects described in this paper, with the exception of No. 5, *Chrysothris femorata*, which belongs to the *Buprestida*, a totally different family of beetles.

## II. CLYTUS SPECIOSUS Say (genus *Glycobius* Lec.)—THE MAPLE-TREE BORER.\*

The colours of this very handsome insect are deep velvety black and bright yellow. The figure represents its shape and markings so accurately that further description is unnecessary; the size depicted, however, is decidedly above the average. This wasp-like beetle is not very abundant, but may occasionally be found on Maple trees, which its larvæ infest both when growing in the forest and also when cut into cord-wood. The eggs are laid by the parent beetle on the trunk of the Sugar maple during the middle of summer; when hatched the grubs penetrate through the bark and make long winding borings through the solid wood. Occasionally they are very destructive to young Maple trees, but on the whole they are not sufficiently numerous to be objects of dread. Should they at any time threaten injury to these favourite shade trees, the larvæ may be got rid of by passing a somewhat flexible wire into their burrows until it reaches the grub within. The entrance may be discovered by the sawdust that they cast out.

## III. ORTHOSOMA CYLINDRICUM Fab.—A PINE BORER.

This large beetle is the commonest and best known of our wood-borers; its habit of flying through open windows into lighted rooms during the warm evenings of July, usually to the great alarm of the inmates, has caused its appearance to be very familiar

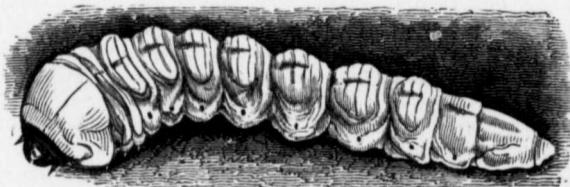


Fig. 1.

to every one. It is one of our largest beetles, measuring oftentimes as much as an inch and a half in length by over a third of an inch in breadth. Its general colour

\* A full account of this Insect, by Mr. E. B. Reed, will be found in the Report of the Entomological Society for 1872.

is a chestnut brown, approaching black on the head and antennæ. The thorax is armed with three sharp spines on each side; each wing-case has three slightly elevated ridges running lengthwise for nearly the whole length; the eyes, which are situated behind the antennæ, are enormously large and very conspicuous. The larva (Fig. 1) is a large fat white grub, with powerful jaws of a darker colour; it feeds upon the wood of the Pine, and from its size often injures the timber very materially. It will, no doubt, however, be considered a decidedly beneficial insect by some of our readers who live in newly-cleared settlements, when we mention that it affects pine-stumps especially, and often aids materially in reducing them to a state of rottenness.

The perfect insect, like most of the long-horned beetles, possesses the power of making a curious creaking noise. In the generality of species this is produced by rubbing the joints of the thorax together, or against the base of the wing-covers; but this species, according to Professor Riley (*Canadian Entomologist*, vol. iv. p. 140), "is a true fiddler, stridulating, like the *Orthopterous Locustidæ*, by rubbing the hind femora against the elytra. If a specimen be carefully examined, the inside of these femora will be found rasped from the base to near the tip by a number of short longitudinal ridges, which, when played against the thin and sharp emarginations of the elytra, produce the rather loud creaking so peculiar to this beetle."

IV. *Clytus* ROBINLE Forst.—THE LOCUST TREE BORER.

(The synonymy of this insect has been rather perplexing; it is now included in the genus *Cyllene* Newm.; for a long time we were accustomed to call it *Clytus flexuosus* Fab., but the specific name given above has the priority. It was also long considered to be identical with *C. pictus* Drury, that bores into the Hickory, but the late Mr. Walsh proved satisfactorily that the two species are distinct.) The general colour of this insect is deep black with light yellow stripes; on the head and thorax these stripes form narrow transverse bands, but on the wing-covers there is first of all a narrow yellow anterior edging (not shown in the figure); then a slightly flexuous stripe (not straight as in the figure); this is followed by a narrow zig-zag band forming a letter W across the wings, and three irregularly wavy and broken stripes; there is also a yellow dot at the tip, and broader stripes on the sides of the abdomen of the same colour. The antennæ are long and many-jointed, and of a dark brown colour; the legs are long and of a tawny hue. The larva is a whitish coloured grub, about an inch long and the thickness of an ordinary goose-quill, and is furnished with six very minute legs. When young it appears to bore chiefly into the sap-wood, but afterwards strikes off into the solid wood of the tree, perforating it in every direction. Its presence is early indicated by the little heaps of sawdust extruded from the holes, and accumulated about the base of the tree.

The following account of the habits of this insect, by Dr. Harris, (*Injurious Insects*, page 103), is so excellent and coincides so exactly with our own observations that we cannot forbear quoting it, though it may be familiar to some of our readers. "In the month of September," he says, "these beetles gather on the locust trees, where they may be seen glittering in the sunbeams with their gorgeous livery of black velvet and gold, coursing up and down the trunks in pursuit of their mates, or to drive away their rivals, and stopping every now and then to salute those they meet with a rapid bowing of the shoulders, accompanied by a creaking sound, indicative of recognition or defiance. Having paired, the female attended by her partner, creeps over the bark, searching the crevices with her antennæ, and dropping therein her snow-white eggs, in clusters of seven or eight together, and at intervals of five or six minutes, until her whole stock is safely stored. The eggs are soon hatched, and the grubs immediately burrow into the bark, devouring the soft inner substance that suffices for their nourishment till the approach of winter, during which they remain at rest in a torpid state. In the spring they bore through the sap-wood, more or less deeply into the trunk, the general course of their winding and irregular passage being in an upward direction from the place of their entrance. For a time they cast their chips out of their holes as fast as they are made; but after a while the passage becomes clogged and the burrow more or less filled with the coarse and fibrous fragments of wood, to get rid of which the grubs are often obliged to open new holes through the bark. The seat of their operations is known by the oozing

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of the sap and the dropping of the sawdust from the holes. The bark around the part attacked begins to swell, and in a few years the trunks and limbs will become disfigured and weakened by large porous tumours, caused by the efforts of the trees to repair the injuries they have suffered."

The history of this insect is rather a curious one. For a little over a hundred years it has been known to inhabit the State of New York, its appearance and habits being recorded by some English Entomologists of the last century. About thirty years ago it was found as far west as Chicago, whence it spread throughout the State of Illinois, but it was not till 1863 that it reached Rock Island, about two hundred miles further west, where—Mr. Walsh relates—it suddenly appeared in great swarms and utterly destroyed all the Locust trees. The first record we have found of its appearance in Canada is by Mr. Couper, who states (*Can. Journal*, 1855, p. 377) that he observed some Locust trees attacked by this insect in Montreal in September, 1855. In 1862 it began to be very destructive to the Locusts in Toronto, and for several years was excessively abundant there. In 1867 we found it at Credit, about twenty miles west of Toronto; it almost entirely destroyed all the Locust trees in the neighbourhood. In 1873 Mr. Reed relates its appearance in enormous numbers at London, Ont.; now it appears to be generally distributed throughout this province, and occasionally becomes very injurious to these ornamental trees. The perfect insect, in the localities it frequents, may usually be found in September on the flowers of the Golden-rod (*Solidago*), of which it eats the pollen, as well as upon the trunks of the trees it infests.

It is not easy to apply a remedy for an insect of this kind, still much may be done to save favourite trees in one's garden, provided they are not very large. The most satisfactory plan seems to be to rub over the trunk and large limbs of the tree with strong soap about the end of August; this will prevent the mother-beetle from laying her eggs upon the bark in September. Of course the application will have to be renewed after heavy showers. Dr. Harris suggests that whitewashing, or covering the trees with grafting-wax, would be effective in repelling the female. It would be of benefit also to gather and destroy the beetles wherever they may be found; children might be employed for this purpose to search the flowers of the Golden-rod as well as to carefully examine the trunks of the trees; should they be too high up to reach, a sharp blow with a stick on the trunk of the tree will cause them to fall to the ground. A little familiarity will soon overcome the natural repugnance to handling so wasp like a creature.

#### V. CHRYSOBOTHRIS FEMORATA Fab.—THE BUPRESTIS, OR FLAT-HEADED APPLE-TREE BORER.

This insect belongs to the family Buprestidæ, while all the others on our plate belong to the Cerambycidæ; the difference in shape and structure, and especially in the length of the antennæ, is very noticeable in the figures. The accompanying wood cut (Fig. 2), when compared with that of the pine-borer given above (Fig. 1), will show our readers how this insect differs in this larval state, also from the long-horned beetles. The larva is shown at *a*, the chrysalis at *b*, the head and first segments of the larva at *c* and the perfect beetle slightly enlarged at *d*.



FIG. 2.

The natural history of the insect may be briefly related, as follows: The egg is deposited by the female beetle in the chinks and crevices of the bark: some time during the early part of summer; from this the young grub soon hatches, and works its way into the soft sap-wood immediately beneath. Here it eats away, while the cavity inside becomes larger and larger, and it increases in size itself, gradually working upwards until it becomes pretty well grown, when it bores into the solid heart of the wood, and forms a flattish burrow, corresponding to its own flat form. When several attack the same tree, as is generally the case, their burrows, of course approach very near each other, and cause its death; in any case, they very much injure its vitality and bring on decay. In the spring of the year the grub assumes its pupa state, and comes out as a perfect beetle in the

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end of June, or during July, when it may be found basking on the tree trunks in the hot sunshine. It is very lively when danger threatens, and will take wing instantly if an attempt is made to catch it. Its blackish colour above so much resembles the bark of the tree that it readily escapes the notice of an ordinary observer; but beneath it is of a beautifully burnished dark copper colour, looking as if it were made of metal, beneath the wing covers it is bluish. While the figure gives the shape of the insect very correctly, it much exaggerates its size, which seldom exceeds three eighths of an inch; the light spots on the wing-cover are also erroneous in being very much too conspicuous.

The presence of the grub in the tree may be detected by the discolouration of the bark, and its flattened, dried appearance. All such spots should be opened with a knife, and the insect at once despatched. The burrows may be discovered by the presence on the bark of the fine sawdust cast out by the larva.

The insect attacks not only the apple, but also different kinds of oak, especially the white oak, and according to Prof. Riley, the mountain ash, linden or bass-wood, box-elder, beech, plum, pear, cherry and peach.

With regard to remedies, one important fact—we quote from Prof. Riley, (7th Missouri Report, page 76) should be borne in mind. The natural breeding place of the insect is undoubtedly in the old decaying oaks of our woods, and I have known it to swarm in old post-oak stumps from which the tops had been felled for a number of years. In fact it prefers partially dead or injured trees to those which are thrifty and vigorous, and partly for this reason, and partly because rough, cracked bark forms a better nidus to lay her eggs, in the species is most abundantly found on the south-west side of young apple trees where they are most apt to get injured by sun-scald. Sickliness in the tree, or injury from any cause predisposes to its attacks. It is for this reason that transplanted trees, checked as they are in their growth usually fare badly. But there is yet one other predisposing cause which few people suspect, and that is reckless and careless pruning, especially of the larger branches. Many a fine orchard tree, and many more city shade trees, receive their death shock from the reckless sawing off of limbs without effort being made to heal the wound by coating with grafting-wax, clay or other protecting substance. Around such an unprotected sawed limb, as around the frustum of a felled tree, the rain and other atmospheric influences soon begin their work of causing decay between the bark and the solid wood; and this is but the forerunner of greater injury by insects which are attracted to the spot, and which, though hidden meanwhile from view, soon carry the destruction from the injured to the non-injured parts. Among the insects thus attracted, the *Chrybothris* plays no mean part, where, had the wounded limb been protected, its presence would never have been known. It thus becomes of the first importance in treating this insect, to keep the young trees vigorous and healthy, and the bark as smooth and as free from injury as possible. Young trees are far more liable to be attacked than old ones, and consequently require greater care."

"As a preventive against the insects attack's there is nothing better than coating the trunks and larger branches with soap at least twice a year, once toward the end of May, and again in July or August. The soap is not only obnoxious to the beetle, but it tends to keep the bark clean and smooth, so as to offer no attraction to the female, and is withal beneficial to the tree. The trees should also be examined carefully late in the fall. At this season, or even in the winter time, the young borers which have just commenced work, are easily detected and destroyed by a knife before they have done much harm.

#### VI. SAPERDA CANDIDA FAB.—THE TWO-STRIPED APPLE-TREE BORER.

This insect, which rivals the foregoing species in the injuries it inflicts upon Apple trees, is a pale-brown beetle with two chalky-white longitudinal stripes running from the head to the apex of the wing-covers; its under side, legs and face are also chalky-white, and its antennæ a little darker; its length is about three-quarters of an inch. The larva is of a pale yellow or whitish colour, with a brownish polished head and black jaws; it is destitute of legs, but like other larvæ of the same family, it is enabled to move in its burrows by the contraction and expansion of its well-defined segments; when fully grown it is about an inch long. It may readily be distinguished from the preceding species by

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its cylindrical and more symmetrical shape, as is apparent from the accompanying figure (Fig. 3). The larva is shown at *a*, the pupa or chrysalis at *b*, the perfect beetle at *c*.

The perfect insect (to quote from our Report for 1870) makes its appearance in June and July, but is seldom seen, as it usually remains in concealment during the day, and flies only at night. The females deposit their eggs upon the bark of the tree near the base of the trunk, or collar as it is termed. From the eggs are soon hatched out tiny whitish grubs, which penetrate the bark and leave a hole so minute that it soon closes up. For the first year the grub feeds only upon the sap-wood, in which it excavates a round

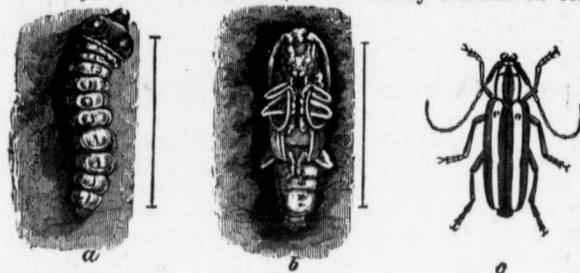


FIG. 3.

smooth cavity immediately beneath the bark, generally nearly filled, when opened, with the saw-dust-like castings of the worm. These castings may very frequently be observed extruded from the burrow and on the ground at the base of the tree; whenever they are noticed search should at once be made for the borer within. As this borer does not occur in any part of Canada in which we have resided, we have had but little opportunity of investigating its habits, we therefore quote the following excellent account from our friend Mr. Beadle's Prize Essay on the Apple (*Fruit Growers' Report*, 1868, p. 172): "When the grub has become about half-grown it ceases to cast the dust out of its cavity, and proceeds to fill it up, at the same time boring a passage or gallery upwards into the heart of the tree. This gallery is continued upwards, of varying length, sometimes not more than two inches, and sometimes twelve inches, and is gradually brought outwards again to the bark of the tree, but not through it. When the grub has completed this gallery, it turns round and returns to that part which is nearest to the heart of the tree; this part it now enlarges by tearing off the fibre from the walls, and with this fibre carefully and securely closes the entrance, so that if some insect enemy should find its way through the hole in the bark at the collar into the chamber where it passed the first part of its life that enemy could not enter the gallery to its present abode. Meanwhile it crowds its sawdust-like castings into the upper extremity of the gallery against the bark, thus, at the same time, diminishing the danger of attack from that quarter, and keeping its chamber tidy. Having thus perfected its arrangements, it again turns round so as to have its head upward, passes the winter in a torpid state, and in the spring casts off its skin and becomes a pupa, from which in June the perfect insect hatches, climbs to the upper end of the gallery, tears away the fine sawdust, gnaws a hole through the bark and creeps forth." When several of these borers are at work in the same tree, their excavations approach each other so closely as often to girdle the tree and cause its destruction.

Many modes have been proposed for the destruction of this noxious insect, some of them essentially absurd, such as plugging up the holes in the trees which are made by the beetle when taking his departure from the scene of his early life, after he has finished his work of mischief. The simplest and most effectual remedies are: (1) the application of soap (cold made soft soap is especially recommended) to the trunk of the tree early in June and again in July; rub it well over, especially near the base of the trunk, and place a portion in the fork of the tree that it may be washed down into the crevices of the bark by the rains. (2) If the Borer has already taken up his abode in the tree, cut into his burrows with a sharp knife and get him out; his presence may generally be detected near the collar of the tree by the discoloration of the bark and by the sawdust castings. This is the most effectual, and by no means difficult remedy; much benefit, however, may also be derived from washing this part of the tree with lye, or any strong alkaline solution, which will penetrate the interstices of the bark and kill any young grubs that may be commencing to make their way inwards. The trees should be carefully examined—especially if young and not long planted out—at different times during the year, as well as in the Spring.

Thus far this most injurious insect has only been found in certain portions of this country, being very abundant in the Niagara district, and in the neighbourhood of Montreal and Quebec, but happily rare, or entirely absent, from almost all other parts. Prof. Bell (in the *Fruit Growers' Report for 1875*) relates that a specimen was captured in the year 1873 near the Town of Belleville; no doubt it was imported, probably in the larval state, in trees from the United States or some other district infested by the insect.

*Monochamus notatus* Dry  
VII. *MONOCHAMMUS CONFUSOR* KIRBY.—A PINE TREE BORER.

This fine beetle, which is especially remarkable for the extraordinary length of its antennæ, is, in our pine regions, one of the most common and destructive of our insect enemies. Its general colour is an ashen grey, mottled with variable darker spots; the scutellum is white; there are also patches of whitish colour on the head, thorax and abdomen. These variations of colour, being due to a covering of very fine short hairs, which oftentimes are rubbed off, are not to be depended upon in the determination of the species. As in *M. scutellatus* (fig. 1), each side of the thorax is armed with a short thick spine. The length of the insect varies from three-quarters of an inch to an inch and a half—the average size being over an inch; the antennæ of the males vary in length from one and a half to three inches; those of the female are somewhat shorter. The larva is a large, white, somewhat cylindrical grub, destitute of feet. During the summer the female lays her eggs in crevices of the bark of the white and red pine, selecting for the most part timber that has been scorched by fire, or felled by the wind or the lumberman's axe; the larva when hatched soon eats its way into the wood, and before this period of its existence is closed it often burrows immense galleries through and through the solid interior. As it lives a long time in the larval state, the perfect insect is frequently only developed after the timber has been built into a house, and then suddenly emerges from its concealment to the great consternation of the inhabitants of the dwelling. The larva, when burrowing in the wood, makes a loud noise like the boring of an auger, which on a still night may be heard for a considerable distance. The species is very generally distributed throughout Canada and the Northern States; in the pine-growing regions it is often excessively abundant.

A very interesting and valuable account of this insect is given by the late Mr. E. Billings, of the Canadian Geological Survey in the *Canadian Naturalist and Geologist*, for December, 1862, (vol. vii. pp. 430-438). As the work is not likely to be in the hands of more than a very few of our readers, we cannot do better than give some extracts from it. Mr. Billings, from his long residence in the lumbering districts of the Ottawa valley, had more than ordinary opportunities of observing the life and habits of the insect, and may therefore be justly considered an excellent authority upon the subject. "These insects," he relates, "attack dead timber, and also trees which have received some injury, and are in an unhealthy condition. I have never seen the female laying her eggs on a perfectly healthy and sound pine tree. Timber newly fallen is always attacked by them. The first dwellings constructed in the new settlements are generally made of logs with either the whole or a portion of the bark remaining on them. The inside is not plastered, except in the crevices between the logs; if these latter happen to be pine, the *Monochammus* lays her eggs in the bark, on the outside of the house, and for months afterwards the larva may be heard in the stillness of the night, making a noise like the boring of a small auger. The perfect insect sometimes comes out on the inside of the wall, and suddenly drops down upon the floor, the table, or the bed, to the great alarm of the inmates, who imagine that an insect with such great horns must bite or sting with proportionate severity."

"For the manufacture of boards or planks, the pine trees are cut up into lengths of from twelve to eighteen feet, and are either drawn or floated to the mill. The logs are got out during the winter, and if they remain in the mill-yard one season, they are invariably found to be bored through in all directions by larvæ of these beetles, and the boards greatly deteriorated in value. Where extensive operations are carried on, a single lumberman will sometimes have a license giving him possession of over a hundred square miles of pine forest. In the months of May and June it often happens that great fires sweep through the woods, burning up all the fallen trees and dry branches strewn over the ground, and so scorching the living pines that most of them wither at the top and die during the season. Trees thus injured are soon attacked by both *M. Confusor* and *M. Scutellatus*, and within one year are

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so greatly bored that they are unfit for the manufacture of timber. Those experienced in the business, however, well understand the habits of the insect in this respect, and hasten to make the timber before it is destroyed. Pines scorched by the spring fires must be cut down and made into lumber the next autumn. After one of these fires it generally happens that there is a regular race between the lumberers and the beetles, the prize being a grove of white or red pine. I was told that Messrs. Egan & Co., lost £40,000 worth of timber by some unavoidable delay of a few months. Pine trees, when scorched, would be sound enough for timber five years afterwards, if it were not for the attacks of these formidable destroyers.

"When there are only a few pines, as in the neighbourhood of Montreal, it is rare to meet with more than one or two of these beetles together. But in the great forests of the Ottawa it is not unusual to find fifteen or twenty on a single tree. On one occasion I saw an extraordinary number, and entered an account of the circumstances in my note-book on the spot. It was on the 11th of September, 1857. I was at that time making some geological observations in the neighbourhood of Lake Clear, in the County of Renfrew. Following on the lumber road through the woods, I came to a place which had been burned over some time during the preceding spring. There was one large white pine standing on the sunny side of a small gently sloping hill. The height of this tree was about 120 feet, and its diameter nearly 3 feet. About 30 feet at the base was scorched; it was 60 feet to the lowest branch, and as nearly as I could judge, the foliage for 20 feet at the very top had turned yellow. The remainder was green, and apparently healthy. This tree was swarming with *M. Confusor*, and many of the females were occupied in laying their eggs. I think there were at least 300 of both sexes, and I saw several flying from other trees thirty or forty yards distant. In flying, the body is not horizontal, but inclined at an angle of only fifteen or twenty degrees from the perpendicular. The insects were on all parts of the tree, and they did not appear to take a firm hold of the bark, for a heavy blow with the hammer, at the base, would bring down a dozen at a time, some of them falling from near the top. While falling, they did not attempt to fly. I had fifty or sixty crawling around me at once, and had a fine opportunity to observe the very considerable variation in the size of the individuals, and the length of the antennæ. When two of them going in opposite directions, met face to face, a clumsy kind of fight took place, in which they reared up and pushed against each other, until one or other fell over backwards. They bit each other with their mandibles, but with no effect that I could perceive. The females fought with each other, or with the males, indifferently. There can be little doubt but that this tree was, during the next twelve months, totally destroyed. If there were 150 females, and each laid 200 eggs, and half of these produced a healthy larva, then in one year this tree must have been perforated by 15,000 galleries. I examined other trees in the neighbourhood, and on a few only did I see any of the beetles, usually from one to four or five on each. I can only account for the preference given to this particular tree, by supposing that it was in a better condition for the nourishment of the larvæ than the others, and that the instinct of the females directed them to it. It is probable that nearly all the females for a considerable distance around were thus brought together on one tree, and were followed by the males."

"I cannot say whether or not these insects ever attack a perfectly healthy and sound tree. I think they do not, and yet their ravages are certainly injurious to the commerce of this country, as they destroy a vast deal of fallen or scorched timber, which otherwise might be brought to market at any time during several years after the trees have received a death-blow by fire or storm. I think also that thousands of trees, only sufficiently injured by fire to throw them for a while into a weakly or unhealthy condition, would recover were it not for the attacks of these formidable creatures."

The only means of warding off the attacks of these destructive insects is to manufacture without delay, all scorched or fallen timber, and to strip the bark off all saw-logs that are left over a summer before being cut up in a mill. When the bark is removed the female has no convenient and safe place in which to deposit her eggs, and thus the timber escapes her attacks.

*bimaculata (oliv)*  
VIII. OBEREA TRIPUNCTATA Fab.—THE RASPBERRY TWIG-GIRDLER.

We now come to the last insect on our plate; the figure is a good deal exaggerated in size, the length of the beetle being under half an inch, and its width one-tenth of an inch.

Its colour is deep black, with the exception of the thorax above and the front part of the breast beneath, which are rusty yellow; on the thorax there are three small elevated black dots, arranged in a triangle (not two only, as in the figure), whence is derived the specific name of the insect. The antennæ are nearly, if not quite, as long as the body. The beetles are usually found in July and the beginning of August; they attack all the varieties of raspberry, and come into gardens from the fields and clearings, where we have often taken specimens and observed their work. The mode of attack is peculiar: the first appearance of injury is usually manifested by the withering and drooping of the ends of the young shoots. On inspection, it is found that at the base of the affected part there are two rows of punctures, half an inch apart, running completely round the canes, and so girdling them that the supply of sap is stopped and the tops necessarily soon wither and break off. The parent insect begins by cutting with its jaws a series of small punctures side by side around the cane, six or seven inches from the top. As soon as the first row is completed, it turns round, and facing the other way, cuts a second row, measuring the length of its own body. These two girdles being completed, it makes a small hole a little way above the lower girdle and deposits in it its small yellow egg. The whole operation occupies an hour or more. From this egg there hatches out in a few days a small, yellow, footless grub, which proceeds to burrow downwards, eating the pith of the cane and eventually causing its destruction.

In our Entomological Report for 1873, Mr. Saunders gives a full, scientific description of the larva of this insect and many other interesting particulars to which we beg to refer the reader. Though certain that the girdling of the raspberry canes was caused by this insect, he states that he had "not yet seen the beetle in the act of depositing their eggs" and making the girdles. We are glad to be able to complete the life-history of the insect by the account we have given above, which is taken from repeated observations that we made ourselves several years ago at Cobourg, the substance of which we embodied in an article in the *Canada Farmer* of 1869, (page 338.) The object of this singular girdling operation is, in all probability, to check the growth of the cane, and so prevent the crushing and destruction of the egg or larva by the rapid increase of cells and tissues in the plant.

An obvious remedy for the injuries inflicted by this insect is to break off *at the lower girdle* and burn the affected twigs, as soon as possible after they are observed to wither; the egg or newly-hatched larva will thus be destroyed and the increase of the species checked.

In the foregoing description of the wood-boring beetles figured on our plate, our aim has been, not to write an original dissertation upon the insects, but to gather together from various sources, as well as from our own observations, all the information respecting them that we have thought would be of interest or value to the readers of these Reports. We hope that the beauty and graceful forms of the insects will lead many of our country friends to collect for themselves, and then study the life history of these wonderful denizens of our groves and forests.

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## THE APHIDES OR PLANT LICE.

BY W. SAUNDERS, LONDON, ONT.

Under the common term aphid or plant louse, is embraced a number of distinct species, belonging sometimes to different genera, but all resembling each other so closely in appearance or habits as to lead to their being grouped under one common name. So closely do many of the species resemble each other, that their distinguishing features cannot be made out without the use of a magnifying lens. There are very few plants, shrubs, ornamental or fruit trees, but are more or less affected by these insects, and on many of them they luxuriate and thrive to such an extent as sometimes to threaten their destruction. These plant lice are not restricted to any particular part of a plant; often they are found on the leaves, but sometimes on the stems, or again on the roots of plants, while other species roll up the leaves, or form gall-like swellings on them. This troublesome tribe of insects holds a position in regard to the vegetable world somewhat analogous to that of some well-known parasites on animals; hence the popular name plant lice. They belong also to the same great order of insects, *Hemiptera*, all of whom obtain their livelihood in a similar manner, viz., by suction. They are all furnished with a beak-like mouth, sometimes hard and solid, which is thrust into the plant or animal they are feeding on, and used to extract its fluids.

Plant lice are remarkable for their fecundity. People are often puzzled at finding their plants or trees swarming with plant lice, where a week or two before there was scarcely one to be found. As a general rule an aphid, during the summer season, reaches maturity in ten or twelve days from birth, after which it produces every day two young ones, which, contrary to the general rule with insects, are born alive. This rate of increase is maintained for a considerable period, from fifteen to twenty days or more; the young begin to produce in like manner in from eight to ten days, and so on through the third, fourth, and sometimes up to the twentieth generation in one season. Some idea may be formed of the numbers which in a short time this rate of increase would produce, from a calculation of Curtis, a celebrated English Entomologist, who has computed that, from one egg only, there would be produced in seven generations, taking thirty as the average of each brood, the enormous number of seven hundred and twenty-nine millions, so that were they all permitted to live, everything on the face of the earth would in a short time be covered with them. Indeed, sometimes the possible rate of increase is even greater than this. Dr. Fitch, late State Entomologist, of New York, has ascertained by actual experiment that in the case of the grain aphid, the wingless females become mothers at three days old, and thereafter produce four little ones every day, so that even in the short space of twenty days the progeny of one specimen, if all were preserved from destruction, would number upwards of two millions.

It may be urged in objection to these calculations, that no allowance is made for a certain percentage being males, but strange to say, all through the summer there are no males born, but all are fertile individuals, giving birth to others, and these to others still, independent of any influence from the opposite sex. With many species, some individuals of each brood acquire wings, while others are wingless; the wingless ones remain, of course, upon the plant on which they were produced, while the winged specimens fly to other plants, where they establish new colonies. About the middle of September the last generation for the year is produced, which consists of males and females, the males generally becoming winged. On reaching maturity, the sexes pair, when the females no longer bring forth young, but lay eggs, which are able to resist the severe cold of winter, and these hatching in the following spring, produce mothers which bring forth their young alive. The individuals composing the late brood having provided for the continuation of their race, generally die on the approach of winter.

It appears that there are, however, exceptions to this general rule. In the case of the grain aphid, Dr. Fitch says that he has watched it the year round so closely that he is perfectly assured that no eggs were laid and no males produced, and he further states that in the autumn the mature lice continued to produce young ones until they and their young became congealed upon the leaves of the young grain by the advancing cold of the season, and in this state they were buried beneath the snows of winter and with the warmth of the ensuing spring they were thawed and returned to life again. Prof. Cyrus Thomas also found living lice upon young fall wheat in South Illinois in the middle of winter, and after much sleet and rain had fallen. Even so far north as Connecticut, Prof. Verrill found numbers of wholly plant lice of all sizes on the branch of an apple tree so late in the year as December 11th, and this after two snow-storms and many cold rains and freezing nights. Indeed those who cultivate plants in their houses or otherwise under glass during the winter, will not require much evidence further than their own experience to convince them that plant-lice, tiny, tender looking, and juicy as they are, are endowed with such perennial vitality and hardihood as to require great watchfulness and the frequent use of remedies for their destruction in or to keep them within due limits.

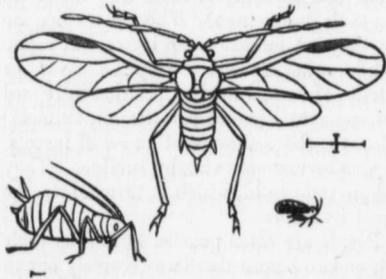


Fig. 4.

In figure 4 we give a highly magnified view of the apple aphid, *Aphis mali*, both in the winged and wingless forms; the hair lines along side of the figures show the natural size of the insects. At the tip of the abdomen is seen a little projection; this is the ovipositor or egg laying instrument, and on each side of this is another little horn-like projection. These latter are called the honey tubes, and through them a sweet liquid is produced which is sometimes discharged upon the leaves of the infested plant, which drying up, forms a sweet glutinous substance known under the name of honey dew. In olden times the origin of this honey dew was shrouded in mystery, and many theories were advanced by sage philosophers to account for the strange phenomenon. Pliny, the great Roman naturalist, hesitates whether to call this honey dew the sweat of the Heavens, the saliva of the stars, or a liquid produced by the purgation of the air. Thanks to the careful observations of entomologists, philosophers have no longer any reason to puzzle themselves as to its origin.

In this connection another strange feature deserves explanation. Most attentive observers will have noticed that where trees or plants in the open ground are infested by plant lice, they are also much frequented by ants who are busy running up and down the trunk or stem the whole day long. This association of these insects has led some to suppose that the aphid are in some way produced from the ants, and we have heard of various ingenious devices being resorted to, to prevent the ants from ascending the trees, under the idea that in this manner the aphid might be in some measure got rid of. A slight examination will suffice to show the fallacy of this view, and reveal the real object the ants have in their visits. It is a well established fact, as most housewives know to their cost, that ants are very fond of sweet things. Examine closely one of the groups of plant lice which are being visited by the ants and you will see one or more ants walking about among them; apply a magnifying lens to the group, and you will presently perceive an ant drumming gently on the back of a plant louse with its feel-like antennæ until it coaxes the aphid to emit from its honey tubes a drop of the sugary liquid. This the ant absorbs and passes on to another, which is subject to similar treatment, and so on until having filled itself, it descends to the earth and having regained its nest, discharges the sweet fluid into the mouths of the helpless maggots, the larvæ of the future ants, which are entirely dependent for their sustenance on these industrious, working ants. Linneus, one of the earliest entomologists, and a most careful investigator, truly observes, "the ant ascends the tree that it may milk its cows, the plant lice." These honey tubes are shown more prominently in fig. 5, which represents a wingless aphid.



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Fig. 5.

lay their eggs among the plant lice. But I have repeatedly seen them gathering in crowds round one of the fat fleshy aphid-devouring larvæ of the *Syrphus* flies, pulling him about in every direction, as if to ascertain whether he had got any honey in his body, like their friends the plant lice, and then, having apparently satisfied themselves that the fat gentleman was not in the grocery business, and not knowing that he butchered daily hundreds of their honey-producing friends, turn away in despair, and leave him, unharmed and unwounded, to his own devices, as a hard case that nobody could make anything of. It is apparently for the same reason, namely, to prevent sugar-loving flies from robbing them of their own private and peculiar honey dew, that ants occasionally construct a kind of tent round a little flock of their plant lice, but only where those plant lice are located on a twig, and never, so far as I have observed, where they are located on a leaf."

Notwithstanding all the care the ants may take to repel intruders, thousands of flies share in the sweets produced by the plant lice, and often the location of a colony of these insects, which would perhaps otherwise escape observation, may be detected by the loud buzz occasioned by the disturbance of the attending flies.

But there is seldom a rule without its exception, and while the details given above apply correctly to hundred of different species of plant lice, yet in the case of the grain plant louse, *Aphis avenae*, although the honey tubes are well developed, yet they emit no honey, and in consequence of this, as has been remarked by Dr. Fitch, this species is not attended by ants. To use the words of the late Dr. Walsh, "as this peculiar breed of cows gives no milk, the milk maids do not think it worth while to visit them."

Having now given our readers some idea of the general habits and immense fecundity of these interesting insects, we shall refer in some detail to a few of the most troublesome and destructive species reserving what we have to say in regard to the remedies which nature has provided or man invented for their destruction until we have completed the enumeration.

#### THE APPLE-PLANT LOUSE (*Aphis mali*).

This insect which is represented in fig. 4 is the same as that which similarly infests the orchards in Europe and has doubtless been introduced on the trees imported into this country from across the Atlantic. The insects of this species of the previous year deposit in the fall in the cracks and crevices of the bark of the apple tree large numbers of their small oval black shining eggs. A large proportion of these are dislodged by the cold, driving rains and snows of winter, and destroyed; doubtless also, multitudes are devoured by the smaller insectivorous birds. The survivors hatch quite early in spring before the buds are fully expanded, when the young lice locate themselves on the small, tender leaves displayed by the bursting bud, and there inserting their sharp beaks into the tissues of the leaves, pump out their juices. The wingless specimens are of a pale, yellowish, green colour with a yellow head and black eyes and are less than the tenth of an inch in length. The winged specimens have the head antennæ and thorax black, and the body green.

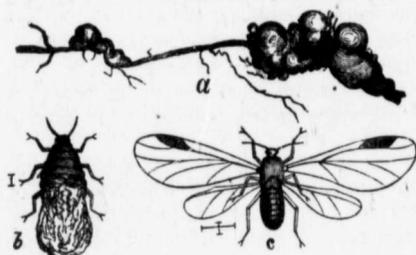
THE APPLE-ROOT PLANT LOUSE (*Eriosoma pyri*).

Fig. 6.

rare to receive a lot of young apple trees either from our own nurserymen or from those of the United States without finding some of them thus affected.

The mature louse (fig. 6, b) is about the tenth of an inch long including the closed wings of a dull colour with transparent wings and black legs, and with a peculiar downy or frosted look produced by the exudation from its body of a bluish white, cottony matter by which character it can often be readily recognised. When the wings are expanded the insect measures nearly  $\frac{3}{16}$ ths of an inch, (fig. 6, c).

As this species, situated as it is under ground requires different methods of attack from those which infest the leaves of plants and trees we will refer to them here. The only artificial remedy yet suggested for the destruction of this pest is hot water used plentifully so as to scald the roots, or, at least, the larger ones over their entire area. To accomplish this successfully, it will be necessary to carefully remove the earth from about the surface of the roots so as to lay them bare. No danger need be apprehended from using the water scalding hot as the application has often been made without injury. This remedy is not so applicable to large trees as it is to young trees in the nursery row or those lately planted. As a preparatory measure, mulching the tree has been recommended, which brings the insects nearer to the surface where they can more readily be reached by the hot water.

Nature's remedies are, however, in this instance, probably more effectual than any which man can devise. In the first place, these lice are subject to the attacks of a very minute parasitic fly; and secondly, they are destroyed by the larva of the "Root-lice Syrphus Fly," *Pipiza radicans*, fig. 7 (after Riley). This latter friend is a fat, footless grub, fig. 7a, which lives underground among the lice and devours large numbers of them; in the fall it changes to a chrysalis, fig. 7b, and appears in the perfect form as a fly, fig. 7c, in the following spring.

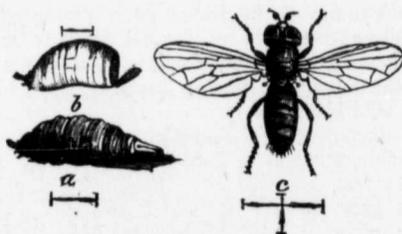


Fig. 7.

THE CHERRY-PLANT LOUSE, *Aphis cerasi*.

Probably no species of tree is so regularly infested by aphides as the cherry, and no species included in this large family of pests is more disgusting in appearance than this cherry-plant louse, for, while most others are of a more or less lively green colour, this is nearly black.

These insects begin to appear soon after the leaves have expanded, hatching from eggs deposited the previous year. They multiply with amazing rapidity, the young ones hud

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ding around their parents so closely as to entirely cover the twig, leaf-stem, or portion of the leaf on which they are feeding; indeed it is not uncommon to find them two deep, a portion of the crowded host standing upon the backs of others, all intent on the one business namely, that of absorbing the juice of the tree, which they do by inserting their beaks into the succulent portions. They seem never to suffer from over-crowding. Dr. Fitch estimates—his calculation being based on actual count—that the two surfaces of a small leaf, but an inch long, would furnish ample space to accommodate a thousand of these insects.

When we consider the rapid rate of increase which prevails among the aphides, some details of which we have already given, it is not astonishing that the leaves, leaf-stalks, tender twigs, and even the fruit-stems are so soon found to be swarming with these pests, their black bodies literally covering every succulent portion, while all around flies, wasps, and other insects are swarming, keeping up a constant buz and hum about the infested tree, to which they are attracted by the sweet liquid which exudes from the bodies of these aphides. By the end of June they have usually attained their maximum numbers, for by this time their numerous enemies, which we shall hereafter refer to more in detail, have become so multiplied as to begin to get the better of them, and when once the scale is turned against them they are sometimes destroyed so rapidly and entirely that in a few days not a living specimen can be found, the empty skins of the slain being the only remaining relics of the vast hordes but recently seen. Dr. Fitch well remarks, "It is by looking at the works of nature in a definite manner, and tracing out her operations specifically and in their minute details that we arrive at some faint conceptions of their magnitude and grandeur, and become vividly impressed with the truth that no other agency than that of a Creator infinite in wisdom and power could have peopled the world which we inhabit with such countless numbers, and such an endless variety of objects animate and inanimate, each occupying its appropriate sphere, and all so arranged as to fulfil the objects for which they were called into existence. Has the reader as he has passed a forest ever attempted to conjecture the number of trees which it contained? and has his mind passed onward to a surmise of the probable number of leaves growing upon each tree, and onwards still to the number of insects which may be drawing their sustenance from each one of these leaves; and still further to the number of minute and infinitesimal parasites which may be subsisting upon these insects?" Such reflections could scarcely fail to lead the thoughtful observer "from nature up to nature's God."

During July the cherry tree generally enjoys some respite from the attacks of these tiny foes, but early in August they usually appear again to increase and multiply until being again overtaken by their enemies they are a second time overcome, this later brood is seldom as numerous as the first one. This black aphid seems to be restricted to the cultivated cherry, for we never find them invading any of our native or wild cherry trees, and these in turn seem each to have a species of plant louse peculiar to them, which seldom if ever attach themselves to the foliage of other kinds. Dr. Fitch has described in his first report on the noxious insects of New York, a green species *Aphis cerasifolia* which affects the undersides of the young and tender leaves of the choke cherry, and refers to another which infests the wild black cherry.

Thus we might go on enumerating and describing species after species to the exhaustion of the patience of our readers, for there is scarcely a tree, shrub, or plant, which is not at some period or other in the year infested with them. We would, however, particularly mention the currant plant louse *Aphis ribis*, which swarms on our currant bushes, and which has probably been imported into this country from Europe; the Cabbage-plant louse *Aphis brassicae*, also introduced from Europe; the Hop-plant louse *Aphis humuli*, and the Grain-plant louse *Aphis avenae*, since these from their great abundance frequently attract general attention.

We now propose to refer to the remedies which nature has provided, and man has devised for the destruction of these tiny foes, and beginning with the more important and most effective, we shall first advert to the natural enemies of the plant lice. It has been truly said, "the plant louse has but one friend—the ant, but its enemies are legion; and wisely is it so arranged, for were they permitted to increase and multiply at their natural rate without material check, ere a few months had elapsed every green thing on the face of the earth would be so covered with them as to cause general destruction.

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Foremost in the list of enemies we must place the lady-birds which feed on little else than aphids either in the larval or perfect states. Probably the commonest species is that known as the nine spotted lady-bird *Coccinella 9 notata* fig. 8, a nearly round insect, of a



FIG. 8.

brick red colour, with nine black spots, fig. 9, shows the same in the larval condition. Another common species is the two spotted lady-bird *Coccinella bipunctata* very similar in form and colour to the previous species, but smaller and with two black spots instead of nine.



FIG. 9.

The spotted lady-bird *Hippodamia maculata* fig. 10, is also frequently met with, and being found both in Europe and America has probably been imported from one country to the other. The colour of this is pink with large black spots. The thirteen spotted lady-bird *Hippodamia punctata* fig. 11, is rather larger than either of the preceding species and has thirteen black spots on a brick red ground.



FIG. 10.

The trim lady-bird *Coccinella munda*, Fig. 12, may be readily distinguished from most of the other species by its having no black spots on its red wing cases. The convergent lady-bird *Hippodamia convergens*, Fig. 13, is



FIG. 11.

of a deep orange red colour, marked with black and white. Its larva *a*, is blue, orange and black in colour, *b*, shows the pupa or chrysalis suspended by the tail, and *c*, the perfect beetle. This insect is also very useful in destroying the eggs and young larvae of the Colorado potato beetle.



FIG. 12.

The fifteen spotted Mysis, *Mysis 15 punctata*, Fig. 14, is one of the largest species. The perfect insect varies much in colour from a light grey to a deep chestnut brown. An ordinary observer might readily conclude that the different forms belonged to those of distinct species, the more prominent of these variations are shown at *d*, *e*, *f*, *g*, in

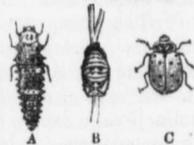


FIG. 13.

The fifteen spotted Mysis, *Mysis 15 punctata*, Fig. 14, is one of

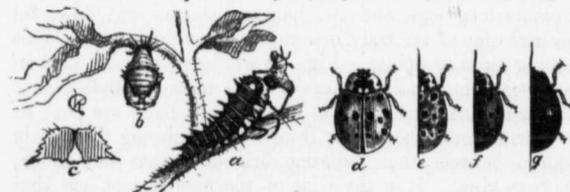


FIG. 14.

the figure. This predacious species also devours the young of the Colorado beetle, at *a*, the larva of this lady-bird is represented in the act of devouring one of these young enemies. In addition to those we have enumerated, there are a number of other less common species, in colour mostly yellowish or reddish with black spots or bands. In the larval state they all resemble each other very much, being elongated in form and active in habit, usually of a dull colour with more or less yellowish or bluish markings, Fig. 9 may be referred to as a type of the whole.

There is still another species, belonging to another genus of lady-birds, which, from its abundance and great usefulness deserves mention, we refer to the twice-stabbed lady-bird



FIG. 15.

*Chilocorus bivulnerus*, Fig. 15, a highly polished black insect with two red spots, and which in form much resembles the half of a split pea. This species preys more particularly upon bark lice, and hence is most commonly found on the trunks and branches of trees. The larva, Fig. 16, is a very curious, prickly looking creature, extremely active and voracious in its habits.

Its chrysalis may often be seen on the trunk of trees partly covered by the prickly larva skin.

Prominent also among the insects which subsist upon plant lice, are the aphid lions, the larvae of the golden-eyed and lace winged flies. The perfect insects are very pretty and delicate-looking creatures, with prominent fiery eyes, slender bodies, and two pairs of large, beautifully netted, pale green wings. Many of them, however, when handled, impart an intensely disagreeable odour to the fingers, and one of a remarkably permanent character, Fig. 17 represents this insect in the perfect state.



FIG. 17.



FIG. 16.

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FIG. 16.

The eggs of this insect are curiously placed upon stalks as shown in Fig. 18. Dr. Fitch says, "Nature has furnished these insects with a fluid analogous to that with which spiders



FIG. 18.

are provided for spinning their webs, which possesses the remarkable property of hardening immediately on being exposed to the air. When ready to drop an egg, the female touches the end of her body the surface of the leaf, and then elevating her body, draws out a slender and cob-web-like thread half an inch long or less, and places a little oval egg at its summit. Thus a small round spot resembling mildew is formed upon the surface of the leaf from the middle of which arises a very slender glossy white thread, which is sometimes split at its base, thus giving it a more secure attachment than it would have if single. The egg at its summit is of a pale green colour when newly deposited, but before it hatches it becomes whitish and shows two or three faint dusky transverse bands. The larva leaves it commonly I think in less than a week from the time it is deposited, through an opening which it gnaws in the summit, and the shell remains empty supported on its stalk, somewhat shrivelled and of a white colour.

The young larva begins at once to seek its food, and if it finds itself in the midst of a colony of plant lice, many of these speedily fall victims to its enormous appetite, but if not so favourably situated, a vigorous search is generally rewarded by the finding of a cluster of insects' eggs or some newly hatched caterpillars, either of which will furnish our young traveller with a dainty meal. The larvæ of the different species vary somewhat in colour and ornamentation, but in most instances the ground colour is of a dull reddish brown, and there are whitish markings along the sides, and a dark central stripe. They all have long, narrow bodies, and are furnished with six rather long legs, and two long and slender, but powerful jaws curved like a sickle, and down each side of the body is a row of tubercles, each tubercle being tipped with a cluster of spreading hairs or spines. Fig. 18 will give a good idea of their general appearance. In some species the bristly clusters of hairs are so multiplied as to almost cover the surface. Dr. Fitch mentions a novel use to which these hairs are put, he says that these voracious creatures often conceal themselves from view by placing the empty skins of the victims they have devoured, between their radiating bristles so that they adhere and thus completely hide the insect from view. It is the skins of the woolly plant lice that they mostly employ for this purpose, and thus covered they resemble a little mass of white down adhering to the bark of the tree, presenting just such an appearance as does a little colony of woolly plant lice. By this device they are enabled to approach their victims without exciting their alarm and to quietly devour them one by one.

After acquiring full growth the ant-lion having made a hearty meal, remains for a time torpid, and then begins to spin its cocoon, which is formed from a glutinous fluid supplied and distributed by the hinder extremity of the body, a fluid which hardens as it is spun into threads. In a few hours the insect spins enough of its cocoon to hide itself from view, and when completed the threads composing the cocoon are so closely compacted as to give the surface a papery look. During the operation the larva contracts much in size and bandages itself so tightly within its enclosure that the cocoon appears very small in comparison with the size of the larva constructing it. Here the insect changes to a chrysalis of a pale green colour and remains in this condition in summer a fortnight, but if the insect belongs to the later brood, it remains in the chrysalis state all winter, appearing as a perfect fly the following spring.

Other enemies to the plant lice are to be found among the larvæ of the various species of *Syrphus* flies. These flies vary in size, some being smaller, others larger than the common house fly, and usually more slender in form, they are also handsomer, their bodies being of a bright yellow colour, banded and spotted with black. Fig. 19 represents one of the species.

They are very swift of flight, darting about with great rapidity, again hovering with poised wing in the bright sunshine, or alighting upon flowers. These flies place their eggs singly, fastening them to a leaf or twig infested by plant lice, usually placing them in the midst of a colony where the young larvæ may not have long to search for appropriate food.

One cannot go far in summer in the careful examination of groups of plant lice without meeting with those small white oval eggs. The young larva when hatched



FIG. 19.



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ful, that whilst every kind of tree and plant appears to have one or more species of aphid infesting and blighting it, each species of aphid seems to have a particular parasite preying upon and devouring it; for each kind of aphid, from which I have reared these insects, has furnished a species differing from all the others, and, in some instances, two species have been obtained from one kind of aphid."

How complicated and how wonderful are the marvels of Nature. There seems a providence in all these arrangements. Kirby has well said that it is strange that among the innumerable species of insects, many of them extremely fragile and exposed to dangers and enemies without end, no link should be lost from the chain, but all be maintained in those relative proportions necessary for the general good of the system; that if one species for a while preponderate and instead of preserving seem to destroy, yet counter-checks should at the same time be provided to reduce it within its due limits; and further, that the operations of insects should be so directed and overruled as to effect the purposes for which they were created, and never exceed their commission; nothing can furnish a stronger proof than this, that an unseen hand holds the reins, now permitting one to prevail and now another, as shall best promote certain wise ends, and saying to each "Hitherto shalt thou come and no further."

A few words will suffice to indicate the remedies which man has devised to lessen the numbers of these destroyers of vegetation. It is universally conceded, that where the remedy can be conveniently applied there is nothing more effectual than tobacco smoke. To exterminate them in green-houses, smoking - by strewing a few leaves of tobacco on hot coals - is regularly resorted to, and, if thoroughly done, is very effectual. A few favourite plants may be similarly treated by enclosing them in a light paper-covered frame and smoking under it, or by placing them under an inverted barrel or box; after such treatment the plants should be immediately washed with luke-warm water from a syringe or watering-pot. Where this remedy cannot be applied, drenching with tobacco-water has been recommended, also the application of strong soap-suds, or weak lye, sprinkling it freely on the plant, and even dipping the succulent ends, where the aphides cluster, into the liquid.

Hot water has also been recommended, but this, if not cautiously applied, is very apt to injure the plant. Some species will bear an application of water heated to 130° Fahrenheit, indeed, some few will bear a higher temperature than this without injury, but others are more susceptible in this respect, hence the remedy requires careful handling.

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# REPORT

ON

## SOME OF OUR FRUIT INSECT ENEMIES,

FOR 1877.

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BY B. GOTT, ARKONA, ONT.

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It was with much pleasure and satisfaction that I was able to be present for the first time at our Society's annual meeting, last September, in London, Ont., I then and there imbibed deeper and wider ideas of the extent and importance of the work in which our entomologists are so ardently and devotedly engaged, I also had an opportunity of personal acquaintance with the characters and qualifications of the men who are the foundation and the noble pillars of the Society. The men then present were practical and intelligent, and the earnest sympathy they showed in the work and objects of the Society, could not be otherwise than encouraging to those engaged in this interesting and serviceable study. It is not easy to conceive how any people possessing and supporting such a Society, whose work and results are so palpable to the masses, can be otherwise than progressive; and as far as their productive results are concerned, every way prosperous. Should we not desire that the effective membership of the Society may largely increase, and that thus the educating and elevating influences of the study may be extended, and felt to be not only an assistance but a powerful helper of the people through the length and breadth of the land. In my own individual case I find my interest in the subject of entomology annually deepening and widening in proportion to the extent in which my attention is directed to it. Since being engaged to some extent as I have been for the last few years in the critical but interesting production and cultivation of fruit in this western part of Ontario; I found from the very start that something more was necessary to success than a mere knowledge of the theory of production. I found insect enemies to contend with, for which, in my ignorance, I had made but little or no provision. My combativeness was at once aroused; but finding progress in a hand to hand fight very slow, and not very encouraging or satisfactory, I began to reflect that prudence was the better part of valour, and I at once set myself bravely to the task of arriving at some knowledge of their differences, their habits, their possible numbers, and their possible use; with also some data for successful competition. I have not advanced far, but I soon found that my opportunities, my samples and specimens were not scarce, especially in our summer and growing season, and that their differences and peculiarities were very interesting, and their numerical forces sometimes appalling. Some were feeding voraciously on a specific plant, shrub, or tree, or on a class of these; and others were feeding as voraciously on their opposites. Some were most injurious and destructive in their immature state, and others needed the complete forces of maturity to do the same amount of effective execution; some were most active in their destructive work on the roots in the ground, some were content with the leaves, and yet others were satisfied with nothing of less value than the fruit. So I concluded that insect depredators were not wanting more or less for everything that grows. It would almost appear too, that we have peculiar local insect troubles, as though special and individual classes of insects were localized and restricted to sectional divisions; but by further acquaintance with the subject, I must suppose this can hardly be. However, it is beyond dispute, and capable of most positive and convincing proof, that in this department of natural research there is much to be studied and much to be learned; there is ample and profitable room for the intellect, and investigation of the most vigilant and the most penetrating.

Moreover, what abundant cause have we for gratitude and thankfulness to those patient, honoured, and great names whose owners have worked hard and long, and spent their valu-

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able and industrious lives in this interesting field of inquiry, and have freely left us, as a legacy, the cherished results of their labours—"their works do follow them,"—and we are thereby assisted in those difficult and puzzling problems of insect life and insect differences and relationships; and although there is yet much to be done, much has already been accomplished and vividly portrayed before our vision. The field has already been surveyed and mapped, and it only remains for us to follow those lines to arrive at rich and desired results. I propose, therefore, in the following pages, to give as short and concise an account as possible of some of the most palpable insect enemies of our fruit, &c., for the past season. And this I do, not with the intention to supplant the able and graphic report of insect enemies by the President of the Fruit Growers' Association, in his address before that body last September; or of that of the President of the Entomological Society, at about the same time, but rather as an adjunct additional testimony in the same direction. I further may be allowed to state that I make no pretensions to scientific accuracy, but shall simply state my observations as they occur to me in my own untutored way. With these preliminaries I come at once to the subject in hand, viz:—

*The insect enemies of our Fruits, &c., for 1877.*

By this caption I do not mean that I shall confine myself exclusively to those insects merely which feed alone on our fruits, but shall include also those injurious to the leaves and even the roots and branches of our fruit trees and shrubs, as equally noxious to our fruit products and prospects. And first, I may mention the

AMERICAN LACKEY WORM, OR TENT CATERPILLAR (*Clisiocampa Americana*)

Of Harris. For larvæ and eggs see fig. 21; the male moth is shown in fig. 22, the female in fig. 23. This insect, by its appalling and unprecedented numbers, and by its voracious and

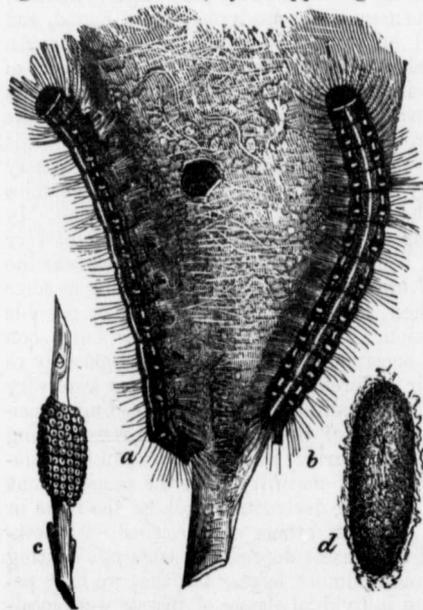


Fig. 21.

orchards standing in the neighbourhood of forests have suffered very severely; and although persistent and industrious, our efforts seem feeble and almost totally unavailing to save our orchards and our gardens. This latter insect is very active, and is on constant parade over trees and shrubs, over fields, orchards, and gardens, where anything can be found to gratify its devouring appetite; and then, it is recruited so plentifully and so frequently that we fairly sicken of the fight, and despair of the prospect of victory. But there is to this dark picture

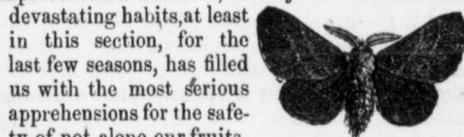


Fig. 22.

devastating habits, at least in this section, for the last few seasons, has filled us with the most serious apprehensions for the safety of not alone our fruits, but also for the very life of the trees. So serious was this damage during the past season that the aid of legislation was talked of, to compel people to do what they could for the suppression of this insect grievance; because not only the orchards of the negligent and careless were thus blighted, but those also of the industrious and careful were besieged and destroyed by the very enemies his careless neighbour was rearing and helping to propagate. People began to ask of one another, "What is the use of planting and cultivating orchards, they will only be devoured and ruined by the caterpillars?" Aided also by *C. Sylvatica*,



Fig. 23.

the larva of which is shown in fig. 24, those

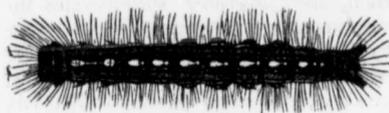


Fig. 24.

of two or three distinct sorts; one was a largish white grub, and existed in the body of the caterpillar, sometimes solitary and sometimes in pairs, and entirely devoured the internal portions; and in other cases they were smaller and closely huddled together, but in each and every case, the destruction of the caterpillar and of the future egg-laying moth was most complete.

Our methods for suppressing this grievance and lessening their numbers were not very effectual, but consisted in entrapping the moths by means of light, and in taking their egg clusters from the branches of the trees and destroying them. As soon as the young larvae were hatched in the spring our practice was, as early as possible in the day, while they were yet very young and closely compacted, to collect them in masses and destroy them. In this way millions were easily and effectually captured and destroyed, but there are always some careless neighbours who would do nothing, and declare it was of no use fighting them as they would eat up the trees anyway, and so by swarming in from the forests, and those neglected orchards, the trouble was annoyingly kept up.

#### MEASURING WORMS (*Geometers*) AND LEAF ROLLERS, (*Tortrices*)

were this year, as usual, very abundant on all our fruit and ornamental trees, shrubs and plants, but the diligent overseer, by his watchfulness and skill can, with comparative ease, so reduce these troublemakers that their work on the mass of foliage is scarcely perceptible. The only way they seem to us damage, and in which we feel them to be a burden is as assistants combined with the already multitudinous forces in the same field of destruction, we feel that we could readily do without their services.

THE CURRANT BUSH BORER (*supposed to be the European Aegeria Tipuliformis*, See fig. 25.)



Fig. 25.

is doing us considerable damage in our currant plantations, and here, too, this evil is permitted by the careless and indolent cultivators to increase upon us, so that eventually, currant growing in this country will become very uncertain and very troublesome. These insects eat out the heart of the young stem and so weaken it that it is incapable of ripening its fruit and shortly dies or breaks off. Of far more serious moment at present, however, is

#### THE CURRANT OR GOOSEBERRY WORM (*Nematus Ventricosus*).



Fig. 26.

The larva of this pest is seen in fig. 26. The perfect fly, male and female, fig. 27; and the eggs as laid on the leaves in fig. 28. This abundant and voracious insect feeds readily in the larval state either on the leaves of the currant or those of the gooseberry, but I prefer to call it by

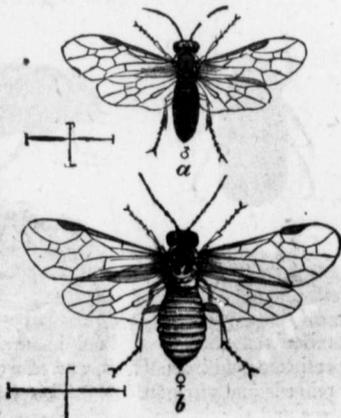


Fig. 27.

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FIG. 28.

among our summer fruits is rather appalling, and not of the most relishable or attractive character.

#### THE GOOSEBERRY FRUIT WORM (*Pempelia Grossularia*).

For a representation of the moth and cocoon of this species, (See fig. 29). This is, perhaps, the most insidious and annoying enemy of the gooseberry and the currant. It winters as a chrysalid near the surface of the ground just under the bush where it was last feeding. In the early spring as soon as the sun has warmed the soil the active and vigilant moths appear, and after copulation, commence at once their work of egg depositing in the young fruit almost before the full and proper expansion of the blossoms. These eggs quickly give rise to little white, insidious worms that make their way into the very heart of the berry and grow and thrive upon its internals. As soon as this berry is consumed and unable, longer, to serve the worm any good and substantial purpose, it leaves and immediately attaches itself to another by means of its silken cords or web-like productions, and thus secures itself safely against all danger and loss. In this way it has attacked and destroyed a dozen or more berries to satisfy its cravings before it has reached the period of maturity or the season for change. When this period arrives it falls to the ground by means of its silken threads, buries itself in the earth and changes to a chrysalis. The remedies are hand-picking, and the application of noxious substances to the bushes in early spring, but these are troublesome and partly ineffectual and hence not very satisfactory.



FIG. 29.

#### THE MAY BEETLE (*Phyllophaga Quercina*.—See Fig. 30).

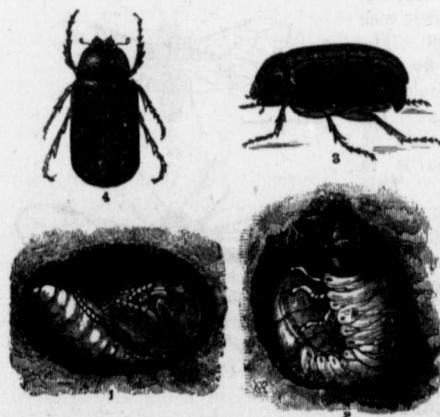


FIG. 30.

2 represents the larva, 1 the chrysalis, and 3 and 4 the perfect beetle. The larva of this active summer evening buzzing beetle stands charged with many and grievous offences against the farmer and the fruit grower. A neighbour of mine said to me the other day "My corn was only half a crop—those cursed white grubs eat it so; it wilted to the ground;" but I suppose that in his case, perhaps, something else did it. However, although our soil is peculiarly suited to their purposes, and is liberally supplied with the larva in all stages of growth. I have but one or two heavy grievances to lay to their charge, one of which I feel pretty deeply and severely. I had long noticed, after planting out young evergreens in nursery rows in the spring, particularly seedlings of spruce, hemlock, and fir, that occasionally several of them just after commencing

their growth would suddenly wilt and at once give up; and this Spring this occurred more extensively than ever. I was in difficulty and could not decipher the cause, as my land I knew was good and well adapted to their successful growth. Upon pulling them up, however, I found that every particle of fibrous root was entirely gnawed off; and besides this, the bark was taken off almost up to the collar, and the tough naked woody branches of the roots only left. This last season I lost whole rows in this way, and, on closely investigating the case, I am pretty well satisfied that the larvæ of the May Beetle are chargeable with the whole trouble; and worse, I know of no remedy! The other charges are, eating the roots entirely off from several of our strawberry plants, and also eating large and injurious holes in our potatoes, &c., &c.

#### THE HAWK MOTH, OR *Sphinxes*

are growing annually more numerous, but we have no very grievous complaints to make against the fine and handsome larvæ of these beautiful moths. Occasionally, however, the foliage suddenly disappears from some branch of our apple trees or our cherry trees, or it may be from our grapes or our potatoes, or perhaps from the tomato vines, and we know from the character and the abundance of the surrounding droppings that one or more of these diligent creatures has been at work. These ravages, however, are not burdensome, and then we readily bear with much from them solely on account of the magnificence and grandeur of their characteristic appearance. About the second and third weeks in October last there were a number of fine larvæ discovered among the grass and late growing green plants in this place. They were about two and a half or three inches in length, fine green colour, mixed and striped with yellow; had the characteristic horn on the last segment, and would curl up as a crescent on being disturbed. I could not determine it, but I have reason to believe it was one of the sphinges.

#### CUT WORMS.

With these I sometimes conclude that the very earth is infested, so great are their numbers and so active their operations. There are evidently many species of them, but the worst and by far the most dreaded is the sneaking thief that cuts our cabbage and tomato plants after they have commenced to grow so finely.

#### AGROSTIS DEVASTATOR

of Harris, and very correctly labelled. These are the most insidious in their attacks, and the most annoying in their devastations, apparently, of any of our garden enemies, and we seem powerless in our defences. They are the most industrious while we are asleep, and like many another dastardly thief hide as soon as the light appears. Our remedies are, vigilant searching for them and destroying them by hand.

#### THE POTATO BEETLE (*Doryphora decemlineata*).

No longer maintains the destructive character which it brought with it at the first, nor are our people so alarmed and troubled by its presence; it has become now a familiar matter-of-course arrangement. Although yet pretty numerous, it affects only the careless and the indolent; the industrious and the ingenious not only baffle their efforts, but to a very large extent render them harmless. It is now well ascertained by our potato raisers that the first broods are comparatively light, and that the insects best efforts are not made until mid-summer and after, so by planting largely or altogether early maturing varieties, and these placed in the ground as early as possible to get their tops and their tubers ripe before the second brood appears, all danger is out of the way. The beetle is perfectly baffled by this arrangement, and it goes wandering about over the fences and on the streets and roads seeking green fields where to pasture, and to deposit its myriads of eggs. This season the crop of potatoes,

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at least in this section, has been most abundant and of great excellence, the variety mostly *Early Rose*, the best potato that was ever given to the American people. Our remedies for the beetle were hand picking; and occasionally a dose of Paris Green applied as a liquid.

#### THE GRAPE VINE BEETLE (*Pelidnota Punctata*, see fig. 31.)

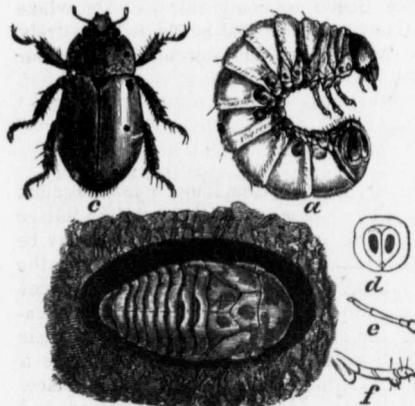


Fig. 31.

as they were at work, which they readily, cheerfully and effectually did. In this way their efforts were greatly lessened. It is becoming more and more evident that we also in this country may yet have trouble from THE GRAPE VINE PHYLLOXERA (*Phylloxera Vastatrix*). I have already seen specimens of it, and it is my most decided opinion that unless some effectual remedy is found, our grape vines will be found to suffer much from the injurious effects of this tiny insects, upon their leaves and especially their roots. Grape growers should seriously study this subject at once; for should the evil become established upon their vines, it would at length be very difficult to eradicate. For description and very full particulars, see Rev. Mr. Bethune's very able and instructive article on the subject in the Society's Report for the year 1874.

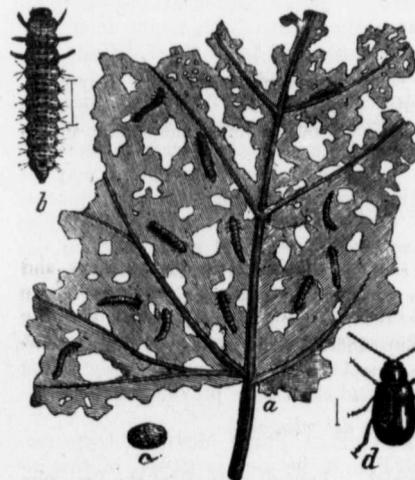


Fig. 32, larva.

numbers and different species feed very heavily upon the leaves of our Cherry, Pear, Apple and other trees, yet this white woolly aphid feeding in immense numbers on the stems and shoots of our young apple trees seem to be the most injurious, and should be looked after most vigilantly. They differ from most insects in one particular, viz.: they attach themselves to a certain spot or spots on the trees, and without locomotion attract their food to them! An opening is made in the bark of the tree which bleeds freely for their support. And the accumulation of unused or unsuited matter forms excrescences about the place. It seems to me they pump very heavily on the vitality of the tree, especially in its young and tender years; and should be kept off by means of oil applications, or destroyed by the hand rubbing them from the spot and crushing them.

Seems very fond of harboring about our grape vines, and has this season been pretty plentiful, but we fail to observe that its presence is an alarming evil or that its injuries are very distinctly marked. It rather appears a sort of harmless case, a pretty creature, whose only office is to vary and beautify nature. But these remarks are not in the least applicable to THE GRAPE VINE FLEA BEETLE, Fig. 32 larva; Fig. 33 the perfect beetle (*Haltica Chalybea*), whose numbers in the spring are rather alarming. This insidious, heartless little arch rogue attempts to baffle and frustrate our plans in the very start. This it does by boring into the swelling bud and totally destroying its promising contents, and thus by one effort he flattens our sanguine hopes by taking the entire product of the bud, leaf, cane, fruit and all. We this year hired our children to capture them on the vines

cheerfully and effectually did. In this way their efforts were greatly lessened. It is becoming more and more evident that we also in this country may yet have trouble from THE GRAPE VINE PHYLLOXERA (*Phylloxera Vastatrix*). I have already seen specimens of it, and it is my most decided opinion that unless some effectual remedy is found, our grape vines will be found to suffer much from the injurious effects of this tiny insects, upon their leaves and especially their roots. Grape growers should seriously study this subject at once; for should the evil become established upon their vines, it would at length be very difficult to eradicate. For description and very full particulars, see Rev. Mr. Bethune's very able and instructive article on the subject in the Society's Report for the year 1874.

PLANT LICE (*Aphididae*, Fam. *Eriosoma*), particularly. Although aphidians in great numbers and different species feed very heavily upon the leaves of our Cherry, Pear, Apple and other trees, yet this white woolly aphid feeding in immense numbers on the stems and shoots of our young apple trees seem to be the most injurious, and should be looked after most vigilantly. They differ from most insects in one particular, viz.: they attach themselves to a certain spot or spots on the trees, and without locomotion attract their food to them! An opening is made in the bark of the tree which bleeds freely for their support. And the accumulation of unused or unsuited matter forms excrescences about the place. It seems to me they pump very heavily on the vitality of the tree, especially in its young and tender years; and should be kept off by means of oil applications, or destroyed by the hand rubbing them from the spot and crushing them.

Fig. 33, the perfect beetle.

PLANT LICE (*Aphididae*, Fam. *Eriosoma*), particularly. Although aphidians in great numbers and different species feed very heavily upon the leaves of our Cherry, Pear, Apple and other trees, yet this white woolly aphid feeding in immense numbers on the stems and shoots of our young apple trees seem to be the most injurious, and should be looked after most vigilantly. They differ from most insects in one particular, viz.: they attach themselves to a certain spot or spots on the trees, and without locomotion attract their food to them! An opening is made in the bark of the tree which bleeds freely for their support. And the accumulation of unused or unsuited matter forms excrescences about the place. It seems to me they pump very heavily on the vitality of the tree, especially in its young and tender years; and should be kept off by means of oil applications, or destroyed by the hand rubbing them from the spot and crushing them.

THE APPLE FRUIT MOTH.—(*Carpocapsa pomonella*).

commonly called codling moth. (See Fig. 34). As usual, has been very diligent this season, and wherever there was fruit upon which to feed, it has shown that this fruit was not overlooked. An account of the general and almost unparalleled scarcity of the fruit, however, this season, it is confidently hoped that they have not propagated to any great extent, and that a comparative immunity from their ravages may be expected in the future. The apple-grower must ever be industrious, and at all times on the watch, never forgetting that "eternal vigilance is the price of fruit." This advice also holds good in the case of plums, for THE PLUM CURCULIO (*Conotrachelus Nenuphar*, see Fig. 35), has had much better accommodation for rapid propagation than that of the apple moth. The plum crop in some sections was very abundant and good; but in others it was totally destroyed by the workings of this industrious and active beetle. I noticed also that the little Turk, as it has appropriately been called, would not scruple

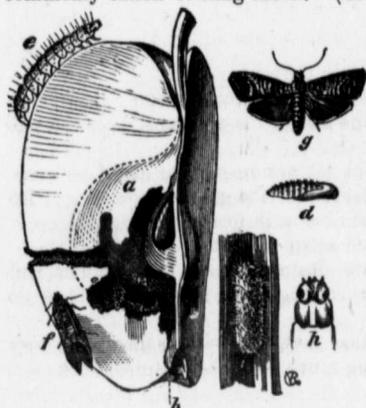


Fig. 34.]

to attack our peaches, in case

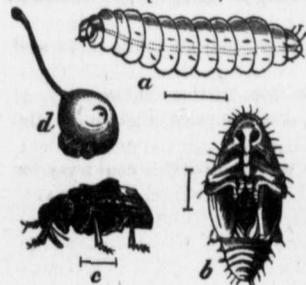


Fig. 35.

regardless of the severe and destructive changes that are at hand. A sharp Canadian frost comes as it did this year, Nov. 9, and lays the whole brood motionless on the ground. Nevertheless there may be some danger of protecting these late worms in our cellars and cabbage pits, where the crop has been early stored away; and so the conditions for future broods may thus be secured.

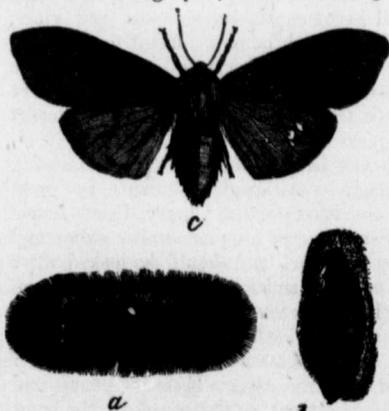


Fig. 36.

a scarcity of plums occurred, and that in this way the the peach crop this season suffered very severely.

THE CABBAGE WORM (*Pieris rapae*), has this season been at work in full force, and has been very generally and extensively disastrous to our cabbages. They are very troublesome, especially to market gardeners, and where remedies were not used, the cabbages were totally destroyed. The parent of this larva seems to have no definite conception of the nature and severity of the changes of our climate, and in this respect it shows its foreign origin, as in any fine day in October she may be seen busily flitting about over the cabbages, &c., apparently eager in the business of depositing her eggs; and the young larva may be seen thus late in the season in all stages of development, But perhaps there is little need of concern on this point, as insect nature has usually been found to carefully and effectually provide for itself.

THE ISABELLA TIGER MOTH.—(*Arctia Isabella*). See Fig. 36 for representation of this insect in its various stages).—As usual, has an abundance of her hairy larva abroad this fall. But as these hairy caterpillars are not known to be very seriously injurious to vegetation, and so scarcely come under our caption. I therefore pass them gently by. I have thus hastily glanced at some of the most common and prominently destructive insects that have come forcibly before my notice this season. I regret, however, my utter inability to treat the subject more thoroughly, and to better advantage.

The fol  
entitled,

May 10th.—  
May 25th.—  
May 30th.—  
June 1st.—

June 18th.—  
June 20th.—

June 21st.—  
June 25th.—

" —

June 27th.—  
June 28th.—  
June 30th.—

" —

July 2nd.—  
Oct. 12th.—

Nov. 9th.—  
Nov. 12th.—

Nov. 29th.—

Arkona

The following details were got up for one of our weekly newspapers this summer, and entitled,

AN INSECT REGISTER FOR 1877.

- May 10th.—Tent caterpillars first hatched out.  
 May 25th.—Gooseberry worms began actively to work into the young fruit.  
 May 30th.—Forest tent caterpillars began to leave the woods in great numbers.  
 June 1st.—The currant worms began to work on the leaves, but apparently were not so numerous as formerly.  
 June 18th.—Potato beetle larvae began to hatch out, but not so numerous as in former years.  
 June 20th.—Gooseberry worms leave the bushes, and retire into the ground to change. Also cut worms are not so numerous or destructive as in former years.  
 June 21st.—Tent caterpillars began to spin cocoons and retire to change.  
 June 25th.—The plum weevils very numerous, and have destroyed many of our plums and peaches. Also the apple fruit worm, or codling moth, larva not much to do this season—*no apples*.  
 “ —Canker worms, measuring worms, and other larvae of various insects are very plentiful this season, and we are suffering much from their depredations.  
 June 27th.—Not many tent caterpillars now abroad.  
 June 28th.—First swarm of bees this season.  
 June 30th.—First newly-made tent caterpillar's cluster of eggs. Moths perfected.  
 “ —The currant worm moth still propagating, and young hatching out.  
 July 2nd.—Pea beetle began to deposit eggs in young peas.  
 Oct. 12th.—The cabbage worm butterfly still depositing her eggs, and the young larva still hatching out.  
 Nov. 9th.—Hard frost, completely stopped the cabbage worm from further increase.  
 Nov. 12th.—Canker worm moths very thickly on the wing, their females clustering on the branches of the trees.  
 Nov. 29th.—Mosquitoes, black flies, and most of the insect world silently nested away for this season.

Arkona Nurseries, November, 20th, 1877.

a).

very diligent this fruit upon which to fruit was not over-heral and almost un-never, this season, it have not propagated comparative immu-pected in the future. industrious, and at getting that “*eternal* his advice also holds HE PLUM CURCULIO 35), has had much d propagation than im crop in some sec-od ; but in others it gs of this industrious that the little Turk, l, would not scruple at in this way the severely.

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YTH.—(*Arctia Isa-* tation of this in- ls usual, has an abroad this fall. are not known to egetation, and so on. I therefore hus hastily glanc- and prominently ne forcibly before owever, my utter ore thoroughly,

## ON GRAPE VINE GALLS.

COMPILED BY JOSEPH WILLIAMS, LONDON, ONTARIO.

### THE GRAPE-VINE APPLE GALL. (*Vitis pomum*) WALSH & RILEY, ORDER, *Diptera* FAMILY, *Cecidomyiidae*.

The following descriptions have been compiled from the valuable reports of Prof. C. V. Riley, St. Louis, Mo.

Besides the leaf-gall caused by the Grape Phylloxera, the Grape Vine is subject to various other gall-growths or excrescences, the nature of which often puzzles the vine grower. I shall give an account of four of the most conspicuous which are found in Missouri. They are all caused by Gall gnats (*Cecidomyiidae*), the larvæ of which are distinguished by being of an orange-colour; but more especially by having on the upper surface, near the head, a horny process known as a breast-bone.\* This process is variable in shape, but more often clove-shaped, Y-shaped, or oar-shaped. It always has a stem, which is mostly hidden, and terminates in two projections or prongs (sometimes three in those which are oar-shaped), which are armed with sharp points. It is retractile, and the prongs may be exerted at will, and are doubtless intended to assist in abrading the tissues of plants, so as to cause an abnormal flow of sap, which serves as food for the larvæ. That they have little, if anything, to do in causing the gall growth, we may infer from analogy, and from the fact that many Cecidomyioid galls are formed before the larvæ hatches, and depend on something deposited with the egg. The perfect flies are of a dull black colour, like that represented at figure 37, (*a* female, *b*, antennæ of male), and many species so closely resemble each other, that it is next to impossible to distinguish them when dry. Those which produce the galls here mentioned, are difficult to rear, and with one exception not yet known.

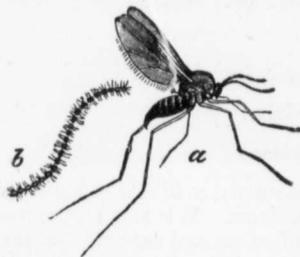


Fig. 37.

The Grape-Vine Apple-gall has been a fruitful source of speculation, and has given rise to some curious botanical theories, as the following extract will attest:

#### AN APPLE GROWING ON A GRAPE-VINE.

*A Vegetable Phenomenon.*—In the garden of Capt. David E. Moore, Lexington, Va., there is growing on a grape vine, a fully developed apple. On one side of the apple is an appearance of what might have been a grape-bloom. This interesting *lusus naturee* is, as far as we know, without precedent, and of course has attracted marked attention, and caused no little speculation in the circle learned in such matters about Lexington. The prevailing opinion, we learn, is that an apple-bloom falling accidentally upon a grape-bloom, became incorporated with it and produced the result; but, if so, is it not singular that such an accident has never occurred before? And, if so, again, does it not teach that the grape and apple may be grafted on each other? We hope the pomologists of Lexington will note very

\* This process is said by all authors with whom I am acquainted, including Baron Osten Sacken, to be neutral, for which reason I suppose, it has been called the "breast-bone." I believe myself that it is dorsal. As, however, it sometimes has a good deal the form of the breast bone, or "wish-bone" of a fowl, the term may be retained, though conveying a wrong idea. The larvæ are also said to differ from all other insect larvæ in having fourteen joints. I have examined a great number of Cecidomyioid larvæ without being able to make out any such abnormal number, while in many species it is difficult to detect more than twelve and a subjoint. Usually, I have been able to clearly make out thirteen joints and a subjoint, which is the normal number in insects. (*Rules*.)

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carefully all the phenomena of this freak of nature, and that they will have the apple photographed, with a portion of the vine, before its removal, for engraving and publication in Horticultural journals.—*Richmond Whig*.

When growing on vines in the vicinity of hickory trees, it has ridiculously been considered a hybrid fruit between these two very widely separated plants.

The form of the gall is variable—sometimes being quite flattened or depressed, but more often spherical, or flattened at base and more pointed at tip. When young it is downy on the outside, and succulent, with a pleasant acidulous flavour. When mature, it usually has eight or nine longitudinal lobes, as in a musk-melon, and is smoother (Fig. 38 a). A transverse section (b) shows it to consist of a fleshy outside covering, like the hull of a walnut, and of a much harder, woody interior, with numerous longitudinal two-tiered cells or cavities, the upper tier twice as long and more regularly separated by harder fibre than the lower. The yellow larvæ are found in these cavities, and they have a brown clove-shaped breast



Fig. 38

bone. This gall which bears so great a semblance to a fruit, doubtless carries the semblance still further by falling to the ground. And, as the seed is released upon the death of the fruit which surrounded it, and consigned to the bosom of the great mother earth for development, so the larvæ escape from the decomposing and softening gall to consign themselves likewise to the same great nursery, which seems to be absolutely necessary for their well being and growth, as I have kept the galls for over a year out of earth and away from her fecund influences without getting the perfect gnats.

This gall was first described in the *American Entomologist*, (vol. 1, p. 106.)

THE GRAPE-VINE FILBERT-GALL, (*Vitis coryloides*) W. & R.

(Order, *Diptera*; Family, *Cecidomyiidae*.)

This gall (Fig. 39 b), as its name implies, bears some resemblance to a large bunch of filberts or hazel-nuts. It is found more frequently than the other, and especially on the River Bank grape (*Riparia*), in the month of July. It is an assemblage of separate galls, more or less coalescent, varying in number from ten to forty or more, and of different shapes, being either round, irregularly oval, fusiform or pyriform, but generally narrowing at the tip. When young, these galls are densely pubescent or woolly on the outside, but less so when mature. The interior is fleshy, juicy, sub-acid, and a transverse section shows a single longitudinal cell in each (Fig. 39 c). The gall is evidently a deformation of a bud, as it springs from a single point where a bud would be, and often has quite a stem to it. A stunted deformed leaf is also sometimes found upon it, as given in the figure.

The larva is orange-yellow, partly transparent, partly opaque, and has the breast-bone clove-shaped, as in the preceding (Fig. 39 a), first described in *Am. Entomologist*, (I. p. 107).



Fig. 39.

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ORDER, *Diptera*

ports of Prof. C. V.

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THE GRAPEVINE TOMATO-GALL, (*Vitis tomatos*.)(Made by *Lasioptera vibis* O. S.)

(Order, Diptera, Family, Cecidomyiidae.)

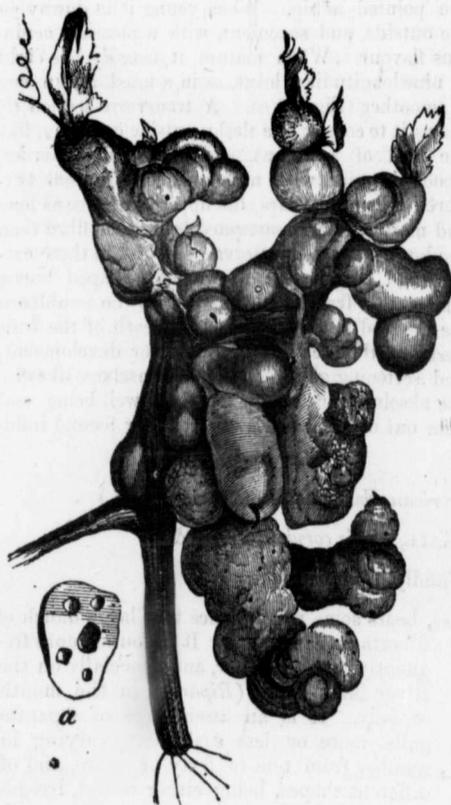


Fig. 40.

The following clipping will show that this gall, which is quite common on the River Bank grape and its cultivated varieties, has not remained unnoticed by the curious, and that it has, like the others, its fruit resemblances.

*Freak in a Vineyard.*—In gathering grapes to-day we found one of the clusters in shape a perfect tomato. It is of quite large size, and on the outside is divided into eight segments or lobes, having a seed to correspond with each segment or lobe. It was found on a cluster of one of Rogers' Hybrids, and a peculiarity is, that the grape is blue, while this is red. In flesh and seeds and all else it is a perfect grape. President Wilder's Trophy tomato stands about three rods from the vine. I call upon President Wilder to explain with what sort of propagating qualities he has invested his Trophy tomato, to know, if we continue the cultivation of that fruit, whether our apples, plums, cherries, etc., will or will not turn into Trophy tomatoes. I have saved the eight seeds for the further solution of the problem. If President Wilder declines an explanation for fear of the consequences, I call upon all the horticulturists of America to commence at once an investigation and I will furnish them with the *hide*, which I have carefully preserved as a testimony against him.—*Rural New Yorker.*

R. L. DORR.

Dansville, Livingston County, N.Y. Oct. 6th, 1872.

It is the most variable gall with which I am acquainted, as it may be found of all sorts of fantastic shapes, from the single, round cranberry-like swelling on a tendril to the large collection of irregular bulbous swellings on the stem or leaf-stalk; sometimes looking not unlike a bunch of currants or a bunch of grapes, but more often like a bunch of diminutive tomatoes, such as the Cluster Tomato, grown by Mr. J. C. Ingham, of St. Joseph, Michigan. It was first briefly described together with the fly which produces it, by Baron Osten Sacken (Diptera of N. A., part I. pp. 201-2). The substance of the gall is soft, juicy and translucent, the flavour pleasantly acid, and the colour yellowish-green, with rosy cheeks, or else entirely red. Each swelling has several cells (Fig 40a) in each of which is nursed an orange-yellow larva, which, upon the dissolution of the gall, enters the ground to transform, and emerge a pale reddish gnat with a black head and antennæ and gray wings.

This gall-maker is subject to the attacks of at least two different enemies—one a species of *Thrips*, which invades the cell and destroys its inmate, and one a true Hymenopterous parasite, belonging apparently to the family *Proctotrupidae*, and which after killing the gall-maker, spins a cocoon within the cell.

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THE GRAPE LEAF TRUMPET-GALL—(*Vitis viticola* O. S.)—Order Diptera. Family Cecidomyiida.

This is another, more regular gall, made by a gall-gnat which has not yet been described. It is elongate, conical, and grows more or less



Fig. 41.

numerously from the surface of the leaf, looking something like a small trumpet. (Fig. 41) I have found it on both wild *Cordifolia* and *Riparia*, and it doubtless occurs on their cultivated varieties. It is also found on *Labrusca* and *Vulpina*. (See A. E., II. p. 28.) The usual colour is a bright crimson, but it sometimes inclines to green; especially when young or on the under side of the leaf; for though it is more often found on the upper side. I have met with it antiposed. Upon cutting into these galls, we shall find them to be hollow, and each to contain a pale orange larva, which probably resembles those already mentioned in transforming under ground. The gall was at first briefly described by Baron Osten Sacken (Diptera of N. A., part I., p. 202). Similar but distinct galls grow on the leaves of Hickory and Hackberry, but are always green.

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## DRAGON FLIES.

BY JOSEPH WILLIAMS, LONDON, ONTARIO.

In the months of July and August there are few insects more abundant than the Dragon flies, and none which attract more attention from even the most indifferent observer, and a description of the more common kinds and some account of their habits may not be uninteresting. For the following account we are largely indebted to the graphic description of A. S. Packard, Jun., in our "Common Insects."

In various countries these insects have received various popular names—the French call them Demoiselles; the Germans, Florfliegen or Gauze-flies, or Wasserjungfern or Virgins of the Water; while the English style the Dragon flies, Horse-stingers, or Devil's Darning-needles. The English terms, although less poetical than those of our European friends, are, we believe, more appropriate to the private character of these insects.

The accompanying illustration of one of our most common species (*Libellula trimaculata*),

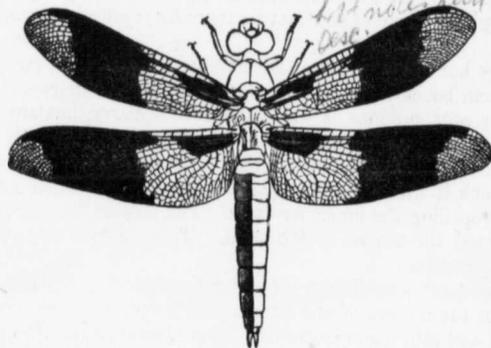


Fig. 42.

Fig. 42, will give an idea of the appearance of these insects. Of the general character of the group Packard says:—"Were we to select from among the insects a type of all that is savage, relentless, and blood-thirsty, the Dragon fly would be our choice. From the moment of its birth until its death, usually a twelvemonth, it riots in bloodshed and carnage. Living beneath the waters, perhaps eleven months of its life, in the larva and pupa states, it is literally a walking pitfall for luckless aquatic insects; but when transformed into a fly, ever on the wing in pursuit of its prey, it throws off all concealment, and reveals the more unblushingly its rapacious character.

"Not only does its horrid visage and ferocious bearing frighten children, who call it the 'Devil's Darning-needle,' but it even distresses older persons, so that its name has become a by-word. Could we understand the language of insects, what tales of horror would be revealed! What traditions, sagas, fables, and myths must adorn the annals of animal life regarding this dragon among insects!

"To man, however, aside from its bad name and its repulsive aspect, which its gay trappings do not conceal, its whole life is beneficent. It is a scavenger, being like that class ugly and repulsive, and holding literally, among insects, the lowest rank in society. In the waters it preys upon young mosquitoes and the larva of other noxious insects. It thus aids in maintaining the balance of life, and cleanses the swamps of miasmata, thus purifying the air we breathe. During its existence of three or four weeks above the waters, its whole life is a continued good to man. It hawks over pools and fields and through gardens, decimating swarms of mosquitoes, flies, gnats, and other baneful insects. It is a true Malthus' delight, and following that sanguinary philosopher, we may believe that our Dragon fly is an entomological Tamerlane or Napoleon sent into the world by a kind Providence to prevent too close a jostling among the myriads of insect life.

"We will then conquer our repugnance to its ugly looks and savage mien, and contemplate the hideous monstrosity—as it is useless to deny that it combines the graces of the Hunchback of Notre Dame and Dickens' Quilp, with certain features of its own—for the good it does in Nature.

"Even among insects, a class replete with forms the very incarnation of ugliness and the perfection of all that is hideous in nature, our Dragon fly is most conspicuous. Look at its enormous head, with its beetling brows, retreating face, and heavy under-jaws—all eyes and teeth—and hung so loosely on its short weak neck, sunk beneath its enormous hunch-

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back—for it is wofully round-shouldered—while its long, thin legs, shrunken as if from disease, are drawn up beneath its breast, and what a hobgoblin it is!

"Its gleaming wings are, however, beautiful objects. They form a broad expanse of delicate parchment-like membrane drawn over an intricate network of veins. Though the body is bulky, it is light, and easily sustained by the wings. The long-tail undoubtedly acts as a rudder to steady its flight."

While we do not hold the Dragon fly to be the "very incarnation of ugliness and the perfection of all that is hideous," as does the author above-named we do not believe its benefits to man have been exaggerated. The rapid flight and enormous range of vision of these creatures enable them to capture other insects with ease; while, their taste not being limited, they destroy moths, butterflies, and other insects without compunction, and they have been known to destroy and eat each other as well as very small fishes. However, it is this ravenous propensity which makes this insect so valuable to man, as they destroy immense numbers of other insects which are injurious to vegetable and other products, while they do not injure these substances themselves. A few of them shut in a house will soon rid it of flies, bugs, and mosquitoes, and therefore their presence should be welcomed. The popular opinion that they are dangerous to man is without foundation, as they can neither bite, sting or poison him.

We may now consider the development of *Libellula trimaculata*, previously figured, as it furnishes some curious and interesting information, and may be taken as representing that of the group.

When the female is about to deposit her eggs, she attaches herself to some plant growing out of the water, and pushing her abdomen beneath the surface, glues a bunch of eggs to the submerged stem or leaf (Uhler). These eggs produce larvæ which have a distant and ugly resemblance to the perfect insect. The larva is active and passes its existence in the water, feeding on numerous weaker insects. It possesses a curious syringe-like apparatus situated in the end of the body, by which it discharges a stream of water for a distance of two or three inches behind it, thereby propelling the insect forward. The motion thus given is most irregular and appears to be beyond the control of the larva. This curious arrangement serves for respiration as well as locomotion.

The larva soon reaches the pupa state (corresponding to the chrysalis state of a butterfly), in which it is also active, crawling over the bottom of the stream preying on other insects. In this state it is longer than the larva and still more resembles the perfect insect. When

about to become a perfect insect, the pupa climbs up some suitable plant near the surface of the water, and attaching itself firmly awaits the last great change. In a short time the skin opens down the back and the adult Dragon fly, by bending backwards and forwards for some time, emerges. It only requires to remain a few hours, until its wings attain their full size and hardness, when it starts off on a life-long expedition of plunder.

In Fig. 43 we have a representation of three stages in the life of a foreign *Libellula*. The figure on the left shows the larva using its mask to capture prey; the figure on the right represents the perfect insect in the act of emerging from the pupa case.

The full-grown *Libellula* may be described as follows:—The body is much elongated and cylindrical, and

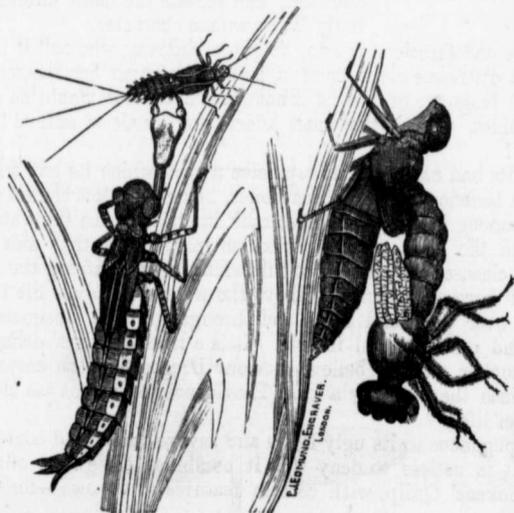


Fig. 43.

attains a length of two inches, in average specimens. The head is large and bears two very large and prominent compound eyes. These eyes which consist of many thousand facets each, are so large that they meet on the upper surface of the head. This great power of vision

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is still increased by three simple eyes, or ocelli, situated on the upper surface of the head. From the front part of the head project two short tapering antennae. The mouth occupies the front surface of the head, and is a most formidable structure. The upper lip is broad and conceals very powerful toothed organs, called mandibles; the other organs of the mouth are also armed with strong teeth which enable the creature to satisfy its carnivorous desires. The most remarkable portion of the mouth, however, is the lower lip, a large, flat, lobed organ, closing the mouth from the under side, and which may be projected forward to a comparatively great distance when attacking other insects.

The thorax, or middle portion of the body, is three or four times as long as the head, and very much greater in diameter. It resembles the head in colour, being of a medium chocolate shade, and is sparsely clothed with very short hairs of the same hue.

The abdomen, or posterior part of *L. trimaculata* tapers very gradually to the end, and is much smaller than the thorax in diameter, but more than twice its length. The colour is slightly paler, and is relieved by a line of yellowish blotches along each side, which gradually becomes smaller in size toward the end of the body. The upper surface is arched, while the under is flattened.

The legs are six in number, and are attached three to each side of the lower surface of the thorax.

The wings, which are four in number, are attached two to each side of the upper part of the thorax, and are about one and a quarter inches long, and three-eighths to nearly half an inch in breadth; the front ones being slightly the narrowest. The substance of the wings is a very delicate network covered by a thin transparent membrane, having a shining surface. From the place of attachment of each wing, there proceeds a narrow elongated patch of a deep brown colour, while from about the middle of the wings there is a large irregular patch of the same colour, which extends completely across. The structure of the wings combines great strength with lightness, thereby enabling the insect to fly with very great rapidity. Their shining surface, transparency and brilliant

colouring in this and other members of the same order, combine to give them a beautiful appearance when flying in the bright sunshine, and evidently suggested the popular names given to them by the French and Germans.

There are several other members of the same group which are more or less common in various parts of the country.

*Libellula quadrimaculata*, the four-spotted Dragon fly, (Fig. 44.) is seen on the wing in June, flying through dry pine woods far from any standing water.

Another very common Dragon-fly is the ruby Dragon-fly *Diplax rubicundula*, which is yellowish red.



Fig. 44.



Fig. 45.



Fig. 46.



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Another common form is *Diplax berenice*, (Fig. 45, male; Fig. 46, female). The accompanying cut (Fig. 47.) represents the larva, probably of this species, according to Mr. Uhler. It is black, the head blue in front, spotted with yellow, while the thorax and abdomen are striped with yellow. There are fewer stripes on the body of the male, which has only four large yellow spots on each side of the abdomen.

Still another specimen is *Diplax Elisa*. It is black, with the head yellowish and with greenish yellow spots on the sides of the thorax and base of the abdomen. There are three dusky spots on the front edge of each wing, and a large cloud at the base of the hind pair towards the hind angles of the wing.

Rather a rare form, and of much smaller stature is the *Nannophya bella*, (Fig. 48.) It was first detected in Baltimore, and was afterwards found unfrequently by a pond in Maine. Its abdomen is unusually short, and the reticulations of the wings are large and simple. The female is black, while the male is frosted over with a whitish powder.

In the allied genus *Agrionina*, there are many interesting insects; we give an illustration in fig. 49. of one of the most common, *Agrion saucium*. This insect is smaller in size than those we have previously mentioned.

Although in this country we rarely see Dragon-flies gathered in large numbers at one time, yet it is known that in some countries they not unfrequently form immense swarms. In Kirby and Spence's Entomology we find the following:—"Meineken tells us, that he once saw in a Village in Anhalt, on a clear day, about four in the afternoon, such a cloud of Dragon-flies (*Libellulina*) as almost concealed the sun, and not a little alarmed were the villagers, under the idea they were locusts; several instances are given by Rosel, of similar clouds of these insects having been seen in Silesia and other districts; and Mr. Woolnough, of Hollesley in Suffolk, a most attentive observer of nature, once witnessed such an army of the smaller dragon-flies, (*Agrion*) flying inland from the sea, as to cast a slight shadow over a field of four acres, as they passed.

A migration of Dragon-flies was witnessed at Weimar, in Germany, in 1816, and one far more considerable, perhaps the greatest on record, May 30th and 31st, 1839, when cloud-like swarms of these insects, chiefly (*Libellula depressa*) were seen at Weimar, Eisenach, Leipsig, Halle and Gottingen, and the intervening country, extending over a large district."

Although so well known in the adult or perfect state, comparatively little is known of the transformations of Dragon-flies. They may be easily kept in aquaria where their various changes may be watched, and any one who can spend the necessary time and patience in rearing them, so as to trace up the different stages from the larva to the adult fly, and describe and figure them accurately, will do good service to science (Packard).

The graceful appearance of these insects has not escaped the notice of poets, for Moore alludes to them as "the beautiful blue damsel flies," while Tennyson, in his poem of the "Two Voices," gives the following description:—

To-day I saw the Dragon-fly  
Come from the wells where he did lie.  
An inner impulse rent the veil  
Of his old husk : from head to tail  
Came out clear plates of sapphire mail.

He dried his wings : like gauze they grew ;  
Through crofts and pastures wet with dew  
A living flash of light he flew.



Fig. 48.



Fig. 49.

## THE HESSIAN FLY.

(*Cecidomyia destructor* Say.—Diptera: Tipulidae.

BY THE REV. C. J. S. BETHUNE, M.A.

For many years this Province has happily been almost entirely free from the ravages of the Hessian Fly. During the present year (1877) however, this very destructive insect has again appeared in the wheat-fields, and is attracting much attention from farmers and others specially interested in the culture of this most important cereal. As far as we have been able to obtain information the Hessian fly has been recently observed in the counties of Grey, Simcoe, York and Ontario, and also in the County of Oxford. No doubt, if not checked, it will soon spread over a much wider area, and cause much loss and disappointment to our wheat-growers.

The subject being one of so great importance, it has been considered advisable to reproduce here our Report upon this insect, published six years ago (*Report of the Entomological Society of Ontario*, 1871, pages 392-5).

The Hessian fly, together with a number of other most destructive insects, has come to us from the other side of the Atlantic. European entomologists have repeatedly maintained that it must be a native of America, as no such insect was observed amongst their wheat-fields during a long series of years; and Mr. Curtis has even gone so far as to call it "the American wheat-midge," in contradistinction to what he terms "the British wheat-midge" (*C. tritici*). It is now, however, generally admitted that it is of European origin, and it is almost certain that it was first brought to this continent in some straw used for the purpose of packing by the Hessian troops, under Sir William Howe, during the American War of Independence. These soldiers landed on Staten Island, and on the west end of Long Island, in the year 1776, and in this neighbourhood the fly was first observed; hence it obtained its popular name of "Hessian Fly." Having multiplied in these places—as Dr. Harris relates—"the insects gradually spread over the southern part of New York and Connecticut, and continued to proceed inland at the rate of fifteen or twenty miles a year. They reached Saratoga (two hundred miles from their original station) in 1789." Proceeding in this manner, the tiny pest gradually spread over the country, and has been found in almost every locality where wheat is grown. In the old world also, its depredations have been sufficiently great to attract notice in England, France, Germany, Austria, Switzerland, Italy, Russia,—in fact in almost every country where this grain is cultivated to any extent. Our own Dominion, though frightfully devastated in subsequent years, was not invaded by the pest till about the year 1816, when it became prevalent in Lower Canada. It appears to have been first noticed in this Province in the year 1846. (For a detailed history of its progress in this country and the neighbouring States down to the year 1854, see Prof. Hind's Essay, pp. 42-46.)

So much has been said and written respecting the Hessian fly, and so many descriptions of it have appeared in agricultural and scientific publications, that we feel disinclined to attempt any new account of it or repeat once more "an oft told tale." As we have no new light to throw upon the subject, and, with the exception of some specimens received from Ancaster during the past summer, have had no opportunity for some years of investigating its habits, we shall not hesitate to make free use of the writings of others, especially those which are not likely to be accessible to the majority of our readers. In every case we shall, of course, make due acknowledgement of the source from which information is derived.

The Hessian fly, though known for its destructive qualities for some time before, was first scientifically described by Mr. Say—one of the most eminent of the early American

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Entomologists—under the name of the Destructive Midge (*Cecidomyia destructor*). “This insect—Dr. Fitch relates—as a general rule passes through two generations annually. The first of these occupy the autumn, winter and fore part of spring, and is reared at the roots of the young grain slightly under the ground. The second occupies the remainder of the spring and summer, and is nurtured in the lower joints of the straw. The time when its several changes occur, however, is not perfectly uniform, being varied by the climate, the state of the weather and perhaps other contingencies, and it is not improbable that individual specimens, placed in circumstances unfavourable to their development, in some instances have their growth so much retarded as to require even a whole year to complete their metamorphoses. In the ordinary course of nature, therefore, our crops of winter wheat are liable to two attacks of the Hessian fly, one generation reared at its roots producing another which occupies the lower joints of the stalks. Thus the larvæ and pupæ are present in it almost continually, from the time the tender young blades appear above the ground in autumn till the grain ripens and is harvested the next summer. Our spring wheat, on the other hand, can rear but one brood of these insects; they consequently resort to it but little if at all. Nor can the Hessian fly sustain itself except in districts where winter wheat is cultivated, in which to nestle during the autumn and winter.”

The eggs of the autumn generation are deposited by the female fly generally early in September, in the young fall wheat, in a crease of the leaf. Twenty or thirty eggs are laid on a single leaf, and these hatch out in about four days if the weather be warm. Mr. Tilghman, of Maryland, has published in *The Cultivator*, of May, 1841, the following minute and interesting account of the mode in which the eggs are laid: “By the second week of October, the first sown wheat being well up, and having generally put forth its second and third blades, I resorted to my field on a fine warm forenoon to endeavour to satisfy myself by ocular demonstration whether the fly did deposit the egg on the blades of the growing plant. Selecting a favourable spot to make my observation, I placed myself in a reclining position in a furrow, and had been on the watch, but a minute or two before I discovered a number of small, black flies alighting and sitting on the wheat plants around me, and presently one settled on the ridged surface of a blade of a plant, completely within my reach and distinct observation. She immediately began depositing her eggs in the longitudinal cavity between the little ridges of the blade. I could distinctly see the eggs ejected from a kind of tube or sting. After she had deposited eight or ten eggs, I easily caught her upon the blade and wrapped her up in a piece of paper. After that I continued my observations on the flies, caught several similarly occupied, and could see the eggs uniformly placed in the longitudinal cavities of the blades of the wheat, their appearance being that of minute reddish specks.” These eggs are computed to be about one-fiftieth part of an inch in length.

When hatched from the egg, the next proceedings of the insect are thus related by Mr. Herrick:—“The little wrinkled maggot or larva creeps out of its delicate membranous egg skin, crawls down the leaf, enters the sheath, and proceeds along the stalk, usually as far as the next joint below. Here it fastens lengthwise, and head downwards, to the tender stalk, and lives upon the sap. It does not gnaw the stalk, nor does it enter the central cavity thereof; but as the larva increases in size, it gradually becomes embedded in the substance of the stalk. After taking its station the larva moves no more, gradually loses its reddish colour and wrinkled appearance, becomes plump and torpid, is at first semi-translucent, and then more and more clouded, with internal white spots; and when near maturity the middle of the intestinal part is of a greenish colour. In five or six weeks (varying with the season) the larva begins to turn brown, and soon becomes of a bright chestnut colour, bearing some resemblance to a flax-seed.” Two or three larvæ, thus embedded in a stalk, serves to weaken the plant and causes it to fall down, or to wither and die.

In this condition, the “flax-seed state,” as it is usually termed, the insect remains all winter. Regarding the structure and formation of this peculiar appearance there has been much controversy, into which we need not enter here. Suffice it to say, that some have held the opinion that the larva spins its cocoon which bears this form; others, that it is the hardened outer integument of the worm, separated from the insect, which remains within; others again, and notably, the late Mr. Walsh, that the pupal cocoon is exuded from the larva. Whatever may be the process, in this condition it remains till the warm days of spring arrive, when the insect completes its pupal state, and finally comes forth as a tiny two-winged fly. (Fig. 50.)

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Fig. 50.



"The head, antennæ, and thorax of this fly are black; the hind body is tawny, more or less widely marked with black on each wing, and clothed with fine greyish hairs. The egg-tube of the female is rose-coloured; the wings are blackish, except at the base, where they are tawny, and very narrow,—they are fringed with short hairs and are rounded at the tip; the legs are pale red or brownish, and the feet are black. The body measures about one-tenth of an inch in length, and the wings expand one-quarter of an inch or more. After death the hind body contracts and becomes almost entirely black." (Harris, *Injurious Insects*, p. 570.) The antennæ of the female are about half the length of the body; those of the male three-fourths. The former are composed of sixteen oval joints twice as long as thick, and clothed with a number of hairs; the latter have short, round joints, each with

a chord of rather long hairs.

After these flies come forth from the pupa state in the spring they speedily, set to work to lay their eggs on the leaves of the spring wheat, now appearing above the surface of the ground, as well as upon that sown the autumn before. From this batch of eggs another brood is soon hatched, the work of destruction goes on, and late in summer the second generation of flies comes forth. The larvæ of the summer brood are found almost always under the sheath of the leaf just above the first joint; their suction of the juices at that point weakens the stalk so much that a high wind very soon bends it down, and even breaks it off when the straw approaches ripeness. Of course the size and value of the grain is also immensely lessened by the absorption of the sap, which ought to go to filling out the ear. The winter brood attack the young plant lower down, and injure it at the root, frequently killing it outright.

Having now traced the life of the insect from the laying of the eggs in one autumn to the same point in the following year, we may turn our consideration to the remedies for the foe, which, as in the case of the wheat midge above, may be classified as natural and artificial.

*Natural Remedies.*—Though we are, unhappily, so very deficient in natural checks to the spread of the wheat-midge on this side of the Atlantic, our case is very different as regards the Hessian fly. It is preyed upon and devoured by a number of parasitic insects, whose combined attacks are computed to destroy nine-tenths of every generation of this pernicious foe. Mr. Say described one of the most useful of these parasites under the name of *Ceraphron destructor*. It is a shining black four-winged fly, about one-tenth of an inch in length. "In the month of June, when the maggot of the Hessian fly has taken the form of a flax-seed, the *Ceraphron* pierces it through the sheath of the leaf, and lays an egg in the minute hole thus made. From this egg is hatched a little maggot, which devours the pupa of the Hessian fly, and then changes to a chrysalis within the shell of the latter, through which it finally eats its way, after being transformed to a fly. This last change takes place both in the autumn and in the following spring. Two more parasites, discovered by Mr. Herrick, also destroy the Hessian fly, while it is in the flax-seed or pupa state." (Harris.) A fourth has been found by the same observer to attack the eggs of the enemy. "This egg parasite is a species of *Platygaster*. It is very abundant in the autumn, when it lays its own eggs, four or five together in a single egg of the Hessian fly. This, it appears, does not prevent the latter from hatching, but the maggot of the Hessian fly is unable to go through its transformations and dies after taking the flax-seed form. Meanwhile its intestine foes are hatched, come to their growth, spin themselves little brownish cocoons within the skin of their victims, and in due time are changed to winged insects, and eat their way out."—Harris.

It is owing almost entirely to these minute allies that our crops have been preserved to so great an extent, of late years, from the ravages of the Hessian fly. For a time the pest inflicted great damage, but its enemies soon increased and gathered strength, and have succeeded in keeping it within due bounds. Assuredly, we should feel deeply grateful to the merciful Creator, who has provided such effectual, though apparently insignificant, means to save the fruits of our fields from destruction.

*Artificial Remedies.*—These are often attempted, but seldom with entirely satisfactory results. The best precaution to take—where the insect has shown itself in numbers and where the wheat-midge is not apprehended—is to sow the next crop of fall wheat as late as can be done with safety in the autumn—about the middle or towards the end of September

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This course prevents the parent fly from obtaining any young wheat upon which to lay their eggs, and destroys the prospects of another generation. A fertile, thoroughly-cultivated, and well drained soil is as effectual a means of escaping loss from the attack of this insect as any, probably, that can be mentioned. Benefit may also be derived from the sowing only of an approved flinty-stemmed variety of wheat, which is thus more capable of resisting the fly's attacks upon it. But after all the chief reliance for immunity is to be placed upon the labours of the parasitic insects mentioned above.

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Currant bush borer.  
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*Diplax elisa* . . . . .  
*Diplax rubicunda* . . . . .  
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