

REPORT
OF THE
ENTOMOLOGICAL SOCIETY
OF ONTARIO,
1872,

INCLUDING A REPORT ON SOME OF THE NOXIOUS, BENEFICIAL AND
COMMON INSECTS OF THE PROVINCE OF ONTARIO.

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

BY

THE REV. C. J. S. BETHUNE, MA.,

*Head Master of Trinity College School, Port Hope; President of the Entomological Society of
Ontario; and Editor of the Canadian Entomologist;*

WILLIAM SAUNDERS,

Vice-President of the Entomological Society of Ontario; and

EDMUND BAYNES REED,

Secretary-Treasurer of the Entomological Society of Ontario.

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1873.

ENTOMOLOGICAL SOCIETY
OF GREAT BRITAIN

THE SOCIETY WAS FOUNDED IN 1830
BY THE MERGER OF THE ENTOMOLOGICAL SOCIETY
AND THE ENTOMOLOGICAL SOCIETY OF LONDON

THE SOCIETY'S OBJECTS ARE TO PROMOTE
THE STUDY OF ENTOMOLOGY AND TO
PUBLISH THE RESULTS OF RESEARCHES
IN THIS BRANCH OF SCIENCE

WILLIAM SYDNEY

EDWARD DAZES REED

MEMBERSHIP IS OPEN TO ALL
WHO ARE INTERESTED IN THE STUDY
OF ENTOMOLOGY

Annual Meeting
President's Address
London Branch
Kingston Branch
Additions to
Insects Injured
Insects Injured
Insects Affected
Insects Infected
Insects Affected
Insects Injured
On some Insects
Beneficial Insects

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REPORT

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REPORT OF THE ENTOMOLOGICAL SOCIETY OF THE PROVINCE OF
ONTARIO, FOR THE YEAR 1872.

To the Honourable the Commissioner of Agriculture,—

SIR,—In compliance with our Statute of Incorporation, I have the honour to submit the Report of the Entomological Society of Ontario for the year 1872.

The annual meeting of the Society was this year held at the City of Hamilton, when the various reports were read, and the officers for 1873 duly elected.

I also beg leave to submit herewith a Report on some of the Noxious, Beneficial, and Common Insects of this Province, which has been prepared by the Rev. C. J. S. Bethune, Mr. William Saunders and myself, on behalf of the Society.

The publication of the CANADIAN ENTOMOLOGIST is still regularly continued, and the value of its pages has been greatly enhanced by the contributions of Entomologists both on this continent and in England, whose learned researches have rendered them authorities in their several branches of this science.

I have much pleasure in being able to report an increase in our membership, which has now reached 300, and that under the fostering care of your Department a more general interest in practical Entomology seems to be making its way steadily among the agricultural community.

To Canadians generally it must be gratifying to know that the course pursued by your Department in encouraging the efforts of the fruit-grower, and in disseminating a knowledge of the various insect friends and foes, has called forth warm commendations from several of the English scientific papers, and strong suggestions have been made that a similar course should be pursued by the Home Department.

I have the honour to remain,

Your obedient servant,

EDMUND BAYNES REED,

Secretary-Treasurer of the Entomological Society of Ontario.

London, Ont., Nov., 1872.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The second annual general meeting of the Society was held at the Court-House, Hamilton, Ontario, on Thursday Evening, September 27, 1872.

The President, the Rev. C. J. S. Bethune, M.A., in the chair.

The minutes of the previous meeting were read and confirmed.

The President's address, the report of the Council, and the financial statement of the Secretary-Treasurer were then read, and on motion duly received and adopted.

ELECTION OF OFFICERS FOR 1873.

The following Officers were then elected:

President.—Rev. C. J. S. Bethune, M.A., Trinity College School, Port Hope, Ont.

Vice-President.—W. Saunders, Esq., London, Ont.

Secretary-Treasurer.—E. B. Reed, Esq., London, Ont.

Council.—Prof. J. Macoun, Belleville; R. V. Rogers, Esq., Kingston; J. M. Denton, Esq., London; J. Pettit, Esq., Grimsby, A. Macallum, Esq., Hamilton.

Auditors.—J. H. Griffiths and Chas. Chapman, London.

On motion duly carried, it was resolved that the sum of \$100 be paid respectively to the President as Editor of the ENTOMOLOGIST, and the Secretary-Treasurer, for their services during the year 1872.

The state of the Library was discussed, and suggestions made with reference to its management.

The subject of the Report on Insects was laid before the meeting, and information elicited from the members respecting the prevalence of any special damage caused in their respective districts by the attacks of insects on field or garden crops. A vote of thanks was passed to Judge Logie for his courtesy in granting the use of his room for the annual meeting.

The meeting then adjourned.

REPORT OF THE COUNCIL.

In presenting the Second Annual Report, the Council feel highly gratified at the measure of success which has attended the Society during the past year. Confined, as its membership naturally is, to a small numerical portion of the public, it is yet very evident from the increased number of new members that the Society's efforts are appreciated, and that the science of practical Entomology is being gradually forced upon the notice of our most intelligent agriculturists and horticulturists. Fifty-four new members have entered our ranks this season, several of them being entomologists of some reputation. Our total number is now 300, made up as below :—

Ontario general.....	70	
London Branch.....	51	
Kingston	15	
		136 in Ontario
Quebec Province.....	14	
Nova Scotia.....	3	
British Columbia.....	1	
		154 in Canada.
United States	138	
England.....	8	
Total.....	300	Members.

The Quebec Branch has ceased for the present to exist; but we hope shortly to see it reorganized.

Our membership in the United States is steadily increasing, and from this source we derive much substantial assistance both to our funds and our magazine. The publication of the CANADIAN ENTOMOLOGIST is still continued; the fourth volume is now nearly completed. The ENTOMOLOGIST is at present the only regularly-issued periodical on this Continent devoted to the science of Entomology. We must not omit to return our hearty thanks to those friends who have so kindly sent material to the editors, and by whose active assistance the latter have been able to keep up the good reputation of our periodical. Especially would we make honourable mention of Mr. V. T. Chambers, of Covington, Kentucky, whose admirable papers on the Micro Lepidoptera have attracted much attention both here and in England.

Some of our members have expressed an opinion that the ENTOMOLOGIST is too exclusively scientific, and that its pages have not been made sufficiently interesting to those amongst us who are at present only beginners in the study of the science. The Council feel that there is some justice in this remark, and we would suggest to our successors that perhaps it may be feasible to publish, in the pages of the ENTOMOLOGIST, the descriptions of our native Lepidoptera, taken from the original sources, as far as practicable, and thus give some assistance to those whose want of proper books, or inability to get even a reference to them, is an insuperable barrier to their working out for themselves the names of the various species in their collections.

The great drawback to the Society's efforts is a want of sufficient funds to procure the requisite scientific works on Entomology, many of which are very rare and costly, and also a proper supply of engravings and electrotypes of the various insects treated of. It is very difficult to meet the latter demand, owing to the want of a good artist who is well versed in the science, and able to give a correct representation of the originals; at the present time we have to send to the United States for the greater part of our wood-cuts and electrotypes.

The Council appointed a delegation to confer with the Commissioner of Agriculture on the subject of an increased grant, and there is every reason to hope that the result will be successful. In their application they will be strongly supported by the Fruit Growers' Association, who are making a similar appeal.

We have much pleasure in referring to the very generous donation of fifty dollars towards our library fund by the Fruit Growers' Association. It becomes indeed more manifest, as each succeeding year rolls on, that the cordial feeling existing between these two sister Societies is a strong element in their success, and furnishes fresh proof of the necessity of their continuing the work in the same friendly manner. We sincerely hope that this feeling will always continue.

The financial statement will, we think, be found satisfactory to the members.

The Council have thought it advisable to rent rooms at London for three years from July 1, 1872, at \$80 per annum; of this the London Branch pays \$30. We would here suggest and recommend that the expenses of fitting it up in a suitable manner be borne by the Society. The estimated cost is about \$100. It must not be forgotten that hitherto the Society has had no proper place for keeping the stock of books, cabinets, pins, corks, etc.

The library has been largely augmented during the year, and is now the nucleus of a very fair collection of entomological books.

The property of the Society is insured for \$850.

Arrangements have been made for the continuation of our Annual Reports, to be published as hitherto under the direction of the Department of Agriculture. If successful in obtaining the increased grant that we are now applying for, it is contemplated to issue with the Reports a coloured plate of insects, believing that by this means we shall be able to present to the public a much more definite and correct idea of the various insects treated of. All of which is respectfully submitted.

EDMUND BAYNES REED,
On behalf of the Council.

FINANCIAL STATEMENT OF SECRETARY-TREASURER.

Receipts.

By Balance in Bank of Montreal.....		\$ 233 73
" Members' Fees, including arrears.....		250 64
" Government grant for 1872		500 00
" Engraving, from Department for Annual Report, 1871.....		150 00
" CANADIAN ENTOMOLOGIST, sale of		40 98
" Pins, sale of.....		15 20
" Cork, "		13 87
" Library acct.—Sale of Duplicate Pamphlets.....	4 75 }	54 75
" " Donation from Fruit Growers' Association.....	50 00 }	
" Expense acct, Exchange, &c		22 53
" Individual accts.....		18 06
		\$1299 76

Disbursements..

To Expense acct., including Editor's salary for 1871.....	\$267 01	
" Engraving for Annual Report.....	152 55	
" CANADIAN ENTOMOLOGIST, printing Nos. 7—12, vol. iii., and Nos. 1—8, vol. iv.....	428 16	
" Library acct.....	181 24	
" Individual accts.....	15 61	
" Balance in Bank of Montreal*.....	255 19	
		\$1299 76
		\$1299 76

* This will be exhausted in meeting liabilities due up to December 31, 1872.

We certify that the above is a correct statement of accounts for the year ending Sept 19, 1872, as shown by the Treasurer's books, with vouchers for all disbursements.

CHAS. CHAPMAN, }
J. H. GRIFFITHS, } *Auditors.*

LONDON, Ont., Sept. 22, 1872.

ANNUAL ADDRESS OF THE PRESIDENT OF THE ENTOMOLOGICAL SOCIETY
OF ONTARIO, 1872.

To the Members of the Entomological Society of Ontario:

GENTLEMEN,—It is my happy privilege once again to congratulate you upon the completion of another year of progress in the annals of our Society. As you have already learnt from the very satisfactory Report of our excellent Secretary-Treasurer, the list of members of the Society has been largely added to during the past twelve months; the Library has been increased by the purchase of a number of valuable Entomological works; a cabinet and microscope have been bequeathed to us by our late lamented member, the Rev. Professor Hubbert, and our collections have been much improved; a comfortable and com-

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modious suite of rooms has been procured in a central locality in London, Ont.—the present headquarters of the Society; the CANADIAN ENTOMOLOGIST has been regularly issued with, we trust, no diminution in the value and interesting character of its contents; our Second Annual Report on Noxious and Beneficial Insects, prepared by Messrs. Saunders and Reed, and myself, and containing notices of the insects affecting the Apple, Grape, Plum, Currant and Gooseberry, Wheat crops, Potato, Cabbage, Cucumber, Melon, Pumpkin and Squash, has been duly published by the Legislature of Ontario, and no doubt has long since been in the hands of you all. Such, gentlemen, is our record for the year that is now brought to a close, and, having in addition, a satisfactory balance-sheet from the Treasurer, we feel that mutual congratulations are not out of place, and that we who have been honoured with official positions in the Society, can look back upon our efforts in its behalf with at least the agreeable feeling that they have not been altogether in vain.

If we turn, moreover, from our own especial interests to the condition and prospects of American Entomology in general, we find much to afford us satisfaction and encouragement. No large work, indeed, on any particular order of insects has appeared during the past year, but many valuable reports of State Entomologists and portions of serial publications have been issued from the press,—among the latter, I may be pardoned, I am sure, for especially drawing attention to the exquisite illustrations of North American Butterflies contained in Mr. W. H. Edwards' invaluable work, which has now reached its Tenth Part. It speaks well, too, for the growing popularity of this branch of Natural Science, that Dr. Packard's useful "Guide to the Study of Insects" has already reached a *third* edition. A pleasing recognition of American Entomological work has recently, I may add, been manifested in England by the publication there, in a collected form, of the writings of the late Dr. Brackenridge Clemens, on the *Tineina* of North America, under the editorial supervision of Mr. H. T. Stainton, the well-known authority in that department of Lepidoptero-logy.

Apart, however, from the position attained by the growth of our Entomological literature, the Science has this year received a recognition that cannot fail to be of great and permanent benefit to it. I allude to the formation of a special sub-section of Entomology at the recent meeting of the American Association for the advancement of Science. It will now be practicable for American Entomologists—to whatever part of the continent they may belong, whether to a Province of the Dominion or a State of the Union, from the Atlantic to the Pacific—to meet together for mutual conference on matters Entomological. Questions affecting the Science in general can hardly fail to arise from time to time, and demand the consideration, and, possibly, the decision of some such united council. Certainly, the proceedings of such a gathering will be of great interest and value to all who take part in them, if not, indeed, to the whole circle of Canadian and American Entomologists.

At the informal meeting at Dubuque, in August last, one subject was specially brought forward for discussion, which I cannot forbear alluding to more particularly here, especially as it may justly be considered the great question of the day in the Entomological world. I refer to the subject of the Specific and Generic Nomenclature of Insects. For some few years past indications have not been wanting of a growing inclination amongst the mass of Entomologists to resist the efforts made by some few able and distinguished writers to impose, year after year, new sets of names upon our common insects. This has been done partly by the revival of the long-forgotten names published at the close of the last century, or the beginning of the present one; and partly by the perpetual formation of new genera, and the re-distribution of species. The ability of the writers and the good work they have done in other respects, have caused these annoying changes to be acquiesced in for the most part, even though the object in view appeared to be rather the exhibition of their powers of research among antiquated tomes, or the supposed immortalization of themselves by the attachment of their own names to those of our familiar insects. I do not say that these men were actuated entirely by such motives, but assuredly one can hardly be accused of ill-natured criticism in ascribing much of the work to such causes. All must admit, I think, that nomenclature is but a means to an end, and that end is surely best attained by the preservation of all names that have been in universal acceptance for a period of years, and that cannot be set aside without disturbing the cabinets of every Entomologist in the land.

Matters in this respect have been brought to a climax by the recent publication of Mr. Scudder's "Systematic Revision of some of the North American Butterflies." I esteem Mr. Scudder so highly as a friend, and value so greatly the good scientific work that he has done,

that it pains me exceedingly to say a single word against anything that he may put forth. His projected "revision," however, is so sweeping and so revolutionary that I cannot forbear to make some remarks upon it. I know that his scientific labours are perfectly unselfish, and that he is entirely destitute of any of the conceit that I have just now referred to; I feel sure, too, that he is actuated only by the desire to benefit the science: yet I do deeply deplore the mode that he has adopted, and am convinced that if his views are pressed, a very great obstacle will be thrown in the way of the advancement and popularization of this department of Natural History. We all, I am sure, look forward with eager anticipation to the publication of his great work upon North American Butterflies, and have no doubt that it will be the most complete, the most scientific, and the most conscientious work of the kind in America; but assuredly its value will be very greatly marred and its general acceptance impaired, if he continues to insist upon all these radical changes.

To show you what these changes are, I will briefly state that in the pamphlet already published, and which is intended as a forerunner of the author's great work on the Butterflies, the following alterations are made in the received nomenclature:—The 228 species enumerated are distributed among 96 genera—almost a genus for every two species; of these 96 genera, 42 are entirely new, and 39 others are obsolete names of Hubner and others that have never been generally adopted; there are thus 15 familiar generic names left, but of these several are transferred from their present position to entirely different groups of species; for instance, the name of *Papilio* is removed from the genus of "Swallow-tailed Butterflies," and handed over to the sole use of the insect at present known as *Vanessa antiopa*! Further, among the 96 genera, there are no less than 45 that include but a single species apiece; and among the 228 species there are only 16 left with their present names unchanged! These figures are surely quite enough to show that I have not misapplied the terms "sweeping," "revolutionary," and "radical," as characterizing this work of revision. I would, then, most earnestly entreat Mr. Scudder, for the sake of the science itself, to reconsider his projected changes,—to discard all antiquated names in favour of those that have been for years in general acceptance and to reduce his list of new genera to as small a number as he conscientiously can. If he does not, if he persists in his revision, I fear that his great work—most valuable as it will undoubtedly be in all other respects—will introduce more confusion, trouble and discord into American Entomology than a generation can get rid of. If these difficulties can be avoided in no other mode, it will remain for us all to unite together and agree to ignore all old forgotten names that may be brought forward, and retain all remaining of familiar species, until a general settlement of the question can be satisfactorily arrived at.

I fear, gentlemen, that I have now completely exhausted your patience; I shall therefore hasten to a close. But before doing so, let me remind you that, since our last annual meeting, our Society has lost by death one of its most valued members, Mr. B. Billings, of Ottawa, Ont. He was one of those devoted lovers of science who do good service by their honest, hearty work, but who, from their innate modesty and retiring disposition, shrink from all publicity. At times he contributed valuable papers to our little periodical, but he could never be induced to make any display of the knowledge he had [acquired by his patient diligence both at home and in the field.

Permit me now, gentlemen, to resign into your hands the office that you have done me the honour of investing me with. I thank you for your kindness and courtesy towards myself and my colleagues, and with every wish for the continued success and prosperity of your Society.

I have the honour to be, gentlemen,
Your obedient servant,
CHARLES J. S. BETHUNE.

Trinity College School, Port Hope,
September, 1872.

THE LONDON BRANCH.

The following officers were elected for 1872:—

President.....	Mr. E. B. Reed,	Secretary-Treasurer.....	Mr. H. Beck,
Vice-President.....	Mr. J. M. Denton,	Curator.....	Mr. Joseph Williams.

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The Branch numbers some 50 members

Since the establishment of the head quarters of the Parent Society, weekly meetings are held every Monday evening, at the Society's Rooms, on the corner of Dundas and Clarence Streets; and every effort is made to increase the interest felt in the Society's work.

The Monthly Business Meetings are also kept up, and fairly attended.

The Cabinet belonging to the Branch is being gradually arranged, and the various orders are now well represented both by Canadian and Foreign Specimens.

A resolution was passed at the annual meeting, That a local collection of Insects should be made of specimens obtained within walking distance of the city.

It was also resolved that Books should be received in the Library on Deposit, proper means being taken for their safe keeping.

Prizes were taken by the members of the Branch at the Western Fair held in October, the proceeds of which were devoted by the recipients to the general work of the London Branch.

It is in contemplation to establish a small Museum of Natural History Specimens in connection with the Branch.

KINGSTON BRANCH.

The Officers for 1872 were:—

President.....Prof. N. F. Dupuis, | Secretary-Treasurer.....Mr. R. V. Rogers,
Vice-President.....Mr. E. H. Collins, | Jun.

It numbers about 20 members.

Meetings have been regularly held during the year.

ADDITIONS TO THE LIBRARY.

	3	Volumes.
Drury's Exotic Entomology, 4to.	1	"
British Beetles: by Janson. 1863.....	1	"
Farm Insects: by J. Curtis.....	1	"
British Moths: by E. Newman	1	"
Agassiz's Lake Superior. 1850	1	"
Transactions of American Entomological Society, vols. 1-2	1	"
Illustrations of British Entomology: by J. Stephens	12	"
Histoire Generale des Lepidopteres de l'Amerique Septentrionale: par Le Dr. Boissduval et M. Le Conte. Paris, 1833.....	1	"
Newman's History of Insects: 1841	1	"
Fitch's Reports on Noxious Insects in State of New York: 1-2	1	"
Packard's Guide to the Study of Insects.....	1	"
Entomological Correspondence: Harris	1	"
The American Naturalist: 1-5.....	5	"
The Canadian Journal, vol 3, O. S.; vols. 1-6, N. S.....	7	"
Systema Naturæ: Linnæus. 1756	1	"
The Canadian Naturalist: Gosse	1	"
Life of North American Insects: Jæger.....	1	"
Stainton's Manual of British Butterflies and Moths	2	"
Hind's Essay on Wheat Insects.....	1	"
Stephen's Manual of British Beetles: 1839	1	"
The Entomologist's Weekly Intelligencer	9	"
Insects At Home: by Rev. J. C. Wood. 1872	1	"
Reports of Commissioner of Agriculture and Arts, Ontario. 1870-1	1	"
Worcester's English Dictionary, Library edition.....	1	"
Geological Survey of Canada, 1853-56	1	"

Geology of Canada. 1866.	1	Volume.
" " Atlas. 1863	1	"
Geological Survey of Indiana. 1869	1	"
" " Maps	1	"
Transactions of Indiana State Horticultural Society. 1870	1	"

BOOKS LENT ON DEPOSIT.

By JOSEPH WILLIAMS—		
The Canadian Naturalist and Geologist: O. S., 1-5	5	"
" " " N. S., 1-8	8	"
Binney's Mollusks. vols. 1-4	2	"
By E. B. REED—		
Noel Humphrey's British Butterflies	1	"
Elements of Entomology: by Dallas.	1	"
Origin of Species: by C. Darwin.....	1	"
A Naturalist's Voyage Round the World: by do.....	1	"
Animals and Plants under Domestication: by do.	1	"
Siebold on True Parthenogenesis	1	"
Variation of Species: by V. Wollaston	1	"
The Naturalists' Note Book 1868	1	"
The Naturalists' Library: (Jardine). Insects.	4	"
The Entomologist's Annual, 1856, 1860-1	3	"
Coleman's British Butterflies	1	"
The Insect Hunter ☉: by Newman	1	"

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REPORT

ON SOME OF THE

NOXIOUS, BENEFICIAL, AND COMMON INSECTS

OF THE

PROVINCE OF ONTARIO.

INTRODUCTORY.

It has been a source of no small gratification to the writers of these Reports to receive so many kind expressions of appreciation of their labours. The favourable notices too, that have appeared in many English and American publications, afford them much encouragement in the pursuit of their Entomological labours, to which they regret they are unable to devote more than a small proportion of their time: each of them being necessarily engaged in other deeply engrossing pursuits, and having but little leisure at his command. The writers would again remind their readers that they are responsible only for their individual portions of the Report.

E. B. REED.

London, Ont., November, 1872.

INSECTS INJURIOUS TO THE GRAPE.

ADDENDA TO REPORTS FOR 1870-71.

BY W. SAUNDERS, LONDON, ONTARIO.

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|--|---|
| <p>No. 17. The Rose beetle, <i>Macrodactylus subspinosus</i>, Fab.</p> <p>18. The Achemon Sphinx, <i>Philampelus achemon</i>, Drury.</p> | <p>No. 19. The Abbot Sphinx, <i>Thyreus Abbotii</i>, Swainson.</p> <p>The Grape Seed Insect, <i>Isosoma vitis</i> Saunders.</p> <p>20. A Cut worm, <i>Agrotis</i>—?</p> |
|--|---|

In addition to the insects already referred to as injurious to the grape in Ontario in the Entomological Reports for 1870 and 1871, we have the following to submit to our readers.

No. 17. THE ROSE BEETLE (*Macrodactylus Subspinosus* (Fab)).

This insect commonly known as the Rose-bug, which for some years past has been reported as doing damage to grape vines in the United States, has always been present with us; but it has not, heretofore, as far as we know, been much complained of by grape growers in any part of Ontario. In the latter part of May, 1872, we received a note from Mr. John Ferguson, of Union, near Port Stanley, Ont., accompanied by a box of these insects, asking for information as to what he should do to get rid of them as they were destroying his grape vines. In a subsequent note he says, "they eat the leaves especially of the Clinton. I found a few on my Concords, but the number was small in comparison to those found on the Clinton; they seem to prefer it, and if left alone, they soon eat all the outer tissue of the leaf, and leave nothing but the net-work."

The fact of this insect showing a preference for the Clinton vine has been remarked before by the late Mr. Benj. D. Walsh, State Entomologist of Illinois, who suggested the taking advantage of this preference on the part of the insect, as a means of lessening the labour attending their destruction. In his first annual report on the "Noxious Insects of Illinois", page 24, he says "In particular seasons, as is well known, and in particular localities this insect occurs in prodigious swarms, and gathers upon grape vines so as to strip them almost entirely of their leaves. The only known remedy that is practically available, is to jar them off the vines and kill them; and of course if we can induce them to concentrate their forces upon one particular vine, and leave the rest alone, the labour of destroying them will be very greatly diminished."

Luckily for the grape grower this can be done. There is concurrent evidence from a great number of different sources, that the Rose-bug prefers the Clinton to all other cultivated varieties, and will gather upon that and leave the others unmolested.

In the *Canada Farmer* for 1867, page 327, the Rose Beetle is referred to as occasionally injurious to the vine, as well as many other shrubs and trees, and mention is made of its great abundance every year in one locality at Oakville; it is also spoken of in Harris' "Insects Injurious to Vegetation" as hurtful to the vine.

Fig. 1.



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FIG. 2.



Fig. 1.

In Figure 1, we have a representation of the perfect Beetle. It is called the Rose-bug on account of its appearing annually at the time of the blossoming of the rose, and of its having been first noticed as injurious to that flower. The body of this beetle measures a little more than one-third of an inch in length; it is slender in form and tapers a little towards each extremity. Its colour is dull yellowish when fresh, arising from its being covered with a greyish yellow down or bloom; and its long sprawling legs are of a dull pale reddish hue, with the joints of the feet tipped with black, the feet are also armed with very long claws. The down on its body is easily rubbed off, and when this is done there is quite a change in the appearance of the insect, the head, thorax, and the under side of the body becoming of a shining black. The following excellent account of its history is given by Dr. Harris.

"The unexpected arrival of these insects in swarms, at their first coming, and their sudden disappearance at the close of their career, are remarkable facts in their history. They come forth from the ground during the second week in June, or about the time of the blossoming of the damask rose, and remain from thirty to forty days. At the end of this period the males become exhausted, fall to the ground and perish, while the females enter the earth, lay their eggs, return to the surface, and after lingering a few days die also."

"The eggs laid by each female are about thirty in number, and are deposited from one to four inches beneath the surface of the soil; they are nearly globular, whitish, and about one-thirtieth of an inch in diameter, and are hatched twenty days after they are laid. The young larvæ begin to feed on such tender roots as are within their reach; and when not eating they lie upon the side, with the body curved so that the head and tail are nearly in contact; they move with difficulty on a level surface, and are continually falling over on one side or the other. They attain their full size in the autumn, being then nearly three-quarters of an inch long, and about an eighth of an inch in diameter. They are of a yellowish white colour, with a tinge of blue towards the hinder extremity, which is thick and obtuse, and rounded; a few short hairs are scattered on the surface of the body; there are six short legs, namely, a pair to each of the first three rings behind the head, and the latter is covered with a horny shell of a pale rust colour. In October they descend below the reach of frost, and pass the winter in a torpid state. In the spring they approach towards the surface and each one forms for itself a little cell of an oval shape by turning round a great many times, so as to compress the earth and render the inside of the cavity hard and smooth. Within this cell the grub is transformed to a pupa during the month of May by casting of its skin, which is pushed forward in folds from the head to the tail. The pupa has somewhat the form of the perfect beetle; but it is of a yellowish white colour, and its short stump-like wings, its antennæ and its legs are folded upon the breast; and its whole body is enclosed in a thin film that wraps each part separately. During the month of June this filmy skin is rent, the included beetle withdraws its body and its limbs, bursts open its earthen cell, and digs its way to the surface of the ground. Thus the various changes, from the egg to the full development of the perfect beetle, are completed within the space of one year."

Although these insects have many natural foes, such as carnivorous ground beetles, dragon flies, toads, insectivorous birds, domestic fowls, &c., yet they often need the intervening hand of man to keep them within due bounds. The best means of disposing of them is to jar them from the vines on which they are resting with a sudden and violent jar, to sheets spread below to receive them. They are naturally sluggish, and do not fly readily, and are fond of congregating in masses on the foliage they are consuming; and hence, in the morning, before the day becomes warm, they can be easily shaken from their resting places, and disposed of, either by burning them, or by throwing them into scalding water.

No. 18. THE ACHEMON SPHINX. (*Phalopus Achemon*, Drury.)

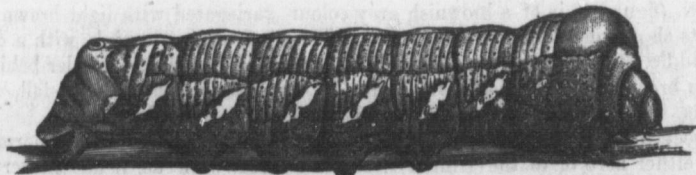


FIG. 2.

The caterpillar of this species (see figure 2) is a formidable looking creature, measuring, when full grown, if at rest, about three inches, and, when crawling, about three and a half inches. While young, as this larva feeds singly, it does not attract much attention, but, as it approaches maturity, it consumes, in a short time, large quantities of leaves, rendering long branches of the vine quite leafless. It is usually met with of full size late in August, and feeds on the American ivy (*Ampelopsisquinque folia*) as well as on the grape vine. The following descriptions of the larva and perfect insect are compiled chiefly from Mr. Riley's second report on the insects of Missouri.

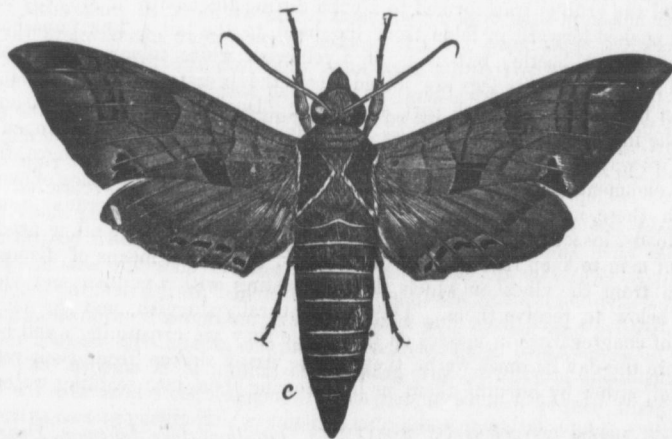
The largest segment in the body of the larva is the third behind the head; the second is but half its size, and the first still smaller; and, when at rest, it usually withdraws the head and the two next segments within the third, as shown in the figure. This caterpillar varies much in colour; when young, it is usually green, with a long slender reddish horn, rising from the last segment but one, and curving backwards. When full grown, the general colour is sometimes green, but more frequently a pale straw, or reddish brown, and the long recurved horn has disappeared, its place being occupied by a polished tubercle. The pale straw colour, or reddish brown deepens at the sides, and finally merges into a rich brown. A broken line of brown runs along the back, and another unbroken, with its upper edge fading gradually, extends along each side. It has six scalloped cream-coloured spots on each side, and is covered more or less with minute spots, which are dark on the back, but light and annulated at the sides. There are also from six to eight transverse wrinkles on all but the thoracic and caudal segments. The head, front segments and breathing holes incline to flesh colour, while the prolegs and caudal plate are deep brown.

FIG. 3.



When full grown, and about to transform to a chrysalis, the colour of the worm often changes to that of a beautiful pink or crimson. It then descends to the ground, and burrows underneath, and undergoes its change there within a smooth cavity. The chrysalis (see fig 3) is of a dark shining mahogany brown colour, roughened, especially on the anterior edge of the segments in the back.

FIG. 4.



The moth (figure 4) is of a brownish grey colour, variegated with light brown, and with the dark spots shown in the figure deep brown. The hind wings are pink, with a dark shade across the middle, still darker spots below this shade, and a broad grey border behind. It is usually single brooded, the chrysalis remaining in the ground through the fall, winter and spring months, and producing the moth towards the latter part of June.

This insect has rarely presented itself in sufficient numbers to prove alarming to the vine grower, either here or in the United States. Indeed, with us, it has hitherto been a rare insect; nevertheless, since some usually rare insects occasionally appear in comparative abundance, we have thought it best to present our readers with a history of the species, so

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that all may be able to recognize it. Should it at any time prove troublesome, its large size makes it so conspicuous, that it might be easily controlled by hand picking.

No. 19. THE ABBOT SPHINX. (*Thyroux Abbotti*, Swainson.)

We have never yet met with the larva of this insect, but have seen specimens of the moth, which were captured in the neighbourhood of Hamilton, Ont. Doubtless, some of our readers will have met with it. Figure 5 shews both larva and moth. The following

FIG. 5.



description of this species occurs in Mr. Riley's second report, already alluded to, which we shall take the liberty of copying:—

"This is another of the large grape feeding insects occurring on the cultivated and indigenous vines, and on the Virginia Creeper, and having, in a full grown larva state, a polished tubercle, instead of a horn at the tail. Its habitat is given by Dr. Clemens as New York, Pennsylvania, Georgia, Massachusetts, and Ohio; but, though not so common as the Sphinx moths previously described, yet it is often met with both in Illinois and Missouri. The larva, which is represented in the upper part of figure 5,

varies considerably in appearance. Indeed, the ground colour seems to depend in a measure on the sex, for Dr. Morris describes this larva as reddish brown, with numerous patches of light green, and expressly states that the female is of a uniform reddish-brown, with an interrupted dark brown dorsal line, and transverse striae. I have reared two individuals, which came to their growth about the last of July, at which time they were both without a vestige of green. The ground colour was dirty yellowish, especially at the sides. Each segment was marked transversely with six or seven slightly impressed fine black lines, and longitudinally with wider non-impressed dark brown patches, alternating with each other, and giving the worm a checkered appearance. These patches become more dense along the subdorsal region, where they form two irregular dark lines, which, on the thoracic segments, become single, with a similar line between them. There was also a dark stigmatal line, with a lighter shade above it, and a dark stripe running obliquely downwards from the posterior to the anterior portion of each segment. The belly was yellow, with a tinge of pink between the prolegs, and the shiny tubercle at the tail was black, with a yellowish ring around the base. The head, which is characteristically marked, and by which this worm can always be distinguished from its allies—no matter what the ground colour of the body may be—is slightly roughened and dark, with a lighter broad band on each side, and a central mark down the middle, which often takes the form of an x. This worm does not assume the common sphinx attitude of holding up the head, but rests stretched at full length; though, if disturbed, it will throw its head from side to side, thereby producing a crepitating noise."

"The chrysalis is formed in a superficial cell on the ground; its surface is black and roughened by confluent punctures, but, between the joints, it is smooth, and inclines to brown; the head case is broad and rounded, and the tongue case is level with the breast; the tail terminates in a rough flattened wedge-shaped point, which gives out two extremely small thorns from the end."

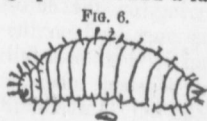
"The moth appears in the following March or April, there being but one brood each year. It is of a dull chocolate or greyish brown colour, the front wings becoming lighter beyond the middle, and being variegated with dark brown, as in the figure. The hind wings are sulphur-yellow, with a broad dark brown border, breaking into a series of short lines, on a flesh-coloured ground, near the body. The wings are deeply scalloped, especially the front ones, and the body is furnished with lateral tufts. When at rest, the abdomen is curiously curved up in the air."

Should this worm at any time become sufficiently numerous to prove destructive—

which is scarcely probable—we could not suggest a better remedy than that given for the preceding species, namely, hand picking.

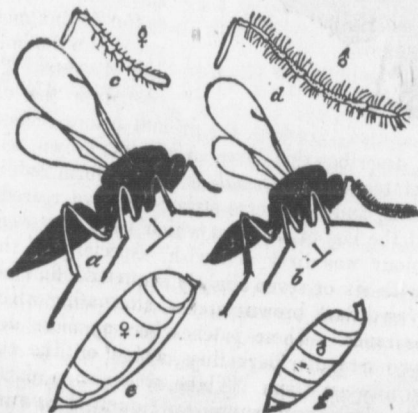
Evaxyssoma
THE GRAPE SEED INSECT. (*Isosoma Vitis*, Saunders.)

This insect, which was fully described in the report of the Entomological Society for 1870, has not, as far as we have been able to ascertain, affected the grape to any extent in Canada during the past year. It seems, however, to be much more widely distributed than we at first supposed. During the latter part of August, we spent a few days at Dubuque, Iowa, and while there paid a visit to the market, where there were offered for sale large quantities of a species of wild grape, which was fully ripe at that early period in the season, and which, we were told, was much used for wine making. On opening the seeds of these grapes we found a large proportion inhabited by the larvæ of this insect, a small, fat white grub. See figure 6, where it is shown much magnified. An outline of the little creature of the natural size is given below. The larvæ at that time were more than two-thirds grown.



For the benefit of those who may not have access to the report for 1870, we give a figure also of a perfect fly, almost identical in appearance with that from which this larva is produced, and well serves the purpose of illustrating

FIG. 7.



it. See figure 7. *a* Represents the female; *c* and *e*, her antennæ and abdomen; *b*, *d*, and *f* give similar details of the male. The larva lives within the seed, and consumes the kernel during the summer; undergoes its change to chrysalis also within the seed, and eats its way out of it in the early part of the summer following, when in the perfect or winged state.

No. 20. A CUTWORM. (*Agrotis*—♀)

This destructive pest, which is referred to at length in this report, when treating of the insects affecting the strawberry, has also proved very destructive to the vine. For details of the history and habits of this insect, the reader is referred to No. 7, Injurious to the strawberry.

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INSECTS INJURIOUS TO THE STRAWBERRY.

BY W. SAUNDERS, LONDON, ONT.

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| <ol style="list-style-type: none"> 1. The Strawberry Root or Crown Borer (<i>Anarsia lineatella</i>, Zeller). 2. The White Grub (<i>Lachnosterna quercina</i>, Knoch). 3. A Strawberry Leaf-Roller (<i>Anchylopera fragaria</i>, Riley). 4. A second Strawberry Leaf-Roller (<i>Ezartema permundana</i>, Clemens). 5. A third Strawberry Leaf-Roller (<i>Lozotænia fragariana</i>, Packard). | <ol style="list-style-type: none"> 6. Other Strawberry Leaf-Rollers. 7. A Cut Worm (<i>Agrotis</i>). 8. The Measuring Worm (<i>Angerona crocotaaria</i>). 9. The Smeared Dagger (<i>Acronycta obliquata</i>, Sm. & Abb.). 10. The Strawberry False Worm (<i>Emphytus maculatus</i>, Norton). 11. <i>Osmia Canadensis</i>, Cresson. 12. A Strawberry Bug (<i>Corimelaena</i> — ?) |
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Fortunately, there are not many insects injurious to this useful and now extensively cultivated fruit. It has, however, several special foes, which have in some localities at times proved troublesome, and there are a few other general feeding insects, which take to strawberry, if it lie in their path, as readily as they will to any other green thing they may meet with. Still, in any case, the strawberry grower must not look upon insects as an unmixed evil, admitting of no toleration, for he would find it very difficult indeed to secure a good crop without their aid. In some varieties of strawberries, the flowers are more or less imperfect, the male organs being more fully developed in some, the female organs in others, so that fertilization can rarely take place, excepting through the agency of insects, who visit flower after flower, and carry and scatter the fertilizing pollen with them wherever they go; and even with the perfect flowers their presence and unconscious labour is required to ensure a liberal crop of well formed fruit.

AFFECTING THE ROOT.

THE STRAWBERRY ROOT OR CROWN BORER (*Anarsia lineatella*, ZELLER).

This is a very troublesome insect where it occurs plentifully, and takes a liking to the strawberry; but, happily, this is not often the case. We have never seen it affecting this fruit anywhere excepting on the grounds of Mr. Luke Bishop, of St. Thomas, Ont., who first called our attention to it about the middle of May, 1869, when he brought us a few specimens. During 1868 and 1869, they played sad havoc with his plants, destroying a large proportion of them. We believe they have been less troublesome since. The borer is a small grub or caterpillar, nearly half-an-inch long, and of a reddish colour, which eats irregular channels in various directions, through the crown and larger roots of the plant, causing it either to wither and die, or else to send up weakened and almost barren shoots.

Devel. of the insect, upon contact

The following description of this larva was taken on the 20th of May, 1869:—Length, .42 inch. Head rather small, flattened, bilobed, pale brownish yellow, darker in colour about the mouth, and with a dark brown dot on each side.

The body above is semitransparent, of a reddish pink colour, fading into dull yellow on the second and third segments; anterior portion of second segment smooth and horny-looking, and similar in colour to head. On each segment are a few shining reddish dots—yellowish on the anterior segments—or faintly elevated tubercles, from each of which arises a single, very fine, short, yellowish hair, invisible without a magnifying power. These dots are arranged in imperfect rows, a single one across the third, fourth, and terminal segments, and a more or less perfect double row on the remaining segments.

The under surface is of a dull whitish colour, becoming faintly reddish on the hinder segments, with a few shining whitish dots; those on the fifth, sixth, eleventh, and twelfth segments, being arranged in transverse rows, in continuation of those above. Feet and prolegs yellowish white, the former faintly tipped with dark brown. It spins a slight silken thread, by means of which it can suspend itself for a time at a short distance from its place of attachment. The specimen described produced the moth on the 8th of July following.

On the 8th of June, we visited the grounds of Mr. Bishop, and found his strawberry beds badly infested—indeed, almost destroyed—by this pest, along with a leaf-roller, to be presently described. We believe there are two broods of this borer during the year. That which we call the first brood is the one in which the larva passes the winter in a young or half-grown state, in the crowns and roots of the plants; while the second brood infests the young runners, soon after the fruiting season is over. The borer eats irregular channels through the crown, sometimes excavating large chambers, at other times merely girdling it in various directions, here and there eating its way to the surface. Whether these various chambers and channels are due to the presence of more worms than one in a single root we were unable to determine with certainty. Most of the cavities contained a moderate-sized soft silky case, which, when opened, appeared nearly full of exuviae. These cases had served as a place of retreat during winter. Most of the larvæ found at this date had eaten their way to the upper part of the crown of the plant, just under the surface, and were found about the centre, with a hole eaten through the surface. From the fact that a large number of roots were examined, and although almost every one was more or less injured, but very few larvæ were to be found, we inferred that the probabilities were that the larvæ, when mature, usually leave the root, and undergo the change to chrysalis, either under the surface of the ground, or amongst rubbish at the surface. One chrysalis only was found, and that was in the cavity of a root. As soon as Mr. Bishop had discovered the destructive character of this pest, he, with commendable caution, refused to sell any more plants until the insect was subdued, for fear of spreading the evil. He is of opinion that the insect came to him from some part of the United States, with some plants of the Hooker strawberry, as it was in a patch of these, so obtained, that he first noticed the insect working.

Specimens of the larvæ got late in the season wintered over, and were examined on the 12th of January following, when they did not appear so plump in body as those examined in July. They appear to spend most of the winter in a torpid state within the silken cases before mentioned. Several were found thus sheltered at this time, and one, whose original abode had been disturbed in the fall, had prepared for itself a similar casing within the fold of a strawberry leaf. In this latter instance, the larva seemed quite active, moving itself briskly about whenever touched.

The chrysalis of this insect is very small, and of the usual dark reddish brown colour. That one which was found on the 8th of June produced the moth on the 12th of July.

The perfect insect is a very small dark grey moth, which was accurately described by the late Dr. Clemens, in the *Proceedings of the Academy of Natural Sciences, Philadelphia*, for 1860, page 69, under the name of *Anarsia pruniella*, as he at that time supposed it to be distinct from the European insect. We quote his description:—"Head and face pale grey; thorax dark grey. Labial palpi dark fuscous, externally, and pale grey at the end; terminal joint grey, dusted with dark fuscous. Antennæ grayish, annulated with dark brown. Fore wings grey, dusted with blackish brown, with a few blackish brown spots

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along the costa, the largest in the middle, and short blackish brown streaks on the median nervure, subcostal, in the fold, and one or two at the tip of the wing; cilia fuscous-grey. Hind wings fuscous-grey; cilia grey, tinted with yellowish."

"The larva was taken, June 16, full-grown, and about to transform on the limbs of the plum. Its head is black, body uniform reddish brown, with indistinct papula, each giving rise to a hair, and with pale brown patches on the sides of the third and fourth segments; shield and terminal prolegs black. One specimen had secreted itself under a turned-up portion of the old bark of the trunk. The cocoon is exceedingly slight, and the tail of the pupæ is attached to a little button of silk."

Mr. C. V. Riley, who has kindly determined this moth for me, draws attention to the coarse nature of the scales on the wings, appearing something like minute granulations. He also observes that, in some specimens of the moth, the dark marks are more or less obsolete. Mr. Riley has bred this moth from larvæ boring into tender peach twigs, and remarks that "the larva, when young, is paler, with a paler head, the body being yellow, each joint with a crimson band superiorly, narrow on the thoracic joints, and broad, and divided transversely by a fine pale line on the feet." Mr. J. Pettit, of Grimsby, Ont., has bred it from the twigs of the peach, and it breeds in peach twigs, also, in Europe; and Professor Townend Glover, of the Department of Agriculture, Washington, has found it feeding on the buds of the peach.

Since this moth is found in Europe as well as in this country, it is in all probability an imported insect, and one that is widely disseminated. We are not aware that it has been recorded as injurious to the strawberry before, and we sincerely hope that this apparently lately developed liking for this food plant will be limited to the specimens residing in the district referred to. Should it ever become general, it would prove a most grievous pest to the strawberry grower.

Remedies.—Happily even this small creature is not without its enemies. Among some larva sent to Mr. Riley, several, he says, contained parasites: probably these tiny friends have been doing much in the past, and are still doing much, to limit their increase. Nature's operations, although often silent, are usually sure. Possibly severe cold or extreme heat may also affect them. Man can do little in this instance, unless he digs up his strawberry roots and burns them.

Phyllophaga
2. THE WHITE GRUB (*Lachnosterna quercina*, KNOCH).

The White Grub, or larva of the May-beetle—*Lachnosterna quercina*, Knoch—is often loudly complained of. Both in the larval and perfect conditions, it is at times very destructive: now and then the ground in certain localities seems full of the larvæ, they turn up with every spadeful of earth, and the plough will expose them by hundreds.

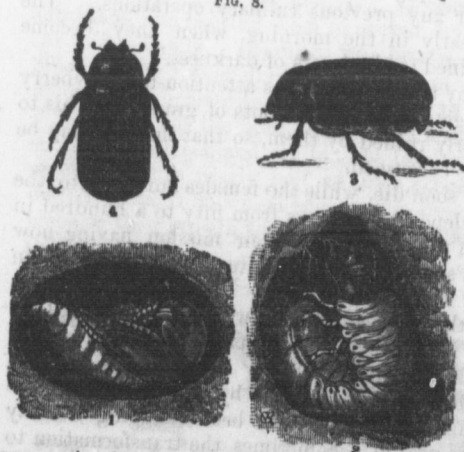


FIG. 8.

In figure 8, we give representations of the insect in its different stages:—2 illustrates the full-grown grub; 1 the chrysalis, and 3 and 4 the perfect beetle. Everyone must be familiar with the May-beetle, or May-bug, as it is sometimes called—a buzzing beetle with a rapid, but wild and erratic flight, which comes thumping against the windows of lighted rooms at night, in May and early in June; and where the windows are open it dashes in without a moment's consideration, bumping itself against walls and ceilings, occasionally dropping to the floor; then suddenly rising again, it sometimes lands unexpectedly against one's face or neck, or it may be on one's head, where its sharp claws get entangled in the hair, and its further progress is stayed until a forcible

removal takes place.

At such times it is quite a terror to those whose nerves are weak.

Although thousands of these summer-evening tormentors are yearly, yea, nightly, trodden to death during their brief season, yet thousands of others rise to supply their places, and sometimes they are reinforced by armies of tens of thousands. Then it is that oftentimes serious damage is done to trees whose foliage they consume, their powerful and horny jaws being admirably adapted for cutting and grinding the leaves. Cherry trees are frequently injured in this way; indeed, these beetles are not at all particular as to what they eat—the oak, the Lombardy poplar, and many other kinds of trees, are just as readily attacked, if in their way.

The *Canada Farmer* for July, 1866, contains an excellent article on this subject, by our esteemed friend, Rev. C. J. S. Bethune, Port Hope, with details of the habits and history of this insect, which we cannot do better than re-produce:—

“A friend in Cobourg has recently mentioned to us, that his strawberries have been very much injured by a large white grub which attacks the roots, and thus destroys at once the vitality of the plants. From his description of the marauder, we have no doubt that it is the larva of the common May-beetle or Cockchafer—*Lachnosterna Quercina*, Knock—which is so abundant just now. In the western part of Cobourg, and, indeed, almost all over the neighbourhood, these beetles may be seen on any fine evening, in perfect myriads flying about the trees, the leaves of which they devour in this stage of their existence.

“This insect has been long and most unfavourably known as very destructive to vegetation, both in its larval and winged state. In the former, it is commonly called the ‘white grub:’ it is then a soft, white worm, with a brownish head, and six legs, becoming, when fully grown, about as large as one’s little finger. It is usually found partially coiled up, near the root of the plant on which it is feeding. Unlike many of our destructive insects, the devastations of each individual are not confined to a single year, but it continues several years in the grub state, and, finally, changes early in the spring into a dark chestnut brown beetle, nearly an inch long, with rather long legs, and its breast covered with yellowish hairs. It flies about at night with a loud buzzing noise, and in a most clumsy manner, as if it had very little control over its movements, to the great discomfort and perturbation of nervous persons, especially when attracted into houses, as it often is, by the light. Its period of flight is usually limited to the months of May and June, though it is sometimes met with a little later in the season. The grubs are very commonly dug up, early in the spring, in gardens, in various stages of maturity; the plough, too, brings many more to the light of day. It is hardly necessary, we suppose, to tell our readers that in such cases they should be destroyed at once, and without mercy, by treading under foot. The perfect insects may be collected and put an end to, by shaking them from the trees they infest, into a cloth spread beneath for their reception, and then throwing them into boiling water; the specimens thus cooked will be readily eaten by pigs, which, in fact, root up and devour multitudes of the grubs without waiting for any previous culinary operations. The best time to shake them from the trees is early in the morning, when they become sluggish and stationary, their flight being confined to the hours of darkness.”

The larva of this May-bug does not by any means confine its attention to strawberry roots, but devours potatoes, corn and other vegetables, also the roots of grass, and this to such an extent that at times meadows are utterly ruined by them, so that the turf may be turned up like a carpet, so utterly are the roots consumed.

After the pairing of the sexes, the males soon die, while the females burrow into the ground some six inches or more, where they deposit their eggs from fifty to a hundred in number, after which they come out again from the earth, but their mission having now been accomplished, they soon die. The eggs soon hatch into white grubs, which begin at once to feed on the roots of any plants within their reach. During the summer, they burrow about and feed not far from the surface; but as winter approaches, they dive deeper into the soil, below the reach of frost, where they remain torpid until spring. At the close of the third summer, they cease feeding, and bury themselves sometimes two feet deep in the earth, and there, in an oval cavity, formed by the motions of the larva from side to side, the change to chrysalis takes place, the beetle digging its way through and appearing at the surface in due season. Sometimes the transformation to

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the beetle state takes place in the fall, for we have several times found fresh specimens at this season, showing by their softness that they had but lately escaped from the pupa case. Such perfect insects secrete themselves under ground during winter, and appear with the rest of their troop in spring.

Remedies. Man can do but little towards checking the ravages of this insect pest, but nature has provided many means for keeping them within due bounds. Some birds, such as the crow and common fowl, eat them greedily, indeed the crow may often be seen following the track of the plough in search of these choice morsels. As already stated pigs eat them with avidity, and will root up the ground most thoroughly in their search for them, and no doubt many other insect eating animals and birds devour them with equal delight. These grubs are also liable in some parts to the attacks of a peculiar disease, which manifests itself in the development of a fungous growth, which sprouts out in a curious manner from about the head, and the result is the death of the insect so occupied. The beetles, as already stated, may be best destroyed by shaking them from the trees and throwing them into scalding water.

AFFECTING THE LEAVES.

3. A STRAWBERRY-LEAF ROLLER (*Anchylopera fragaria*, RILEY.)

This insect, which is also known in some parts of the United States as *the* strawberry leaf-roller, is but one of the several insects which affect the strawberry in this way. It has been found very troublesome in some of the adjoining States for several years past, and in all probability it occurs in Canada also. In the *Canada Farmer* for August, 1867, some account is given of a leaf-roller found by Mr. Chas. Arnold, of Paris, Ont., eating the leaves of his strawberry plants, which has been referred, and probably correctly so to this species. Possibly some of our readers may recognise the insect after reading the following description of its appearance and mode of working, condensed chiefly from a paper by Mr. C. V. Riley, State Entomologist of Missouri, and published in the *American Entomologist* for January, 1869:

The larva or caterpillar measures when full grown a little more than one third of an inch. It is largest on the front segments, tapering slightly towards the hinder ones. In colour it varies from a very light yellowish brown to a dark olive green or brown, with a body soft and somewhat semi-transparent. Its head is of a shining yellowish brown colour, with a dark eye-spot on each side. The second segment has a shield above similar in colour and appearance to the head, and on each segment or ring of the body are a few pale spots, from each one of which arises a single hair. The hinder segment has two black spots, while the under-surface, feet and prolegs are about the same colour as the body above. In certain parts of North Illinois and Indiana this insect has been ruining the strawberry beds in a most wholesale manner. It crumples and folds the leaves, feeding on their pulpy substance, and causing them to appear dry and seared. It most usually lines the inside of the fold with silk. There are two broods during the year, and the worms of the first brood, which appear during the month of June, change to the pupa state within the rolled up leaf, and become moths during the fore part of July.

The moth has the head, thorax, and fore wings reddish brown, the latter streaked and spotted with black and white; the hind wings and abdomen are dusky. The wings when spread measure nearly half an inch across. After pairing the females deposit their eggs on the plants, from which eggs in due time there hatches a second brood of worms, which come to their growth towards the end of September, and changing to pupæ pass the winter in that state.

FIG. 9.



In the accompanying figure 9, drawn from nature by Mr. Riley, *a* represents the larva natural size, *b* the head and four succeeding segments of the body, and *d* the terminal segment, all magnified; *c* the moth, also enlarged, the hair lines at the sides showing the natural size.

4. A SECOND STRAWBERRY LEAF-ROLLER (*Exartema (Tortrix) permundana*, CLEMENS.)

This species was found in immense numbers attacking Mr. Bishop's strawberry vines in 1868 and 9, along with the "crown borers" already described. All these leaf rollers have the habit of rolling up the leaves and fastening them with silken threads, and living within the enclosure, but this little creature prefers taking the flowers, expanded and unexpanded, and bringing them together with silken threads into a sort of ball, it feasts on their substance. This peculiarity makes its attacks much more annoying and destructive than any mere consumption of leaves would be. It is small in size, of a green colour, and with very active habits, wriggling itself quickly out of its hiding place when disturbed. It is the progeny of a small moth, with its fore wings yellowish varied with brown streaks and patches, and darker hind wings, who lays her eggs quite early in the spring, placing them upon the developing leaves, where the newly hatched larvæ may be sure to enjoy an abundance of tender and juicy food, and these attain to nearly their full growth, and are just then capable of most mischief, at the time when the plant is coming into full flower. During 1869, Mr. Bishop must have lost nearly half his crop of strawberries from this cause alone. We have found this species attacking the wild strawberry in different localities, and have little doubt but that it is widely disseminated; but why it should so persistently attack the plants in one locality, and multiply so amazingly there, while comparatively unknown in other places, we are unable to do more than guess at: possibly they may have been kept under in other localities by parasites which feed on them. The larvæ of most moths are liable to attack from one or more of such enemies, and we know that this species is not exempt, for several of the larvæ which we succeeded in bringing into the chrysalis state, instead of producing moths, yielded specimens of these small parasitic flies instead.

We are indebted to Mr. C. V. Riley for determining this species for us. It was described by Dr. Clemens in the Proceedings of the Academy of Natural Sciences, Philadelphia, for August, 1860, where the author states that "the larvæ bind together the terminal leaves of *Spiræa*." Hence it would appear that this insect does not confine itself to the strawberry as a food plant, and may possibly be quite a general feeder.

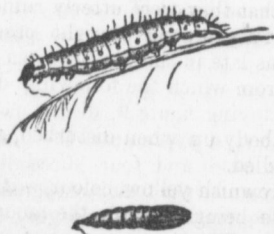
The chrysalides of this species were of the usual dark brown colour, from which the moths made their escape from the eighth to the twelfth of July.

5. A THIRD STRAWBERRY-LEAF ROLLER (*Lozokenia fragariana* PACKARD.)

This insect has been reared by Dr. A. S. Packard, of Salem, Mass., from the wild strawberry, and is described in his "Guide to the Study of Insects." The larva was found in Maine early in June, in folds of the leaves; the moth appearing about the middle of the same month. The moth is very pretty, and measures, when its wings are expanded, eight-tenths of an inch. Its fore wings are red, darker on the outer half, and with a large triangular white spot near the middle of the front edge; the outer edge of the spot is hollowed out. The outer edge of the wing is pale especially in the middle, and about the same colour as the head and thorax; the hind wings and abdomen are of a whitish buff, underneath they are whitish. It is quite likely that this species occurs also in Canada, although it has not yet been observed.

6. OTHER STRAWBERRY LEAF-ROLLERS.

FIG. 10.



Several other species have been observed by us affecting the strawberry, all of them green, with pale or dark brown heads, and more or less semi-transparent bodies, sometimes tinged in parts with yellowish. One of these, the oblique banded leaf roller *Lozontenia rosaceana*, Harris' is a very general feeder, and has been already referred to in the reports of the Entomological Society of Ontario for 1870 and 1871, and to these the reader is referred for its full history. We shall, however, reproduce the figures relating to this insect, as they will serve somewhat to illustrate all the leaf-rollers spoken of, since

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FIG. 11.



they have more or less of a family resemblance in all their different stages. Fig. 10 shows the caterpillar and chrysalis, and Fig. 11 the perfect moth, with its wings expanded as well as folded.

The life history of the other leaf-rollers referred to above has not yet been fully worked out, and as they have not thus far attracted much attention, we pass

them over with this brief notice.

Remedies. Since all these leaf-rollers feed on the foliage and come out of their hiding places for this purpose, an application of hellebore and water on the leaves would probably destroy many of them. It has also been recommended to plough deeply either in the Autumn or Spring, such beds as may be badly infested, with the view of burying the chrysalides sufficiently deep to ensure their destruction. Hand-picking may also be practised with advantage, as the curled leaves are easily seen.

A CUT-WORM (*Agrotis*).

This is an insect which has been most unusually injurious during the past season on the fruit plantations of Mr. Mountjoy and Mr. Bunning, on the borders of Lake Huron, near Sarnia. At first its habits were not understood, and it pursued the "even tenour of its way" uninterrupted night after night; the perplexed fruit growers not knowing why it was that every day the foliage on their fruit trees and strawberry patches grew slimmer. But soon it was found that the enemy was a night worker, and this knowledge of its habits was at once turned to account, and night watches instituted with the view of counteracting this insidious foe, and with good results, as many as 1800 having been killed by Mr. Mountjoy in one night.

Their manner of life may be thus described. The moths from which the worms are produced appear on the wing during the month of August, and soon after pair, and deposit their eggs on the ground or on some plant or other substance near the ground; they probably hatch in the fall, and feed for a time on the leaves of grass and other plants then abundant, and after attaining but a small measure of their growth, they burrow into the earth, and there remain in a torpid state during the winter; but the warmth of spring revives them and soon they are abroad and active. During the first few weeks while they are still small, the quantity of food they consume is not sufficient to attract much attention; but as they approach nearer maturity, that is about the time when the trees first put out their tender foliage, the quantity of food they consume is enormous. In the day time they rest tolerably secure from harm, by burrowing a short distance underground, and towards night they sally forth from their hiding places to begin their work of destruction. They are extremely active in their movements, and travel over quite a space of ground in a very short time, eating almost everything green in their way; they climb the trunks of trees, and consume not only the young foliage, but the buds also, leaving the limbs almost bare, and before the light of another day dawns they retreat to their hiding places and rest in quiet. When full grown they burrow deeper into the earth, and form for themselves an oval cell or chamber, in which they change to chrysalis, and from which the moths are produced early in the autumn to continue the race.

In this instance these caterpillars took a decided liking for the strawberry vines, and in spite of the most vigilant search for them day after day and night after night, they defoliated a large patch of the vines to such an extent that they were utterly ruined. Nearly all through the month of June they literally swarmed and scarcely a night passed without considerable damage being done by them. It was late in the month when we received a package of the larvæ from Mr. Mountjoy, and from which the following description was taken on the second of July:—

Length one and a half inches, cylindrical, coiling the body up when disturbed, and discharging a green liquid freely from the mouth when handled.

Head small, rather flat, scarcely bilobed, of a dull brownish yellow colour, with a triangular looking furrow in front, the base of the triangle being towards the mouth; between the lobes the colour is of a slightly darker shade. On the upper part of each

lobe is a blackish dot, and two or three more on each side near the base of the palpi; mandibles or jaws tipped with dark brown.

The body above is greenish grey and semi-transparent; on the second segment or ring there is a horny plate above, similar in colour to the head, slightly bordered behind with dark brown. There is a dark greenish line down the middle of the back with a whitish centre, the green colour becoming fainter and almost disappearing on the anterior portion of the body. Along the sides, about half way down is a dull whitish line, and another of the same colour just above the stigmata or breathing holes, while close to the under surface the body is bordered with an irregular band of the same hue. On each side of the dorsal or central line above, is a small dark brown dot, on each ring or segment of the body. Stigmata nearly round and of a deep black colour.

The under surface is more transparent than the upper, especially on the anterior and terminal segments; the colour is dull yellowish with a greenish tinge, from the internal organs showing through. The feet and legs are yellowish and semi-transparent.

In colour these caterpillars vary somewhat, some are of a deeper shade, becoming greenish brown, with the whitish lines fainter; in these the green in the band down the back, can be seen alternately contracting and expanding when the larva is at rest, the greater transparency of the skin showing the working of the internal organs through it. Many of them died in confinement, and only six or seven completed their various stages, going into chrysalis early in July, and producing the moths late in August.

The chrysalis is about $\frac{1}{16}$ ths of an inch in length, and of a pale brown colour, and is contained in a little oval chamber or cell of earth a few inches below the surface.

The moth, when its wings are expanded measures about an inch and a half across. The fore wings are pale brownish, streaked and spotted with grey; the hind wings are of a uniform pale brownish grey, with a white fringe around the margin. There is a whitish grey band across the front just behind the head, the anterior portion of the body is dark brownish grey, and the abdomen the same colour as the hind wings.

Experience seems to indicate that these insects are much more numerous in light sandy soils, than they are where the soil is heavier.

Remedies.—This is a very difficult insect to cope with. In all probability the moths which are attracted by light might be trapped, or poisoned by hanging about pieces of cloth or flannel daubed with a mixture of molasses and a strong solution of arsenic, but as they fly late in the season, when the sense of pressing danger is past, it would be difficult perhaps, to induce people generally to take much pains with them then. Hence the battle must be fought with this insect while in the larva or caterpillar state, and then the surest way of disposing of them is to catch and kill them. By searching around the vines just under the surface of the ground during the day, many may be turned up and destroyed, and by inspecting again at night when they are active and busy their ranks may be still further thinned, and by continuing this treatment, day after day, they may no doubt be kept under. Probably dusting the vines with hellebore would poison them as it does other leaf-feeding insects; this measure is at least worthy of a trial.

8. THE MEASURING WORM (*Angerona crocataria*, GUENEE).

Fig. 12.



This larva, which was described in last year's report as injurious to the currant and gooseberry, has also been found attacking the strawberry. The caterpillar is yellowish-green, with longitudinal whitish lines, and is about an inch and a half long. The moth, see Fig. 12, varies in colour from a pale to a deep yellow, with dusky spots and dots, in some specimens few, in others quite numerous, and in the latter case the larger ones are so arranged as to form an imperfect band across the wings. For further details re-

specting the life-history of this insect, the reader is referred to the report of the Entomological Society for 1872, page 37.



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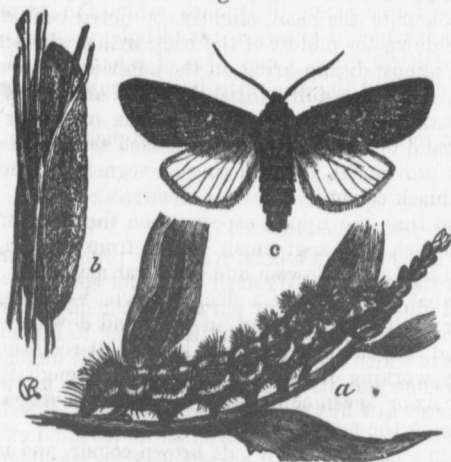
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9. THE SMEARED DAGGER (*Acronycta obliquata*, Sm. and Abb.).

Fig. 13.



The accompanying figure illustrates this insect in its various stages. The larva is a brightly ornamented, hairy caterpillar, about one and a quarter inches long. Its head is flat in front, rather below medium size, with a few yellow hairs; its jaws are black.

The body above is of a deep velvety black, with a transverse row of prominences or tubercles on each segment, those above are bright red, and set in a band of the same colour, extending far down on each side. From each tubercle there arises a tuft of short stiff hairs, those on the upper part of the body being of a red colour, while below they become yellowish or mixed with yellow. On each side of a line drawn down the centre of the back, is a row of bright yellow spots, two or more on each segment, and below these and close to the under surface, is a bright yellow band deeply indented on each

segment, the indentations being on a line with the rows of tubercles. The spiracles or breathing holes are pure white, and are placed in the indented portions of the yellow band; there are also a few whitish dots scattered irregularly over the surface of the body.

The under side is dull reddish along the middle, and brownish black along the sides; the feet are of a shining black, and slightly hairy, while the thick fleshy hinder legs, called the prolegs, are reddish tipped with brown, with a cluster of short hairs on the outside of each.

This caterpillar is conspicuous from its beauty, and at first one can scarcely believe that such a handsome caterpillar could produce so plain and quiet looking a moth. Since this larva does not usually feed in company, but is scattered about singly, and as it is such a general feeder, there is no probability of its ever becoming very injurious, but its brilliant appearance is sure to attract the attention of every beholder. We have found it feeding very commonly on strawberry, also on raspberry, and occasionally on the Lombardy poplar. Mr. Riley has found it very common on smartweed, and a correspondent of his in Jefferson City, Mo., has found them very numerous on his peach trees, and has known them to denude both apple and willow trees.

As soon as this larva is full grown it draws together a few leaves or other loose material and constructs a rude case, within which it changes to a dark brown chrysalis. In this enclosure it remains a considerable time; those that we have bred have changed to chrysalis early in September, and did not produce the moths till June following. Mr. Riley says that in Missouri there are two broods each year, and it is possible they may be double-brooded with us also, in which case the summer brood must pass through the various stages of its existence in a much shorter time.

The moth, Fig. 13, c., is shown of the natural size. Its fore wings are grey, with a row of blackish dots along the hind border. There is a broken, blackish, zigzag line—sometimes indistinct—crossing the wing beyond the middle, and some darker greyish spots about the middle of the wings. The hind wings are nearly pure white.

In Mr. Riley's third "Report on the insects of Missouri," he says, "there are at least three natural enemies which serve to keep this insect in check. The largest of these is the Uni-banded Ichneumon fly (*Ichneumon unifasciatus*, Say) a large black fly, 0.60 inch long, and characterized by a white annulus about the middle of the antennæ, a large white spot about the middle of the thorax, and a white band on the first joint of the abdomen."

"This fly oviposits in the larva of the Smeared Dagger, but the latter never suc-

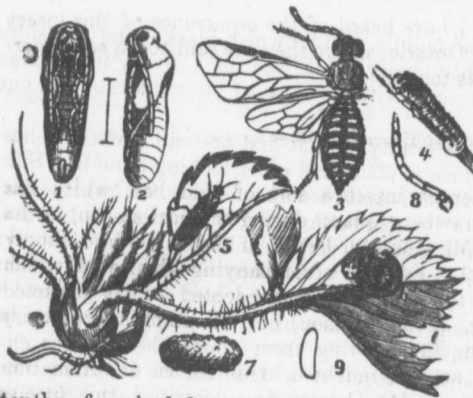
cumbs till after it has spun up and become a chrysalis, for I have always obtained the ichneumon from the chrysalis. The other parasites are smaller and work differently. They cause the larva of the Smeared Dagger to die when about full grown, and its contracted and hardened skin, which may often be seen during winter, with the head attached, fastened to the twigs of apple and willow trees, forms a snug little house, where the parasite undergoes his transformations, and through which it gnaws a round hole to escape the latter part of April. One of these flies (*Aleiodes Rileyi*, Cresson) is of a uniform reddish yellow colour. The other is a black fly of about the same size, but belonging to an entirely different genus, *Polysphincta*."

The only artificial remedy which has been recommended is that of hand-picking.

10. THE STRAWBERRY FALSEWORM, (*Empkytus maculatus*, NORTON).

This insect, although it has not yet been observed in Canada, will very probably be with us before long. It has been common in the adjoining Western States for some time past, and as the perfect insect is winged, and during the hotter portion of the day quite active, and since the strawberry now is so widely cultivated, there is nothing to hinder the spread of this destructive insect, the habits of which it will be well for us to fully understand, so that we may know how to treat the enemy, on its first appearance. We know that a near relative of this insect, the gooseberry saw-fly (*Nematus ventricosus*) has spread in a short time over a large section of our Province. Since we have had no personal experience with this foe to the strawberry grower, we shall avail ourselves of an excellent description of its life, history and habits, written by Mr. C. V. Riley, of St. Louis, Mo., and published in the first volume of the "American Entomologist," p. 90.

Fig. 14.



The adjoining Figure 14, drawn from nature by Mr. Riley, admirably illustrates this insect in its various stages. 1 shows the under side of the pupa or chrysalis. 2, a side view of the same. 3, an enlarged view of the perfect fly, showing the arrangement of the veins of its wings. 4, the larva or worm crawling. 5, the perfect fly of natural size. 6, the larva at rest. 7, the cocoon. 8, one of the antennæ of the insect enlarged, showing the joints. 9, an enlarged egg of this insect. The fly belongs to the order *Hymenoptera*, and is known in popular language as one of the saw-flies. The larva is a soft dirty yellow worm, which feeds externally on the leaf of the strawberry. It is a little more than six-

tenths of an inch long when full grown. Its head is of a more decided yellow colour than the rest of its body, and usually has a dark brown spot above, one nearly of the same size at the upper front, and two rather smaller ones at each side, joined by a brown line. It has twenty-two legs.

"The parent flies may be seen hanging to and flying around strawberry vines about the beginning of May, in North Illinois, Iowa and Michigan, in all three of which States we know them to occur. They are dull and inactive in the cool of the morning and evening, and at these hours are seldom noticed. They are of a pitchy black colour, with two rows of large transverse dull whitish spots upon the abdomen. The female, with the saw-like instrument peculiar to the insects of the great family (*Tenthredinidæ*) to which she belongs, deposits her eggs by a most curious and interesting process, in the stems of the plants, clinging the while to the hairy substance with which these stems are covered. The eggs are white, opaque and 0.03 of an inch long, and may be readily perceived upon splitting the stalk, though the outside orifice at which they were introduced is scarcely visible. They soon increase somewhat in bulk, causing a swelling of the stalk, and hatch in two weeks—more or less, according to the temperature—and from the mid-

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dle of May to the beginning of June the worms attract attention by the innumerable small holes which they make in the leaves. The colours of these worms are dirty yellow and grey green, and when not feeding they rest on the under side of the leaf, curled up in a spiral manner, the tail occupying the centre, and fall to the ground on the slightest disturbance. After changing their skin four times they become full grown, when they measure about three fourths of an inch."

"At this season they descend into the ground, and form a very weak cocoon of earth, the inside being made smooth by a sort of gum. In this they soon change to pupæ, from which are produced a second brood of flies by the end of June or beginning of July. Under the influence of July weather the whole progress of egg depositing, &c., is rapidly repeated and the second brood of worms descend into the earth during the fore part of August, and form their cocoons, in which they remain in the caterpillar state through the fall, winter and early spring months, till the middle of April following, when they become pupæ and flies again, as related. This fly has received the name of *Emphytus Maculatus*, by Norton, in allusion, doubtless, to the whitish transverse lines on the abdomen."

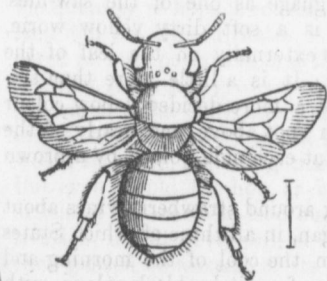
"With the facts here given, it will be no difficult matter for anyone interested to make war in his own way. The worm's habit of falling to the ground enables us to destroy them with a solution of cresylic acid soap, or any other decoction, without necessarily sprinkling the vines; while knowing that they are in the earth during the fall and early spring, when there is no fruit, the ground may be stirred and poultry turned in with good advantage."

Doubtless, also, our well-known panacea for the gooseberry sawfly, powdered hellebore mixed with water, would do as good service here as it is known to do with that pest, as they both belong to the same family and have similar habits.

[NOTE.—Since the above was in type, I have heard of the occurrence of this insect in Warwick, Ontario, and also in Brantford, Ontario, where they are said to be so numerous, that they soon strip a bed entirely of its foliage.]

11. OSMIA CANADENSIS—Cresson.

This is the name of a small hymenopterous insect, a sort of wild bee, which has proved destructive to the foliage of some strawberry plants during the past season, in the Township of Oxford. It was observed by Mr. Johnson Pettit, of Grimsby, who kindly furnished me with specimens of the insect. For the accompanying Figure 15, which



represents the female, I am indebted to my esteemed friend, Mr. E. T. Cresson, of Philadelphia, who very kindly made the drawing from which the cut was engraved. I am also indebted to him for the determination of the species. Mr. Cresson first described this species in the *Proceedings of the Entomological Society of Philadelphia*, vol. 3, p. 33. In the figure the fly is represented on an enlarged scale: the hair line at the side shows its natural length. In both sexes, the head, thorax and abdomen is green and more or less densely covered with whitish down or short hairs, those on the thorax being longest. The wings are nearly transparent, with blackish veins. The female is larger than the male.

Mr. Pettit says, "The insects were taken in East Oxford, July 2nd, on a few strawberry plants in my brother's garden. The plants, perhaps nearly 100 in number, had been nearly all denuded of their leaves, and a search in the evening having failed to reveal the authors of the mischief, I examined them again in the heat of the day, and found the little culprits actively engaged in nibbling away the remaining shreds of the leaves. They appeared to chew the fragments into a pulp and carry it away, but the little time I spent in observing them was insufficient to determine anything further respecting their habits."

Doubtless in this instance the leaves so consumed were used in the construction of suitable nests, in which to deposit the eggs and rear the young of those insects.

A STRAWBERRY BUG (*Corimelaena*—?).

The insect above referred to belongs to an entirely different order from any of those already treated of, its place being among the *Hemiptera* or true bugs, but in its general appearance it very much resembles a small beetle, and indeed it is often mistaken for one. This bug is about one-tenth of an inch long, nearly round, and of a deep shining black colour. Its habit is to puncture the stem of the fruit and thus cause it to wither. In the *Canada Farmer* for 1837, page 328, and also in that for 1868, page 189, references are made to this insect, and it would seem that about that time it was very troublesome to the strawberries in the grounds of Mr. Chas. Arnold, of Paris, Ont., but it does not appear to have continued its devastations sufficiently since then to attract much attention. Mr. Riley refers to it as occurring in the west quite abundantly in some localities.—See *Amer. Entomologist*, vol. 1, page 207. Besides being injurious to the strawberry, it is said to have affected the raspberry, the cherry and the quince.

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INSECTS AFFECTING THE HOP.

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

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| <p>1. The Hop Aphis (<i>Aphis humuli</i>, Curtis).</p> <p>2. The Hop-vine Snout-moth (<i>Hypena humuli</i>, Harris).</p> <p>3. The Semicolon Butterfly (<i>Grapta interrogationis</i>, Godt),</p> | <p>4. The Hop-vine Plusia (<i>Plusia balluca</i>, Geyer).</p> <p>5. The Io Emperor Moth (<i>Hyperchiria varia</i> Walker).</p> |
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The cultivation of the hop has never attained to any very large dimensions in Canada, though at times, when prices have been high, it has attracted no little attention amongst the farming community. Just now the acreage occupied by this plant in Ontario is probably considerably below what it was some four or five years ago, but even yet many a lovely trellised field may be seen here and there as one travels through the country. As, however, there is nothing in our climate or soil that is unsuited to the successful growth of the plant, we have little doubt that its culture will one day become an object of great and extended importance, unless, indeed, the Canadian entirely relinquishes his English taste for malt liquor in favour of the far more baneful spirits that are now a curse to so many. The present production of malt liquor in the Dominion of Canada averages nearly eight millions of gallons a year; in the manufacture of even this amount a very considerable quantity of hops is consumed, and if we add to it the quantity that is exported to England and the United States, it is apparent that the culture of this plant cannot be considered an unimportant item in the resources of the Canadian agriculturist. There is no doubt too, that if our hop growers paid more attention to the selection of the most approved English varieties for cultivation, and were more particular in regard to the picking and curing of their hops, they would be enabled to obtain much better prices for their crop, and would secure an unfailing market in Europe for all that might not be required here. But even should the hop, as is by no means likely, cease to be a sufficiently attractive article of commerce to lead our agriculturists to devote any of their broad acres to its cultivation, it will never fail, at least, to occupy a conspicuous place in the good wife's kitchen garden on account of its value in the production of yeast. Such being the case, then, we imagine that some account of the insects affecting this plant will not be out of place in these reports, and may prove of interest, and possibly of value, to many.

Before proceeding to the discussion of its insect enemies, we may remark that the common hop plant (*Humulus lupulus*, Linn.) is apparently indigenous to the western parts of this country as well as to Europe. We have seen it growing in great luxuriance and gathered sprays of its clustering flowers on the fertile banks of the Kaministiquia River, a few miles above Fort William, Lake Superior. It is said also to be found in a wild state on the borders of the Mississippi and Missouri rivers. The hops of commerce consist of the female flowers or seeds—the plant being dioecious *i.e.* with stamens and pistils in separate flowers on different individuals. The male flowers are very different in

appearance from the female, and are grown in hop yards at about the rate of six plants to an acre, for the purpose of fertilizing and maturing the hop blossoms.

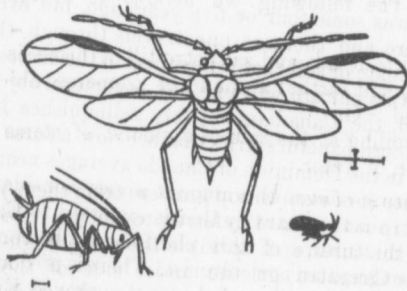
THE HOP APHIS (*Aphis humuli*, Curtis).

1. HEMIPTERA HOMOPTERA—APHIDÆ.

It would almost appear as if no catalogue affecting any particular plant could be complete without referring to some species of Aphis, or Plant-louse, so ubiquitous and destructive are these tiny creatures. We have already noticed in these reports* the particular species that infest the apple and the wheat, and have recounted the damage that they oftentimes inflict. But when we come to the Hop we find that the Aphis, or "Fly" as it is termed in England, is, *par excellence*, its greatest enemy, and that the profits of the grower depends very largely upon the presence or absence of the hordes of this minute foe. As Kirby and Spence so strongly state, "the hop-grower is wholly at the mercy of these insects; they are the barometer that indicates the rise and fall of his wealth, as well as of a very important branch of the revenue—the difference in the amount of the duty on hops (in England, being often as much as £200,000 per annum, more or less, in proportion as the fly prevails or the contrary." In this Province we have seen the produce of a field of many acres almost utterly ruined by this insect—the amount of hops produced being diminished more than one-half below the average, and the quality of that which was gathered very much impaired.

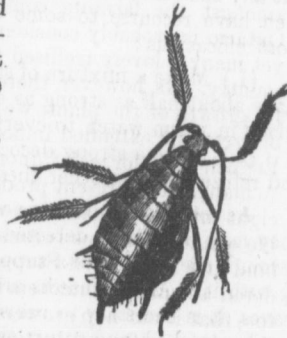
The Hop Aphis resembles very closely in size and appearance the species that infest many other plants. As we have already described similar species in these Reports (1st Report, p. 77; 2nd Report, p. 57), we need do no more than state that the enemy of the Hop is green in colour, and about one-tenth of an inch in length when fully grown. The accompanying illustrations display the shape and structure of the creature. Fig. 16

Fig. 16



represents a highly magnified winged male above; below it, on the right hand side, a male of the natural size, and on the left a magnified female. Fig. 17 represents a female on a very much larger scale. Notwithstanding the similarity in colour which exists between these

Fig. 17.



insects and the leaves and stems of the Hop-plant, their presence may be immediately detected by the blackish discolouration of the leaves below where they are at work. This is caused by the continual exudation from the insects of a sweetish fluid called "honeydew," which is emitted from the two processes that project from each side of the extremity of the abdomen. As we have remarked on a previous occasion, many insects, and especially ants, are very fond of feeding upon this sweet substance; the latter even go so far as to perform upon the Aphis an operation analogous to that of milking a cow, for the purpose of obtaining this sweet fluid. And not content with this, some species of ants make a property of these Aphis cows, jealously guarding them, and using every means to keep them to themselves. As related by Kirby and Spence: "Sometimes they seem to claim a right to the Aphides that inhabit the branches of a tree or the stalks of a plant and if stranger ants attempt to share their treasure with them, they endeavour to drive them away, and may be seen running about in a great bustle, and exhibiting

* First Annual Report—Insects affecting the apple, p. 77; Second do—Insects affecting the wheat crops, p. 57.

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every symptom of inquietude and anger. Sometimes, to rescue them from their rivals, they take their Aphides in their mouth; they generally keep guard round them, and when the branch is conveniently situated, they have recourse to an expedient still more effectual to keep off interlopers. They inclose it in a tube of earth or other material, and thus confine them in a kind of paddock near their nest, and often communicating with it."

Another curious and noteworthy fact in the history of Aphides is their occasional migration from one place to another in enormous swarms. Nearly a century ago Gilbert White observed at Selborne, in Hampshire, a shower of Aphides, which covered persons walking in the street, hedges, garden plants, and everything else that came in their way; he considered that they were borne by the east wind from the great hop fields of Kent and Sussex. Kirby and Spence mention similar swarms in the vicinity of Ipswich in 1814, and at Hull in 1836. To come to later times, Mr. Knaggs relates (*Entomologists' Monthly Magazine*, No. 5, p. 123) that on the 14th of July, 1864, "whilst walking along the beach from Bournemouth towards Poole, a strange mossy-looking, green track, which varied in width from one to three or four inches, arrested my attention; this moss-like line, left at high-water mark by the tide, extended, so far as my observation went, for a mile, though probably to a far greater length, and consisted of millions upon millions of Aphides." The following year, it is stated by Mr. Haswell (*Ent. Mag.*, No. 18, p. 142) that the Aphides were a perfect pest in Edinburgh and other parts of Scotland in September and October; they swarmed over everything even in the streets of cities, and to such an extent that "they rendered one very uncomfortable by their numbers, especially when they got into one's mouth or eyes!"

The numbers and devastating powers of the Hop Aphid being so great, it becomes necessary oftentimes to apply some artificial remedy in order to save the crop from entire destruction. In parts of England where the labour of women and children can be obtained at a cheap rate, it has been recommended to clear the plants of insects by hand; but any such mode of dealing with them is quite out of the question in Canada. We must then have recourse to some other expedients. The following we believe to be the most efficacious:

(1.) Make a mixture of strong soap-suds; add to it salt and saltpetre till a brine is made about half as strong as ordinary beef pickle; add further a pound of copperas dissolved in warm water to every five gallons of liquid. Or

(2.) Make a strong decoction of tobacco by boiling at the rate of a pound of stems and refuse parts, or other cheap tobacco, to a gallon of water.

As soon as the insects are observed on the vines (or *bines*, as hop-growers term them,) they may be at once detected by the discolouration that we have referred to above. Go through the rows with a supply of either of these mixtures, and sprinkle them thoroughly with it. As the insects are for the most part congregated on the under side of the leaves, it is necessary to use a strong syringe, or better, a small garden engine with a rose-nozzle attached, and squirt the liquid upon the insects from beneath. Constant watchfulness and a diligent application of these means will keep a hop-yard clear of these insects, without incurring any very great expense. The modern system of training the vines upon horizontal trellises, instead of long poles, renders easy the successful employment of this method.

Another remedy that has been highly spoken of is the dusting of the affected plants with powdered plaster, which not only kills the Aphid, but is of benefit to the soil as well. Instead of plaster, sulphur, or lime may be employed with advantage, the former being especially useful also as a preventative for mildew.

In addition to the use of the artificial remedies just referred to, much benefit may be derived from the encouragement of various insects that prey almost exclusively upon the various species of Aphid. As we have before stated, when giving an account of the enemies of the Grain Plant Louse (*2nd Report*, p. 58), "the most common and useful are the different species of Lady-birds (Fig. 18); the Lace-wing Flies (*Chrysopa*), both in their perfect state (Fig. 19), and in their larval condition (Fig. 20);



FIG. 18.

the Syrphus Flies in their larval state (Fig. 21); Fig. 22 represents a winged Syrphus Fly; Dragon Flies, &c.; all of which should be heartily encouraged by the husbandman."

It is a singular fact that the Lady-birds (*Coccinellidæ*), the first mentioned of the foes of the Aphis, occurs at times in immense swarms, like those of its prey to which we have already referred. Vast numbers of these little beetles are sometimes found on the shores of lakes



FIG. 20.



FIG. 21.



FIG. 22.



and rivers, and along the sea coast. Kirby and Spence state that "many years ago the banks of the Humber in England were so thickly strewn with the common Lady-bird, that it was difficult to avoid treading upon them." On another occasion they were observed in vast numbers on the sand-hills of the seashore in Norfolk; again they covered the cliffs of Kent and Sussex, "to the no small alarm of the superstitious, who thought them forerunners of some direful evil!" In the summer of 1870, they were observed in various parts of England in countless numbers, while some other places were visited by swarms of Syrphus Flies—another enemy to the Aphis. The sudden appearance of all these creatures is accounted for by the supposition that the simultaneous hatching of a large number in one locality caused a scarcity of food there, and compelled many of them to move elsewhere. On coming to some obstruction, such as the sea, they would accumulate in masses and so attract general attention. In *Newman's Entomologist* (No. 73, p. 16), it is stated that during the prevalence of the swarms of Lady-birds in 1870, "Mr. Jansen had an apple tree completely covered with black aphides, the whole of which were cleared off in three or four days by *Coccinella septempunctata*."

We trust that all who read these Reports,—farmers, gardeners, and hop-growers especially—will make it a rule never to destroy any of these most useful little creatures, and will also impress upon all connected with them the importance of following their example in this respect.

2. THE HOP-VINE SNOUT-MOTH (*Hypena humuli*, HARRIS).

LEPIDOPTERA PYRALIDÆ.

Next in destructiveness to the Hop-aphis comes, in this country, the Snout-moth; at times, indeed, it more than rivals in its injuries the other noxious insect. In the month of June, earlier or later according to the season, the Hop-grower may frequently observe the leaves of many of his vines riddled with holes, or eaten down to the ribs. On inspection, he finds a small caterpillar at work, pale green in colour, with a dark, almost blackish longitudinal stripe on the back, and two narrow white lines on each side. Sometimes these lines are wanting. The body is long and slender, with its wings or segments very prominent; each segment is furnished with two transverse rows of black dots, from each of which proceeds a short hair. The head is rather deeply divided into two lobes, and is covered with similar dots and hairs; the mouth is yellowish, with the jaws tipped with black. Unlike the majority of caterpillars, this creature is furnished with only seven instead of eight pairs of legs, being destitute of the first pair of pro-legs beneath the middle of the body. The result of this deficiency is that the caterpillar is obliged to loop itself up to a slight extent when crawling, though not to the same degree as the Geometer or measuring worms, (*Geometridæ*). When fully grown it is over half an inch in length. It is a particularly active creature, and when disturbed jerks its body from side to side, and leaps from one spot to another; it is also able to let itself down

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from its leaf by a fine silken thread. After it has attained to maturity it descends to the ground, and crawling into any crevice or other place of concealment, forms a slight silken cocoon and changes into the chrysalis state.

FIG 23.



In this condition it remains for a fortnight or three weeks, and then comes forth at the end of June or early in July as a dusky brown moth, measuring an inch and a quarter across its expanded wings. The forewings are marbled with gray beyond the middle, and have a distinct gray spot on the tip; they are crossed by two wavy blackish

lines, one near the middle and the other near the outer hind margin. These lines are formed by little elevated black tufts, and there are also two similar tufts on the middle of the wing. The hind wings are dusky brown or light brown, with a pale fringe, and are without bands or spots."—(Harris). A peculiarity of the insect, from which it derives its common name of "Snout-Moth," is that it has a pair of very long and slender compressed palpi or feelers, which project from the head in the form of a snout. The accompanying wood-cut (Fig. 23) represents the creature in all its stages. There are two broods in the year; the caterpillars of the second appear in July and August, and attain to the imago state in September.

This insect is rather variable in its appearance, but is oftentimes excessively destructive. In 1869 we observed two Hop-yards in the County of Peel almost ruined by it, while in the preceding and succeeding years no great number of the caterpillars was to be seen. Dr. Fitch considers it "the most universal and formidable of the depredators of the Hop, making its appearance suddenly, in a few days sometimes, and before their presence is noticed completely riddling and destroying the leaves of whole fields." In Europe there is a similar insect, termed the Beaked Snout-Moth (*Hypena Rostralis*, Linn), which may be identical with our species; probably, indeed, our insect, like so many of our greatest pests, has been introduced from the other side of the Atlantic.

The most approved remedy for the insect is to drench the vines with strong soap-suds. To shower them with powdered white hellebore mixed in water—an ounce of the drug to a pailful of water—would, we should think, be even more effective. Much might also be done by jarring the poles among which the Hops are entwined, and crushing under foot all the caterpillars that fall to the ground.

3. THE SEMICOLON BUTTERFLY. (*Grapta interrogationis*, GODT.)

LEPIDOPTERA—NYMPHALIDÆ.

The two species already described are by far the worst insect enemies that the hop-grower has to deal with. The others to which we now desire to draw attention are seldom found in sufficiently large numbers to cause much alarm, though at times their depredations are somewhat serious, especially when they attack a few hop-vines in a garden.

The species before us, the Semicolon Butterfly (*Grapta interrogationis*, Godt), is a large handsome insect, with wings above of a tawny orange colour, spotted with black and brown; beneath, the wings are in some specimens rusty red, in others marbled with red and brown tints; in the middle of the underside of the hind wings there is a conspicuous silvery mark, shaped like a small semicolon (;), from which the species derives its name. The modern semicolon is employed in the Greek language as the mark of interrogation; hence both common and technical specific names have the same meaning and refer to the same characteristic. The wings of this butterfly measure, when expanded, as much as two and a half to three inches. There are two broods of them in the year, the first late in June, the other in August.

The larva feeds upon the leaves of the elm and basswood, as well as upon the hop. When partially grown, in the early part of August, it is thus described by our friend Mr. Saunders:—"Length, half an inch. Head black; body above, black, with transverse

*Canadian Entomologist, vol. 1, p. 76.

rows of branching spines, those on the third, fourth, and terminal segments black, with a row of the same colour along each side, close to the under surface; all the other spines pale whitish. Under-surface nearly black, with dots of a pale hue." When fully grown, and an inch and a quarter in length, Mr. Saunders describes it as follows:—"Head reddish black, flat in front, somewhat bilobed, each lobe tipped with a tubercle, emitting five simple black pointed spines; head covered with many small white tubercles mixed with a few blackish ones. Body above, black, thickly covered with streaks and dots of yellowish white. All the segments, except the second, with either four or seven branching spines yellow with blackish branches. Under surface, yellowish grey; feet, black and shining; pro-legs, dull reddish."

The chrysalis is ashy-brown in colour, with the head deeply notched, and surmounted by two projections resembling ears; on the thorax is a long, nose-like prominence, giving the creature the appearance of a grotesque mask; and on the back are eight silvery spots. It is suspended by the tail, frequently under the leaves of the plant, at other times under any convenient projection. In this state the insect remains from twelve to fourteen days; the later brood usually somewhat longer.

This insect is greatly kept in check by a minute parasite belonging to the family of Ichneumonids; it is called by Dr. Harris the *Pteromalus Vanessa*. We have oftentimes been disappointed in our attempt to raise the butterfly of this species by this little fly. Everything apparently goes on well, and the caterpillar assumes the chrysalis state, but by-and-by, instead of a butterfly, out comes, through a hole in the side, a swarm of tiny flies. If it were not for these creatures the caterpillar would soon become a most formidable and destructive pest.

Fig. 24.



There are two other species of American Butterflies, whose larvæ feed upon the hop; one, not uncommon in Canada, the Comma Butterfly (*Grapta Comma*, Harris), is like the preceding species, in general appearance and habits; instead of a semi-colon, it has a silvery comma on the middle of the hind-wings beneath.

Fig. 24 represents this butterfly.

The caterpillar feeds also upon the currant and elm. The other species is the Hop vine Thecla (*Thecla humuli*, Harris; *melinus*, Hubner). It ranges from the New England States to Texas and California, but we are not aware that it has yet been taken in Canada.

4. THE HOP-VINE PLUSIA (*Plusia balluca*, GEYER).

LEPIDOPTERA-PLUSIDÆ.

The larva of this very handsome moth feeds upon the hop, and is occasionally found in some numbers; seldom, if ever, however, is it so numerous as to become a source of serious trouble. It is essentially a Canadian insect, being but very rarely observed to the south of us.

The larva was found by Mr. W. Saunders, of London, Ontario, on the 13th of June, 1872, and is thus described by him in the January No. (1873) of the *Canadian Entomologist*:

"Length, 1.20 inch. Body, thickest on middle, and posterior segments tapering towards the front; the body is arched or looped along the middle segments, when in motion.

"Head rather small, bilobed, of a shining green colour, with a few whitish hairs.

"Body above yellowish green, streaked and spotted with white, intermixed all through with green, thus dividing the white into a series of streaks, dots, and broken lines; there is also a line of greenish white on each side, close to the under surface. Each segment has a few tubercles of a green colour, striped with white; these are small on the 2nd, 3rd, and 4th segments, but much larger from 5th to 12th inclusive, and entirely wanting on the terminal segment. On each of the hinder segments, with the exception of the last,

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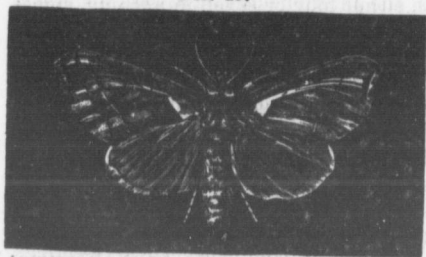
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there are ten or twelve of these tubercles, which almost cover the whole surface, and from each of the tubercles throughout there arises a single whitish hair.

"The under surface is of a deeper green than the upper, with a few short whitish hairs, chiefly on 5th, 6th, 7th, 8th, 11th and 12th segments; feet, green; pro-legs, of which there are three pairs, green also.

"This larva became a chrysalis on the 18th of June, and produced the moth on the 13th of July."

FIG. 25.



The Moth (Fig. 25), into which this caterpillar turns is a remarkably handsome creature; the fore-wings are almost entirely covered with brilliant metallic green scales, darker below the middle, and paler towards the inner angle; they are crossed by two oblique dark lines. The hind-wings are a dusky grey, without markings. The wings expand about an inch and three quarters. We have usually taken the moth in the month of August, and have found it in various parts of this

Province.

As this species is seldom numerous, it is unnecessary to suggest any remedy. In all probability its numbers are prevented from becoming excessive by some insect parasite.

5. THE IO EMPEROR MOTH (*Hyperchiria varia*, WALKER).

Automeris io Fabr.

LEPIDOPTERA-SATURNIADÆ.

Besides the foregoing, there are two other insects that affect the hop-vine, respecting which we would say a few words before leaving this subject. One of these is so very general a feeder that it can hardly be termed a Hop insect; it is the larva of what is commonly known as the Io Emperor-Moth, of Harris (*Hyperchiria varia*, Walker). It feeds indiscriminately upon the leaves of willow, elm, white poplar, cornel, sassafras, cherry and locust, as well as the Hop; it is even said to eat clover and the leaves of Indian corn. When first hatched out, the caterpillars are dark brown, and covered with bristles; later on, when about a third of an inch in length, their general colour is black, the body being entirely covered with long sharp branching spines, and having two reddish white lines along the sides. When fully grown, they attain to a length of two and a half inches, and are of a delicate yellowish green colour, with a reddish lateral band, not extending the whole length of the body towards the head; the spines are then of a pale yellowish green colour, and have an irritating property, like that of the stinging nettle. Specimens that we have reared formed their cocoons in September, and appeared in the perfect state in the following June. The Moth varies very much in the two sexes, but both are remarkably handsome. The male is of a deep yellow colour, with a few darker lines across the fore-wings; the hind-wings are broadly bordered with purplish red next to the body, and have in the middle of each a large and beautiful eye-like blue spot. The female, which is usually larger, has its fore-wings, of a purplish brown colour, with grey transverse lines, and its hind-wings coloured like the male, and with a still larger eye-like spot.

The insect is quite common throughout Canada and the Northern States, but never so numerous as to be considered destructive. The Moth is one of our most beautiful species.

One other insect, to which we just now referred, is one of which we do not know the name, as we have only seen it in its larval state.

On the 27th of June, 1868, about a pint of larvæ were sent us by Mr. Wm. Magrath, of Erindale, Credit, which he had taken from the roots of his hop-plants. They fed upon the crown of the root, at its junction with the stem, and ate out a roundish cavity in it;

two or three often worked together at the same root. We endeavoured to rear them to the perfect state, but did not succeed, and have never had an opportunity since. We give a full description of the larva taken at the time, in the hope that some of our readers may be able to identify it.

Length, 1.25 to 1.50 inch. Ground-colour, dirty white; head, chestnut-colour; mandibles, black. Body, with a pale narrow dorsal line; first segment above, with a glassy shield-like patch, dirty yellow, with a black edge in front; below this, on each side and above the first pair of legs, two black shining dots, the anterior one larger than the other, which contains the spiracle. On each side of the dorsal line, a dusky lilac stripe; and on each segment a darker flat wart in front, and a blackish dot behind, on the lower side of the stripe. Next, a pale line, broader than the dorsal line; a lilac line of the same width; another pale line; a lilac tubercled stripe, having on each segment a black-tipped wart in the middle above, a tiny black dot lower down, behind it the shining black spiracle, and then another black-tipped wart; next, a pale stripe, with a black wart on each segment, except the first and the tenth, which have each two small warts; below this another faint lilac stripe, along the top of the pro-legs. The anal segment shining black above, white elsewhere; and pro-legs blackish exteriorly. From each of the warts alluded to there proceeds a single dark bristle. The larva has its full complement of sixteen legs.

The more mature specimens have the lilac stripes more obscure, and the black warts, therefore, more conspicuous; while the less mature specimens have the lilac stripes much more developed and spot-like on the segments, rendering the black warts much less apparent.

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INSECTS INFESTING MAPLE TREES.

BY E. B. REED, LONDON, ONT.

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| <ol style="list-style-type: none"> 1. The Maple Borer or Beautiful Clytus (<i>Clytus speciosus</i>, Say). 2. The Rosy Forest Caterpillar (<i>Dryocampa rubicunda</i>, Fab.) 3. The American Silkworm (<i>Telea polyphemus</i>, Linn.). 4. The Cecropia Emperor Caterpillar (<i>Platysamia cecropia</i>, Linn.). | <ol style="list-style-type: none"> 5. The Maple Owlet Moth (<i>Apatela Americana</i>, Harr.). 6. The Banded Maple Moth (<i>Ophiusa bistriaris</i>, Hubner). 7. The Maple Leaf Cutter (<i>Ornix acerifoliella</i>, Fitch). 8. The Maple Measuring Worm (<i>Stegania pustularia</i>, Guènee). |
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The cultivation and protection of our forest trees is a subject which is, as each succeeding year rolls by, being slowly but forcibly brought to the notice of our Canadian agriculturists.

The rapid destruction of timber trees for fuel and building purposes, and the very evident effect that is being gradually produced on our climate and soil, added to the lessons that experience in other countries affords, ought certainly to attract the attention of every well-wisher to our future prosperity. Whilst the forests of Canada are justly a source of much pride and material wealth to the community, the Maples amongst all our native trees are perhaps the best known and the most highly and widely esteemed.

Admirably adapted for shade and ornamentation, whether for garden, park, or field, most excellent for fuel, exceedingly beautiful when worked up by the cabinet maker, and especially valuable for their saccharine matter, the Maples surely stand preëminent among our native Canadian forests.

It is, therefore, very desirable that we should examine and learn something of the habits and history of any insects whose depredations would affect the growth or well-being of these beautiful trees.

Clytus

1. THE MAPLE BORER (*Clytus speciosus* Say).

Order, COLEOPTERA ; Family, CERAMBYCIDÆ.

This destructive insect belongs to a family of beetles known as the Long-horns or Capricorns, the grubs or larvæ of which are all borers, penetrating with ease the hardest timber, and causing immense devastation amongst the respective trees which they severally affect.

In consequence of their habits, which are exceedingly varied, the proceedings of the larvæ are difficult of observation, some living altogether in the main trunk of trees, while others attack the branches only, some devouring the wood, others the pith.

The number of species in this family is very large, and there is hardly a single kind of tree that is exempt from the attacks of one or other of these Borers.

The Maple Borer or *Clytus speciosus* was first observed and described in its beetle state by Mr. Thomas Say, in 1824. It is a very beautiful insect, and may readily be distinguished by its brilliant black and yellow colours, giving it much the appearance of

a large hornet, so much so, indeed, that very few persons except Entomologists would at first sight care to touch it. In England there is a similar but smaller beetle, *Clytus arictis*, popularly known as the Wasp beetle, a member of the same family as our Maple Borer. The latter, when arrived at its perfect state (See Fig. 26), varies from 9 to 12 tenths of an inch in length, and from 3 to 5 tenths in width. The head is yellow and furnished with powerful mandibles or jaws; the eyes and a band above them extending across the head are black; the antennæ or horns are also black, and are curved somewhat after the fashion of those of a goat, a similarity which gave rise to their general name of *Capricorns* or goat-horns. The thorax is deep black, with two yellow oblique stripes on each side; it is very large, somewhat globular, and flattened or depressed above. The body is deep black, oblong, somewhat cylindrical, a little flattened above, and tapering behind. The elytra or wing covers have yellow bands, the first of which forms a regular arch, of which the keystone is composed of the yellow scutellum and a little shield-shaped spot at the top of the wings, just behind the centre of the thorax; the second band is in the form of the letter W, each V receiving a termination of the first band; the third band is nearly transverse, and placed across the middle; the fourth is bent obliquely backward, parallel with and near to a large terminal spot or band, which latter has a large black central spot on each wing case.



FIG. 26.

Colours—Yellow & black.

The elytra are each tipped with a short blunt tooth. The legs are long and yellow, with a brown line on the inner side of the thighs; they are made for standing securely, being very broad, and with the third joint deeply notched. The underside of the abdomen is reddish-yellow, variegated with brown. Figure 26 represents the male. The female is larger and stouter than the male, and has rather shorter antennæ. She may also be easily distinguished by having a jointed tube at the end of the abdomen, which is capable of being extended or contracted at will, and is used for the purpose of conveying the eggs into the crevices or holes of the bark of the trees. These insects emit a shrill, screeching noise on being handled or disturbed. This noise is caused by rubbing the joints of the thorax and abdomen together.

The beetles may generally be seen reposing quietly on the trunks of the trees during the day time, as they are more active at night, which period they select for their excursions in search of their mates. According to Mr. Harris, the beetle lays its eggs on the trunk of the maple in the months of July and August.

The larvæ hatched from these eggs are long, whitish, fleshy grubs, with deeply marked transverse incisions on the body. Their legs, which are six in number, are only rudimentary and are of no service in locomotion; it is by means of the alternate contraction and extension of the rings or segments of the body that these little creatures force their way through the wooden tunnels in which they live, and in order to further assist their progress each segment is furnished with fleshy tubercles capable of protrusion, and which, being pressed against the sides of their retreats, enable them to thrust forward by degrees the other segments. As the grub has to feed upon very hard material it is provided with strong horny jaws, and the head, which is slightly bent downwards, is also covered with a strong horny skin. The grubs penetrate the bark, under which they lie dormant during the winter, and in the succeeding spring and summer they pierce further in, running long winding galleries up and down the trunk. The larvæ probably remain more than one year in this condition and then change into pupæ, in which state they are at first whitish and very soft, but gradually harden and darken until the time arrives when the beetle is perfectly matured, and forcing a passage through the outer bark, near which it has instinctively eaten its way whilst yet a grub, emerges into the open air.

Although the attacks of these beetles are not as yet of any great extent, still in some localities they have done a good deal of harm. In and near London, especially, we are aware of many fine and valuable maples, chiefly the hard or sugar maple, *Acer saccharinum*, that are being gradually destroyed by the operations of these insects. Their attacks can readily be detected by the sawdust and exuviae that they cast out of their burrows, and in the spring, whilst still near the surface, it is quite possible to kill them by means of a stout piece of wire, or the judicious use of a good sharp knife.

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2. THE ROSY FOREST CATERPILLAR (*Dryocampa rubicunda*, Fab.)

Order, LEPIDOPTERA ; Family, DRYOCAMPA.

The last described insect, as we have seen, attacked the wood only of the trees, but the insects we are about to treat of devour the leaves, and by their attacks on the young buds materially affect the growth of the young maples.

The name *Dryocampa*, signifying oak or forest caterpillar, was originally applied by the late Dr. Harris, the talented Entomologist of the State of Massachusetts, to certain insects found sometimes in great numbers on oak trees, and of which one species, *Dryocampa senatoria* is exceedingly common in the larval state. The Ruby Forest Caterpillar, however, is generally found on the silver maple, *acer dasycarpum*, or the swamp maple, *acer rubrum*.

The caterpillars are hatched about the month of July, and their presence may often be detected by their droppings on the ground beneath the trees, although it is not always easy to discover the insect itself. Mr. William Saunders has bred the moth from the larva, and we therefore avail ourselves of his description published in the *Canadian Entomologist*, Vol. II., page 75.

The larva when full grown is about one inch and three quarters long. The head is rather small, flattened and bilobed in front, of a pale orange colour, and having a black dot on each side below, near the mandibles or jaws. The body above is yellowish white, with a stripe of rather indistinct pale green on the back, and three stripes of the same hue on each side. *The third segment has two black horns fully one tenth of an inch long, one on each side of the dorsal stripe, and spreading outwards.* On each segment are several black dots or tubercles, those on the twelfth and thirteenth segments being the most distinct. On the sides of the posterior segments is a pale reddish, orange patch, nearly the colour of the head. The under surface is deep, glossy green, with a faint whitish line down the middle, and many small blackish dots or tubercles. The feet are pale reddish ; the pro-legs pale green, dotted with black.

The larvæ having arrived at maturity seek shelter in the ground, and there undergo their transformation into the pupal state, remaining thus all the winter and spring, and emerging as perfect moths the following summer. The method by which the apparently inanimate pupa effects its escape has been well described by Dr. Harris in writing of a very similar insect—the *Dryocampa imperialis*: “The Chrysalis is rough with little elevated points, particularly on the anterior extremity, and ends behind with a long forked spine, and is surrounded on each ring with a notched ridge, the little teeth of which point towards the tail. Three of the grooves or incisions between the rings are very deep, thus allowing a great extent of motion to the joints, and these with the notched ridges and the long spine at the end of the body, enable the chrysalis to work its way upwards in the earth above the surface of which it pushes the fore part of its body just before the moth makes its escape.”

Fig. 27.



Colours—Pale yellow and rose.

The perfect insect, of which Fig. 27 represents the male, is a very beautiful and delicately coloured creature. The forewings are rose coloured crossed by a broad pale yellow band ; the hind wings are pale yellow with a short rosy band behind the middle, this in some specimens especially males is wanting ; the body is yellow ; the abdomen and legs are rose coloured. The male expands about one inch and three quarters, while the female reaches fully two inches, the body of the male does not extend beyond the hind wings as does that of the female. The antennæ of the latter are simple and thread like in form while those of the male, as will be seen on referring to the figure, are deeply pectinated or comb shaped to much beyond half their length, and minutely serrated or saw-shaped from thence to the tips. Dr. Harris conjectured that sometimes two broods might occur in the season ; as in 1842, he captured specimens of the larvæ in July which produced the moth in August, and in September following, he took many more caterpillars. He, however, accounted for this on the ground, “that all insects have their periods of increased numbers which in some instances may be unfixed

and irregular, but in others their periods of numbers are as fixed and regular as that of the seventeen year locust.

For young trees which are easily accessible the caterpillars may be collected by hand and destroyed.

As the moths, being night fliers, are not very often seen, it might be a good idea to try the entomologist's plan for collecting moths viz: Placing a piece of rag saturated with sugar at night on the trunk of the tree, and visiting it occasionally with a lantern, and capturing with a net any of the moths that are sure to be found feeding on the attractive sweets.

3. THE AMERICAN SILK WORM (*Telea Polyphemus*, Linn.)

Order, LEPIDOPTERA ; Family, BOMBYCIDÆ.

Fig. 28.

Female.

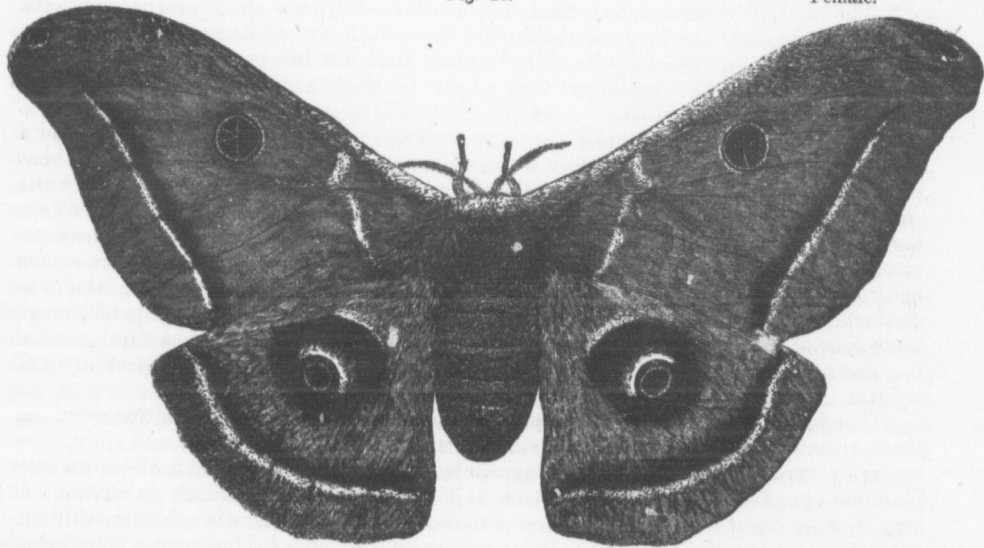
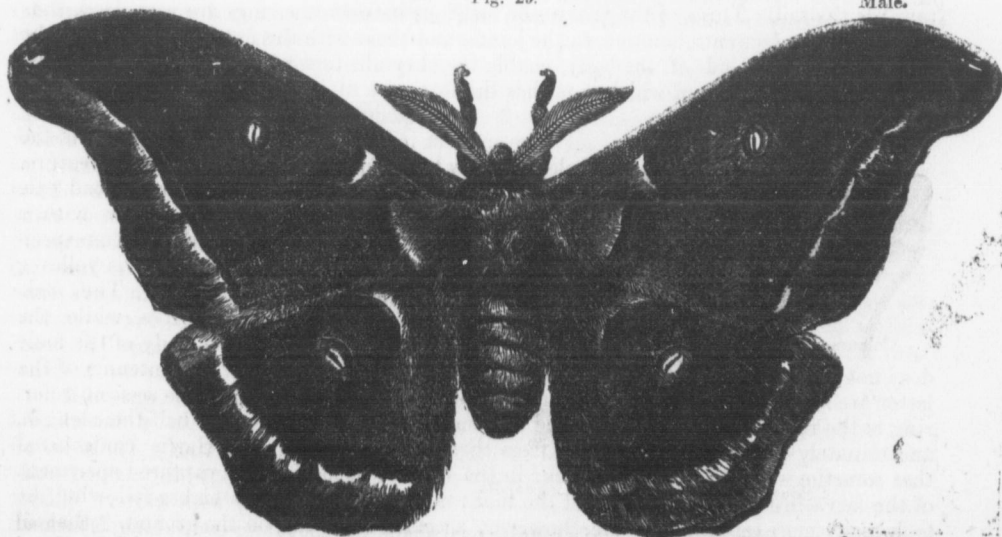


Fig. 29.

Male.



Colours—Dull ochre yellow—purplish bands and eyes.

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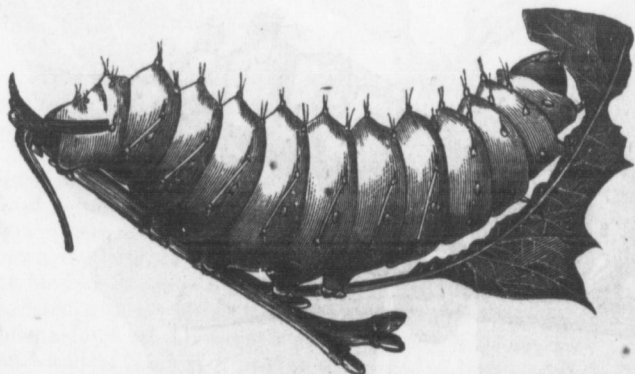


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This magnificent insect belongs to the same Family as the well known Chinese Silk Worm, *Bombyx mori*. It has received the especial name of THE American Silk Worm, because for all practical purposes it is the only American silk-spinner now known that can be rendered of any commercial value. For many years *Sericiculture* or the art of raising silk producing insects, has been very seriously threatened with great loss if not entire destruction by the various epidemic diseases that affect the Mulberry silk-worm. Much attention has therefore been paid lately towards acclimatizing in Europe and elsewhere, other silk producing Bombyces in order to supersede if necessary the mulberry species. *Telea Polyphemus* being found easy of propagation, its whole history is well known and we, therefore, purpose to give our readers a detailed account of its various transformations, the more especially as it is a tolerably common insect and from its size and splendid appearance both as larva and moth, it is sure to attract attention and excite the curiosity of those who see it. Hitherto it has been supposed to feed only on oak, and those who have bred it in large numbers for the silk market have raised it exclusively on oak leaves, but it, nevertheless, frequently attacks the maples and from the enormous size of the caterpillar and its voracious appetite, a great deal of damage is often done. Figures 28, 29 are admirable illustrations of the perfect moth, male and female. Dr. Harris thus describes its appearance: "Its wings are cut off almost square at the corners. It is of a dull ochre-yellow colour more or less clouded with black in the middle of the wings, on each of which there is a transparent eye-like spot, divided transversely by a slender line, and encircled by yellow and black rings; before and adjoining to the eye spot of the hind wings is a large blue spot shading into black; near the hinder margin of the wings is a dusky band edged with reddish white behind; on the front margin of the fore wings is a gray stripe which also crosses the fore part of the thorax, and near the base of the same wings are two short red lines edged with white." On the under side the colours are paler, but the bands are more distinct. The antennæ are broad especially in the male and deeply pectinated. The wings expand from five to six inches. When at rest the wings are held elevated above the body like those of a butterfly, but if disturbed they are spread out flat, both pairs being displayed. The moth usually flies towards dusk or in the early part of the evening. The moths make their first appearance about the month of June. The female lays a large number of eggs; she deposits them on the underside of the leaves leaving but a single egg in each place.

Mr. L. Trouvelot, in an admirable article in the *American Naturalist*, has given a very interesting account of his success in raising large broods of these caterpillars, having had in 1865, five acres of woodland swarming with insect life, numbering not less than a million. According to him "the incubation of the egg lasts from ten to twelve days." The caterpillar eats its way out of the egg, the shell of which it devours. The Larva (Fig 30) attains its maturity in about 70 days, having changed its skin five times during that period.

FIG. 30.



Colour—Pale, bluish green—orange spots.

It is about three inches in length, though it has a peculiar fashion of contracting its body, and hunching up its segments, when not in motion. Its colour is pale bluish green. The segments are covered with orange or reddish warts, or tubercles which have a pearly lustre, and are furnished at their extremities with a few hairs. The head and feet are brown, and the tail or anal segment is bordered with a brown V-shaped line. The sides of the body are striped obliquely with white.

The cocoon, (Fig 31) which is of a regular oval shape and about two inches long, is formed

FIG. 31.



by fastening together a few leaves with silken threads, in the interior of which the larva spins a second strong and very close cocoon in which it changes into the pupa (Fig 32). These cocoons fall with the leaves in the autumn, and remain on the ground during the winter, until the perfect insect emerges. The pupa is very thick and short, and shows very clearly the antennæ and wings. The larva takes about a week to complete its cocoon. The silk of which the inner one is formed is very glossy, rather coarser than that of *Brombyx mori*, and according to M. Trouvelot, can be used very extensively in commerce. It has a continuous thread and can be readily unwound. We are not aware what the actual length of the silk in each cocoon amounts to, but it must be something very great, if one may judge it by comparison with that of the Chinese silk worm. Rennie, in his *Insect Architecture*, in speaking of the latter states, "that the length of the unbroken thread in a cocoon varies from six hundred to a thousand feet; and as it is all spun double by the insect, it will amount to nearly two thousand feet of silk, the whole of which does not weigh above three grains and-a-half; five pounds of silk from ten thousand cocoons is considerably above the average." When we see the enormous difference in size between the cocoons of *Polyphemus* and *mori*, we can well believe that it may be very advantageous to the silk grower, to do all he can towards developing the experiments already made in the culture of our American silk worm. We must not forget, however, that amongst our ornamental and forest trees the larva is capable of doing much harm, and in the present instance we can only regard it as a noxious insect, and therefore one to be destroyed. Like everything else in the insect world, it has its special enemies, being very subject to the attacks of an Ichneumon fly, named *Ophion Macrurum*. Hand picking is the only remedy we are aware of.

FIG. 32.

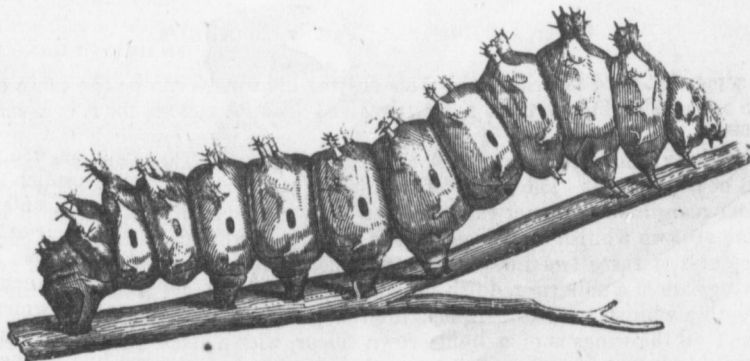


4. THE CECROPIA EMPEROR CATERPILLAR. (*Platysamia cecropia*, Linn.)

Order, LEPIDOPTERA ; Family BOMBYCIDÆ.

This insect was fully described by the Rev. Mr. Bethune, in his treatise on insects injurious to the Apple, contained in the Commissioner's Report, for 1870, to which we refer our readers for further details. As the caterpillar feeds also on maple leaves we have given a figure of it, No. 33.

FIG. 33.



Colours—Green, blue, yellow and red.

Mr. Bethune well describes it as a giant among caterpillars. It is about four inches long when full grown. The colour of the body is pale green, and it is covered with tuber-

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cles of green, blue, yellow and red colours. It spins a cocoon in a manner similar to *T. Polyphemus*, which it much resembles in its habits save that the cocoon remains attached to the trees. The larva is subject to the attacks of a parasitic *Tachina* fly. Mr. Bethune states that the most effective remedy is to go round the orchard or garden in the winter, and cut off the cocoons which are so large and conspicuous as to be at once seen.

5. THE MAPLE OWLET MOTH. (*Apatela Americana*, Harr.)

Order, LEPIDOPTERA ; Family, NOCTUIDÆ.

During the later portion of the summer months and early in the fall, the caterpillar of the owlet moth may often be met with. It is about three inches long at maturity, the upper side of the body is greenish-yellow, and covered with long soft yellow hairs, with four long slender erect tufts of black hairs, two on the fourth and two on the sixth segments, and a long single tuft on the eleventh segment; the head, last segment, and all the under side, including the feet, are black. During repose it remains curled up sideways. Dr. Harris writes that "when about to make its cocoon, it creeps into chinks of the bark or into cracks of fences and spins a loose half-oval web of silk, intermixed with the hairs of its body; under this it then makes another and tougher pod of silk, thickened with fragments of bark and wood, and there when its work is done changes into a chrysalis, in which state it remains till the following summer." The perfect moth expands about three inches. The fore wings are light gray—near the outer margin there is a wavy scalloped whitish line, edged with black, and there are various black lines and streaks edged in the same way; as are also the reniform or kidney shaped spots in the middle of the wing. The outer edge of both fore and hinder wings is fringed with wavy black and white spots. The hind wings are of a rather darker shade of gray in the males, while those of the female are more dingy or reddish brown. All the wings are whitish and shining on the under side, with a black wavy, curved band and a central semi-circular spot on each, the fringes are the same colour as on the upper side. The body is reddish brown above, and much lighter in colour on the under side. The four wings have the peculiar mark resembling the Greek letter " ψ ," though not so distinctly as in "*Acronycta Psi*," whose history we related in the report for 1870, when treating of the plum. The Thorax is very thick, with prominent collar and shoulders.

The family name of this moth is given to it from its nocturnal habits, having been named by the great entomologist Linnæus from "*Noctua*," the Latin word for an owl. The maple owlet is the largest of our American species. It is very similar to, and has sometimes been mistaken for *Apatela Aceris*, the maple moth of Europe, although the larvæ do not bear any resemblance to each other.

6. THE BANDED MAPLE MOTH (*Parallela Ophiusa bistriaris*, Hubner.)

Order, LEPIDOPTERA ; Family, NOCTUIDÆ.

It is somewhat hard to believe that this elegant little moth can be the cause of any mischief to our maples, but we must not be deceived by appearances, for it is a veritable enemy.

The moth expands about one inch and three-quarters. The wings are large, and clearly and neatly shapen. The colour of the forewings is a rich chocolate brown, with a broad lighter margin on the outer edge, with a wavy scalloped line dividing it lengthways; there are two whitish lines edged on the inner side with a deeper shade of chocolate brown, the outer of these two lines forms the inner side of the marginal broad border; the hindwings are of a uniform reddish brown, with two indistinct transverse lines and bordered with a whitish fringe, margined interiorly with a scalloped black line. The under side of all the wings is of a light brown colour, with a black wavy transverse line and a central black spot in each wing, and a broad whitish border with blackish scalloped margin, and a fringe; the body is the same colour above as the fore wings; the head is thickly clothed with deeper red collar; the feelers are erect and prominent.

The larva has been bred by Mr. William Saunders from the Silver Maple, *Acer*

dasy carpum, and we give the following condensed description from his notes published in the *Canadian Entomologist*, vol. ii. p. 130.

A number of specimens were taken late in July. Their length was 1.40 inches; somewhat onisciform. The head was medium sized, flattened and bilobed; of a pale, ashen gray colour, a dark brown stripe on each side, and a few short gray hairs scattered on its surface.

The body above is brownish grey, with numerous streaks and dots of pale brown; a double irregular dorsal line widening here and there throughout its entire length. There are many other broken lines of the same character, composed chiefly of dots, but none of them continuous. On the hinder part of the twelfth segment is a raised crescent shaped line, edged behind with black, and on the terminal one two whitish dots, with a small patch of black at their base. The spiracles, or breathing pores, are pale, oval, edged with black. The under surface is paler and bluish-green, with two round central blackish spots on the hinder part of the seventh and eighth segments. The feet are greenish, and semi-transparent. This larva is subject to considerable variation in its colour and markings. When about to go into chrysalis the larva cuts through a portion of a leaf of the tree on which it has fed, and turning it over constructs a snug little case, fastening it up closely and carefully with silken threads, and in this completes its transformations. After remaining in the pupa state about two weeks Mr. Saunders' specimens produced the perfect imago.

Although not appearing in any very great numbers the moth is tolerably common in the western part of the Province.

Paraclemensia

7. THE MAPLE LEAF CUTTER (*Opion acerifoliella*, Fitch.)

Order, LEPIDOPTERA; Family, TINEIDÆ.

Many persons, we have no doubt, have often noticed a peculiar appearance of the maple leaves, resembling the effects of fire or frost, and giving a dingy brown look to the whole foliage. It is more or less common every year in this Province, but it has been unusually noticeable in the London district during the past season. It is caused by the larvæ of a pretty little moth, whose dark brilliant blue colour and bright orange yellow head may frequently attract the attention of an observer during the early part of the summer, as the moth flies about from tree to tree, or rests exposed upon the leaves.

This little creature belongs to a family that embraces the smallest in size of all our *Lepidoptera*, and many members of which are very familiar to us, as we know to our annoyance and discomfort when our furs and carpets and wearing apparel are attacked. Dr. Asa Fitch, the talented Entomologist of the State of Massachusetts, was the first to work out the life-history of this destructive little maple leaf cutter, and from his excellent treatise, published in 1856, we intend to make a few extracts. "The cause of this fading of the leaves was recently discovered upon examination. It was found that the green parenchyma or pulpy substance of the leaf was destroyed in spots and irregular patches, leaving only the fine net-work of veins and the transparent cuticle. These spots were commonly in rings or in segments of a circle, with the centres green and unaffected. In addition to these, holes of a nearly circular form appeared in the leaves, about a quarter of an inch in diameter, with others of a smaller size. A dozen or more of these holes were at that time found in almost every leaf; and some of the pieces which had been cut out of the leaf, forming these holes, might be observed adhering like round scales to the surface of the leaf, some on its upper, others on its under side. On elevating this scale from the surface of the leaf another smaller one was found beneath it, and beneath them was a small white worm, which was evidently the artizan by whom all this work had been done—cutting out these circular pieces from the leaf to form a cloak for himself, and when hungry feeding upon the pulpy substance of the leaf, thus forming the circular and irregular spots seen upon it. Occasionally one of these scales might be observed to move slightly along, the worm at such times protruding its head from under the edge of the scale, and with its feet pulling its unwieldy domicile to another part of the leaf."

"The worm within these cases is nearly a quarter of an inch in length when mature. It is slender, and of a flattened cylindrical form, soft and contractible, composed of

thirteen segments which is sometimes interrupted. Only the third and

"These when they are among the following the following

Dr. Fitch were exempt statement, from country however one-tenth of probably is as a remedy in orchard, and travelling at this moth, animals und destroyed.

The holes are at growth

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We quote *Canadian Entomologist*

"The larva is common in the branches of the tree, hanging suspended in its position of chrysalis state.

"When cylindrical, its green colour and its surface;

"Body yellow; a dorsal line which are unobscured on each side, fainter than the skin all over.

"The upper surface yellowish green.

"The margin of the costal margin is a little broader than them a little.

The larva does some injury. by Dr. Fitch

thirteen segments marked by slight intervening constrictions. It is dull white, the head, which is strongly depressed, and the three thoracic segments pale rusty brown. An interrupted broad blackish stripe along the middle of the back is more or less distinct. Only the three pairs of legs upon the thoracic segments are distinctly developed."

"These worms, or many of them at least, are carried to the ground upon the leaves, when they fall from the trees in autumn. They remain in their cases and change to pupæ among the fallen leaves beneath the trees, in which situation they may be found early in the following spring."

Dr. Fitch mentions the fact that trees standing alone in fields or yards around houses were exempt from the attacks of the leaf-cutter. Our experience does not confirm this statement, for we found that several isolated trees were badly disfigured around the country house where we spent the past summer months. A small Ichneumon-fly, about one-tenth of an inch in length, and pale yellow, is parasitic upon the larvæ cases, and probably is of material service in checking the increase of the moth. Dr. Fitch suggests as a remedy that sheep or cattle be allowed to range the ground occupied by the sugar orchard, and if notwithstanding the trampling of the earth by cattle standing under or travelling around them, the leaves of particular trees show that they are preyed on by this moth, it will be well after the leaves have fallen in autumn to feed salt to the animals under such trees, that any insects among the leaves may be trampled upon and destroyed.

The holes made by these insects are nearly circular when first cut, but by the subsequent growth of the leaf they become oblong.

Physostegania

8. THE MAPLE MEASURING WORM (*Stegania pustularia*, Guenee).

Order, LEPIDOPTERA; Family, GEOMETRIDÆ.

We quote the following account from Mr. W. Saunders' notes, as published in the *Canadian Entomologist*, vol. iii. p. 325:

"The larvæ of this delicate looking little geometric moth feeds on the maple. It is common in the London neighbourhood, and may be readily got in season by striking the branches of the trees a sharp blow, when it drops at once part way to the ground, remaining suspended by a silken thread, by means of which, when danger passes, it can regain its position on the tree. It is found full grown about the middle of June, enters the chrysalis state within a few days afterwards, and produces the moth early in July.

"When full grown the larva measures about five-eighths of an inch in length; body cylindrical, head medium-sized, rather flat in front and slightly bilobed, and of a pale green colour, with a few very fine hairs, invisible without a magnifying glass, scattered over its surface; mandibles tipped with black."

"Body above bluish green, with thickly set longitudinal stripes of whitish and yellow; a double whitish dorsal line with bordering lines of yellowish white, neither of which are unbroken, but are formed of a succession of short lines and dots. Below these, on each side, are two or three imperfect white lines, made up of short streaks, and much fainter than those bordering the dorsal line; spaces between the segments yellowish. The skin all over the body is much wrinkled and folded."

"The under surface is green, with a tinge of yellowish between the segments; feet yellowish green, prolegs green, faintly tipped with brown."

"The moth is of a pure white colour, with three or four reddish brown spots on the costal margin of each of the fore wings, and with a faint curved line of the same, crossing them a little beyond the middle; it expands one inch."

The larva feeds on the young and tender leaflets and buds, and of course causes some injury. In all probability the same remedy would be of service as that suggested by Dr. Fitch in the case of the maple leaf cutter.

INSECTS AFFECTING THE PEACH.

BY E. B. REED, LONDON, ONT.

Gynanthodon
THE PEACH BORER (*Ageria exitiosa*, Say.)

Order, LEPIDOPTERA; FAMILY, ÆGERIDÆ.

This notorious pest, which has been well termed "the silent and insidious destroyer of the peach tree," is so common, and its attacks are so universal wherever peach-culture is attempted, that we deem it matter of interest to our readers to lay before them the full details of its history. The laborious researches of those able American Entomologists, Mr. Thomas Say, of Philadelphia, Dr. Thaddeus Harris, of Massachusetts, and Dr. Asa Fitch, of New York, have caused the whole history of the peach borer to be well worked up, and it is from their writings that we propose to condense the following treatise for the benefit of our Canadian readers.

Mr. Say first described the insect in 1826, and gave it the name of *exitiosa*, a word signifying "destructive," in allusion to its powers of mischief. The perfect insect belongs to a group or family of moths, which, from their transparent wings and slender bodies with coloured bands, bear so strong a resemblance to certain bees, wasps, hornets and flies that various species have received the names of *apiformis*, the bee-shaped; *vespiformis*, the wasp-shaped; *crabroniformis*, the hornet-shaped; *tipuliformis*, the gnat-shaped, etc. So deceptive is this likeness that even the celebrated naturalist, DeGeer, in writing of one of the species observes, "the first time that I saw it I hesitated to take it with my naked hand, believing that I had found a wasp." The moths fly only in the day time, and they may be frequently seen basking in the sunshine. Their larvæ derive all their nourishment from the wood and pith of the various shrubs and trees which they affect, and in the stems or roots of which they lie concealed.

FIG. 34.



Colours Steel Blue and Yellow Band.

side with numerous fine short hairs. The palpi, or feelers, the shoulder-covers, the rings of the abdomen, and of the peculiar brush or fan on the tail are edged with pale yellow. The wings expand about one inch; they are all transparent and glass-like, with a slight tinge of smoky yellow, their veins, margin and fringe are steel blue. The body is slender and cylindrical. The feet are black, with two rings of pale yellow on the shins.

The female, No. 1, has a very dark steel blue body, with a tinge of purple, and a broad band of a bright glossy orange-yellow colour, occupying the whole of the fourth and fifth segments. The abdomen is of a long oval form, nearly twice as broad as that of the male. The antennæ have no fringe along their inner sides. The fore wings are opaque, and of a steel blue colour, with the tips and fringes of a purplish tint. The hind wings are transparent like those of the male; they are broadly margined upon both

At figure 34 we give a representation of the perfect or winged state of the peach borer, No. 1 showing the female and No. 2 the male, by which our readers will notice that the sexes differ so remarkably in appearance that it is difficult to believe that they both belong to the same species. The male, No. 2, is of a deep steel blue colour, with various pale yellow marks, and has a glossy satin-like lustre. The antennæ are black, and fringed on the inner

sides, and many of these there are traces of. The wings expand about one inch; they are all transparent and glass-like, with a slight tinge of smoky yellow, their veins, margin and fringe are steel blue. The body is slender and cylindrical. The feet are black, with two rings of pale yellow on the shins.

The eggs of the tree nematode leave from one end of the tree according to its position; it is difficult to determine when they are retarded in progress.

Dr. Fitch has discovered the borer of the root, for a distance of an inch or more consumed in burrows. The wood is eroded, so that the tree cannot for the season repose. It is commonly in summer covered over with a kind of gum, or between the gum and the wood forming a kind of worm inhabiting the gum, or between the gum and the wood.

The presence of the gum which issues from the tree.

Dr. Harris has discovered the borer of the tree trunk, which issues from the base of the tree and runs forth in the wood.

"The last time I saw it I hesitated to take it with my naked hand, believing that I had found a wasp." The moths fly only in the day time, and they may be frequently seen basking in the sunshine. Their larvæ derive all their nourishment from the wood and pith of the various shrubs and trees which they affect, and in the stems or roots of which they lie concealed.

Dr. Fitch has discovered the borer of the tree trunk, which issues from the base of the tree and runs forth in the wood.

FIG. 35.



The larva of the peach borer measures when full grown about one inch in diameter. It is of a dark brown colour, with several constrictions.

The head of the larva is of a dull palish colour, and is divided into three segments. The first segment is of a pale yellow colour, the second segment is almost black, and the third segment is of a dull palish colour. There are a few hairs—those at the base of the first segment. A faint line runs along the rest of the body. The colour of the larva is of a dull palish colour. The larva

sides, and marked at the base with steel blue; they have five thick veins, and commonly there are traces of a straw-yellow stripe on the outer margin towards the tip. The wings expand about one inch and a half. Both sexes have several varieties, but the two above mentioned descriptions are those of the ordinary types.

The eggs are deposited by the moths in the course of the summer, upon the trunk of the tree near the root. Mr. Evan Thomas, as quoted by Mr. Say, says that "they leave from one to fifty, and in some instances nearly three hundred eggs in each tree, according to its size and capacity to support the future progeny. These soon appear, but it is difficult to detect them until they have acquired a growth of two or three weeks, when they are four or five lines in length. From this period their growth is accelerated or retarded in proportion to the quantity of nourishment afforded."

Dr. Fitch writes "that the worms when hatched work downwards, at first in the bark of the root, forming a slender flexuous channel, which becomes filled with gum. At the distance of an inch or two below the surface the whole of the bark of the root becomes consumed in badly infested trees, and the soft sap wood is also extensively gnawed and eroded, so that frequently the root is nearly severed. The larger worms in the winter season repose with their heads upwards, in contact with the exterior surface of the root, commonly in smooth longitudinal grooves which they have excavated, their backs being covered over with the castings mingled with the gum and with cobweb-like threads, thus forming a kind of cell, the cavity of which is considerably larger than the body of the worm inhabiting it. The smaller worms have no such cell, but lie promiscuously in the gum, or between it and the root."

The presence of these borers may always be readily detected by the castings and gum which issue from the hole in the bark.

Dr. Harris tells us "that these borers, when nearly one year old, make their cocoons either under the bark of the trunk or root, or in the earth and gum contiguous to the base of the trees. Soon afterwards they are transformed to chrysalides, and finally come forth in the winged state, and lay the eggs for another generation of borers."

"The last transformation takes place from June to October, most frequently, however during the month of July in the State of Massachusetts. Here, although there are several broods produced by a succession of hatches, there is but one rotation of metamorphoses consummated within a year. Hence, borers of all sizes will be found in the trees throughout the year, although it seems necessary that all of them, whether more or less advanced, should pass through one winter before they appear in the winged state."

Dr. Fitch also confirms the statement that whoever examines infested roots will find worms upon them of all sizes, at all times of the year. From his report it appears that the

Fig. 35.



pupa state lasts at least three weeks in the warmest part of the summer, and that in the State of New York the moths generally deposit their eggs about the end of July and the beginning of August. At fig. 35 we give a faithful representation of the full grown larva, and we quote its description as given by Mr. Saunders in the *Canadian Entomologist*, vol. iii.

The larva is a naked, soft cylindrical grub, slightly flattened on its under side, and measures when full grown over half an inch in length, and nearly a quarter of an inch in diameter. It is divided into fourteen nearly equal segments by broad transverse constrictions.

The head is of a medium size, with a depressed line down the centre, dividing it into two lobes. It has a triangular piece inserted in the middle, with its base towards the mouth and its apex terminating just under the anterior edge of the second segment. The head is also flattened, and of a reddish colour, becoming darker, almost black, on its anterior edge. The jaws are black and prominent. The body above is of a dull pale yellow, with the segments or rings of the body deeply cut. The second segment is of a pale reddish brown colour, smooth and horny looking. On each segment there are a few minute pale reddish dots, from which arise short reddish or brownish hairs—those along the sides and on the posterior extremity being somewhat larger. A faint line runs along each side through the stigmata or breathing pores of a paler shade on the rest of the body. The stigmata are small, nearly round, and of a dull reddish colour. The under surface is very similar in colour to the upper. The feet are tipped

with reddish brown, and the prolegs are pale yellow, with the fringe of hooks crowning each, of a dark reddish brown.

From Dr. Fitch we learn that "when ready to enter the pupa state the worm crawls upwards to the surface of the ground, and there forms for itself a follicle or pod-like case of a leathery texture, made from its castings, held together by dry gum and cobweb-like threads. This follicle is of a brown colour, and oval in its form, with its ends rounded; it is about three-fourths of an inch long, and over one fourth in diameter, but is variable in its size, being sometimes but half an inch long. Its inner surface is perfectly smooth, and of the colour of tanned leather. It is placed against the side of the root, often sunk in a groove, which the worm appears to have gnawed for this purpose, with its upper end slightly protruding above the surface of the ground. But if the earth has been stirred recently, so as to lie loose around the root, the worm will commonly form its follicle an inch or more below the surface."

A great variety of remedies have been proposed by the numerous writers who have treated upon this insect, but we think that the following extracts will give the results of those experiments that appear to have met with the best success.

Dr. Harris informs us "that the following plan, which was recommended by me in the year 1826, and has been tried with complete success by several persons in this vicinity, will effectually protect the neck or most vital part of the tree from injury. Remove the earth from the base of the tree, crush and destroy the cocoons and borers which may be found in it and under the bark, cover the wounded parts with the common clay composition, and surround the trunk with a strip of sheathing-paper eight or nine inches wide, which should extend two inches below the level of the soil, and be secured with strings of matting above. Fresh mortar should then be placed around the root, so as to confine the paper and prevent access beneath it, and the remaining cavity may be filled with new or unexhausted loam. This operation should be performed in the spring, or in the month of June. In the winter the string may be removed, and in the following spring the trees should again be examined for any borers that may have escaped search before, and the protecting application should be renewed."

Mr. James Worth, who is largely quoted by Mr. Thomas Say, writes: "The best plan of guarding against the ravages of this insect which I have found, is to examine the tree early in the month of July; take a bricklayer's trowel, and opening the ground around the trunk the lodgment of the insect will at once be discovered by the appearance of gum, and it can be readily destroyed. One person can thus examine more than a hundred trees in less than half a day, and very few, if any, of the insects will escape."

Mr. C. V. Riley, the State Entomologist of Missouri, in his first annual report published in 1869, gives yet another remedy, and one which appears to be so successful that we cannot refrain from giving our readers the full extract. "I have had ample occasion," he writes, "to witness the effect of the mounding system during the summer in several different orchards, and am fully convinced that it is the best practical method of preventing the attacks of this insect, and that it matters little whether ashes or simple earth be used for the mound. True, there are parties who claim that the almost total exemption from borers in mounded peach-orchards is due, not to any special effect produced by the mound, but to the general rarity of the insect. But I have found no general rarity of the insect wherever I have been in our own State, but, on the contrary, have with difficulty found a single tree in any orchard that was in anywise neglected that did not contain borers; while I have found mounded trees entirely exempt. The following paragraph communicated to the *Western Rural* by Mr. B. Pullen, of Centralia, Illinois, touches on this point, and I can bear witness to the thrift and vigour of Mr. P.'s trees:

"As spring will soon be upon us, I wish to add my testimony in favour of the "banking system," as a preventive against the attacks of the peach borer. As to its efficiency there can be no doubt, I have practised it for four years with complete success. I would not advise its adoption until after the trees are four years old. During most of this period the bark is tender and trees are liable to be entirely girdled by even a single worm. Safety lies only in personal examination and removal with the knife in fall and spring (September and April). In April of the fourth year bank up to the height of from ten to twelve inches, pressing the dirt firmly around the tree. A little dirt should be added each successive spring; it is not only a preventive, but a great saving of labour."

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As further testimony, and with a view of giving the method by which the trees may be mounded, I also insert the following communication from E. A. Thompson, of Hillside (near Cincinnati), Ohio, which appeared in the *Journal of Agriculture* of November 14th, 1868:

"The mounding system was first practised, so far as I know, by Isaac Bolmar, of Warren County, Ohio. I visited his orchards some years ago, acquainted myself with his system, and concluded to try it upon my orchard of 4,000 trees—then one year planted. I plant my trees in the fall, and in the spring following cut them back to six inches above the bud. The tree, then, instead of having one body has several—from three to six. The second summer I plough both ways, turning the furrows towards the trees. The men follow with shovels, throwing the loose soil around the trees to the height of about one foot. In the fall I cut the trees back, taking off about one-third of the year's growth. The next spring or summer I pursue the same method, raising the mound about one foot higher, cut back in the fall, and in the third summer repeat the process, raising the mound another foot, which finishes the job. The mound will then be about three feet high at its apex, and six feet in diameter at its base. The mounding need not be done in the summer or at any particular season; it is just as well done in the fall when the hurry is over. The dirt is never taken away from the trees; in fact it cannot be removed without injury to the tree, for the young rootlets each year keep climbing up through this mound. I had occasion to remove one of these mounds a few days since, and found it a mass of healthy roots."

"Now for the benefits. First, you have no trouble with the grub or borer; he must have light and air, and the mound is too much for him; he comes out, and that is the last of him. I have never wormed my trees or hunted for borers, and an orchard of healthier or thriftier trees cannot be found. It has been asserted that the borer will reappear again near the top of the mound—but I am satisfied this is not the case; I have never thus far been able to find one. Second, the system imparts longevity to the tree. I saw a tree in Warren County, treated in this manner, *thirty* years old, still healthy and bearing annual crops. Third, trees thus treated are not subject to disease. I have never had a case of *yellows* in my orchard. Fourth, the expense is trifling—one man can mound fifty trees per day. The system can be applied to old as well as young orchards; but if old trees are thus treated they should first be severely cut back, when they will make a growth of young wood."

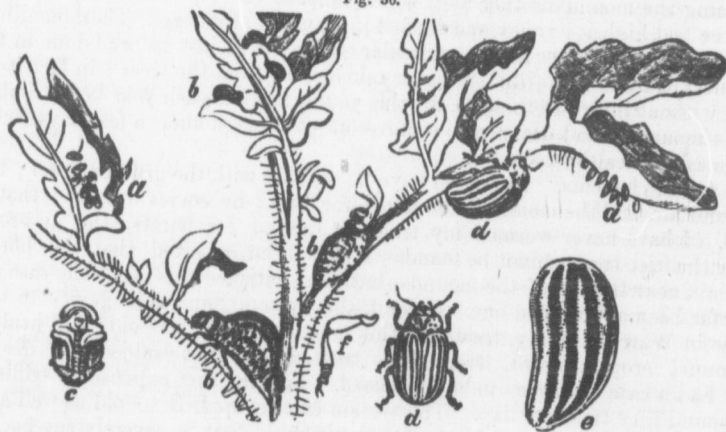
It is also stated that tobacco stems thrown round the stem of the trees have been productive of good, as they seem to have the effect of keeping away the moth.

INSECTS INJURIOUS TO THE POTATO.

BY E. B. REED, LONDON, ONTARIO.

Addenda to the Report of 1870.

Fig. 36.



Colours—(a) deep orange; (b) and (c) venetian red, inclining to cream colour; (d) and (e) cream colour and black.

During the past year we looked forward with considerable anxiety to the effect that the Colorado Beetle would produce on the potato crop; we are glad to be able to report that on the whole, less mischief has been done than we anticipated. It is somewhat difficult, however, to arrive at an accurate estimate. The Bureau of Agriculture forwards every year to the Secretaries of the Electoral Division Agricultural Societies a printed circular requesting a detailed return of the crops in each district, if these returns were properly made they would afford much valuable information. It is to be regretted that they are not more universally attended to. So far as we can learn only 40 of these returns have been made for 1872, and it is on these partial details that we must base our analysis for the Potato crop. While, however, the ravages of the beetle have been somewhat less than we expected, its increase in numbers and onward progress have yet been such as to cause not only a material effect on the crop, but also to maintain a good deal of alarm amongst the farming community. A comparison of the crop returns for the two past years fully confirms the statement made in our former reports, that the second and third years of appearance of the beetle are worse than the first.

A few statistics may not be out of place here.

In 1871, 45 Agricultural Societies sent in returns shewing an average crop of 131 bushels per acre.

In the past year, 1872, only 40 Societies reported, with an average of 118 bushels per acre.

In 1871 only 14 Societies reported the presence of the beetle, while 23 were free from it, and none badly affected.

In 1872, 26 Societies report injury from the beetle, and 8 report very serious damage, in some cases almost total destruction, and only 14 appear to be free.

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It is to be noticed that all the western places which in 1871 were the most badly affected, were in 1872 far more seriously attacked. In no one place do we find that the beetle after making its appearance one year, has not reappeared in the following season. The following list of Societies reporting the advent of the beetle for the first time, will shew what its onward progress is:—

— Middlesex, N.	— Hastings, E.	— Perth, S.	— Norfolk, N.
— Durham, W.	— Northumberland, W.	— Simcoe, S.	— Wellington, S.
— Wellington, N.	— Middlesex, W. ×	— Niagara,	— Grey, S.
— Frontenac,	— Peterborough,	— Victoria,	— Oxford, N.
— Hastings, N.			

While the following were those receiving most injury:—

— Bothwell,	— Essex,	— Middlesex, E. ×	— Wellington, N. ×
— Lambton,	— Perth, S.	— Elgin, E.	

We are quite aware of the inaccuracy of these statistics, as we know that in some of the new places the beetle appeared in 1871. We base the statements, however, upon the returns given to the Commissioner. It would be very desirable to obtain statistics of the various sorts of potatoes grown, as we are quite satisfied from our own experience that some varieties are much more subject to attack than others, and we would beg respectfully to suggest to the Commissioner of Agriculture the propriety of obtaining such information during the coming season.

From the monthly reports of the Agricultural Department published at Washington, we obtain some information respecting the ravages of the Colorado Potato Beetle in the United States.

The returns of their correspondents shew that the crop of 1872 was less than that of 1871 by about six millions of bushels. This, however, comprehends "sweet potatoes" as well. The western States, in which the potato crop had suffered for several years past from the ravages of the Colorado beetle, reported diminishing losses from that cause, and were the only States, North Carolina and Texas excepted, reporting increased production.

In the following twelve Western States, viz., Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Nebraska, Missouri, Kansas, California, and Oregon, the average yield was only 98 bushels to the acre, while the average price on December 1, 1872, was 50 cents per bushel.

Harding County, Iowa, is reported exempt, after several years' visitation of the beetle "Tyck's Seedling" Potato is claimed to be "bug proof."

We give these statistics as it is from the Western States that the Colorado Beetle has worked its way, and they shew to some extent what effect has been produced by its ravages for some years past.

In our immediate neighbourhood at London the beetles literally swarmed, and thousands were daily trodden down on the sidewalks and streets, and we look for a still further increase next year. We may mention as a curious fact, that although we had previously seen many hundreds of thousands of the perfect beetle, it was only last season that we for the first time saw even one in actual flight; but perhaps the numbers we saw this year on the wing fully compensated for the "masterly inactivity" of those formerly observed by us.

Our natural allies the insect enemies of the Colorado Beetle appear to be slightly on the increase, thus furnishing further evidence, if any is required, that Dame Nature still maintains the "balance of power," and that for every natural evil that arises, some natural remedy is sure to be found; and although the remedy perhaps may not, in our estimation, work quite so rapidly as we could desire, yet it is none the less sure and effectual in the end.

Especially have we noticed the more frequent presence of the Fifteen Spotted Ladybird



Anates (Mysia-15 punctata), (Oliv.)—see Fig. 37—and several friends have brought us in specimens of *Perillus circumcinctus*, Say—see Fig. 38—which they detected in the act of attacking the larvæ of the Colorado beetle.

We still continue to recommend Paris Green as the chief

remedy. Wherever it has been properly used, good results have invariably been obtained. It is, of course, of the utmost importance that the quality should be good. As a marketable commodity, the quality of Paris Green is exceedingly variable. It is an arsenite of copper, and the best qualities contain about 60 per cent. of arsenic, on which its activity depends, but the inferior grades contain a much smaller percentage, and are consequently much less effective, and in some cases almost worthless for this purpose. We are satisfied that every reported case of failure in the use of Paris Green as a remedy for the Colorado potato beetle, may be traced directly to the inferior quality of the poison used. We have been informed by Mr. W. Saunders, of London, Ont., that he has found Plaster of Paris a most excellent substitute for flour to mix the poison with. It should, most certainly, be very useful as a fertilizer, and where available, would doubtless be found to obtain success. Its cheapness also is a very important point in its favour. Its proportions for mixture are somewhat more, owing to the difference between the weight of the plaster and that of flour, for while the latter works well in the ratio of from 15 to 20 parts to 1 of Paris Green, the Plaster will require at least 30 to 40. Flour, however, we consider for several reasons to be still a capital material for this purpose.

There is a mixture prepared at Strathroy, Ont., which it is claimed is a very good remedy for the beetle. We tried some on a small scale, but not enough to justify us in recommending it as a substitute for the Paris Green. We purpose testing it more extensively this next season.

In the State of Illinois we are told that the following plan has been tried and found to succeed, *i.e.*, to plough a small furrow between the rows of potatoes, knock off with a stick all the larvæ into the furrows, and then by running the plough up the row again cover them with earth.

We can hardly imagine that in our climate this would answer at all, for as the larvæ when full grown seek the earth in which to undergo their transformation into the pupal and perfect states, it would seem that this plan would only kill a few of the tenderest and youngest of the brood, and would not interfere with the older and more mature ones.

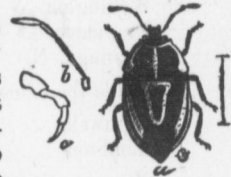
From the general returns, the early crops appear to escape the more easily, and in several instances the late crops seem to have been saved by a plentiful supply of rain, even after the bugs had attacked and finally left them.

The chief thing, however, seems to be not to grow too large a crop, and to exercise a vigilant watch over what is grown; this, with hand picking and the use of Paris Green will, we think, ensure success in most instances.

We have not heard of a single case of poisoning from the bite or handling of the beetle. As to our opinion on this point, we refer our readers to our Report for 1871.

We would beg here to record our thanks to our esteemed friend, Professor Geo. Buckland, the able and well-known Secretary of the Ontario Bureau of Agriculture, for his courtesy in furnishing us with statistics of the past year's crop; the Entomologists of Ontario indeed owe a great deal to the Professor for his invariable kindness and attention to their wants, and the promptitude with which he always seeks to assist them in carrying out their attempts at Practical Entomology. We feel sure that we express the feeling of all the members of the Entomological Society of Ontario, in offering to our friend all the kindly wishes of this Christmas season, and trusting that he may long be spared to superintend the working of the Bureau with which he has been so long and so honourably associated.

FIG. 38.



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ON SOME INNOXIOUS INSECTS

BY W. SAUNDERS, LONDON, ONTARIO.

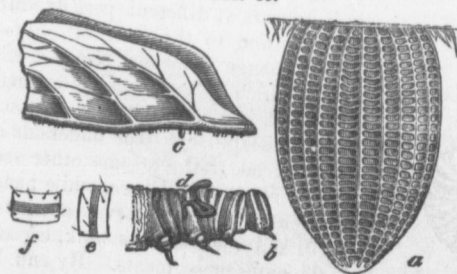
Under the above heading it is proposed to give our readers the life history of several of our more common insects, which are neither injurious nor beneficial to the farmer or fruit grower, but which from their great abundance, or else from some peculiarity in their appearance, habits or size, excite curiosity and claim our attention.

THE ARCHIPPUS BUTTERFLY (*Danaus Archippus*, Fabr.)

The first insect of which we propose to treat is one of our commonest butterflies, known as the Archippus Butterfly (*Danaus Archippus*.) Its first appearance on the wing is usually about the middle of May, but it is not very common until later in the season. It is said that it passes the winter in a state of torpidity, hidden in some sheltered spot where it sleeps securely till awakened by the warmth of spring. The few individuals which thus early appear, lay their eggs on the tender leaves of the young milkweed plants (*Asclepias cornuti*) and other species of *Asclepias*, and also on the bitter root (*apocynum Androsamefolium*); this takes place during the latter part of May or the beginning of June.

The eggs when first laid are white, but in two or three days they become yellow, and when dull grey just before the time of hatching. They are $\frac{1}{16}$ th of an inch long, conical

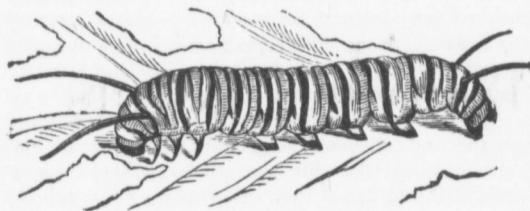
FIG. 39.



in form, flattened at the base. When viewed with a magnifying glass they appear very beautiful, (see figure 39) where *a* represents the egg much enlarged, while at *c* it is shown of the natural size, and in its usual position on the under side of the leaf. On each egg there are about twenty-five raised longitudinal lines or ribs, and about the same number of cross-lines between each, so that the whole appears covered with a regular and beautiful network as shown in the figure, which has been drawn from nature, as those also have which are to follow by our esteemed friend, Prof. C. V. Riley, of St. Louis, Mo. In about six or seven days the egg matures, producing a very small caterpillar, one tenth of an inch long, with a large black head and yellowish white body, with a few black hairs on each segment or ring, as shown at *e* and *f* (Fig 39.) This caterpillar grows very rapidly, and soon finds that its skin, although very elastic; will bear no further stretching, when it conveniently disrobes itself and appears in colours fresh and gay, by simply crawling out of its skin through a rent down the back, which takes place just at the proper time. This process, which is called moulting, is repeated three times during the growth of the larva, and requires no other preparation for its accomplishment than that of a short fast. Any abstemiousness shown at these critical periods in the creature's history is however soon compensated for by the enormous appetite with which it is furnished as soon as the crisis is past. At *b* (Fig. 39) the head and anterior segments of the larva just before its last moult, is figured for the purpose

of showing how the long fleshy horns with which the mature caterpillar is furnished are conveniently coiled up while lying buried beneath the old skin.

FIG. 40.



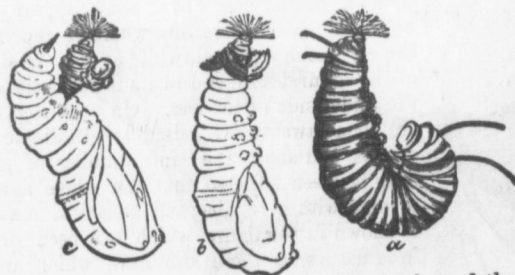
Colours—White, Black and Yellow.

low occupies the spaces between. On the third segment (reckoning the head as first) are two long black fleshy horns, and on the twelfth two others of a similar character, but shorter, and not quite so stout.

The underside is black, with a greenish flesh-colour between most of the segments.

The next change which comes over this caterpillar is that which transforms it to a pupa or chrysalis, a most astonishing transformation, when the voracious larva becomes for a time torpid, senseless, and almost motionless, while preparing for that change when it is to appear in brilliant plumage and gracefully float and flutter through the air, enjoying the summer's sunshine and sipping the nectar of flowers. Kirby in his "Introduction to Entomology" says, "were a naturalist to announce to the world the discovery of an animal which for the first five years of its life existed in the form of a serpent, which then penetrating into the earth and weaving a shroud of pure silk of the finest texture, contracted itself within this covering into a body without external mouth or limbs, and resembling more than anything else an Egyptian mummy; and which, lastly, after remaining in this state without food and without motion for three years longer, should at the end of that period burst its silken coverments, struggle through its earthly covering, and start into day a winged bird—what think you would be the sensation excited by this strange piece of intelligence? After the first doubts of its truth were dispelled, what astonishment would succeed! Amongst the learned what surmises! what investigations! Amongst the vulgar what eager curiosity and amazement! All would be interested in the history of such an unheard-of phenomenon." Yet the changes which the insect we are referring to undergoes in common with many others, is scarcely less wonderful or startling.

FIG 41.



rent takes place in the skin down the back, and the chrysalis begins to appear, and after long and persevering efforts in stretching, contracting, and wriggling the body, the skin is crowded backwards and worked nearly up to the hinder extremity, as shown at *b*; and now a difficulty presents itself, and a feat has to be performed to imitate which would puzzle the most daring acrobat, for without hands or feet to hold on by, it has to withdraw itself from the remnants of its larva skin, and hang itself up by a black protuberance crowned with a bunch of hooks at the extremity of the chrysalis. Although this feat is so wonderfully difficult, it is very seldom indeed that a failure occurs in its accomplishment. A ready explanation of the means by which this is done is given at *c*, (Fig. 41.) The joints of the abdomen being freely moveable, are first stretched against a portion of the larva skin, and by a sudden jerk backwards the skin is grasped and firmly held while the terminal segments are

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FIG. 42.



Colours—Green Gold.

down the back time the entire themselves to- When fully de chrysalis they welfare of the position for ex serviceable size down as they a here, securely s undergo in a sh the wings dou process, from t the wings, sel high in the hea rigid, and the l

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withdrawn and the process of suspension completed. Soon after this the chrysalis begins a series of wriggling and jerking movements with the view of dislodging the empty larva skin after the removal of which it remains motionless unless disturbed, and becomes gradually, harder and more contracted until it assumes the appearance represented by Fig. 42.

FIG. 42.

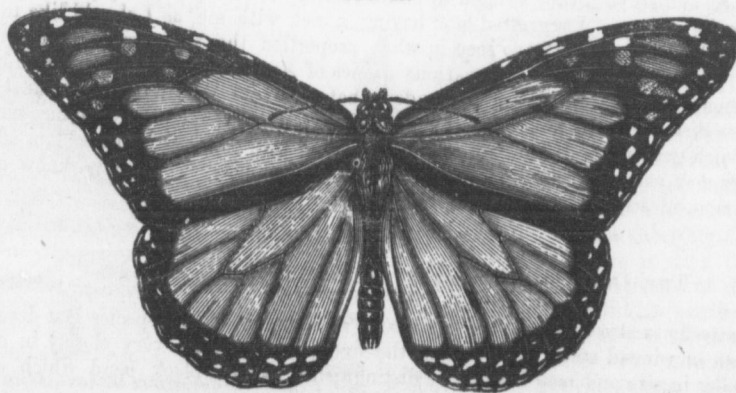


Colours—Green and Gold.

The chrysalis is about an inch long, and of a beautiful pale green colour spotted with gold, and with a band of golden dots extending more than half way round the body above the middle; this band is shaded with black. There is also a patch of black around the base of the black protuberance by which it is suspended, and several dots of the same on other portions of the surface. The chrysalis state seldom lasts more than ten or twelve days, and towards the expiration of this period the handsome green and gold colours begin to fade, and the chrysalis grows gradually darker until the diminutive wings of the future butterfly show plainly through the semi-transparent enclosure. The escape of the imprisoned insect, now nearly ready for flight, is usually made quite early in the morning. We have several times watched for their deliverance, and have usually found it to take place soon after daybreak. A sudden crackling and slight tearing sound is heard, which arises from a splitting of the chrysalis case part way down the back; the fore legs, head and antennæ are first withdrawn, and in a very short time the entire insect is liberated. Strange looking creatures they are when they first present themselves to view, with bodies so large as to be out of all proportion to the tiny wings. When fully developed their wings measure about four inches across, but when fresh from the chrysalis they are about the size of those of a large bee. The first necessity now for the welfare of the individual is to find a suitable location where the wings may be held in a good position for expanding, for without such favourable circumstance they would never attain a serviceable size. It is necessary that a position should be secured where the wings can hang down as they are expanding, for which reason the underside of a twig is often selected; and here, securely suspended by the sharp claws with which the feet are furnished, the wings undergo in a short time the most marvellous growth it is possible to imagine. We have seen the wings double their size by actual measurement within three minutes, and the whole process, from the time of the escape of the butterfly to that of the full development of the wings, seldom occupies more than from fifteen to twenty minutes, and ere the sun is high in the heavens, on the morning of its birth, the soft flabby wings have dried and become rigid, and the butterfly is ready for flight.

A wing clipped from the insect immediately after its escape, and examined under the microscope, reveals the fact that the thousands and tens of thousands of scales with which the wings are covered, and which afterwards assume such beautiful feather-like forms, are now

FIG. 43.



Colours—Bright Orange, Red, Black and White.

nearly all linear or thread-like, not folded up or wrinkled, but undeveloped. Impressed with this thought, one is fairly astonished at the almost incredible change wrought in so limited a time, for the growth embraces not only the extension of the membranous surface of the

wing, but the enlargement and maturity of every scale or feather on it, the individuals of which appear but as particles of dust to the naked eye. What a wonderful and intricate system of circulation and power of nutrition must be possessed to accomplish this marvellous result.

The Archippus Butterfly (see Fig. 43) is so well known that it needs but little description to recall its appearance, especially where so good a figure is given. The ground colour of the wings when fresh is a beautifully bright orange red, the veins are heavy and black, and the margins are spotted with white, the latter being more or less covered or encroached upon by the general colour. Near the middle of the hind wings there appears in the figure, on one of the veins, an enlarged black streak or blotch, which, when closely examined, is found to be a small excrescence: as this is found only on the wings of the male, the sexes may be readily distinguished by this peculiarity.

We have frequently seen these butterflies in great numbers on pine trees which have been infested with aphids, attracted there no doubt by the sweet exudations which flow from the bodies of the aphids, thus interfering with the rights and privileges which have always been accorded to the industrious ant. They also have a fashion of congregating at times usually late in the season, in prodigious swarms, consisting of tens of thousands or hundreds of thousands of individuals. In September, 1871, we met with a swarm of this character, the particulars of which were communicated to the *Canadian Entomologist*, Volume 3, Page 156, as follows:—"On the first day of September while driving along the Lake Shore Road on the borders of Lake Erie, I was favoured with a sight which will not soon be forgotten. For several days previous *archippus* butterflies had been unusually abundant, and early in the morning on the day in question, some groups—numbering probably hundreds of individuals—which had rested during the night on trees adjoining the hotel at Port Stanley, were gyrating in a wild manner at all heights, some so high up that they appeared but as moving specks in the sky; others floating lower, over the tops of the trees in an apparently aimless manner. This was, however, as a mere skirmishing party when compared with the vast hosts seen a little later.

"It was about nine o'clock in the morning, when, passing a group of trees forming a rude semi-circle on the edge of a wood facing the lake, the leaves attracted attention, they seemed possessed of unusual motion and displayed all over fitful patches of brilliant red. On alighting, a nearer approach revealed the presence of vast numbers—I might safely say millions—of these butterflies, and they were clustering everywhere. I counted those on a small space, about the size of my two hands, on one of the trees, and there were thirty-two butterflies suspended on it, and the whole group of trees was hung in a similar manner. When disturbed they flew up in immense numbers, filling the air, and after floating about a short time gradually settled again. There appeared to be nothing on the trees to attract them, yet when undisturbed they seemed to prefer resting in quiet, as if enjoying the presence of congenial society. I regretted not having a net with me, as I should like to have captured a number of them, to have seen in what proportion the sexes were represented in the company. Their food plants—the various species of *Asclepias*—did not appear to be unusually common in that section. I apprehended that many of the individuals must have travelled some distance to be present at this gathering." No satisfactory reason has yet been assigned for such gatherings. The fact that the larvæ of the *archippus* is but seldom affected with parasites may partially account for their occasional abundance; we only know of one small ichneumon infesting them, and have but rarely met with this.

Basilarchia archippus Cram.
THE DISIPPUS BUTTERFLY. (*Limnitis disippus*, Godt.)

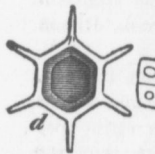
This butterfly is also common, but not nearly so abundant as the species last described. In the perfect, or winged state, it resembles the *archippus* butterfly very closely in colour, but it is smaller in size and may always be distinguished by the black band which crosses the hind wings, which is altogether wanting in the *archippus*.

The *disippus* butterfly is represented by Fig. 44. The ground colour of the wings is of the same warm orange red as the *archippus*; the veins also are heavy and black, and the wings along their margins spotted with white. In the figure the left wings represent

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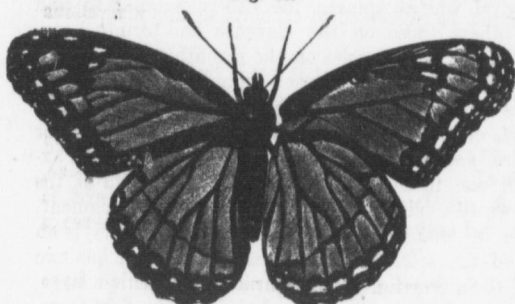
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the upper surface, while those of the right, which are slightly detached from the body,

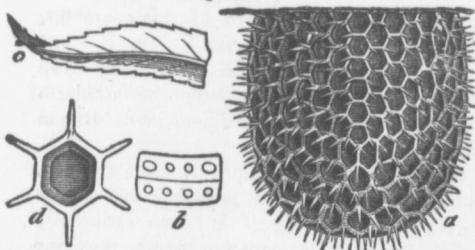
Fig. 44.



Colours, Orange, Red, Black and White.

show the under surface. The two surfaces differ but very little in colour and markings. It appears on the wing a little later in the summer than *archippus*, and deposits its eggs on the willow, which is its favourite food plant. Mr. Riley says that it feeds on the poplar and also on the plum. Although the *disippus* butterfly resembles the *archippus* so closely in the winged state, in the earlier periods of its history it is very dissimilar.

Fig. 45.

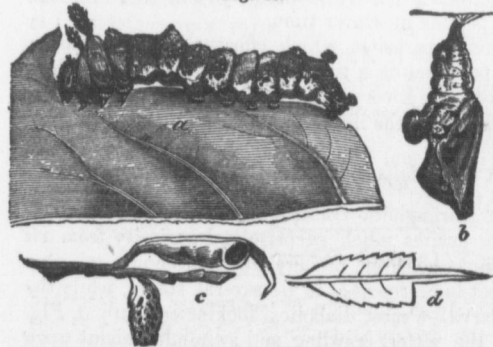


The egg is well represented by Fig. 45, and is a very beautiful and interesting object: *a* shows it highly magnified, while at *c* it is shown of natural size and in its natural position on the willow leaf. At *d* is represented one of the minute cells of the egg, very highly magnified, showing the little threadlike processes which proceed from each angle. Mr. Riley, who was the first to observe this egg, thus describes it in his "Third Annual Report," page 154. Length 0.38 inch. Diameter at base about the same. Globular, with top often slightly depressed Hexagonally reticulate, the cells more or less regular, sunken so as to give

the egg a thimble-like pitted appearance, and about ten of them in the longitudinal row, and thirty in the circumference. Covered with translucent filamentous spines, one arising from every reticulate angle and giving the egg a pubescent appearance. Each spine about as long as the cell is wide, those on the top being longest." He also says that the colour of the egg is at first pale yellow, but it soon becomes grey as the young larva within develops. These eggs are usually deposited singly near the tip of the leaf, generally on the underside, but sometimes on the upper side, and occasionally two or even three together.

The newly-hatched larva is nearly one-tenth of an inch long, with a large yellowish brown head. The body is pale yellowish brown with darker streaks, and with a few pale dots and warts, from which latter arise pale spines or bristles. In about a month from the time of hatching the larva becomes full grown, and appears as shown

Fig. 46.



at *a*, Fig. 46, the following description of the mature larva was published by us in the *Can. Entomologist*, vol. 1, p. 94. Found feeding on willow, July 24th. Length one inch and a quarter. Head rather large, flattened in front, strongly bi-lobed, pale green, with two dull white lines down the front, and roughened with a number of small green and greenish-white tubercles. Each lobe is tipped with a green tubercle, or short horn.

The body above is dark rich green, with patches and streaks of dull white; the second segment is smaller than the head, and its surface covered with many whitish tubercles: the third segment dull

whitish green, raised considerably above the second, with a flat ridge above, having a long brownish horn on each side of it, thickly covered with very short white and brown spines; fourth segment about the same as third, with the same kind of ridge above, with a small tubercle on each side, tipped with a bunch of short whitish spines; between the ridges on third and fourth segments are two small black dots above. Each segment from fifth to thir-

teenth inclusive, has two tubercles, one on each side, and in a line with the long horns on third segment, each crowned with a cluster of whitish spines; the tubercles on sixth and twelfth segments are much larger than the others those on the eleventh and terminal segments next in size, those on the ninth smallest. The tubercles on the seventh, eighth, tenth and eleventh segments have a streak of white at their base, and each segment behind fourth, excepting ninth, has several smaller tubercles of a bright blue colour. A large whitish patch covers nearly the whole of the ninth and parts of the eighth and tenth segments, and another of a similar character covers the second, third and part of the fourth. A white stripe extends along each side, close to the under surface, from the fifth segment to the end of the body, and in which is set a small cluster of whitish spines about the middle of each segment, from sixth to tenth inclusive. On each side of seventh, eighth and tenth segments is an elongated blackish spot, just above and behind the spiracles; the terminal segment has two dark greenish brown spots above in front of the tubercles. The spiracles are rather large, oval and brownish-black.

The under side is whitish-green, with a central dull white stripe on the hinder segments; the feet are brown, ringed with brownish-black; the prolegs pale greenish, faintly tipped with brown.

This caterpillar varies somewhat in colour, some specimens being of a paler green than that just described.

The chrysalis, Fig. 46, *b*, Mr. Riley describes as "marked with burnt amber, brown, ash grey, flesh-colour and silvery white, and is characterized, like that of the other species of the genus, by a curious, thin, almost circular projection, which has been likened to a Roman nose, growing out of the middle of its back."

There are two broods of this insect during the year; the larvæ resulting from the eggs deposited by the second brood usually attain to less than half their full growth before winter, when they hibernate and complete their growth the following spring. The interesting preparations made by these caterpillars in the construction of little cases, in which they rest tolerably secure from harm while in this state of torpor, is thus described by Mr. Riley "First and foremost—with wise forethought, and being well aware through its natural instincts that the leaf which it has selected for its house will fall to the ground when the cold weather sets in, unless it takes measures to prevent this—the larva fastens the stem of the leaf with silken cables securely to the twig from which it grows. It then gnaws off the blade of the leaf at its tip end, leaving little else but the mid-rib, as shown in Fig. 46, *d*. Finally, it rolls the remaining part of the blade of the leaf into a cylinder, sewing the edges together with silk. The basal portion of the cylinder is, of course, tapered to a point, as the edges of the leaf are merely drawn together, not overlapped; and invariably the lower side of the leaf forms the outside of the house, so as to have its projecting mid-rib out of the way of the larva, as it reposes snugly in the inside. The whole when finished (see Fig. 46, *c*.) has somewhat the appearance of the leaf of a miniature pitcher plant. These curious little cases may be commonly found upon our willows or poplars in winter time.

This insect is liable to the attacks of several parasites, which effectually prevent its increase beyond certain limits. One of these parasites is a tiny dark four-winged fly, which infests the eggs of the *disippus* butterfly; another is a very small black four-winged fly; and a third a larger two-winged fly, both of which attack the insect in its caterpillar state.

THE HELGRAMMITE FLY (*Corydalis cornutus*—Linn.).

This is an insect which is not uncommon throughout Ontario, and whenever and wherever found, either in the larval or perfect state excites much surprise and curiosity from its large size and formidable appearance; it is not, however, in any way poisonous, as some people imagine it to be. In Fig. 47 this insect is represented in its several stages, while the expanded female is shown in Fig. 48. The larva—a most diabolical looking creature *a*, Fig. 47—spends the earlier portion of its life in the water, crawling and swimming about upon the bottoms of rivers and streams, feeding upon the larvæ of various other insects which also inhabit the water. Mr. Riley has published a very interesting account of this insect in the first vol. of the American Entomologist, from which most of the following remarks are condensed.

Most aquatic larvæ spend the period of their chrysalis state in the water, and only emerge therefrom when ready to pass into the perfect or winged state; but the insects form

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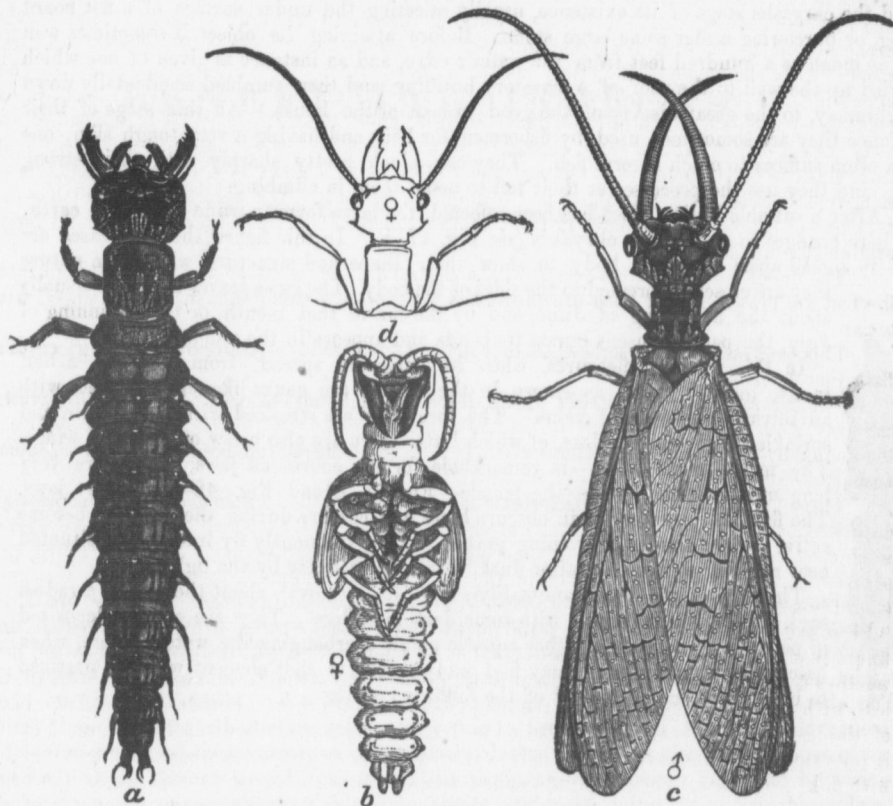


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ing the group to which this larva belongs, leave the water while they are still in the larval state and do not usually become pupæ for several days or even weeks thereafter. Hence the Creator

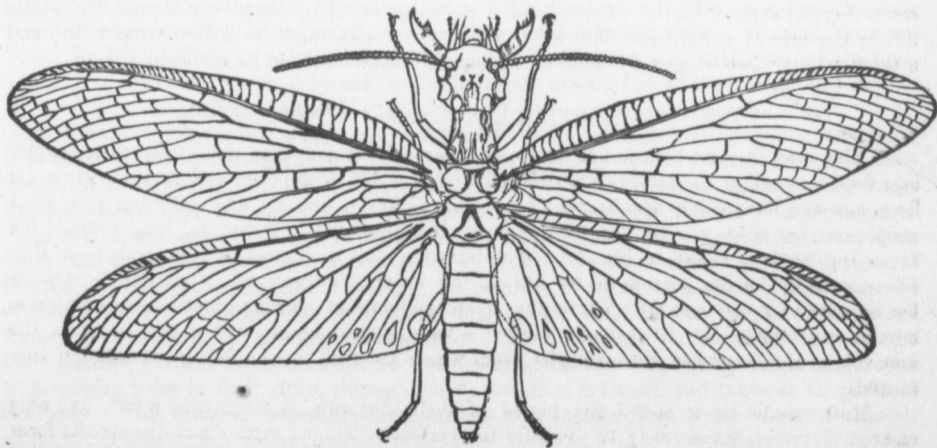
Fig. 47.



Colours—(a) dark brown, (b) whitish, (c) and (d) light brown.

to meet their necessities has given them a double system of respiration—a set of gills to breathe with in the water, and a set of breathing holes, or spiracles, to breathe with upon

Fig. 48.



land. In this larva the gills assume the form of paddle-like appendages, and are placed one pair upon each of the seven front segments of the abdomen, while the spiracles are arranged in the usual manner along the sides of the body. After leaving the water the larva crawls rapidly about, chiefly in the night time, in search of a safe and suitable place in which to spend the chrysalis stage of its existence, usually selecting the under surface of a flat board or log, or burrowing under some large stone. Before attaining its object it sometimes wanders as much as a hundred feet from the water's edge, and an instance is given of one which crawled up the wall to the roof of a one-story building, and then tumbled accidentally down the chimney, to the great dismay of the good woman of the house. At this stage of their existence they are sometimes used by fishermen for bait, and having a very tough skin, one larva often suffices to catch several fish. They can pinch pretty sharply with their strong jaws, and they use the processes at their tail to assist them in climbing.

After a suitable hiding place has been selected, the larva forms a rude cell in the earth, and here changes to an inactive chrysalis (see Fig. 47, *b*). In this figure the wing cases are slightly spread apart from the body to show their shape and structure, whereas in nature they are closely appressed to the sides of the body. The larva leaves the water usually about the beginning of June, and by the end of that month, or the beginning of July, the perfect insect bursts its bonds and appears in the winged state.



In this form it measures, when its wings are spread, from four and a half to five inches; these, as shown in the figure, are gauze-like and covered with an intricate network of veins. The forewings are streaked with dark brown and sprinkled with whitish dots, of which latter there are also a few on the hind wings. The male—Fig. 47, *e*—is remarkable for its enormous jaws, which are very long and hook-like, while the female—Fig. 47, *d* and Fig. 48—has short jaws. The flies hide themselves in obscure holes and corners during the day and become active as the shades of evening gather. They frequently fly into houses situated near running water, soon after dusk, attracted probably by the light.

The eggs of the Hellgramite Fly—Fig. 49—are oval, about the size of a radish seed, and of a pale colour, with some dark markings. They are usually deposited in patches, upon reeds or other aquatic plants overhanging the water, where, when hatched, the young larvæ may find ready access to that element which is destined to be its home until the end of the following spring.

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Hitherto those numerous while we have destroyed of our class—our I merely those insects that v families that as scavengers This is, indeed, limited space time and con to the reader decide; we into which in families or tr be confined t and at the sa upon which o

In order it is advisabl which the cla implies (Lat rings, which other. and ca the Animal I of short cylin from the An their mouths, or breathing the body. T

BENEFICIAL INSECTS.

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

Introductory (General Account of Insects).

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|---|---|
| 1. Tiger Beetles (<i>Cicindelidæ</i>). | 5. Scavenger Beetles (<i>Staphylinidæ</i>). |
| 2. Carnivorous Ground Beetles (<i>Carabidæ</i>). | 6. Dung Beetles (<i>Scarabæidæ &c.</i>) |
| 3. Water Beetles (<i>Dytiscidæ, Gyridæ etc.</i>). | 7. Luminous Insects (<i>Lampyridæ</i>). |
| 4. Carrion Beetles (<i>Silphidæ</i>). | 8. Lady Birds (<i>Coccinellidæ</i>). |

INTRODUCTORY.

Hitherto, in our Annual Reports, we have devoted ourselves to the consideration of those numerous species of insects that inflict damage upon our crops, fruits and vegetables, while we have only incidentally drawn attention to those other species that are useful to us as destroyers of their noxious fellows. We now propose to treat more especially of the latter class—our Insect Friends. We shall include amongst the number of these friends not merely those parasitic tribes whose special duty it is to keep in check the vegetable-feeding insects that would otherwise sweep everything away before them, but also those various other families that are directly useful to us from their products, or indirectly beneficial by acting as scavengers, removing nuisances, fertilizing plants, and performing other valuable offices. This is, indeed, a vast field of nature—one that we cannot traverse in a few pages or in a limited space of time; we must content ourselves, then, with taking one portion of it at a time and considering it somewhat in detail, in order to afford information that may be of use to the reader. Where to begin, and what mode of division to select, is not an easy matter to decide; we think, however, that it will tend to simplicity, if we follow the natural orders into which insects are distributed, taking one at a time and selecting for consideration those families or tribes which are especially serviceable in their different ways. We shall thus not be confined to one form of service fulfilled by insects, but be presented with a variety in turn, and at the same time we shall be able to touch slightly upon a few of the leading distinctions upon which classification is based.

In order to render our arrangement intelligible to the ordinary non-Entomological reader it is advisable that we should give a brief account of the principal structural differences upon which the classification into Orders depends. In the first place, then, an INSECT as the name implies (Latin:—*in* and *seco* I cut), is an animal whose body is divided into segments or rings, which are sometimes—as in wasps and hornets—almost entirely detached from each other, and cause the creature to appear as if cut in two. It thus belongs to that portion of the Animal Kingdom called the *Articulata*, the members of which have their bodies composed of short cylinders or annulations, jointed or articulated together. Insects may be distinguished from the *Articulata* by several characteristics. They breathe, for instance, not through their mouths, like the larger animals, nor yet through gills, like fish, but by means of spiracles or breathing holes in their sides, through which the air is drawn in and taken to all parts of the body. This mode of breathing distinguishes true insects from many kinds of animals

that are sometimes included in the same class with them, such as crabs, lobsters, shrimps, etc., which breathe through gills, and spiders scorpions, etc., which have breathing sacs in the abdomen. The head of insects is distinct and more or less plainly separated from the rest of the body, thus differing again from crabs, scorpions and spiders. In their larval or grub state insects have, in many cases, a large number of legs, even as many as twenty-two in the caterpillars of some saw-flies, but in their perfect or winged state they never have more than six; this limitation separates them from spiders, which have eight; Centipedes which have from thirty to forty or more, and Millipedes or thousand-legged worms, which have in some species as many as two hundred. Another marked characteristic of insects is their wonderful system of metamorphoses or changes of state (for instance, from egg to caterpillar, caterpillar to chrysalis, and chrysalis to butterfly), ending, in the great majority of cases, in the acquisition of wings. A few other classes of animals undergo some metamorphoses,—in fact, if we include the embryo state, all do so,—but none of these attain to a winged form. Again, insects in their perfect or imago condition uniformly possess a pair of those very singular organs which we call feelers or Antennæ (from the Latin *Antenna*, the yard of a ship's mast), and which are not possessed by any of the numerous members of the spider family. Furthermore insects have their six legs, referred to above, very highly organized, with numerous joints and applications to fit them for all manner of purposes, and very different from the mere bristle like appendages of many worms.

To recapitulate, the distinguishing marks of an insect are briefly these:—1st. They have their bodies divided into *segments*; 2nd. They breathe through openings in their sides (*spiracles*) from which proceeds *tracheæ* or windpipes; 3rd. They have distinct heads, with jointed *antennæ*; 4th. When adult they have *six articulated legs*; 5th. They go through a number of metamorphoses, ending in a *winged state*.

These are the five grand characteristics of an insect proper; any members of the animal kingdom that do not possess them we exclude from the class, and omit from our consideration in these Reports. Many authors, we are aware, take a somewhat different view of the limits of the class of insects, and—regarding Spiders, Scorpions, Mites, Centipedes, Millipedes, etc., as degraded forms of insects—include them in their Entomological systems. As we all agree, however, pretty much in our definition of an insect proper, it becomes merely a question of technicalities rather than one of practical moment, whether we include or exclude these lower and closely allied forms. For the sake of simplicity and of greater ease in imparting information, we prefer to adhere to the limitations that we have laid down. Any of our readers who desire to look further into the matter—and we trust there may be many—we would refer to Dr. Packard's *Guide to the Study of Insects* as a convenient repertory of information gathered from the works of all the leading authorities upon the subject.

In the higher orders of animals—to quote an account that we wrote some years ago,—* while the internal anatomy is wonderfully complicated, the outward appearance is comparatively simple and plain; all the works of the intricately constructed machine are concealed from view, a few primary organs only being apparent to the sight. In insects the case is just the reverse. The internal organs are few in number and simple in construction; while the external parts are particularly numerous, and marvellously varied to suit the special ends of the almost infinite number of differing species. To the student of Entomology this is a manifest advantage, as with the aid of a magnifier he is enabled to observe and note most of the various parts, or trace out their special uses, without having to resort to the dissection of the object. The great majority are on the surface, and if we give them a little careful examination and patient study we shall soon learn a great deal about them. The most obvious parts of an insect, when closely examined are: 1st: the *Head* and its appendages; 2nd: the *Thorax* to which are attached the wings and feet; and 3rd. the *Abdomen*, which is composed of several joints or segments and which is usually terminated by the organs of generation, or a sting or other instrument.

When we look at the head of a quadruped, we see that it is very small compared with the rest of the body, and that it exhibits only a pair of eyes and nostrils, a mouth, ears, and sometimes horns or tusks. A bird's head, again, displays still less, little more being seen than a pair of eyes and a beak. But take up an insect and examine its head with a lens, or, if it be a large specimen, even with the naked eye, and what a complicated structure do you

* *Canada Farmer*, April 15th, 1868, p. 126.

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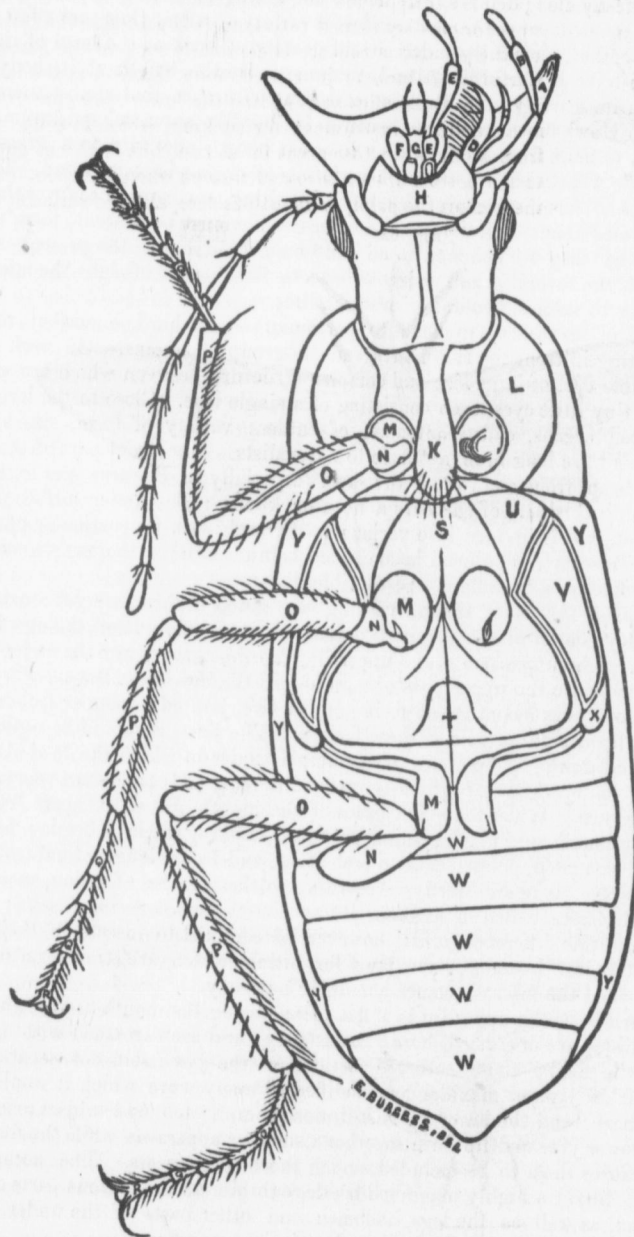
behold! Eyes there are, big and little, antennæ or horns; mouth with jaws above and jaws below, pairs of feelers or palpi, perhaps a sucker, or possibly a set of lancets; instruments for observation, instruments of defence, instruments for taking food, all grouped together in a very small space, and constructed in the most wonderful variety of ways. Compare a few insects of different orders together, and the wonder is still greater. Look at the head of the large Pine-borer beetle, with its powerful jaws and antennæ twice the length of its body, then at the Dragon-fly with its scarcely perceptible antennæ, but with eyes that almost surround it; look again at a large Hawk-moth, with its beautiful feather-like antennæ, and its coiled up sucker that will unroll to more than the length of its great body; now turn to a grasshopper, a fly, or a bug and see what a change—what a variation of organs is to be seen! To recount all these differences of form, structure, size, colour, clothing, etc., would occupy volumes, without even saying a word about their objects and offices. We must be content, then, with considering the organs as they are common to all, and only observe, for the present, the variations that distinguish the several grand orders of insects, leaving out of sight the minor differences that are peculiar to species, genera, or even families.

The *Head* of an insect—to come to particulars—is a hard, somewhat rounded skull; having an opening in front for the mouth and its group of organs. On each side it has a fixed, immovable eye, of large size and complex structure, between which are sometimes two, or often three, tiny little eyes, each consisting of a single lens. Close to the large eyes are two moveable jointed organs, called antennæ, of endless variety of form, size and structure, whose exact uses have long been a puzzle to naturalists. The front part of the head is often separated by a seam from the rest of the skull (especially in Beetles), and is then called the *Clypeus* or shield; this part often bears a horn or knobs. The under surface of the head is called the throat, and is divided into various parts, each with its particular name, in the different orders of insects. The head is connected behind with the thorax, sometimes by a very slender neck, sometimes by a barely perceptible division.

The *organs of the mouth*, though varying very much in form, are yet constructed on one principle. They consist of six principal organs, two on each side of the opening, one above, and one below. The upper one is the upper lip (*labrum*); the lower the under lip: the upper pair of side organs are the upper jaws or *mandibles*; the lower pair the *maxillæ* or lower jaws: Each of the lower jaws has attached to it one, or two, jointed organs or feelers, called *palpi*, and the under lip has also a pair of these feelers. The jaws, it should be noticed, move sideways, not up and down. There are two principal modes in which the food-obtaining organs are employed, the operation of which is vastly different, and causes an enormous change in form and structure. When the side pieces of the mouth are short, apart from each other, and have a horizontal motion, the action produced is *biting*, as in a beetle; but when these side pieces are elongated, pressed close to each other, and have a longitudinal motion, the action produced is *sucking*, as in a butterfly. According to these modes of action, insects are divided into two grand classes, called in English, *Biting Insects* and *Suctorial Insects*; any classification based upon this difference, must, however, be confined to insects in their perfect form, since caterpillars, for instance, have jaws for biting, which are transformed into a spiral sucking-tube when the insect becomes a moth or butterfly.

In *Biting Insects* the upper lip is a flat plate closing the mouth above; the upper pair of jaws or mandibles are of a hard, horny consistency, and are furnished with teeth for biting and gnawing the food; these teeth are portions of the jaw itself, not separate in any way. The lower pair of jaws or maxillæ, are modified in many ways which it would be tedious to particularize here; and the lower lip is still more complicated, and subject to great variations. In bees, the lower jaws and lip form together a sucking apparatus, while the form of the upper biting jaws causes them to be included among the biting insects. The accompanying large wood-cut, (Fig. 50) of a highly magnified beetle, exhibits all the various parts of the mouth of a biting insect, as well as the legs, abdomen and other parts of the under surface. The clearness of the illustration renders much description superfluous.

Fig. 50.



HARPALUS CALIGINOSUS, Say.

PARTS OF CUT.

Ventra Surface of *Harpalus Caliginosus*.

A Mandible.
B' Maxillary palpus.
C Outer lobe of maxilla.
D Inner lobe of maxilla.
E Labial palpus.
F Paraglossæ.

G Ligula.
H Mentum.
I Antenna.
K Prothorax.
L Episternum of prothorax.
M Coxæ.

N Trochanter.
O Femora.
P Tibiæ.
Q Tarsi.
R Ungues.
S Mesosternum.

T Metasternum.
U Episternum of mesothorax.
V Episternum of metathorax.
W Ventral segments.
X Epimeron of metathorax.
Y Epipleura.

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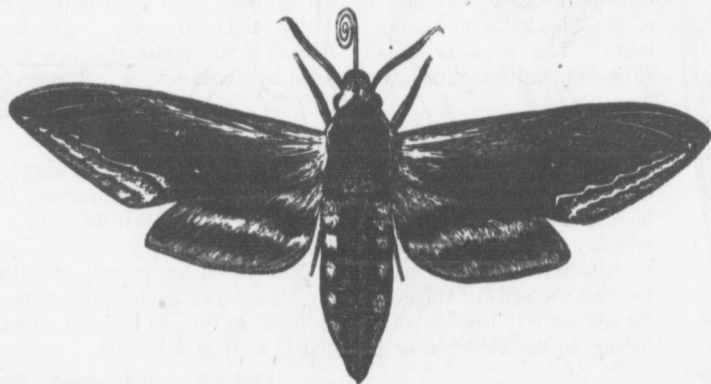
In *Suctorial Insects* there is a wonderful diversity of structure. Bugs, for instance, have the two pairs of side-pieces lengthened out into slender lancet-like organs for piercing, the whole being enclosed in the fleshy elongated lower lip, which acts as a sucker. (Fig. 51 a.) In Flies, also, the five



Fig. 51.

upper organs are turned into lancets sheathed in the fleshy sucker of the lower lip; this structure is especially seen in the fierce, blood-thirsty Horse-fly (*Tabanus*); in the common House-flies the lancets are wanting. In Butterflies and Moths the lower jaws are greatly elongated into a delicate instrument for sucking, which is coiled up and hidden from sight when the insect is at rest, but is thrust out and extended to the bottom of long-throated flowers when in action. (Fig. 52.) In all these cases the palpi, or mouth-feelers, also are variously modified. The

Fig. 52.



other organs of the mouth about which we need not now speak in particular are the antennæ, and the different kinds of eyes.

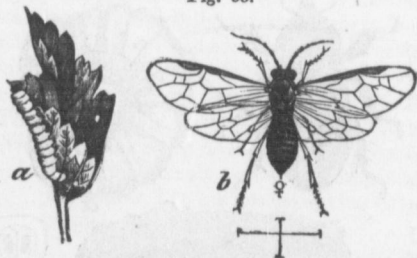
We have just now spoken of insects as being divided into two great sections according to

the structure of the mouth in the perfect insects, viz: *Suctorial* (*Haustellata*) and *Biting* (*Mandibulata*). These sections are further subdivided into seven Orders, depending upon the structure of the wings. We shall briefly recount the special characteristics of each Order, and then turn from what we fear are dry, even though necessary, details to the consideration of our proper subject—Beneficial Insects.

There is an immense difference of opinion among Naturalists with regard to the arrangement of these Orders, but as this is a question that does not concern us in these Reports we shall not enter into it, but merely content ourselves with following here the series adopted by Dr. Packard.

Order 1. HYMENOPTERA. (Greek: *Hymen* a membrane, and *Pteron*, a wing). Includes Bees, Wasps, Sawflies, Ants, Ichneumons, etc. Four membranous wings, with few veins or nervules; the hind pair usually the smaller. Fig. 53 represents a

Fig. 53.



the hind pair usually the smaller. Fig. 53 represents a Saw-fly and its larva; Fig. 54 a magnified Ichneumon.

Fig. 54.



Order 2. LEPIDOPTERA. (Greek: *Lepis* a scale, and *Pteron* a wing). Includes Butterflies (Fig. 55.) and Moths. (Fig. 56.) Membranous wings, generally four, entirely covered with scales, antennæ almost always composed of numerous minute joints. Butterflies may be distinguished from moths by their club-shaped antennæ; the latter have these organs of very various forms, but never clubbed or thickened at the extremity. The larvæ are usually called caterpillars (Fig. 57),

Fig. 55.

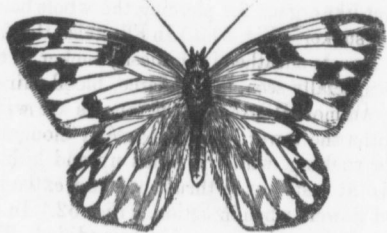


Fig. 56.



Fig. 57.



and are so familiar to every one that we need not enter into any description of them; they may be distinguished from the false caterpillars of Saw-flies by never having more than eight pairs of legs. The pupa is usually termed a chrysalis (Fig. 58), and sometimes is protected by a cocoon.

Fig. 58.



Fig. 59.

Order 3. DIPTERA. (Greek: *Dis* twice; *Pteron* a wing). Includes the common Horse and Flesh-flies, Gnats, Mosquitoes, Crane-flies, etc. Two wings only apparent, the hinder pair being in a rudimentary condition, and represented by what are termed 'halteres,' poisers or balancers (Figs. 59 and 60). The larvæ are usually destitute of feet, and are called 'Maggots;' some, however, as the mosquitoes are aquatic and actively locomotive. This order, as well as the two preceding, belongs to the Suctorial or Haustellate section of Insects.

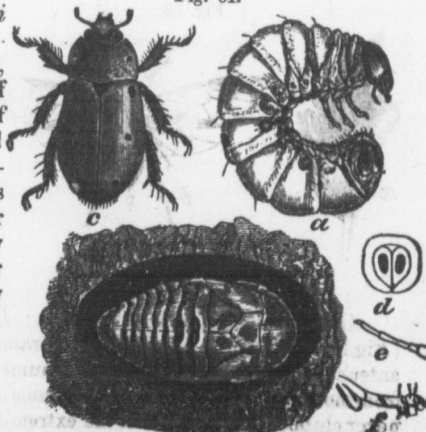


Fig. 60.



Order 4. COLEOPTERA. (Greek: *Coleos* a sheath, and *Pteron* a wing). Includes all the various tribes of beetles. Four wings usually present, the anterior pair of which are hardened and thickened so as to resemble the substance of the head and thorax, and are not adapted for flight, but form protecting cases (called *elytra*) for the ample hind wings, concealed beneath them. Fig. 61 represents a perfect beetle (*c*), the larva (*a*) and pupa (*b*). The mouth is always furnished with jaws for biting.

Fig. 61.



nished with jaws for biting.

Order 5. HEMIPTERA. (Greek: *Hemi* half, and *Pteron* a wing.) Includes Bugs, Plant-lice, Boat-flies, Cicadas, Cochineal Insects, &c., Four wings, the anterior pair of which are stiff and hard like those of the beetles, for about half their length, while the remainder is thin and membranous; the hinder pair are also membranous. The mouth is furnished with a sucker or beak, through which they imbibe the fluids, animal or vegetable, upon which they live. (Figs. 62 and 63).

Fig. 62.



Order 6.

Fig. 63.



winged flies, finely reticulated work of veins furnished with

Having chief characteristics those of its members have decided peculiarities of its own. The first family in Canada. This and is applied shine. In England of leaping upon state, and when warm sunny be sun, and free from frequent grassy of the passer-bird him, alighting in direction of the again, but after he craftily eludes mer station. I succeeded in finding without the aid venient retreat,

The eggs of their lives. This tion. It would Fig. 65. the rest of the legs, a toward They which they usually sufficiently near there to be devoted

Order 6. ORTHOPTERA. (Greek: *Orthos* straight, and *Pteron* a wing.) Includes

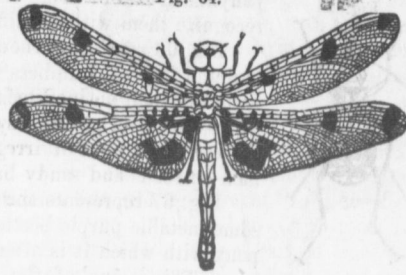
Fig. 63.



Grasshoppers, Locusts, Crickets, Cockroaches, &c. Four wings, the anterior pair of which are somewhat thickened to protect the broad net-veined hinder pair, which fold up like a fan upon the abdomen, in long straight folds. The hind legs are large and thick, and adapted for leaping. Mouth furnished with strong jaws for biting and masticating.

Order 7. NEUROPTERA. (Greek: *Neuron* a nerve, and *Pteron* a wing.) Includes Dragon-flies (Fig. 64), May-flies, Caddis-flies, Termites, Lace-

Fig. 64.



winged flies, etc., Four thin, glassy wings, very finely reticulated, or covered with a fine network of veins or nerves. The mouth is usually furnished with biting jaws.

1. TIGER BEETLES (*Cicindelidae*).

Having now enumerated the various Orders into which Insects are divided, and their chief characteristics, it remains for us to select one for our consideration here, in respect to those of its members who may be deemed directly or indirectly beneficial to mankind. We have decided upon beginning with the Beetles (*Coleoptera*), partly because they are very favourite objects of study with Entomologists, and partly because they present strongly marked peculiarities both in structure and habits, and are very abundantly distributed everywhere. The first family of Beetles is the *Cicindelidae*, of which we have only one genus, *Cicindela*, in Canada. This name, derived from the Latin, signifies a Glow-worm or bright shining insect, and is applied to them on account of their bright metallic colours, which sparkle in the sunshine. In English they are commonly called Tiger-beetles from their fierce disposition and habit of leaping upon their prey. They feed entirely upon other insects, both in the larval or grub state, and when they attain to the winged or beetle condition. Their favourite haunts are warm sunny banks, sandy roads, railway tracks, or other spots exposed to the full glare of the sun, and free from vegetation, which would impede their movements. Some species, however, frequent grassy places on the borders of woods and among scattered trees. At the approach of the passer-by they suddenly take wing, and fly with great rapidity for a few yards before him, alighting again as suddenly as they rose, but always with their heads turned in the direction of the approaching danger. The same individual may be started up again and again, but after a few alarms, when he begins to find himself the object of a particular pursuit, he craftily eludes further persecution by making a long and circuitous flight back to his former station. By carefully marking where he goes, and going quietly back, we have often succeeded in finding the desired specimen careless and off his guard, and captured him even without the aid of a net. In cloudy or stormy weather they hide themselves in some convenient retreat, but they soon re-appear with the returning sunshine.

The eggs are laid in the earth, where the grubs that are hatched from them also spend their lives. These grubs or larvæ are very curious creatures, and well repay a little observation. It would be difficult to describe their form so as to render them easily recognizable to the reader, but the accompanying cut (Fig. 65.) will afford a sufficiently good idea of their appearance.



It will be seen that they have a pair of tremendous, curved jaws, three pairs of legs, and a pair of very curious recurved hooks or spines on the eighth segment towards the tail. They are of a yellowish white colour with a brownish horny head. They live in deep round holes, about the diameter of a lead pencil, the orifice which they usually close with their heads. No sooner does any unsuspecting insect approach sufficiently near than it is seized by a sudden effort, and carried off to the bottom of the hole, there to be devoured at leisure. The larva lives in this manner throughout the summer, and

is supposed to pass through its pupa state in the ground during the winter, appearing in the beetle form early in the following spring.

The beetles, of which over one hundred different species are known to inhabit North America, and about a dozen have been found in Canada, are provided with sharp cutting jaws, three pairs of long slender legs, which enable them to run with great rapidity, and a pair of membranous wings, concealed beneath the handsome wing-covers when not in use. They feed upon small insects of every description, and must destroy incalculable numbers. The accompanying figures of some of our commonest species will enable the reader to recognize them without difficulty.

Fig. 66.



Fig. 66 represents the common Tiger-beetle (*Cicindela vulgaris*, Say), which is found in great numbers all over Canada and the United States. It is a little over half an inch long, and about half as broad, of a dull purplish colour above, and a bright brassy green beneath. On each wing cover above are three whitish lines of irregular shape, as seen in the figure. It is very common on roads and sandy banks throughout the summer.

Fig. 67



Fig. 68.



Fig. 67 represents the purple Tiger-beetle (*C. purpurea*, Riv.), a very handsome metallic purple beetle, nearly the same size as the preceding, in company with which it is often found. Sometimes it is greenish instead of purple. This is one of the first beetles to come out in the spring. We have

taken it in numbers in April, and once as early as the 17th of March, before the snow had all gone.

Fig. 68. The hairy-necked Tiger-beetle, (*C. hirticollis*, Say) is another common species that bears a general resemblance to *C. vulgaris* though smaller, and with the neck covered with whitish hair, as the name implies.

A most beautiful species is the Six-spotted Tiger-beetle, (*C. sex-guttata*, Fabr.), a most brilliant metallic green insect, with six tiny white spots on its wing-covers. It is sometimes found in gardens, but more usually in partially shaded places, where it chooses as its post of observation some projecting stone or log.

It is rather difficult to capture, being exceedingly active in its habits, and is not nearly so common as the preceding species.

Fig. 69 represents another very handsome and rather larger species which is occasionally found in Canada. As all these beetles live upon other insects, and devour enormous numbers of those that are injurious to us, we beg that our readers, one and all, will abstain from ruthlessly trampling them under foot in the future, and will rather encourage them about their farms and gardens.*

Fig. 69.



2. CARNIVOROUS GROUND BEETLES. (*Carabidæ*).

Next of the Tiger-beetles comes the family of the Carnivorous Ground Beetles (*Carabidæ*). Under this general name are included a very large number of different genera and species, which are found all over the world and in all sorts of situations. In Canada we have over forty genera and an immense variety of species already known to our Entomologists, and more are added to the list every year. Some of the species are the most difficult to determine of all our beetles, and afford an intricate puzzle to the student; the general features of the whole family can, however, be easily learnt from a few specimens, descriptions and illustrations of which we now proceed to place before the reader.

* To avoid misapprehension we would state that in this account of the Tiger Beetle, and in those that follow, we have quoted freely from our own contributions to the *Canada Farmer*. As our articles are scattered over a number of volumes and have not been published in consecutive form, we think no apology is needed for their partial reproduction here.

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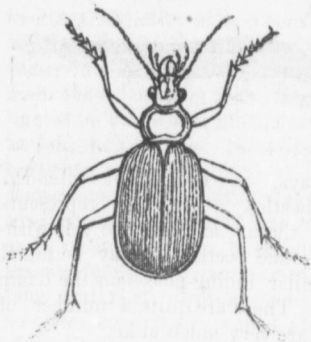
Fig. 72



Fig. 7



Fig. 70.



Colours, Metallic Green, Purple and Copper.

Fig. 71.



by the spots just mentioned; still it is a handsome beetle, though not to be compared to the preceding species.

Fig. 72.



Fig. 73.



The largest and handsomest member of the family is the green Caterpillar-hunter (*Calosoma scrutator*, Fab.—'The Beautiful-bodied Searcher'). Fig. 70. It is of the same general shape as the following species, but no wood-cut can convey an idea of its exceeding beauty and brilliance of colour. The head and thorax are dark purplish black, the latter with a greenish coppery margin; the wing covers (elytra) are bright and shining green, with fine longitudinal lines and scattered punctures, and a broad, coppery red margin; the under-side is deep shining green varied with coppery markings: the legs are blackish-brown, in some lights deep purple. This magnificent beetle, as its name implies, feeds upon caterpillars, especially the obnoxious canker-worm of the United States, sometimes even ascending trees for the purpose; its larva (or grub) has also the same useful propensities. It is rather a rare insect in Canada, though found occasionally in most parts of Ontario;

collectors of insects can often find specimens in summer after a southerly gale, on the outer shore of Toronto Island, which is a famous place for obtaining rare beetles that have been drowned in the lake and washed ashore by the waves.

Another caterpillar-hunter, (Fig. 71), belonging to the same genus as the preceding, is quite a common insect in Canada, and can be found in May and June under logs or stones, as long as the ground is moist; in the hot dry weather it is not so readily met with. It is called the hot, or glowing *Calosoma* (*C. Calidum*, Fabr.) from the appearance of the wing-covers, which are black with six rows of bright coppery impressed spots, thus bearing a fanciful resemblance to a vessel of coals with a perforated cover. Its general colour is shining black, unrelieved except by the spots just mentioned; still it is a handsome beetle, though not to be compared to the preceding species. Like its congener, it devours caterpillars with avidity, both in its larval and perfect states, and is a capital hand at reducing the numbers of those horrid pests, the cut-worms; we usually transport a number of these big beetles into our garden every spring to keep down these cutters-off of our young cabbage plants.

The next large beetle of this family to which we would draw attention, is the murky ground beetle (*Harpalus Caliginosus*, Say); it is entirely of a dull black colour, and may be readily recognized from Fig. 72. We beg our readers to take particular notice of this figure, as there are a very large number of beetles of the same general shape and structure, though usually smaller, that prey upon other insects and are consequently useful to man. Any dark-brown, black, green or metallic coloured beetles of this shape, that are found under chips, or stones in damp places, or running in grass, may be safely considered as belonging to this family, and therefore be treated with kindness and consideration; it always gives us a pang of regret to find the crushed body of one of these beetles lying by the way side, where it has been ruthlessly trampled under foot by some ignorant "lord of creation." The particular species here referred to is stated by Mr. Riley to be a formidable enemy of that western plague, the Colorado potato beetle; it is also satisfactory to learn that an allied species (*H. Pennsylvanicus*, De Geer?) a very common insect in Canada, is a merciless devourer of the plum curculio. Fig. 73 represents the perfect insect, and Fig. 74 the larva.

A much smaller but very peculiar genus of beetles, is called the Bombardier (*Brachinus*), from its extraordinary power of discharging from its tail end a very pungent fluid, accompanied by a report (resembling the sound *phut*) and some smoke-like vapour; this fluid, which resembles nitric acid in its effects, and makes a stain

Fig. 75.



on the fingers that will last for several days, is no doubt intended for its defence against more powerful beetles. Fig. 75 represents one of these beetles (*B. fumans*, Linn.); its head, thorax, and legs are yellowish-red, and its wing-covers dark blue. Like other ground beetles, it may be found under sticks and stones in the spring, and in similar hiding-places on the damp margin of rivers during the hot summer months. There are quite a number of different species of this genus in Canada, but all are very much alike.

It would be almost an endless task to go through the list of species of this family, but we trust that the examples now given will be sufficient to enable our readers to recognize these friendly beetles, and save them from being doomed to a pitiless destruction, that knows no difference between friend and foe.

3. WATER BEETLES (*Dytiscidae*, *Gyrinidae* &c.)

After the carnivorous Ground Beetles, we come, in the ordinary classification of insects to a large group that live almost entirely in or upon the water. Some of them live on the surface of lakes, ponds and pools; others prefer clear running streams; others, again, the muddy bottoms of half-stagnant pools.

This group is divided into two principal families, the "diving-beetles" (*Dytiscidae*), and the "whirligigs" (*Gyrinidae*). They are all more or less insectivorous, both in their larval and perfect state, and hence beneficial. As their food, however, consists mainly of insects that inhabit the water, and which are either similar in their food and habits to their destroyers, or live upon water plants of no particular value, it can hardly be said that they are beneficial to the farmer or fruit-grower; still, as they are not noxious and are certainly useful in their own sphere, we shall go on to describe them, and implore that their lives may be spared from the destruction so universally dealt out to the poor insects.

The Diving-beetles (*Dytiscidae*) are mostly large-sized insects of an oval flattened shape, generally of a dark brown, olive, or blackish colour, and often with a margin and other markings of yellowish. Their legs are specially adapted for swimming, being large and oar-like, and covered with long hairs; the hinder pair are very much flattened, also, so as to give a propelling stroke. When they rise to the surface to take in a fresh supply of air—a silver-like bubble of which may generally be seen attached to their hinder extremities—they appear to come up merely from being specifically lighter than the water; but when they dive or swim through the liquid, which they do with great swiftness, they move by means of regular and successive strokes of their oar-like legs. When at rest upon the surface they extend these legs at right angles with the body, generally with the head under water and the tip of the abdomen above, enabling them to draw in air to the spiracles beneath the wing-covers. They inhabit stagnant pools in preference to running water, and are very voracious in their habits, attacking and devouring other denizens of the water, even occasionally preying upon very young fish. We have kept a specimen for many weeks in a glass jar of water, and watched its graceful movements and curious habits with much interest; it fed greedily upon house-flies, aphides, etc., with which we supplied it.

Their larvæ are called "water tigers" from their ferocity; they are long and cylindrical, with large flattened heads, armed with scissors-like jaws, by means of which they seize other insects, and, it is said, "snip off the tails of the tadpoles!" Their body terminates in a pair of long tubes through which they inhale the needful supply of air. When about to transform they creep into the earth near by, and make a round cell, inside of which they assume the pupa state, the perfect beetle appearing in two or three weeks, if in summer, but not till the following spring if in the autumn. We have sometimes seen little pools of water in the spring perfectly swarming with these and other larvæ.

Fig. 74.



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The whirligigs (*Gyrinidae*) must be familiar to every one. They are those little black beetles that one sees so often in groups on the surface of water, whirling and circling about in every direction with great rapidity. "When thus occupied their motions are so exceedingly quick that the eye is perplexed in following them, and dazzled by the brilliancy of their wing-cases, which glitter like bits of polished silver or burnished pearl. On approaching them they instantly take alarm and dive beneath the surface, carrying with them a little bubble of air, which glitters like a drop of quicksilver, and is attached to the posterior portion of their bodies. Sometimes they may be taken flying, their large wings enabling them to change their abode without difficulty, when the drying up of their native pool compels them to migrate. This enables us to account for the occasional discovery of these insects in small puddles of newly-fallen rain-water. The structure of the short hind legs, and especially of the curious branched tarsi, must be examined in endeavouring to account for the singular motions of these insects; the assembling together of which has been regarded by some writers as resulting purely from a strong social influence, and by others as indicating no closer bond than that of animals congregating round their common food. That the food of the *Gyrinidae* consists of small dead floating insects, I have ascertained; but I would further suggest that, being produced on the same spot, as is the case with the swarms of midges, they are influenced in some degree by the common desire of continuing their species. I have often observed that, in their gyrations, they hit against one another. In dull and inclement weather they betake themselves to quiet places, under bridges, or beneath the roots of trees growing at the water's edge. When touched they emit a disagreeable odour, arising from a milky fluid, which is discharged from the pores of different parts of the body. The remarkable structure of the eyes, which, unlike those of most insects, consist of two distinct pairs, one on the upper and the other on the lower surface of the head, must be greatly serviceable to the insect in the peculiar situation in which it is generally observed, and whereby it is enabled to see objects beneath it in the water, and above it in the air." (Westwood). They are all of a broad, oval form, generally of polished black colour, with broad oar-like hind tarsi, and long slender fore-feet, used in seizing their prey. They vary in size from about one-fifth to half an inch in length.

Besides the Diving-beetles and the Whirligigs, there is yet another great family of aquatic beetles, which belong to a different sub-tribe of this order of insects; its members are termed "Water Lovers," (*Hydrophilidae*) from their habits.

The members of this family live either in the water, or on the damp margins and shores of streams and ponds; they are carnivorous in the larval state, but as beetles they feed upon refuse and decaying vegetable matter, thus uniting the qualities of the two families already noticed, and those of the scavenger beetles, which we purpose bringing before the reader by and by. A considerable number of these "Water Lovers" are found in Canada; some of the species attain a very large size, while others are quite minute, and not to be discerned without close observation. As these creatures are not of any very general interest, we may dismiss them from our notice and pass on to the more conspicuous and note-worthy Carrion Beetles.

4. BURYING AND CARRION BEETLES. (*Silphidae*).

These curious and interesting creatures belong to the family *Silphidae*; they are distinguished by the flattened form of their bodies, their knobbed antennæ, their habits, and the black nauseous fluid they discharge when handled. Their grand duty is to remove from the surface of the earth all dead or putrefying animal matter, which would otherwise become noxious and offensive. They are usually found in or close to carrion of all sorts, though sometimes they devour putrid fungus; occasionally we have taken them on the wing, and have even found them attracted by light into our rooms in summer. The *Silphidae* are divided into several genera, the chief of which are *Necrophorus*, including the Sexton or Burying Beetles, and *Silpha*, the Carrion Beetles; both of these genera are well represented in Canada.

The Sexton Beetles (*Necrophorus*), in spite of their loathsome occupation, are decidedly handsome insects. Their usual colour is deep shining black, variegated with rich orange-red spots; beneath they are frequently ornamented with yellowish silken hair like that of a Humble-bee; their antennæ are very remarkable, consisting of a jointed stem terminated by a rose-coloured or orange knob composed of four little cups or plates piled

one above the other. The largest species we have is called the ^{Necrophorus} American Sexton (*N. Americanus*, Oliv.); it is nearly an inch and a half long, deep black, ornamented above with large orange-red spots on the head, thorax, and wing-covers, and beneath with light yellow hairs on the breast.

These insects are wonderfully powerful for their size, their flight is vigorous, and they are able to run with rapidity. We have at least ten species of these grave-digging beetles in Canada, differing from each other in size and ornamentation, but all possessing the same habits and instincts. They are not at all uncommon during the summer months; no sooner, indeed, is any small dead animal or piece of flesh left in a decomposing state on the surface of the ground, than they assemble in troops to bury it. After a careful examination of the object, as if to take its dimensions, and ascertain how many labourers would be required for the job, several of them commence operations by creeping beneath the carcass and digging away the earth with their fore-legs; they continue their labours till they succeed in sinking it several inches, sometimes nearly a foot, beneath the surface; and at the end of twenty-four hours the object is generally out of sight, unless it be particularly large, or the ground difficult to work in. In this labour the males assist, and as soon as it is accomplished, the females deposit their eggs in the carcass.

Many curious and interesting accounts have been published respecting the habits and instincts of these creatures—two interesting narratives of the kind are given in the *Canada Farmer* for July 15th, 1868, page 214. A German Entomologist relates that he confined four beetles of this genus in a small space, and supplied them with the following quantity of materials: four frogs, three small birds, two fishes, one mole, two grasshoppers, the entrails of a fish, and two pieces of ox's liver; they succeeded in interring the whole in fifty days. Of course this quantity was much more than sufficient for the nourishment of their future progeny, for whose benefit the burying takes place, and it was probably only because these carcasses were placed within their reach that they continued their burying propensities, (Westwood). As a further instance of their powers, we may mention the following case, related in the *American Entomologist* :—

"On one particular occasion, having deposited a full-grown rat upon newly-moved earth in a particular spot, as a trap for these Burying-Beetles, we found that in twelve hour's time the carcass had been completely buried, all but the tip of the tail, by a single individual of our largest and handsomest species, (*N. Americanus*, Oliv.) a beetle which is only one inch and a half long. It would puzzle an Irish labourer to bury a full-grown whale in the same length of time; yet proportionately this would be a task of precisely the same magnitude."

The Carrion Beetles (*Silpha*, etc.) differ from the foregoing in their more flattened shape, and dulness of colour, as well as in their habits and minor peculiarities of structure. Our largest and commonest species is the Surinam *Silpha* (*S. Surinamensis*, Fab.) Its colour is uniformly black, with a transverse irregular, reddish coloured band or series of spots, near the end of the wing-covers. It is found abundantly in carrion during the summer, and may certainly be considered from its fetid odour and repulsive appearance an exceedingly disgusting, even though highly useful creature. It does not bury its food, like the Sexton Beetle, but may be found swarming in and over exposed carcasses during the summer months, evidently reveling in filth. The handsomest species of this genus is the Shield-bearing *Silpha* (*S. peltata*, Catesby,) which is remarkable for the broad, thin expansion of its thorax in the form of an ancient semi-circular shield, of a creamy-white colour, ornamented in the middle with a device somewhat in the form of a cross. We have occasionally taken it in numbers about the body of a dead fish. The larvæ of this genus, unlike those of the preceding one, are obliged to seek their own food, which is of the same character as that of their parents, and consequently have strong legs, and a crustaceous flattened body.

5. SCAVENGER BEETLES (*Staphylinidæ*).

The preceding group of insects follow the useful occupation of sextons for the smaller animals, or employ themselves in other ways for the removal of carrion. The next tribes of beetles that come within the scope of our present observation, discharge a somewhat similar office in the domain of nature, and busy themselves in the removal of nuisances from the surface of the earth.

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To quote the words of Kirby and Spence (*Introduction, Letter ix.*),—"How disgusting to the eye, how offensive to the smell, would be the whole face of nature, were the vast quantity of excrement daily falling to the earth from the various animals which inhabit it, suffered to remain until gradually dissolved by the rain, or decomposed by the elements! That it does not thus offend us, we are indebted to an inconceivable host of insects which attack it the moment it falls; some immediately begin to devour it, others depositing in it eggs from which are soon hatched larvæ that concur in the same office with tenfold voracity; and thus every particle of dung, at least of the most offensive kinds, speedily swarms with inhabitants which consume all the liquid and noisome particles, leaving nothing but the undigested remains, that soon dry and are scattered by the winds, while the grass upon which it rested, no longer smothered by an impenetrable mass, springs up with increased vigour." The insects that engage in this work belong to many different tribes, chiefly pertaining to the orders of beetles and flies (*Diptera*). A large proportion of the former come in natural sequence almost immediately after the Carrion Beetles already described, and may, therefore, be fitly reviewed here. To give a complete account of all the different families of beetles that belong to the hordes of scavengers, would be a long, and—to the general reader—by no means an interesting proceeding; we shall, therefore, content ourselves with describing the peculiarities in structure and habits of the common sorts.

The first and most numerous family that we come to, includes all those species of beetles, called in England "Rove-beetles" or "Cock-tails" (*Staphylinidæ*). They are readily distinguished from all the other families by their peculiarly long and narrow bodies, flattened form and very short wing-covers, (*elytra*) which only cover one or two segments of the abdomen, instead of almost the whole of it, as is the general rule with beetles. These short wing-covers give the insect somewhat the appearance of wearing a boy's short jacket, instead of a long coat; notwithstanding their brevity, however, they completely conceal and keep out of the way the ample membranous wings, which, when not in use for flight, are beautifully tucked away beneath them. The long uncovered abdomen is capable of being moved in different directions, and is employed by the creature in folding and unfolding its wings. When irritated or alarmed it cocks its tail over its back, and assumes a ludicrously threatening aspect: it also possesses the power, probably for defence, of protruding at will two vesicles from the extremity of the abdomen, which emit a very unpleasant, and sometimes indescribably fetid odour.

The chief food of these insects, both in the larval and perfect states, consists of decaying animal and vegetable matters; in early summer every piece of dung that falls to the earth speedily swarms with them, and in the autumn they are equally numerous in fungi, agarics, etc. Some species are also carnivorous, feeding upon other insects; in England a large species, commonly called the Devil's Coach Horse, (*Georus olens*) devours large numbers of the destructive Ear-wig (*Forficula*). "On the least approach of danger," Westwood relates, "this insect, like the rest of the group, immediately puts itself into a most ferocious-looking posture of defence, throwing the tail over the head like a scorpion, protruding the anal vesicles, elevating its head and widely opening its long and powerful jaws."

Upwards of four hundred species of this family of beetles are found in North America, and of these, one hundred and five species have been taken in Canada. Many more undoubtedly remain to be found and described when collectors pay more attention to the minuter forms of insect life. Eight hundred species have been described as found in England alone. In tropical climates they are very rare; their places as insect-scavengers being supplied by the excessively abundant ants and termites.

6. DUNG BEETLES (*Scarabæidæ*, etc).

The members of the family to which we have now come, and to which we have given the title of "Dung-beetles," for want of a better, have been objects of peculiar interest to mankind for many thousand years, and will, no doubt, continue to attract the attention of all observers of nature as long as the world lasts. Were it not for their extraordinary habits and for the reverence which was accorded to some of them in ancient times, these creatures—like the preceding family—would be simply disgusting to us, even though of great value in the economy of nature.

Every one has, no doubt, heard of the Sacred Beetle of the Egyptians, which was worshipped by them as a god, and revered in various ways. It was called the Scarabæus, and belongs to the tribe we are now considering. "Hor-apollo"—according to Louis Figuier—"the learned commentator on Egyptian hieroglyphics, thinks that this people, in adopting the Scarabæus as a religious symbol, wished to represent at once *an unique birth—a father—the world—a man*. The *unique birth* means that the Scarabæus has no mother. A male wishing to procreate, said the Egyptians, takes the dung of an ox, works it up into a ball, and gives it the shape of the world, rolls it with its hind legs from the east to the west, and places it in the ground, where it remains twenty-eight days. The twenty-ninth day it throws its ball, now open, into the water, and there comes forth a male Scarabæus. This explanation shows also why the Scarabæus was employed to represent at the same time *a father, a man and the world*. There were, however, according to the same author, three sorts of Scarabæi; one was in the shape of a cat, and threw out brightly shining rays (probably the Golden Scarabæus), the others had two horns (Coprîs)."

There is a colossal granite figure of a Scarabæus brought from Egypt in the British Museum, and other smaller representations that we have seen appear to have been worn as amulets, suspended from necklaces or bracelets. It is supposed by some that the plague of "flies" inflicted upon this people in the days of Moses consisted of swarms of this beetle, thus rendering the object of their superstitious worship a means of punishment; but we can hardly think that so innocent and harmless a creature, in other respects, would have been chosen by the Almighty for such a purpose; we do not, however, insist upon any particular view of the subject, as so little is told us in the pages of holy writ.

In Canada we have one species (*Canthon levis*, Drury), which bears a strong resemblance to the Egyptian Scarabæus in appearance and habits, it is not very common, but is, however, generally distributed throughout the Province of Ontario. There are also several species of another genus (*Coprîs*), which possess similar habits but differ in their striated wing-covers, and in the extraordinary curved horn with which the head of the males is armed. A remarkable peculiarity of these insects exists in the structure and situation of the hind legs, which are placed so near the extremity of the body and so far from each other, as to give the insect a most extraordinary appearance whilst walking. This peculiar formation is, however, particularly serviceable to its possessors in rolling the balls of excrementitious matter in which they enclose their eggs. These balls are at first irregular and soft, but by degrees, and by continued rolling, they become rounded and harder; they are propelled by means of the hind legs, and the insects occasionally mount on the top, when they find a difficulty in urging them along; probably in order to destroy the equilibrium. Sometimes these balls are an inch and a half in diameter; and in rolling them along the beetles stand almost upon their heads, with their heads turned away from the balls. These manœuvres have for their object the burying of the balls in holes, which the insects have previously dug for their reception; and it is upon the dung thus deposited that the larvæ feed when hatched (MacLeay). These rhinoceros or unicorn beetles—as they may be termed—frequently fly into houses through open windows, when attracted by light in the warm summer evenings. They are especially abundant on sandy soils.

Another family of Dung-beetles (*Geotrupidæ*) performs a similar important part in the economy of nature, by feeding upon and burrowing under newly fallen dung. Its species, however, do not make up pellets and roll them along the ground, as those above mentioned, but content themselves with sinking shafts immediately under the mass of excrement, and there hoarding up the supply of food for their young. They are much more common in this country than the preceding, and may often be observed on a warm summer's evening, when the shadows are growing long, hovering about the droppings of some horse or cow, and preparing to do their part in the removal of a nuisance, and the fertilization of the earth.

Yet another family (*Aphodiidæ*) must be briefly noticed, before we leave these useful creatures. One species is almost the first beetle to greet us in early spring, as it flies about the manure of the hot-bed, and expands its coral-red wing-covers to the sun. It is the *Aphodius fimetarius*, Linn. and is common in England as well as in Canada. Another tiny species (*A. inquinatus*, Fab.) swarms in the spring along the highways, resembling a fly as it hovers in the air, but easily distinguished when captured in the hand, or otherwise arrested in its flight; both of them feed upon horse-dung. The species of this family are especially numerous in the temperate regions of the northern hemisphere, and devote them-

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7. LUMINOUS INSECTS (*Lampyridæ*).

In the regular order of families of beetles, according to the generally received classification of Coleoptera, we come to a number of decidedly noxious insects after the Dung-beetles just described; such for instance as the May-beetles and other leaf-eaters, (*Melolonthidæ*), the

Buprestis Borers that perforate the wood of a majority of our trees, (Fig. 76), and the Spring-back Beetles, (*Elateridæ*), parents of the justly dreaded Wire-worms. The first family of common insects that we come to after these, are the Fire-flies—luminous insects of the family *Lampyridæ*.



Fig. 76.

myriads of the latter.

Our fire-flies, in the perfect state, are soft flattened beetles, with the head almost entirely concealed under the projecting hood formed by the thorax; they are generally of pale colours, though sometimes black. They are voracious in their habits; feeding in the larval state, upon earth-worms and soft-bodied insects. The light which they emit proceeds from the extremity of the abdomen, and appears, from its fitfulness, to be under the control of the insects. Its origin and composition have long been a matter of doubt. According to Siebold, "the luminous organs of these insects consist of a mass of spherical cells, filled with a fine granular substance, and surrounded by numerous trachean branches. This substance appears, by daylight, of a yellow, sulphur-like aspect. The light produced from these organs, so remarkably rich in tracheæ, is undoubtedly the result of a combustion kept up by the air of these vessels. This combustion explains the intermission of the phosphorescence observed with the brilliant fire-flies, and which coincides, not with the movements of the heart, but with those of inspiration and expiration."

All our readers are, no doubt, perfectly familiar with the sparkling intermittent light exhibited by fire flies on damp summer evenings. They appear to take especial delight in moisture, frequenting low marshy grounds and river bottoms in myriads, while they but occasionally visit the drier air of high ground. We have sometimes seen them in tens of thousands, nay millions, when driving at night along some sequestered country road bordered by wet, swampy ground, or when taking a nocturnal ramble in search of insects up the valley of the Credit. Brilliant and numerous though our Canadian fire-flies are, they cannot be compared—judging from the accounts of naturalists—with the glories of the tropical species. There, besides species similar to ours, they have the huge lantern flies, said to be two or three inches long, and emitting a most brilliant light and also the large spring-back beetle (*Elater Noctilucus*) that gives forth a bright glow from spots on the thorax. Southey thus describes the appearance of these creatures in tropical America:—

"Soon did night display
More wonders than it veiled; innumerable tribes
From the wood cover swarm'd and darkness made
Their beauties visible; one while they stream'd
A bright blue radiance upon flowers that closed
Their gorgeous colours from the eye of day;
Now motionless and dark, eluded search,
Self-shrouded; and anon, starring the sky,
Rise like a shower of fire."

In England they have but one species of luminous insect, well known under the name of 'glow-worm.' The females of this insect are long, flat, soft wormlike creatures, quite destitute of wings; emitting usually a pale steady light from the extremity of the abdomen. The males, on the other hand possess complete wings and wing covers, and are but feebly luminous. We have taken them in early summer in the long damp grass beside hedge-rows in Lancashire, where their tiny light attracted us from some little distance. They did not, however, appear to be at all common.

In this country both sexes of the fire-flies are fully winged, and both appear to be equally luminous. The larvæ also of several species possess the property of emitting light; but of these we have rarely obtained specimens. In 1868 we obtained a remarkable larva

which in all probability belonged to the genus "Melanactes" of the Elater family. "Its general colour, (as we described at the time in the *Canadian Entomologist*, vol. 1, page 2) was a dark drab, the posterior angles of each segment, the softer connecting portion between the segments and the under side of the body being very much paler, and of a somewhat dirty yellow hue; on each side there is a deeply impressed line in which the spiracles are situated. When seen in the dark, the insect presented a very beautiful appearance, being apparently ringed and dotted with greenish fire. Each spiracle appeared to be a point of bright greenish light, and the division between each segment a line of the same colour; it looked indeed as if the whole insect were filled with fire, which shone out wherever it was not concealed by the dark shelly integument. When coiled up on its side it looked like a lovely Ammonite whose striae emitted green light, and with a point of green fire in each interspace."

All the insects of the Lampyris family, whether luminous or not, may be classed among our friends, as they do not feed upon our crops or fruits, but upon various worms, snails and insects. One species (*Chauliognathus Pennsylvanicus*) a pretty yellow soft-winged beetle, with a black oval spot towards the tip of each wing cover, is especially useful from its commendable habit of devouring the larvæ of the dreaded Plum Curculio, when in the larval state itself. The perfect insect we have sometimes taken in great numbers upon the blossoms, towards the close of summer.

Cantharid Beetle

8. LADY BIRDS (*Coccinellidæ*.)

From Luminous Insects to Lady-birds is a long leap to take in our description of neutral and beneficial insects. The intervening families of beetles, however, are so addicted to the destruction of our property in one form or another, and the exceptions are so few and inconspicuous, that we must pass them all over, and go on to the consideration of the pretty little creatures—as useful too, as they are pretty—that are generally known by the name of "Lady-birds," (vulgarly called *Lady-bugs*). They belong to the family *Coccinellidæ* of Coleoptera.

After the Luminous insects (*Lampyridæ*) which we just now brought before the reader, there come, according to the generally received classification, a large number of most destructive insects. Of these we may mention the *Plinidæ*, the species of which "are found in old houses, in furniture, in rotten palings, stumps of trees, etc., which they and their larvæ perforate with round holes in every direction, which are filled with a very fine powder formed of gnawed wood and excrementa; some species feed upon collections of dried plants, skins of insects, etc; whilst others bore into our chairs, tables, and other woodwork, books, etc.; other species feed upon almost every substance, devouring ginger, rhubarb, cayenne pepper, etc.: and rendering ship-biscuit often unfit for use; others again feed upon woollen clothes, wheat in granaries, and other stores,"—a most noxious family certainly. After them come the *Scolytidæ*, the members of which are very destructive to trees and timber; the *Cantharidæ*, (Fig. 77,) useful for blistering purposes, as 'Spanish flies,' but very injurious to vegetation; the *Curculionidæ*, (Fig. 78,) one or two well-known species of which are enough to condemn the whole family, e. g. the Plum Curculio and the Pea-weevil; the *Cerambycidæ* or Capricorn Beetles, (Fig. 79,) the larvæ of which are wood-borers, and attack trees of every kind; and the *Chrysomelidæ*, beautiful golden insects many of them, but including such noxious creatures as the Three-lined potato beetle, (Fig. 80,) the Turnip-fly or Flea beetle, the Colorado Beetle, the newly imported Asparagus Beetle, etc,



Fig. 77.

Colour—Black and Yellow.



Fig. 78.



Fig. 79.



Fig. 80.

Colours, Pale Yellow and Black.

The "Lady-birds" belong to the last family of all of the orders of beetles. They are so common and so well known to every child that it is hardly necessary to give any description of them. The accompanying wood-cuts will suffice to remind the reader of their appearance.

(Figs. 81, 82, 83, 84.)



Who is there, glee, "Lady-birds burned!"? Dieu," "Vach Lady-birds.

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As every one their larval and the utmost success very successful numbers of the

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Who is there, indeed, that has not set one on outstretched finger and sung to it in childish glee, "Lady-bird, Lady-bird, fly away home, your house is on fire and your children all burned!"? In France they are much regarded also, and called by children "Bêtes à bon Dieu," "Vaches de la Vierge," etc.; and in England they are termed Lady-cows as well as Lady-birds.

The general colours of these insects are yellow, red or orange, with black spots; and black, with red, white, or yellow spots; their shape is hemispherical, and though they vary somewhat in size, an average specimen bears a considerable resemblance in size and figure to an ordinary split pea; they have but very short legs and therefore creep but slowly; their powers of flight, however, are considerable. When alarmed they fold up their legs under the body and drop to the ground, and if handled they emit a yellowish fluid from the joints of the limbs which has rather a strong and disagreeable smell. In old times this fluid was considered to be an admirable specific for toothache! We have never, however, possessed sufficient courage to test its qualities in this respect ourselves!

As every one knows—or certainly ought to know by this time—the Lady-birds, both in their larval and perfect states, feed upon the obnoxious plant lice (*Aphides*), and are thus of the utmost service to the gardener, orchardist and hop-grower. Some species also prey very successfully upon the dreaded Colorado beetle, and assist beneficially in reducing the numbers of this new insect plague.*

More than thirty species of this family of beetles are known to inhabit Canada. Attention has so frequently been drawn to them in the course of these reports, that we need do no more than say—spare their lives and encourage their propagation by all means; they are the most useful class of insects that we have.

We have now enumerated all the leading varieties of beetles that are in their several modes serviceable to mankind. If any of our readers are now enabled to distinguish between insect friends or foes of this order, we shall feel well repaid for any trouble that these descriptions may have cost us. Our limited time and space preclude us from going on to other orders in this report; when another year comes round we hope, however, to have something further to say upon the subject.

* Vide *Second Annual Report*, p. 72.