

12<sup>th</sup>.  
ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

*als.*  
OF THE

PROVINCE OF ONTARIO,

FOR THE YEAR

1881.

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Printed by Order of the Legislative Assembly.

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Toronto:

PRINTED BY C. BLACKETT ROBINSON, 5 JORDAN STREET.

1882.

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Alaus gorgops  
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Aletia argilla  
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Amorpha mo  
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Anisota rubic  
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" "  
A. A. As.  
Annual Meet

Bell, James T  
Bethune, Rev  
Blister beetle  
Bolitotherus  
Book notices

Cabbage butt  
" "  
Caloptenus sp  
Calosoma frigi  
" scri  
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Canadian Sp  
Carabida, ge  
Carbolic acid  
Cepocapsa p  
Caulfield, F.  
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Cheimatobia  
Chinch bug.  
Cherocampa  
Chrysomela e  
Claypole, E.  
Clisiocampa r

Darapsa choer  
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Daremma un  
Dellephila ch

Eacles imperi  
Ellema Harri  
Entomologica  
"

# INDEX.

## A.

	PAGE.	PAGE.
Abraxas grossularia .....	83	Annual Meeting of Ent. Sub-sec. A. A. As....
"    ribearia .....	83	"    Report of Council.....
Aegeria acerni .....	11, 20	"    "    Montreal Branch.....
Agaricus campestris .....	23	"    "    Treasurer.....
Alaus gorgops .....	10, 28	Anthomyia ceparum.....
"    oculatus .....	21	"    raphani .....
Aletia argillacea .....	10, 26	Aphis mali.....
Amara interstitialis .....	25	Apple aphid, woolly .....
Amphion nessus .....	52	"    root louse .....
Amorpha modesta .....	63	"    tree caterpillar, red-humped .....
Angoumois grain moth .....	5	Arboreal auscultation .....
Anisota rubicunda .....	18	Argynnis myrina .....
Annual Address of President Ent. Soc'y, Ont..	5	Army worm .....
"    "    Entom. Sub-sec.	45	Asopia costalis .....
A. A. As .....	14	Asparagus beetle .....
Annual Meeting of Ent. Soc'y, Ont.....	2	Aspidiotus conchiformis.....

## B.

Bell, James T., article by .....	27	Burying beetles .....	70, 74
Bethune, Rev. C. J. S., articles by .....	35, 74	Butalis cerealella .....	5
Blister beetles .....	31	Butterflies, length of life of .....	12
Bolitotherus cornutus .....	23	"    their structure, etc.....	34
Book notices .....	33		

## C.

Cabbage butterfly .....	10, 25	Clouded Sulphur butterfly.....	47
"    southern .....	33	Clover Drasteria .....	47
Caloptenus spretus .....	8, 12	"    hay worm .....	45
Calosoma frigidum .....	28	"    insects .....	10, 37
"    scrutator .....	28, 29	"    leaf midge .....	45
"    Wilcoxi .....	28	"    root-borer .....	43
Canadian Sportsman and Naturalist .....	33	"    seed midge.....	38
Carabidae, genera of .....	35	"    stem borer.....	44
Carbolic acid, a remedy for insect ravages .....	13, 26	Clytus speciosus .....	11
Carpocapsa pomonella .....	76	Codling worm, proposed remedy for .....	8
Caulfield, F. B., article by .....	30	"    moth.....	76
Cecidomyia leguminicola.....	10, 17, 38	Colias philodice.....	47
"    trifolii .....	45	Collection notes for 1880 .....	27
Ceratonia amyntor .....	64	Colorado potato beetle.....	7-10, 31, 32
Cetonia indica .....	19	Conotrachelus nenuphar .....	32
"    aurata .....	84	Cook, A. J., article by.....	26
Cheimatobia brumata .....	84	Cotton worm .....	10, 26
Chinch bug .....	5	Crambus vulgivagellus .....	6, 13
Chorocampa elegans .....	56	Cratoparis lunatus .....	24
Chrysomela terna .....	25	Cressonia juglandis .....	63
Claypole, E. W., article by .....	31	Crioceris asparagi.....	36
Clisiocampa neustria .....	82	Cupes capitata .....	31

## D.

Darapsa chœrilus .....	57	Deilephila lineata .....	55
"    myron .....	58	Diabrotica longicornis.....	7
"    versicolor .....	57	Diaperis hydni .....	24
Daremma undulosa .....	64	Dolba hylæus .....	69
Deilephila chamaenerii .....	54	Drasteria erechtea.....	47

## E.

Eacles imperialis .....	26	Entomology, popular papers on.....	18
Ellema Harrisii .....	70	Eriosoma pyri.....	74
Entomological books .....	9, 16	Euryomia lida .....	18
"    notes .....	29, 32	Eyed Elater .....	21

**F.**

	PAGE.		PAGE.
Field notes .....	25	Fungi-eaters .....	22
Fletcher, J., article by .....	70		

**G.**

Gaurotes cyanipennis .....	31	Green rose chafer .....	84
Gooseberry sawfly .....	79	Gyrinus, cocoon of .....	17
"    measuring worm .....	83		

**H.**

Hæmorrhagia Thysbe .....	51	Hemaris tenuis .....	50
"    uniformis .....	51	Heustis, Caroline E., article by .....	22
Harrington, W. H., article by .....	29	Honey ants .....	35
Hawk moths .....	48	Hoplocephala bicornis .....	24
Heliconia charitonia .....	12	Hornets' nest, how captured .....	27
Heliothis armigera .....	17, 30	Hydrophilus triangularis egg, case of .....	17
Hemaris diffinis .....	50	Hylastes trifolii .....	43
"    marginalis .....	51		

**I.**

Ichneumon rufiventris .....	29	Injurious Insects, manual of .....	35
Indian cetonina .....	19		

**L.**

Lechnosterna fusca .....	7, 33	Longicorns, food habits of .....	30
Lackey moth .....	82	Lucanus dama .....	22
Languria Mozardi .....	44	Lytta atrata .....	31
Lebia grandis .....	10	"    cinerea .....	32
Lepisesia flavofasciata .....	52	"    marginata .....	31
Leucania unipuncta .....	6, 12, 17	"    vittata .....	31

**M.**

Maple tree borers .....	11, 20	Moths, North American .....	36
May bug .....	7, 33	Mycetophagus flexuosus .....	24
Megalodacne heros .....	23	"    punctatus .....	24
Moffat, J. A., article by .....	29	Mytilaspis pomicorticis .....	77

**N.**

Necrophora .....	70	Notodonta concinna .....	20
Necrophorus velutinus .....	72	Noxious Insects in England and Canada .....	74
Nematus ribesii .....	79		

**O.**

Onion fly .....	36	Oyster-shell bark louse .....	77
Onthophagus hecate .....	24		

**P.**

Paonias exæcatus .....	62	Photinus angulatus .....	25
"    myops .....	61	Phytonomus punctatus .....	17
Papilio .....	34	Pieris protodice .....	33
"    cresphontes .....	30	"    rapæ .....	10, 25, 33
Parasite on Painted Lady butterfly .....	29	Platycerus quercus .....	25
Pea bug .....	11	Plum weevil .....	32
Pear tree slug worm .....	81	Pogonocherus mixtus .....	30
Penthe obliquata .....	24	Poisons for insects .....	7
"    pimelia .....	24	Polestes annulatus .....	25
Philampelus achemon .....	60	Potato worm .....	33
"    pandorus .....	18, 59	Pyrameis cardui .....	29
"    satellitia .....	18, 59		

**R.**

Reed, E. B., articles by .....	31, 48	Riley's Reports, supplement to .....	34
Retarded development in insects .....	11	Rocky Mountain Locust .....	8, 12

Saperd  
Satelli  
Saund  
Schizo  
Selanc  
Serica  
Smeri  
Sparr  
Sphin

Thecl

U. S

Wint

Xyl

S.

	PAGE.		PAGE.
Saperda Fayi.....	29	Sphinx chersis.....	65
Satellite sphinx.....	18	"  drupiferarum.....	67
Saunders, W., articles by.....	5-11-18-33, 37	"  eremitus.....	69
Schizoneura lanigera.....	74	"  gordius.....	68
Selandria cerasi.....	81	"  kalmiae.....	68
Serica sericea.....	25	"  luscitiosa.....	69
Smerinthus geminatus.....	62	"  quinquemaculata.....	33, 65
Sparrow, English, habits of.....	10	Stag beetle.....	22
Sphingide.....	48		

T.

Thecla Henrici.....	18	Thyreus Abbotii.....	53
---------------------	----	----------------------	----

U.

U. S. Commissioner of Agriculture, Reports of.....	36
--	----

W.

Winter Moth.....	84
------------------	----

X

Xyloryctes satyrus.....	28
-------------------------	----

PAGE.  
 ..... 22  
  
 ..... 81  
 ..... 17  
  
 ..... 50  
 ..... 22  
 ..... 35  
 ..... 24  
 ..... 27  
 ..... 17  
 ..... 43  
  
 ..... 35  
  
 ..... 30  
 ..... 22  
 ..... 31  
 ..... 32  
 ..... 31  
 ..... 31  
  
 ..... 36  
 ..... 24  
 ..... 24  
 ..... 77  
  
 ..... 20  
 ..... 74  
  
 ..... 77  
  
 ..... 25  
 ..... 17  
 ..... 33  
 10, 25, 33  
 ..... 25  
 ..... 32  
 ..... 30  
 ..... 7  
 ..... 25  
 ..... 33  
 ..... 29  
  
 ..... 34  
 ..... 8, 12

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TWELFTH ANNUAL REPORT  
OF THE  
ENTOMOLOGICAL SOCIETY  
OF  
ONTARIO,

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

PREPARED FOR THE HONOURABLE THE COMMISSIONER OF AGRICULTURE, BY  
THE OFFICERS AND MEMBERS OF THE SOCIETY.

---

1881.

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*To the Honourable the Commissioner of Agriculture:*

SIR,—In accordance with our Statute of Incorporation, I have the honour to submit to you the Report of the Entomological Society for the year 1881.

The Report includes the audited Financial Statement and the Transactions of the annual meeting for the election of officers and general business, which was held at the City of London on September 24th, 1881. I have also the honour to submit for your approval illustrated reports on the life history and habits of various insects, which have been prepared by members of the Society for the information of the general public, and more especially of those interested in the productions of the soil.

The liberality and fostering care of the Ontario Government during the last twelve years, in aiding our Society by an annual grant, has stimulated the efforts of our practical entomologists, and a reference to the Annual Reports furnished to your Department will show that the Society has faithfully endeavoured to prove of some real benefit to the public interests. The many kind expressions of approval, and the continued courteous support and assistance which we have received from yourself and your predecessors in

the Department of Agriculture have been most cordially appreciated, and I feel assured that the members of the Society will always most cheerfully render the Department all the assistance in their power to promote the interests of the great agricultural community of the Province.

It is a matter of thankfulness that during the past year the country has escaped the serious ravages of any special insect pest.

I have also to report for your information that the Society still continues the regular publication of its monthly periodical—the *Canadian Entomologist*—which has now reached its thirteenth volume.

The library has been largely increased, and the acquisition of a valuable microscope has very materially added to the capabilities of the Society for scientific investigations.

I have the honour, Sir, to remain,

Your obedient servant,

EDMUND BAYNES-REED,

*Secretary-Treasurer.*

#### ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The annual meeting of the Society was held, according to announcement, in their Rooms, Victoria Hall, Clarence Street, London, Ontario, on Monday evening, September 26th, 1881.

A number of those interested in Entomology were present from different parts of the Province—the President, Mr. Wm. Saunders, in the chair. Letters of apology for non-attendance were read from Rev. C. J. S. Bethune, Port Hope; Jas. Fletcher, Ottawa; W. H. Harrington, Ottawa; W. Couper and G. J. Bowles, Montreal.

The Report of the Council was read and adopted, also that of the Montreal Branch, and the Secretary-Treasurer submitted his Financial Report, duly audited, which was also adopted.

#### ANNUAL STATEMENT OF THE SECRETARY-TREASURER OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, FOR THE YEAR ENDING SEPTEMBER 24TH, 1881.

##### *Receipts.*

Balance from previous year, 1880 .....	\$354 80
Members' fees, sale of <i>Entomologist</i> , etc. ....	294 23
Government grant, 1880 .....	1000 00
Merchandise: pins, cork, etc. ....	31 38
Sale of Cabinet .....	4 00
Interest .....	21 77
Engraving—received for electrotypes of cuts .....	55 70
	\$1,761 88

*Disbursements.*

<i>Canadian Entomologist</i> ; printing, paper, stationery, etc. ....	\$476 55
Library and apparatus .....	551 82
Expenses of Report for 1880, including engraving, electrotypes and woodcuts .....	265 90
Annual vote to Editor and Secretary .....	150 00
Rent .....	80 00
Insurance .....	6 35
Expenses of delegation to A. A. A. S. ....	32 00
Bookcase for Library .....	60 00
Sundries: postage, etc. ....	65 34
Balance .....	73 92
	\$1,761 88

We have examined the above with books and vouchers, and found the same correct.  
Balance in hand, seventy-three dollars and ninety-two cents (\$73.92).

CHARLES CHAPMAN, }  
ABRAHAM PUDDICOMBE, } *Auditors.*

London, Ontario.  
September 24th, 1881.

## REPORT OF THE COUNCIL FOR THE YEAR 1881.

Once again, at the close of another year, it becomes the duty of your Council to report on the state and condition of the Entomological Society of Ontario. It is with pleasure that we feel ourselves able to bear witness to the continued activity, progress, and usefulness of our Society. Our roll of membership is still being constantly augmented by new and valued additions, and the interest in the special work of the Society is more and more widely diffused, not only in our own Province and Dominion, but in the wider circles of the adjoining Republic, as well as in the various countries of the European continent. The publication of the *Canadian Entomologist* is maintained as of yore, and under the able management of its Editor, our worthy President, and with the assistance of its numerous contributors, our periodical continues its useful work of adding to our store of entomological knowledge, and distributing far and wide the results obtained from much hard work and patient observation.

The Annual Report receives the approval of those for whose benefit it is written, and adds an additional proof of the Society's vitality. We are therefore able to state that the work of the Society has been productive of much good, and by its quiet, unobtrusive way has aroused the attention of many whose interests can be materially affected by an acquaintance with the practical results of entomological science. We commend this study to the thoughtful consideration of every farmer, gardener, and fruit-grower, and we feel convinced that the day is not far distant when some knowledge of Entomology will be a necessary part of the education of every tiller of the soil. During the year a large addition has been made to the Library, which now numbers some 550 volumes. Arrangements have been made for a catalogue, and we hope that each succeeding year will add greatly to the number and value of this important property of the Society.

Your Council also availed themselves of an excellent opportunity to procure a valuable microscope, which will be found a most useful adjunct to the Society's rooms, and be of inestimable service in our entomological work.

The Montreal Branch is still flourishing, and their Annual Report will, as usual, be submitted to you.

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The London Branch, after due deliberation, decided this year to suspend its operations, and merge its work and membership in the parent Society so long as London was the headquarters of the Society. This has, we are glad to say, been a source of strength to the parent Society. Regular monthly meetings have been kept up, and a greater degree of interest aroused. The audited Report of our financial operations will, as usual, be laid before you by the Secretary-Treasurer.

E. BAYNES-REED,  
*Secretary-Treasurer.*

#### MONTREAL BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Eighth Annual General Meeting of this Branch was held at the residence of Mr. Geo. J. Bowles, Montreal, on Tuesday, 8th of May, 1881, at 8 o'clock p.m.

The President read the following Report of the Council :

##### EIGHTH ANNUAL REPORT.

Your Council, at the end of the eighth year since the organization of the Branch, beg to present their Annual Report.

Eight very pleasant meetings have been held during the year, and the interest of the members in the Society has been well kept up. Four new members have been added to the list during the year.

Your Council would record with regret the loss of our indefatigable Secretary, Mr. G. H. Bowles, who in February last removed from this city to reside in Chicago.

The following papers have been read before the Society during the year :

1. "Remarks on *Papilio Breviceauda*."—By W. Couper.
2. "The Mouth Parts of some Carnivorous and Wood-eating Beetles," with illustrative drawings.—By G. H. Bowles.
3. "Notes on the *Coleoptera* of the Island of Montreal, Part I."—By F. B. Caulfield.
4. "Notes on the Species of *Callimorpha* occurring on the Island of Montreal."—By F. B. Caulfield.
5. "List of *Lepidoptera* taken by Dr. Robert Bell, in 1880, in the North-West Territory."—By H. H. Lyman.

Also a paper by the Rev. T. W. Fyles, entitled, "Advice to Farmers, and How to Deal with the Potato Beetle."

The following works have been added to the Library during the year :

Cassino's Naturalist's Directory for 1880.

The *American Entomologist* for 1880.

*Psyche* for 1880.

The Financial Statement for the year is herewith submitted.

In conclusion, your Council would record with pleasure the satisfactory state of the Society, and would express the hope that with the accession of new members the work of the Society will be prosecuted during the coming year with even more zeal and perseverance than in the past.

The whole respectfully submitted.

(Signed)

GEO. JOHN BOWLES,  
*President.*

The Report having been adopted, and two new members elected, the meeting proceeded to the election of officers for the year, with the following result :

H. H. Lyman, M.A., President ; W. Couper, Vice-President ; G. J. Bowles, Secretary and Treasurer ; Geo. Bowles, Curator ; Robert Jack, F. B. Caulfield, and Robert Burland, Council.

Two papers were then read, namely: "Notes on Some Species of *Hymenoptera* occurring at Montreal," by F. B. Caulfield; and one "On Instinct in Insects," by G. J. Bowles. The meeting then adjourned, having spent a most agreeable evening.

G. B. PEARSON, JR.,  
Secretary pro tem.

The President then delivered his annual address, on the conclusion of which the meeting unanimously tendered Mr. Saunders a vote of thanks, with a request that his address be printed in the *Canadian Entomologist*.

#### ANNUAL ADDRESS OF THE PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

*To the Members of the Entomological Society of Ontario:*

GENTLEMEN,—While Entomology may be said to deal with small things, the abundance or scarcity of the tiny creatures called insects involves great issues. The truth of this statement has been illustrated forcibly in several directions this year, notably in the case of the Angoumois wheat moth, which has played sad havoc among the stores of corn and wheat in granaries in the South-western States. It is said to have destroyed many thousand bushels of grain, and so widespread has the evil become that it is the opinion of the *New York Sun* that if the Government or the farmers of America could at this time arrest the progress of this insect by expending five millions of dollars, it would be the best investment ever made by the people.

The Angoumois grain moth, *Butalis cerealella* Oliv., is a small moth, the larva of which is very destructive to all sorts of grain. The female lays her eggs on the grain sometimes in the field before it is fully ripened, but more frequently in the bins in the granary. The eggs are of a bright orange red colour, and in a few days there issue from them very minute whitish-coloured worms, scarcely thicker than a hair, which bore into the grain and occupy it, one larva in each kernel. Each kernel contains sufficient food to support one occupant until it reaches maturity, when it changes to a chrysalis within the grain, which, although hollowed and almost entirely consumed within, appears outwardly sound and plump. On pressing between the fingers the grain is found to be soft and yielding, and when dropped into water it floats on the surface.

When the larva is full grown it spins a white silken cocoon, which occupies one end of the cavity within the grain, the other end being filled with the castings of the worm. The moth makes its escape through a small round hole in the side of the grain, which the larva cuts with its jaws before spinning its cocoon. When preparing this orifice for the escape of the future moth, the larva is careful not to cut entirely through, but leaves a thin tissue-like skin unbroken, which the moth finally ruptures when it makes its escape. The body of the moth is about one-third of an inch long, and its wings when spread measure about two-thirds of an inch across; the fore wings are of a plain brownish-buff colour, with a satin-like lustre; the hind wings above and below, as also the under side of the fore wings, are blackish-grey.

This insect is a native of the warmer parts of Europe, and has long been very destructive in France. It was introduced into the southern portion of the United States more than 100 years ago, where it has become fully naturalized. It is often brought into New York in cargoes of grain, but the climate of the Northern United States and Canada appears to be too cold to permit it to thrive amongst us, or to permanently establish itself. It has never yet, to my knowledge, been found within the limits of our Province.

The Chinch Bug, which, although always present in our midst, has happily never yet proved a serious trouble with us, has been very destructive to the corn crop in Missouri and Kansas, and combined with the drought, has seriously affected the yield of this cereal in those States.

The Army Worm has appeared during the season in some portions of the West, and inflicted much damage; and there were good reasons for anticipating trouble from this source in our own Province next year, unless the exceptional drought we have lately experienced, and which has been generally looked upon as an unmitigated evil, should check their natural increase. The Army Worm, in common with many other of our night-flying moths, is double-brooded, but whether the later brood pass the winter in the larval or chrysalis state has never been fully settled. It is probable that with us the bulk of the brood pass the inclement season in the larval condition, the young larva burrowing into the ground for protection during the extreme cold of winter. It has been observed by Entomologists that an unusually wet season, which induces a free growth of vegetation, is very favourable for the sustenance of these pests, and if preceded by a dry autumn, which appears to have the effect of disseminating the moths over a wider area, the worms are often met with in great abundance. During this summer the Army Worm moths (*Leucania unipuncta*), which are always present with us to a greater or less extent, have been unusually abundant in the western portion of our Province. To the sugar-bait, employed by Entomologists to attract night-flying moths, these insects have flocked by hundreds, and this has been observed not only in Ontario, but also in the Western States, showing that this moth has been unusually abundant over an extended district. Millions of their eggs must have been deposited on the leaves and stems of grasses, but the intense drought we have had has probably deprived the newly-hatched larvæ of the food necessary to their existence, and we may hope that the evil we have suffered from in the way of drought has saved us to a great extent from serious invasions of Army Worms next year.

Much attention has been paid of late by Entomologists to the natural conditions which favour or prevent the increase of injurious insects; and I think there is good ground for expecting, after a few more years of close observation, that it will not be difficult to prognosticate, with a large measure of accuracy, several months in advance, the probabilities as to the insect pests likely to prevail during any year in any given district. When this can be satisfactorily accomplished, much practical good may be expected to result therefrom, since by avoiding the planting of such crops as are likely to be especially injured by insect hosts, and growing others comparatively free for the time from these troubles, a large saving may be effected.

During the summer a small moth, well known to Entomologists as a common insect throughout the Northern States and Canada, but never before recorded as destructive anywhere, has invaded the pastures in some parts of Northern New York, and inflicted great injury. It is a species of Crambus, *Crambus vulgivagellus*. The Crambidae are known by the common name of grass moths, from the fact that as far as is known they all feed in the larval state on grass, and hence the moths are found everywhere in meadows, flying about in the daytime, with a short but rapid flight. The moths are small, with narrow front wings, which are usually ornamented with metallic spots and stripes. It was about the middle of May that a serious invasion of what was popularly supposed to be the Army Worm occurred in St. Lawrence County, New York. The State Entomologist, Prof. J. A. Lintner, at once visited the scene of destruction, and found the injury widespread and serious, extending over eight of the northern counties. Hundreds of acres of grass presented a brown appearance, as if winter-killed. A pasture lot of ten acres, which ten days before offered good pasture, was so thoroughly destroyed that in many places not a blade of grass could be seen to the square yard. The upland pastures were first attacked, and entire fields were laid waste in ten or twelve days. Unlike the Army Worm, the caterpillars were seldom seen, and never observed actively feeding, and it was believed by the farmers that they fed at night, or by drawing the blades of grass into their subterranean retreats. In two instances the larvæ were observed in immense numbers collected on the trunks of trees, so that they could have been scooped up by handfuls. The cause of their congregating at these points could only be conjectured; it was not for feeding on the foliage, for the grasses alone are their natural food. The caterpillars were slender, cylindrical worms, about three-quarters of an inch long, of an obscure greenish colour, with shining black heads. They were destitute of lines or other ornamentation, excepting some small, warty spots on their upper

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side. Early in August the moths began to appear, when they were identified as specimens of *Crambus vulgivagellus*, the new enemy proving to be an inconspicuous and hitherto unobtrusive little Crambus. It is quite probable that several accounts of injuries to pasture lands in the New England States during the last three or four years by some unknown depreducers are to be credited to this species.

At a late meeting of our Entomological Society, held in London, one of our members, Mr. J. M. Denton, referred to the injuries which were at that time being inflicted on some pasture lands within a few miles of London by the larva of the common May Bug (*Lachnosterna fusca*), and exhibited specimens of their work. He had found whole fields of pasture land with the roots of the grass so eaten that the turf could be readily lifted with the hand by the yard, and underneath were thousands of these grubs feeding on the remaining fragments of roots. In one instance, near the village of Delaware, a field had been so completely destroyed that the farmer had set fire to the withered grass with the hope of scorching the enemy to death. As these larvæ readily burrow in the ground when disturbed, he was advised to adopt a different method and turn his hogs into the field to root amongst the grass and devour the larvæ, which they greedily consume in immense numbers. Such wholesale destruction by this insect is not common, but when it does occur it is very alarming.

In the tenth annual report of the State Entomologist of Illinois, just received, mention is made of a new insect injurious to corn. This is a small beetle closely allied to the common striped Cucumber Beetle, and known to Entomologists under the name of *Diabrotica longicornis*. In Illinois the damage caused by the larva of this insect has been considerable. They are small white worms about half an inch long and very slender, which attack the fibrous roots of the corn, and so destroy them that the plants may be pulled up very easily with the hand. After a time the plants begin to wither and the grain fails to mature. In some instances it is believed that the injury inflicted by this tiny creature would result in the loss of fully one-third of the crop. The perfect beetle is about one-fifth of an inch long, with a width scarcely equal to half its length, and of a pale, dull greenish yellow colour without spots or stripes.

The general alarm which prevailed several years ago in reference to the Colorado Potato Beetle seems now to have to a great extent subsided, and notwithstanding that the insect has been very abundant in some sections, it has not been so generally injurious, and where it has appeared in abundance prompt remedial measures have been successfully employed. It has been claimed, and, I suppose, correctly so, that this pest originally came from the canons in the Rocky Mountains, in the State of Colorado, where it is said to have fed on some wild species of *Solanum* growing there. It was my privilege during the latter part of August of this year to spend a week in this district, and while there I travelled fully one hundred miles through those canons. Several species of wild *Solanum* grow in abundance almost everywhere, in the adjoining plains as well as in the canons, and every opportunity was embraced of examining them, but in no instance could I detect any evidence of the presence of the Colorado Potato Beetle in any of its stages. Besides, I saw several potato patches, and these also seemed quite free from any insect trouble. This seemed to me not a little singular in view of the extremely prolific nature of the insect. Can it be that it has migrated so completely as to leave over large areas no representatives behind? or have its natural enemies so increased as to almost annihilate the pest? Our farmers here would, I am sure, gladly hail the advent of either of these agencies should it free them from this troublesome insect.

The question of the use of the most suitable and economical poisons for the destruction of injurious insects still attracts much attention, and Paris Green continues to head the list as the most generally useful, notwithstanding the efforts which have been made by interested parties to replace it by London Purple. London Purple is an arsenical mixture, a waste product, which accumulates during the manufacture of aniline dyes. Before its introduction as an insect destroyer it had no commercial value; on the contrary, the dye makers were at considerable expense and trouble in getting rid of it as it accumulated. Arsenic, which is the active ingredient in this compound, is present in very variable proportions, which is just what one might expect in a waste product. Sometimes it forms less than twenty per cent. of the mixture, while other samples will

contain more than forty per cent. It is associated chiefly with lime and colouring matter. The arsenic present is in a very fine state of division, and intimately mixed with the lime and other ingredients, forming a very fine powder. It is much more soluble than Paris Green, and hence more liable to scorch the foliage, while its very variable strength makes it uncertain in its effects. For these reasons London Purple is not likely to take the place of Paris Green as an insecticide, which, when unadulterated, is nearly uniform in its composition and effects. An artificial mixture of arsenic and lime of uniform strength and coloured could be supplied at about the same price, and would be more reliable than London Purple; but, owing to the more ready solubility of the arsenic in this form and its caustic character, it is apt, unless used with much care, to destroy portions of the tissues of the leaves on the plants to which it is applied, making them appear as if scorched or burnt.

Experiments have been carried on for the past two seasons at the Agricultural College at Lansing, Michigan, by Prof. A. J. Cook, on the use of London Purple as a remedy for the Codling Worm. Early in the summer, while the fruit was quite small, some crab apple trees were syringed thoroughly with London Purple mixed with water, and it is claimed that the poison, which, when the water has evaporated, forms a thin coating on the fruit, either prevents the Codling Moth from depositing her eggs or else poisons the young larvæ as soon as they are hatched, the result being the saving of a very large proportion of the crop from injury, while other trees near by not similarly treated bore very wormy fruit. It is also said that, as the fruit approaches maturity, the most delicate chemical tests fail to show a trace of the poison. I scarcely think that the experiments yet tried in this direction have been sufficiently extended to warrant any general conclusions being based on them; and provided it were proven that this remedy was a certain and safe one, the popular prejudice against applying such virulent poisons directly to the fruit we are to eat would be so strong as to prevent the general use of any such means. Indeed, were it generally known that the apple growers of any district were in the habit of applying arsenic in any form directly to their fruit, it would interfere very seriously with their sales, and it is doubtful if apples so treated would find a ready market anywhere.

It is well known that the seeds of certain noxious weeds will sometimes lie dormant in the soil for almost any number of years, awaiting a favourable opportunity for germinating; but it is not so generally known that the development of insect life is sometimes similarly retarded. It has many times been observed that a few individuals out of a large brood of moths will remain in the chrysalis state over one season and produce the perfect insect the following year, thus remaining a full year more in the dormant condition than is usual; and instances are on record where the perfect insects have escaped after three years spent in this condition of torpor. Recently, Prof. Riley, of Washington, has called attention to a very remarkable case of retarded development in the eggs of the destructive Rocky Mountain Locust, *Caloptenus spretus*. These eggs were laid in 1876, on the grounds of the Agricultural College at Manhattan, Kansas. While grading the ground around the chemical laboratory in the autumn, a quantity of eggs were buried some ten inches below the surface, the covering material being clay, old mortar, and bits of stone, and above this a plank sidewalk. On removing and regrading the soil last spring a number of these eggs were disinterred quite sound and fresh-looking, and when exposed to normal influences they readily hatched; so that these locusts' eggs actually remained nearly four years and a half in the ground unhatched, or four years longer than is their wont. How much longer they would have retained their vitality under favourable conditions of temperature and dryness is unknown. This point has a very practical bearing and deserves further investigation, not only in reference to the eggs of this insect, but to those of all injurious species whose eggs are deposited on or under the ground.

The Sub-section of Entomology of the American Association for the Advancement of Science met this year at Cincinnati, Ohio, where I had the honour of representing our Society. A large number of distinguished Entomologists were present, and many useful papers read and discussions held at the meetings. An account of the proceedings will appear in our Annual Report. It having been decided to hold the next meeting of the American Association in Montreal, I trust that our representative men in all depart-

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ments of science will be present to greet with a hearty welcome the distinguished scientists from the United States and abroad who will on that occasion honour the Dominion with their presence. I have strong hopes that the Entomologists of Canada will turn out in good force.

If the progress of a science is to be indicated by its literature and the number of its devotees, then Entomology has made very rapid progress within the last two or three years. There are on this continent now nearly 500 persons pursuing the study of this important branch of natural history, and during the past year a large number of original papers have been published on the subject. The *Canadian Entomologist*, the monthly organ of our Society, continues to hold its place in the front rank among the most useful periodicals in this connection, while clustering around it now are *Psyche*, the organ of the Cambridge Entomological Club; the *Bulletin* of the Brooklyn Entomological Society; and last, though by no means least, *Papilio*, a journal devoted exclusively to lepidoptera and mainly to descriptions of new species, which has now completed its seventh number. All these are devoted exclusively to Entomology, and will be found of great value to every Entomologist. To these must be added the valuable reports of the U. S. Entomological Commission, whose good work is still being continued; the annual reports of the Entomologist of the Department of Agriculture at Washington, those of the several State Entomologists, the annual report of our own Society, as well as a large number of papers on the subject to be found in the Transactions and Proceedings of all Natural History Societies. There has also appeared in the *Canadian Sportsman and Naturalist*, edited by William Couper, of Montreal, some Entomological items of special interest to Canadian Entomologists.

In my last annual address I referred to the appointment by the Ontario Government of a Special Commission to enquire into the agricultural resources of the Province, and the progress and condition of agriculture therein. In view of the important bearing of Entomology on successful agriculture, the Government was pleased to appoint your President as one of the Commissioners. The report of the Commission has since been compiled and published, in which the insects injurious to the farmer and fruit-grower have been fully dealt with; also the remedies suggested for their destruction, and the beneficial insects which prey upon them. The evidence relating to the subjects of insects and insectivorous birds occupies 104 pages in the full report, and 61 pages in the condensed report, both of which are adorned with many excellent illustrations. The eagerness with which these publications have been sought after is indicative of the estimation in which they are held by the public. It would, I think, meet a strongly felt want if some arrangement were made whereby this valuable work, so useful to every farmer, might become accessible by purchase to all who are seeking for it throughout the length and breadth of our Dominion.

I have the honour to be,  
Yours very sincerely,  
WM. SAUNDERS.

The election of officers then took place, when the following gentlemen were declared duly elected:—

*President*.—Wm. Saunders, London.

*Vice-President*.—G. J. Bowles, Montreal.

*Secretary-Treasurer and Librarian*.—E. Baynes-Reed, London.

*Council*.—Rev. C. J. S. Bethune, Port Hope; J. A. Moffat, Hamilton; James Fletcher, Ottawa; R. V. Rogers, Kingston; J. M. Denton, London; W. H. Harrington, Ottawa; and W. Couper, Montreal.

*Editor*.—Wm. Saunders.

*Editing Committee*.—Rev. C. J. S. Bethune, J. M. Denton, E. Baynes-Reed.

*Auditors*.—Chas. Chapman, H. Bock.

The report of the Montreal Branch was next read.

Routine business having been transacted, the Chairman invited discussion on any Entomological matters.

## POTATO BEETLE.

Prof. J. T. Bell, of Belleville, remarked that he had found the Potato Beetle feeding in his neighbourhood on the "Bittersweet," *Solanum dulcamara*.

Mr. Saunders stated that during his recent visit to Colorado, although he travelled much over the plains and through the mountain canons, he found no traces of this insect in any of its stages.

Mr. Chas. Arnold, of Paris, said that in his section the Colorado Beetle, after having devoured the potato vines, attacked the tomato plants.

Mr. P. C. Dempsey, of Trenton, stated that he had preserved his tomato vines from injury by the beetle by the free use of Paris Green on his potato plants.

Mr. J. A. Moffat, of Hamilton, stated that he had observed serious injury to be caused to the young plants by the beetle.

Mr. Saunders reported that *Lebia grandis*, one of the beneficial insects which devour the larvæ of the Colorado Beetle, had been found by him in greater numbers than usual, and that he had taken a number of specimens at night while sugaring for moths. Mr. Moffat had also observed it to be common near Hamilton, on the Golden-rod *Solidago*.

## COTTON WORM.

Mr. Jas. Fletcher had written to ask if any member had made any observations during the year on the moth of the Cotton Worm, *Aletia argillacea*, in reference to which an interesting discussion took place at the last annual meeting.

Mr. Moffat reported having captured several specimens, and Mr. Reed had observed their frequent occurrence, attracted by light in the house at night during September.

## CABBAGE BUTTERFLY.

Mr. Saunders reported that as far as he could ascertain, the extreme western limit of this insect did not at present exceed 100 miles west of Chicago.

Prof. Bell stated that he was of opinion that in the neighbourhood of Belleville the common English sparrow had proved useful in destroying the larvæ of this butterfly.

The chairman, Mr. Saunders, remarked that this was contrary to the experience of all those who had made a special study of the habits of this sparrow, and enquired whether the Professor had ever examined the crop of the bird for evidences of the presence of this larva, to which the Professor replied in the negative.

## A RARE BEETLE.

Prof. Bell exhibited several specimens of *Alaus gorgops*, one of which he had captured near Belleville; and showed the peculiar points of difference between this insect and our common Eyed Elater, *Alaus oculatus*.

## NEW CLOVER INSECT.

Mr. Wm. Weld, editor of the *Farmer's Advocate*, said that he had lately read in several American papers accounts of the ravages of a new clover insect; that specimens of clover heads had recently been sent him by several correspondents, infested with an insect which he believed to be this new species; and asked whether any of the Entomologists present could give him any information as to where it had occurred, and the amount of damage it was likely to cause in this Province.

Mr. Arnold thought, from what he had heard from those growing clover in his vicinity, that this insect was injuring the crop there. Mr. Saunders said that the insect had not yet come under his observation, and that he would be very glad to receive specimens from any person who should find them in this Province.

The insect referred to is the Clover Midge, *Cecidomyia leguminicola*, a small fly which in its larval state devours the ripening seeds in the clover heads.

## PEA BUGS.

Mr. Weld also inquired as to the experience of those present as to the ravages of this pest during the year.

Mr. Arnold said that the Pea Bug had committed more damage this year in his neighbourhood than ever before. Some friend had recommended him to enclose a piece of camphor in the bags of seed peas with a view of destroying the insect; this he had tried, and found useless. Mr. Gott, of Arkona, had not found the beetles so plentiful this year as usual. The subject was discussed at some length, and the general opinion expressed that the most feasible remedy was to cease growing peas for a time in any district where the insect had proved seriously destructive, and thus starve them out.

## THE MAPLE TREE BORER.

Prof. Bell remarked that he had found this borer, *Clytus speciosus*, not nearly so common as formerly. Mr. Saunders said that he believed it to be increasing in the neighbourhood of London, and that some of the street trees had been seriously injured by it; he also referred to the depredations of another maple borer, *Aegeria aceris*, a small moth whose larva burrows under the bark of the Red Maple, *Acer rubrum*, and in season was quite common on the trunks of the maple trees on our streets. Mr. Reed also reported the maples round his house being much infested by this pest, the empty cocoons being found protruding from the trunks of the trees in quantities during the summer.

A discussion then ensued on the probabilities of new insect pests being introduced from abroad by the importation of grains, seeds and trees, in which several of the members took part. Mr. Weld urged that the Society should call the attention of the Government to the necessity of taking every possible precaution to prevent the introduction of such insects. The President remarked that in his official capacity he had, through the Provincial Agricultural Association, already brought this matter before the Government, and that some steps in this direction had been taken.

The meeting then assumed an informal character, and the members were shown by Messrs. Saunders, Denton, and Reed many of the more interesting specimens in the Society's large collections, and also exhibited microscopic specimens illustrating the structure of insects. The valuable library of the Society was also examined by the members, and added to the interest of the gathering.

After enjoying a very pleasant and profitable evening, the meeting adjourned.

## MEETING OF THE SUB-SECTION OF ENTOMOLOGY OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The meeting of the American Association for the Advancement of Science was held at Cincinnati, Ohio, commencing at 10 o'clock a.m. on Wednesday, the 17th of August, 1881. At the conclusion of the opening exercises the several Sections proceeded to organize, when the Sub-section of Entomology was called to order by the President, Rev. J. G. Morris. A large number of Entomologists were present, among others C. V. Riley, Washington; Cyrus Thomas, Carbondale, Ill.; Wm. H. Edwards, Coalburgh, W. Va.; J. A. Lintner, Albany, N. Y.; Rev. J. G. Morris, Baltimore, Md.; Wm. Saunders, London, Ontario; E. W. Claypole, Yellow Springs, Ohio; Miss M. W. Brooks, Salem, Mass.; B. Pickman Mann, Washington; C. D. Zimmermann, Buffalo, N. Y.; A. J. Cook, Lansing, Mich.; J. D. Putnam, Davenport, Iowa; S. H. Peabody, Champaign, Ill.; V. T. Chambers, Covington, Ky.; and Chas. Drury, Avondale, Ohio.

On Thursday, August 18th, the Sub-section of Entomology met at 2.30 p.m.

The first paper read was by Prof. C. V. Riley, on Retarded Development in Insects. In this paper the author recorded several interesting cases of retarded development in insects, whether as summer coma, or dormancy of certain portions of a given brood of caterpillars, the belated issuing of certain imagines from the pupa, or the deferred hatching of eggs. One of the most remarkable cases of this last to which he called attention

was the hatching this year of the eggs of the Rocky Mountain Locust or Western Grasshopper, *Caloptenus spretus*, that were laid in 1876 around the Agricultural College at Manhattan, Kansas. These eggs were buried some ten inches below the surface in the fall of 1876 in grading the ground around the chemical laboratory, the superincumbent material being clay, old mortar and bits of stone, and a plank sidewalk above this.

In removing and regrading the soil last spring, Mr. J. D. Graham noticed that the eggs looked sound and fresh, and that they readily hatched when exposed to normal influences; the species being determined by Prof. Riley from specimens submitted by Mr. Graham. Remarkable as the facts are, there can be no question as to their accuracy, so that the eggs actually remained unhatched during nearly four years and a half, or four years longer than is their wont. This suggests the significant question: how much longer the eggs of this species could, under favoring conditions of dryness and reduced temperature, retain their vitality and power of hatching?

Putting all the facts together, Prof. Riley concludes that we are yet unable to offer any satisfactory explanation of the causes which induce exceptional retardation in development among insects. The eggs of Crustaceans, as those of *Sepus* and *Cypris*, are known to have the power of resisting drouth for six, ten or more years without losing vitality, while in some cases they seem actually to require a certain amount of desiccation before they will hatch. Yet the fact remains that different species act differently in this respect, and that individuals of the same species, under like external conditions of existence, act differently; that temperature, moisture, food, etc., do not influence them alike. We can understand how this great latitude in susceptibility to like conditions may, and does in the case of exceptional seasons, prove beneficial to the species by preserving the exceptional individuals that display the power to resist the usual changes.

The next paper was by the same author, on New Insects injurious to American Agriculture, in which attention was called to several insects hitherto unknown as injurious, which during the present year have proved very destructive to one crop or another. Such hitherto unknown and unreported injury is either caused by—1st, imported species; 2nd, native species previously known, but without destructive habit; 3rd, unknown or undescribed species.

Mr. W. H. Edwards then read a paper on certain habits of *Heliconia charitonia*.

Some interesting discussion followed the reading of these papers, after which an informal discussion on Entomological subjects took place, in which many of the members joined. The meeting then adjourned.

On Friday, at 11.30 a.m., the Entomological sub-section held another session.

The first paper, "On the Length of Life of Butterflies," was read by W. H. Edwards, followed by one on the Life Duration of the Heterocera, by J. A. Lintner, both of which will appear in the pages of the *Entomologist*.

A few remarks were made by C. V. Riley on his own extended observations on the duration of the lives of both butterflies and moths, indicating that they were, as a rule, of very short duration.

Cyrus Thomas stated that according to his observation the Army Worm, as a caterpillar, a chrysalis and a moth, existed in all seventy-seven days. Some observers had, however, made it seventy-six, others seventy-nine days. He contended that in confinement, in a proper temperature and with ample food, the Army Worm passed through its metamorphosis more quickly than in natural conditions.

B. P. Mann disagreed with Mr. Thomas on this latter; so also did C. V. Riley, it being contrary to their experience.

J. A. Lintner, State Entomologist of New York, then read a paper on "A Remarkable Invasion of Northern New York by a Pyralid Insect."

He said that about the middle of May, of the present year, a serious invasion of St. Lawrence County, N. Y., and several of the adjoining counties, by the "Army Worm" was announced. It was stated that many pastures had been completely ruined, and the entire destruction of the pastures and meadows was threatened. Not having witnessed the operations of the Army Worm, he at once visited the infested locality. The reports had not been exaggerated. The injury was widespread and serious, already extending over eight of the northern counties. Hundreds of acres of grass presented a brown

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appearance, as if they had been winter-killed. A pasture lot of fifty acres, which ten days before offered good pasture, was burned so that in places not a blade of grass could be seen to the square yard. Numerous dead caterpillars were adhering to the dead stems of last year's grass, which it was believed had fallen victims to starvation. The upland pastures were first attacked. The progress was remarkably rapid; entire fields were laid waste in ten or twelve days. The secrecy of the depredations was remarkable. The larvæ had seldom been seen, and never observed in active feeding. It was believed by the farmers that they fed at night, or by drawing the blades of grass into their subterranean retreats. In two instances the larvæ were observed in immense numbers, collected on the trunks of trees, so that they could have been scooped up by handfuls.

The tree trunks were enveloped by a firm web of silk, spun by the caterpillars, of so firm a consistence that it could be lifted up in a sheet like a piece of woven silk. The cause of the congregation at this point could only be conjectured. It was not for feeding on the foliage, for the grasses alone were eaten by the caterpillars.

The caterpillars observed and collected by Mr. Lintner were slender, cylindrical forms, sixteen footed, of an obscure greenish colour, with a shining black head. They were destitute of lines or other ornamentation, except some warty spots on their upper side. Their average length was three-fourths of an inch. He was unable to identify them with the Army Worm, for they were quite unlike the mature form of that species, and their habits seemed to be quite different.

On the 6th of August the first moth emerged from some cocoons furnished by Mr. J. Q. Adams, of Watertown, N. Y., and it turned out to be a *Crambus vulgigagellus*.

The interesting question as to which of our insect depredators was chargeable with the ravages in Northern New York was decided. The new enemy was found to be an inconspicuous, hitherto unobtrusive little *Crambus*. It had long been known in our cabinets, but had never before presented itself as an injurious insect.

It is probable that several accounts of injuries to pasture lands in New England States during the last three or four years, which have been ascribed either to the Army Worm or an unknown depredator, are due to this species. Its subsequent appearance may hereafter be recognized.

The Crambidae are small moths with narrow front wings often marked with metallic spots and stripes, which are frequently driven up for short flights in our pastures and meadows during the fall months. Specimens of the larvæ, pupæ, cocoons and perfect insects were exhibited to the Section.

Following this three papers were read by A. J. Cook, of Lansing, Mich., "How Does the Bee Extend its Tongue?" "The Syrian Bees," "Carbolic Acid as a Preventive of Insect Ravages."

The author explained how the bee extends its tongue by means of a diagram; it is done, he believes, by forcing into the extremity of that member some of the fluid contained in the glands. In his paper on Syrian Bees, he related how D. A. Jones, of Canada, and Frank Benton, of Michigan, went to Europe in search of new varieties of bees. They brought from Cyprus both the Cyprian bee and the Syrian bee, and Mr. Benton went to Ceylon and Java in search of other varieties. From the former place he brought two new species not very unlike our own, but in Java he failed to find the great Java bee. With the Syrian bees the author had Syrianized the apiaries of the Michigan Agricultural College. The Syrians are of a yellow type, closely allied to the Italian bee; they are indefatigable workers, but more irritable than other bees, especially when queenless. They are undoubtedly a valuable acquisition to American apiculture.

The next paper was by Mr. W. H. Edwards, on "The Alleged Abnormal Peculiarity in the History of *Argynnis myrina*," which was followed by one by E. W. Claypole, of Yellow Springs, Ohio, on the Buckeye Stem Borer. The writer remarked that during the spring months some of the leaves of the Buckeye tree droop and die without any obvious cause; indeed these dying leaves may be seen almost as soon as the foliage is expanded. On examination, a small hole was discovered in every stalk on which a dying leaf was found, and in splitting this round stalk a living caterpillar was observed ensconced in the narrow tunnel evidently excavated by itself. The destruction of the central part of the leaf stalk was clearly the cause of the death of the leaf. A number of leaves were

collected and the larva reared in confinement, producing a small moth closely resembling *Sericoris instrutana*. When or where the egg is laid has not been discovered. The young larvæ may be found in the leaf stalks of the Buckeye tree from the 2nd to about the 8th of May. After spending a few days in this secure retreat, it comes out and dwells for the rest of its caterpillar life in the dying leaf at the top of the stem upon which it feeds; after thus feeding for about a fortnight it passes into the chrysalis state, from which in about ten days more it emerges a moth.

The President then read his annual address.

#### PRESIDENT'S ADDRESS.

GENTLEMEN,—I regret exceedingly that I am compelled to begin my address by the recital of a melancholy event in the history of our Section.

About ten days after our adjournment last year, and after probably we had all arrived at home and settled down to our autumn's work, the distressing intelligence reached us of the sudden death of one of our most honoured and distinguished members. He had mingled with us at Boston and had taken part in our deliberations, and though cheerful and full of hope, yet his usually buoyant temperament was plainly mellowed by advancing years, the every-day anxieties of life, and the pressure of severe intellectual pursuits. He returned home after our adjournment and immediately resumed his linguistic studies with his usual incessant ardour, for he often said to me: "I never take exercise when I am at home, but work all day and sometimes late into the night," and on the 1st of September, 1880, Samuel Stehman Haldeman was suddenly stricken down. His lamented death has been noticed in most of the leading papers and scientific journals of the country, accompanied with some biographical facts, for he was widely known as a scholar and a scientist, and no man was more highly esteemed as a companion and gentleman. We all are aware of the distinction he achieved in letters and science in our own and foreign countries, of the learned books and papers he has written, and of the titles and prizes which his works secured for him.

If this were the proper place, it would be pleasing to dwell, even at length, upon the many valuable traits of his character, the vast extent of his diversified acquirements, and his almost unparalleled qualities as a friend and scientific fellow-labourer. I feel as if I were announcing the death and reciting the admirable virtues of a brother. For forty years he and I were what may properly be called "bosom friends." In early life we were engaged in similar scientific pursuits, and living but a few hours' distance from each other, our mutual visits were frequent, and our warmest friendship and confiding intercourse continued uninterrupted to the end.

It is well known that in early life he devoted much of his time to our favourite science, to which he made some valuable contributions. His principal papers are: Materials toward a History of Coleopterous Longicornia of the U. S.; Corrections and Additions to this paper; Description of N. Am. Coleoptera; Cryptocephalinorum Borel. Am. Diagnosis. These papers give evidence of honest and painstaking research, patient analysis and sharp discrimination, and are profitably consulted by investigators of the present day.

Of late years he had turned his attention particularly to the study of language, and became a distinguished member of the Philological Society. All readers know the celebrity he attained in that department, and the ardour with which he pursued those studies; but notwithstanding their engrossing attractions, he never ceased to feel an interest in everything that concerned our department. It is hard for a man to forget his first love.

Thus much I thought it proper to say of the lamented Haldeman. He was no ordinary man, whom you might compliment with a passing respectful obituary notice. In science and letters he was a great man. His memory will be long cherished by admiring friends. "*Idem extinctus amabitur.*" It may not be out of place to mention here one fact to me, at least, personally interesting. Less than two months ago the monument of Haldeman, chiselled out of enduring granite by Strecker, a brother Entomologist, was

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erected over his grave by the pious care of the skilful artist himself, who spends his days in cutting marble and granite into classic forms, and half of his nights in studying and figuring the butterflies of his own unequalled private collection.

Gentlemen, forty years ago I could count the known working Entomologists of our country with the first ten numerals. The older Melsheimer, who may properly be designated as the father of our science in this country, Say, Peck, Gould, Randall, Peale, and a few other pioneers, had died or retired, and the only workers then were Harris, of Cambridge; Major LeConte and his son John L., of the city of New York; Fitch, of the State of N. Y.; Haldeman, Melsheimer, jr., and Zeigler, of Pennsylvania, and a few others of no special note, were the only ones, as far as is at present recollected, who prosecuted our science with any zeal, and who contributed to its progress by the descriptions of species. There were others who collected insects, but they made no claim to be scientific Entomologists. I remember distinctly when Melsheimer, Haldeman, Zeigler and I used to meet several times a year at our respective homes to read papers, discuss questions, exhibit new species, recite our Entomological adventures, and then adjourn to a well-appointed table. We regretted that we had no collaborators within two hundred miles, for the LeContes, in New York, were our nearest neighbours. In that day there was not a man in Philadelphia who studied insects. We then established "The Entomological Society of Pennsylvania," and after electing all our confreres in this country as honorary members, we had the audacity to confer the same distinction upon some great men abroad, whose letters of grateful acceptance indicated that they thought that the Society was something more than a club of four comparatively unknown men meeting in Haldeman's study on the banks of the Susquehannah!

And now look at the mighty change. In the Naturalist's Directory for 1880 there are no less than 436 names reported as pursuing our science. Now, whilst it is true that many of these may be collectors only, still they are more or less useful. They all must be interested in it to a greater or less extent, or they would not have reported themselves as such. Be this as it may, the increase is simply wonderful and very encouraging. Doubtless there are numerous others in the country engaged in the same delightful employment whose names do not appear in the Directory.

There is no other distinct branch of science that has so many representatives in that book as ours, excepting Botany and Geology, and in Zoology specially we are ahead of the Ornithologist by over 50; the Conchologist are fewer than 100 all told, and all other specialists in Zoology are behind us. All this is cheering, and we are sure that the number of collaborators is growing every year.

But there is a still more encouraging view of the subject, which is founded not only on names, but on facts, and I am sure it will gratify the Section to hear of the number of the published contributions of our fellow-workmen. True, they are not all members of this Section, but they belong to the family, and we hail them as brethren of the same household.

Most of us have, of course, kept our eyes upon the various journals, and have been pleased to see so many papers, and yet perhaps few of us have any proximate conception of their number and variety. Hence I have thought that probably the most acceptable contribution I could make at this meeting would be a complete list, as far as was possible, of all American Entomological writers since our meeting in August last, and this I have done and will present it at the proper time. Some names may have been inadvertently omitted, but these can be subsequently introduced. In order to insure perfect accuracy and fullness, I made the list of each author's writings as far as I could find them and sent it to him for correction, and I here desire to thank those gentlemen for the uniform courtesy with which they granted me their aid.

This paper will give us a better idea of the progress of our science during the past year than any other mere description possibly could.

A brief analysis of it gives 77 writers and 302 titles; 25 of these articles treat of Coleoptera; 19 of Lepidoptera; 15 of Orthoptera; 5 of Neuroptera; 10 of Diptera; 11 of Hymenoptera; 11 on Hemiptera; 8 or 10 describe larvæ of various orders; 5 or 6 are on fossil insects; a few on Myriopods and Spiders, and 11 on Economic Entomology.

This brief exhibit will give an idea of what has been done as far as has been made

public. Doubtless there are many other papers in preparation, and much efficient work has been privately done which may never be published.

It would be out of my province to specify any of these writings in this address, and much more to express any opinion of their relative value, or to indulge in any critical remarks. That must be left to the reviewers.

We now have four journals exclusively devoted to our science, and in several others considerable space is allotted to it. In connection with these must be mentioned the annual reports of the State Entomologists. The Proceedings and Transactions of all Natural History Societies also contain frequent articles upon the subject.

*The Canadian Entomologist*, *Psyche*, *The Bulletin* of the Brooklyn Entomological Society, and *Papilio*, should be supported by every one of us. Indeed, no man can know how our cause is advancing without them, and as it is likely that none but Entomologists read them, so much the more general should be our patronage that they may be maintained.

Each of these four seems to occupy its peculiar field. *The Canadian* is general, and the organ of a special association. Although it is geographically *extra limital*, yet it is very near to us, and a large share of its original papers come from this side of the Niagara. We claim it as one of our own, and being the oldest and admirably conducted, we hope that its present efficient editor may long continue to conduct it and render it still more interesting and instructive.

The next oldest is *Psyche*, and in relation to it I may quote what our first President said in his opening address: "*Psyche*, though small, is indispensable to every one occupied with the insects of North America." It covers a ground not occupied by any other periodical in the world, and is very creditable to the disinterested labours of American Entomologists. Its accuracy has never been questioned, and it is extremely desirable to secure its continuous publication. You know that it was begun by the Cambridge Entomological Club, which is really the parent of the Club of the A. A. S., which has now been elevated to the dignity of a Sub-Section. The Cambridge Club differs from some others in the country in freely granting the use of its library to Entomologists throughout the whole country, and hence it is very desirable that the library should be enriched and the Club thus enabled to extend its benefits still more widely.

*The Bulletin* of the Brooklyn Entomological Society is a spirited publication, displaying much zeal, correct diagnosis and careful description.

*Papilio*, the youngest of the family, is entirely devoted to Lepidoptera, and thus occupies an exclusive field and cultivates it successfully. The necessity for it arose, I apprehend, from the fact that our investigators had so much that was new to publish, that room could not be found in the other journals; and when we consider that the number of our writers is increasing every year, and new discoveries are constantly made, it is plain that all the journals now in existence among us could not publish all the communications unless the journals were greatly enlarged. As it is likely that all these editors render their valuable services gratuitously, and that the present patronage would not justify an enlargement, we shall have to be content for some time to come with their present size.

It is much to be regretted that it was deemed necessary by the editor of the *American Entomologist* to suspend its publication in January last. We have all derived instruction from its pages, but whilst we shall not hereafter have its monthly greetings as a distinct journal, there is some compensation in the fact that the department it so ably represented has been transferred to the *American Naturalist*, in which we discern evidences of the same talent which distinguished it under its previous form.

In conclusion, I will make bold to throw out one or two suggestions.

1. In view of the wonderful progress which our science has made in this country, has not the time come for condensed, complete, systematic books on each of the Orders, after the style of many German books that might be mentioned? Every one of us is often asked by beginners: What book would you recommend on beetles? And our answer is: There is none which contains descriptions of all our known species in systematic order, but you must gather them from various monographs, journals and proceedings, which are not easy to procure. This disheartens the young student. The same is to a great extent

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also true of butterflies, especially of *Noctuidæ* and of other orders of insects, although the want is supplied in *Lepidoptera* more fully than in any other. But even this order, beyond the Diurnals, although hundreds of species are described, has not been brought together in systematic arrangement. The material is at hand, and nothing is wanting but a competent editor and an accommodating publisher to bring out a series of works which would contribute immeasurably to our progress.

My second suggestion is, that it would be interesting to know the extent, character and condition of the larger public and private collections in the country, with a mention of the varieties they contain. This might embrace two sections, those of our own species and those of foreign countries. A paper on this subject for the next meeting would be an interesting contribution, and I hope some gentleman will furnish it; or let some member be appointed, so that there may be no conflict, and the whole field be open to him. No doubt the owners of private collections and the curators of public ones would cheerfully render him their counsel and aid.

And now, gentlemen, congratulating you upon our meeting again, let us proceed to our business and prosecute it with vigour, patience and order.

JOHN G. MORRIS.

At the conclusion of the address a vote of thanks was tendered to the President, coupled with the request that the copy be sent to the *Canadian Entomologist* for publication, which was kindly assented to.

On Saturday morning the Entomological Sub-section was again in session, when the following papers were read:

The Egg Case of *Hydrophilus triangularis*, by C. V. Riley; on the Oviposition of *Prodoxus decipiens*, and also one on the Cocoon of *Gyrinus* by the same author. Following these a paper was presented by B. P. Mann, entitled Suggestions of Co-operation in Furthering the Study of Entomology; and another by C. V. Riley, on New Insects Injurious to American Agriculture.

In this latter paper the author called attention to several insects hitherto unknown as injurious, which during the present year have proved very destructive to one crop or another. Such hitherto unknown and unreported injury is either caused by, 1st, imported species; 2nd, native species previously known but without destructive habit; 3rd, unknown or undescribed species. The author gave an account of the injury which had been done to clover plants by a beetle, *Phytonomus punctatus*, in Yates Co., New York. The cocoons of the beetle were found on the ground in the fields, but the beetles were difficult to find on account of their shyness, as they fall to the ground when approached. Mr. Riley also reported that much injury had been done to corn in South Carolina and Georgia by a borer which was probably the larva of a Pyralid moth.

After the reading of papers an informal discussion on Entomological subjects took place.

Mr. A. J. Cook remarked that *Heliothis armigera* had attacked corn in Michigan for the first time in 1880. That was a very wet year, whereas this year had been very dry, and this season the army worm, *Leucania unipuncta*, had been observed injuring it for the first time.

Mr. W. Saunders said that the imago of the army worm, *Leucania unipuncta*, had been unusually abundant in Ontario during the summer, and had been seen at sugar in great numbers, and referred to the fact that the destructive brood of this insect was not the first brood. Mr. Cook had found the moths similarly abundant in Michigan.

Mr. Cyrus Thomas stated that he had positive proof that the eggs of *Leucania unipuncta* had been deposited in fields of oats. He also said that wet weather was very favourable for the development of this insect.

Mr. J. A. Lintner spoke of the great abundance of the clover-seed midge, *Cecidomyia leguminicola*, which was rapidly spreading over a large area. Mr. B. P. Mann considered that the rearing of insects in the house tended to prolong the life of the larvæ, and to

shorten that of the pupæ. Mr. C. V. Riley agreed with him, but Mr. Thomas held the opposite view.

Mr. S. H. Peabody, speaking of the duration of life of some moths, remarked that in *Endropia* and in *Ctenucha virginica* the period of existence of the imago was short.

Mr. Riley said that *Anisota rubicunda* feeds on both the hard and soft maple trees, and that the colouring of the imago in the western limits of the region where the moth is found is very pale in colour. Mr. J. A. Lintner stated that he had captured this insect at Schoharie, N. Y., having a yellow colour with only a slight tinge of rose.

Mr. W. H. Edwards remarked that he had found *Thecla henrici* only in April. It feeds on the wild plum tree. The larva eats into the unripe plums, burying its head and shoulders in the fruit, and eats no other kind of food. The larva becomes full grown by the time that the plum has become half grown. The insect has but one brood in the year. Mr. Edwards also remarked that *Lycaena violacea* feeds upon many different food plants.

The meetings of the Entomological Sub-section were throughout very interesting and profitable, and the "brethren of the net" separated with regret, the hope being expressed by all that they might be privileged to meet again next year in Montreal.

## POPULAR PAPERS ON ENTOMOLOGY.

ENTOMOLOGY FOR BEGINNERS.

THE SATELLITE SPHINX—*Philampelus satellitia* (Linn.).

BY WM. SAUNDERS, LONDON, ONT.

This is one of the most beautiful of our Sphinx moths, a rare as well as lovely creature, and an object highly prized by collectors. It is found throughout the northern United States and occasionally in Canada, but is nowhere very common.



Fig. 1.

The moth (fig. 1), when its wings are expanded, will measure from four to four and a half inches across. Its colour is of a light olive mixed with gray and varied with patches of a darker olive-green, rich and velvety, and some portions with a rosy hue. The moths appear in July, when, after pairing, the female deposits her eggs singly on the leaves of the grape-vine or Virginia creeper (*Ampelopsis quinquefolia*), where they shortly hatch

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into small green larvæ of a pinkish hue along the back and with a very long pink horn at the tail. As the caterpillar increases in size the tail becomes shorter, and after a while

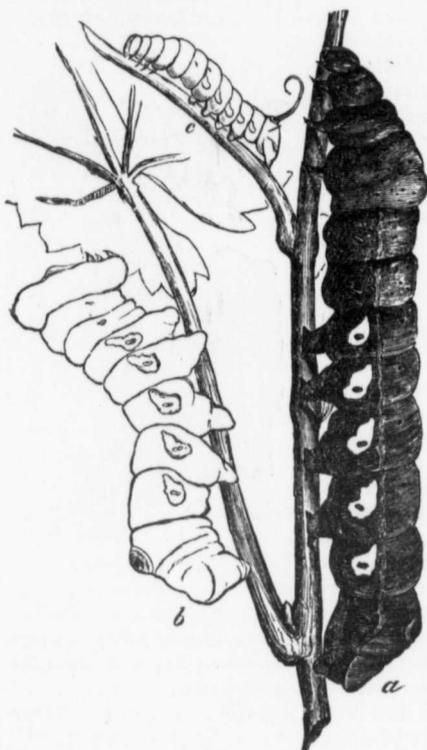


Fig. 2.

curves round, as shown at *c* in fig. 2. As the larva approaches maturity it changes to a reddish-brown colour, and after the third moult entirely loses the caudal horn, which is replaced by a glassy eye-like spot. The mature larva when in motion, as shown at *a*, fig. 2, will measure nearly four inches in length, but when at rest it draws the head and two adjoining segments within the fourth, as shown in the figure at *b*, which shortens its length nearly an inch, giving it a very odd appearance with its anterior portions so blunt and thick. It is of a rich reddish brown colour, of a lighter shade along the back, with five or six nearly oval cream-coloured spots along each side from the fifth to the tenth segments inclusive; sometimes the spot on the fifth segment is indicated by a dot only, in other instances entirely wanting. On the anterior segments there are a number of black dots; a dark polished raised eye-like spot in place of the tail; stigmata black, showing prominently in the cream-coloured spots along the sides.

It is a very voracious feeder, and where present strips the vine so rapidly of its leaves that it soon attracts attention. When full grown it descends and buries itself in the ground, where it forms an oval cell, within which it changes to a chrysalis.

The chrysalis is of a chestnut brown colour, with the segments roughened with impressed points, the terminal ring having a long thick spine. The insect usually remains in the chrysalis state until the following summer, but sometimes it hatches the same season. In the 9th vol. of the *Canadian Entomologist*, p. 120, an instance of this sort is recorded by Mr. R. Bunker, of Rochester, where the larva became a chrysalis on the 1st of August, and produced the moth on the 10th of September. Should these larvæ at any time prove troublesome, they can be readily subdued by hand-picking.

#### THE INDIAN CETONIA (*Euryomia inda*).

This is a stout, hairy beetle (fig. 3), which makes its appearance early in spring, usually towards the end of April or beginning of May, flying about in open fields and about the borders of woods, with a loud buzzing sound resembling that of a bumble bee. It belongs to the flower beetles, most of whom live on pollen and the honey of flowers, and are fond of sweets.



Fig. 3.

This insect is of a brownish-gray color, dotted and spotted with blackish and thickly covered with short greenish-yellow hairs. It measures half an inch or more in length. During the summer it disappears, but a second brood comes out in the fall, usually during September, when they may be found feeding on the pollen of flowers and also upon the sweet sap of plants and trees. Not content with this, they attack our finest and most luscious fruits, eating their way into the richest ripening pears and burrowing into the finest peaches so deeply that only the tips of their bodies are visible, and in this way spoiling the fruit and inducing rapid decay. They also attack grapes and other sweet fruits.

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THE LEGGED MAPLE BORER—*Aegeria acerni* (Clemens).

In 1860 Dr. Clemens described this pretty moth in the Proceedings of the Academy of Natural Sciences, Philadelphia, and since then it has been written on by Mr. P. Gennadius in the *American Naturalist* for January, 1874, and in the same year by C. V. Riley, in his 6th Missouri Report. It is well figured in the accompanying cut, figure 4 (after Riley), in all its stages; *a* shows the larva, *b* the cocoons exposed by removal of the bark, *c* the moth, and *d* the chrysalis.

The moth appears late in May and during June. When the wings are expanded it measures about three-quarters of an inch across; its wings are transparent, decorated with bluish-black markings. The head and palpi are of a deep reddish-orange, antennæ bluish-black, thorax ochreous yellow, abdomen bluish-black varied with ochreous yellow and terminated by a tuft of brilliant reddish-orange hairs.

The under side of the body is ochreous-yellow, with bluish-black markings.

The female deposits her eggs on the bark of the soft and sugar maple trees, chiefly on the former, and when hatched the young larvæ burrow through the bark and feed upon the inner portion and sap wood, never penetrating to the solid heart wood. The excavations made by the larva are filled with its brown castings. When full grown it is more than half an inch long, cylindrical to the eleventh segment, then tapering to the end, with the skin wrinkled and folded. The head is small, of a yellow colour, cervical shield paler; stigmata brown; legs and tips of prolegs reddish. When the larva is full grown it eats its way nearly through the bark, leaving but a very thin layer unbroken; it then retires within its burrow, and having enclosed itself within a loose, silky cocoon, changes to a brown chrysalis. A short time before the moth escapes the chrysalis wriggles itself forward, and pushing itself against the thin papery-like layer of bark, ruptures it and the chrysalis protrudes as shown in the figure. Soon afterwards the imprisoned moth in its struggles ruptures the chrysalis and escapes.

This insect appears to be increasing in numbers every year, and is very destructive, especially to young maple trees. Many of our shade trees in London are much injured by it, and where very numerous it is liable to completely girdle the tree and kill it. It is also found throughout the Middle States. To prevent the moths from laying their eggs, the trunks of the trees should be painted about the 1st of June with a mixture of soft soap and lye about the thickness of paint, or with a mixture of lime and soap. When once the larvæ obtain an entrance it is very difficult to discover them, and they will then carry on their destructive work all through the summer.

THE RED-HUMPED APPLE TREE CATERPILLAR (*Notodonta concinna*).

This insect appears in the perfect or moth state (fig. 5) during the latter part of June. When its wings are expanded it measures from one inch to one inch and a quarter across. The fore wings are dark brown on the inner margin and grayish on the outer margin, with a dot near the middle, a spot near each angle and several longitudinal streaks along the hind margin dark brown. The hind wings of the male are brownish or dirty white, those of the female dusky brown; the body is light brown, the thorax of a darker shade.

The female deposits her eggs in a cluster on the under side of a leaf during the month of July, where they shortly hatch into tiny caterpillars, which at first consume only the

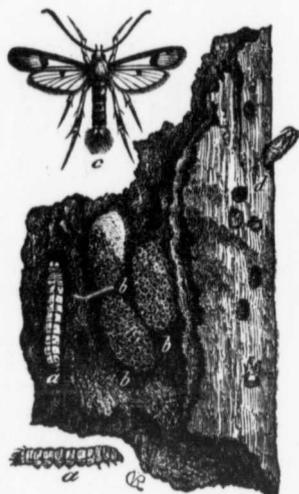


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Fig. 5.

substance of the under side of the leaf, leaving the upper surface unbroken, but as they increase in size they devour the entire leaf. When not eating they lie closely together on the twigs, and sometimes entirely cover the branches they rest on; they attain their full growth during August or early in September. When mature the larva presents the appearance shown in fig. 6. The head is coral red, and there is a lump on the back on the fourth segment of the same color. The body is traced lengthwise by lines of black, yellow and white, and has two rows of black spines along the back, and other shorter ones upon the sides, from each of which there arises a fine hair. The hinder segments taper a little and are always elevated, as shown in the figure, when the insect is not crawling. It measures



Fig. 6.

when full grown about one and a quarter inches long.

They entirely consume the leaves of the branch on which they are placed, and when these furnish insufficient food to bring them to maturity, the adjoining branches are laid under tribute. When handled they discharge from their bodies a transparent fluid with a strong acid smell, which doubtless serves as a defence from their enemies, especially birds, since their habit of feeding openly in large flocks renders them particularly liable to attack from these active foes.



Fig. 7.

When full grown they all disappear about the same time, descending from the trees to the ground, where they conceal themselves under leaves upon or slightly under the earth. Here, after a long time, the larva changes to a brown chrysalis, fig. 7, and remains in this condition until late in June or early in July of the following season. They are very generally distributed, but seldom abundant, and while very partial to the leaves of the apple tree, feed also on those of the plum, pear, cherry, rose, and thorn.

As they feed in flocks during their entire existence, these larvæ can easily be gathered and destroyed, either by cutting off the limbs on which they are feeding and burning them, or by dislodging them by suddenly jarring the limbs, when the larvæ fall to the ground and may be trampled under foot.

#### THE EYED ELATER (*Alaus oculatus*).

This is the largest of our Elaters or "spring beetles," and is found with its larva in the decaying wood of old apple and other trees. The beetle, fig. 8, is about an inch and a half—sometimes more—in length, of a black colour, sprinkled with numerous whitish dots. On the thorax there are two large velvety black eye-like spots, from which has arisen the common name of the insect. The thorax is about one-third the length of the body, and is powdered with whitish; the wing cases are ridged with longitudinal lines, and the under side of the body and legs thickly powdered with white. It is found in the perfect state in June and July; is active in the daytime, flying about with a loud buzzing noise.



Fig. 8.

The mature larva, which attains its full growth early in April, is about two and a half inches long, nearly four-tenths of an inch across about the middle, tapering slightly towards each extremity. The head is broad, brownish, and rough above; the jaws very strong, curved and pointed; the terminal segment of the body blackish, roughened with small pointed tubercles, with a deep semicircular notch at the end, armed at the sides with small teeth, the two hindermost of which are long, forked, and curved upwards like hooks. Under this hinder segment is a large, fleshy foot, armed behind with little claws, and around the sides with short spines; it has six true legs, a pair under each of the first three segments. Early in spring the larva casts its skin and becomes a chrysalis, and in due time emerges a perfect beetle.

This beetle, when placed upon its back on a flat surface, has the power of springing

suddenly into the air, and, while moving, turning its body, thus recovering its natural position; this unusual movement, together with its curious, prominent eye-like spots, combine to make it a constant source of wonder and interest. Since it feeds only on decaying wood, it scarcely deserves to be classed with destructive insects.

#### THE STAG BEETLE (*Lucanus dama*).

This is another very common beetle, somewhat similar in its habits to the eyed Elater, but very different in appearance. It is a large and powerful insect belonging to the family called *Lamellicornes*, or leaf-horned beetles, from the leaf-like joints composing their antennæ. In the male, fig. 9, the upper jaws or mandibles are largely developed, curved like a sickle, and furnished internally beyond the middle with a small tooth; those of the female are much shorter and also toothed. The body measures from an inch to an inch and a quarter in length, exclusive of the jaws, and is of a dull mahogany-brown colour. The head of the male is broad and smooth; that of the female narrow and roughened with punctures. The insect appears during the months of July and August; is very vigorous on the wing, flying with a loud buzzing sound during the evening, when it frequently enters houses to the alarm of nervous occupants. It is perhaps scarcely necessary to remark that it is not in any way venomous, and it never attempts to bite without provocation.

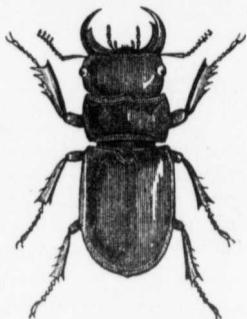


Fig. 9.

The female lays her eggs in the crevices of the bark of trees, especially near the roots. The larvæ live in decaying wood, and are found in the trunks and roots of various kinds of trees, particularly those of old apple trees; they are also found in old cherry trees, willows, and oaks. They are said to be six years in completing their growth, living all the time on the wood of the tree, reducing it to a coarse powder resembling sawdust. The mature larva is a large, thick, nearly cylindrical whitish worm, with a horny-looking head of a reddish-brown colour, dark mandibles, and reddish legs. The body is curved when at rest, the hinder segments being brought towards the head.

When the larva has attained full size it remains in its burrow and encloses itself in an oval cocoon formed of fragments of wood and bark, cemented together with a glue-like secretion, and within this enclosure it is transformed to a chrysalis of a yellowish-white colour. Through the partially transparent membrane the limbs of the future beetle are dimly seen, and in due time the beetle bursts its filmy enclosure and emerges to the light of day.

As this insect affects only old and decaying trees, it seldom does much harm. The use of alkaline washes, applied to the bark of the trees in July, would probably deter these beetles, in common with others, from depositing their eggs on the trees thus coated, and any mischief they might otherwise do be in this manner prevented.

#### SOME FUNGI-EATERS.

BY W. HAGUE HARRINGTON, OTTAWA, ONT.

It is related by a celebrated traveller and naturalist that, in the dreary islands of Terra del Fuego, the only vegetable food to be obtained by the wretched inhabitants, with the exception of a few berries, is a fungus which grows in great abundance on certain trees. This fungus appears on the bark in the shape of bright yellow, globular masses of the size of small apples, and at a certain stage of development is gathered and eaten uncooked. Other savage tribes inhabiting barren territories may be partially dependent on similar substitutes for the nutritious roots and succulent fruits used by more favourably located races; but civilized man, with his long list of food plants to choose from, considers fungi more as luxuries than as essential articles of diet.

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The common field Mushroom (*Agaricus campestris*), found wild throughout the greater part of the world, ranks high as a table delicacy, and is largely cultivated in some countries. Several other species of fungi are also used in considerable quantities; for instance, the famous Truffle, which grows several inches below the surface of the ground, and requires to be hunted with the aid of dogs trained to scent them out. Many others, likewise very wholesome and palatable, are, however, seldom used because of their resemblance to poisonous varieties.

We find man not alone in his liking for fungi and his use of them as food. Domestic cattle and many wild animals also relish them and devour species shunned by man. The insect world produces a great variety of species subsisting either in the larval or perfect state, or in both, upon fungus. Often when a fine, fresh-looking, pink-gilled, snowy-clad Mushroom is plucked, the picker finds, much to his disappointment and disgust, that his savoury morsel is already "food for worms." A number of small grubs are feasting within the stalk, and in a few hours the cherished Mushroom becomes a black decaying mass, filled with little maggots.

A great variety of fungi are similarly attacked and made the banqueting chambers of numerous foes. The tender, short-lived species, such as Mushrooms and Toadstools, decay and perish quickly; but the harder kinds, growing upon old and dead or fallen trees, harbour their tenants much longer, and preserve their shape and outward comeliness even after they have been eaten and withered away inwardly.

The object of this brief paper is to call the attention of any who have recently commenced collecting to the fact that fungi are so much frequented by insects, and that many species can be obtained from them with but little trouble. I will therefore briefly mention a few of the numerous *Coleoptera* which I have taken on or in fungus, not because they are rare beetles, but rather because they may be easily obtained and are well known.

*Megalodaene heros* is the finest beetle which I have found feeding upon fungus. It belongs to the *Erotylidae*, a family known by the large antennal club, formed by an enlargement and flattening of the three last joints. This family is said to be largely developed in tropical America, where its members are mostly leaf-eating beetles, differing in this respect from northern species, which live upon fungi. One day last summer (9th June) I met with a number of large chocolate-coloured fungi growing upon the roots and bark of the stumps of some large hemlocks recently felled. Hiding in crevices of the bark, or in the damp chips and leaves from amidst which the fungi on the roots were springing, I discovered numerous specimens of this handsome beetle and collected about thirty, which had been recently feeding upon the fungus, as evidenced by the holes gnawed therein.

The beetles varied much in size, being from four to seven-eighths of an inch long. They are of an elongated oval shape, three times as long as broad. The head, bearing the distinguishing club-tipped antennæ, is inserted to the eyes in the almost square thorax. The beetle is broadest across the base of the elytra, which taper gradually and are rounded off at the tip. Each elytron is marked by two orange patches; the one at the base is somewhat in the form of a Maltese cross with the lower arm broken off, but varies in different specimens; the other is an irregular band about one-third the distance from the tip. With these exceptions the beetle is of a jet black, highly polished, and is a handsome insect. About six weeks later I visited the same locality in the expectation of obtaining some more of these fine beetles, but could find none. In some fresh fungi of the same kind I found numbers of large stout grubs, from one-half to over three-quarters of an inch long, with a broad black band across the top of each segment. They were probably the larvæ of this beetle, but as I did not succeed in rearing any of those I took, and could not visit the place again, they may have been those of some fungi-eating *Tenebrio*, to some larvæ of which family they had much resemblance.

From the same fungi from which I had previously taken the above-mentioned beetles, and which were now hard and dry, I obtained nearly forty specimens of *Bolitotherus cornutus*, the majority females. This beetle belongs (with the two species next to be described) to the *Tenebrionidae*, the members of which family live chiefly in or about dead stumps and logs, hiding in crevices or under bark, fungus, and moss. It is a dark

brown or dull black beetle, thickly covered with tubercles, so that it looks like a bit of rotten bark or dry earth, and easily escapes detection when it drops to the ground with its legs tightly folded. The male has two horn-like projections upon the thorax and also two minute ones on the front of his head. Those on the thorax are more than an eighth of an inch long, flattened inwardly at the end, and fringed with a light pubescence. The beetles are found abundantly during the summer and autumn, feeding upon the large woody fungi which spring from stumps and decaying trees. While the beetles are found imbedded in holes gnawed in the surface, the larvæ in different stages will be obtained by breaking apart the fungus, in which they burrow out cells until the whole mass is full of holes and tunnels filled with excrement. The grubs are long and cylindrical, attaining when full grown a length of three-quarters of an inch, and have two spines on the last segment, as have the larvæ of many species of this family.

*Diaperis hydni* is a small stout beetle, a quarter of an inch long, common in fungus growing upon old and decaying beech trees (such as are infested by *Dicerca divaricata* and *Tremex columba*). It is very smooth and glossy, and is jet black with the exception of the elytra. These are light brown, and are marked by two small black dots just behind the thorax and by two larger ones midway between these and the tip. They are also ornamented by lines of minute punctures, hardly visible to the naked eye, and not interrupting the glistening appearance of the beetle.

*Hoplocephala bicornis* is a little dark greenish beetle, found in great numbers in the dry leathery fungus which grows, like overlapping scales, on hardwood stumps. Although this beetle is less than one-fifth of an inch long, the male may be easily distinguished by the two little spines or horns which he bears on his head, and from which the species derives its name. They soon reduce the dry fungus to a white powdery state.

*Mycetophagus punctatus* is abundant in the fresh, soft, white fungi which grow from the bark of various trees, not in compact masses, but laminated or gilled beneath like Toadstools. On giving the tree a smart tap, the beetles will shower down from between the gills upon a beating net held below. They are nearly one-fourth of an inch long, and are black, except the yellowish elytra, which are marked by a black spot surrounding the scutel, a black band across near the tip, and two black spots midway between this band and the thorax. Associated with them are generally found numbers of a smaller but very similarly coloured species, *M. flexuosus*.

Similar fungi will sometimes be found to contain a great many very slender little white grubs, with a black head no larger than a pin-hole. I have seen them twisted together in such lumps that the black heads seemed like some tiny mites creeping about over the wriggling mass, in which the respective bodies were lost. These are the larvæ of *Triplax thoracica*, a reddish beetle, one-fifth of an inch long, with blue-black elytra, belonging, like the first beetle described, to the *Erotylidae*.

*Penthe obliquata* is a very active beetle, which scampers hastily away when disturbed at its fungus feast or in its hiding-place under bark, and thus frequently eludes its discoverer. It is of a deep dull black, only relieved by the reddish-yellow scutel and a yellow apical joint to the antennæ. The elytra are very densely and irregularly punctured. This fine beetle is half an inch long and almost oval in shape. A rarer and slightly larger, but not so handsome insect, is *P. pimelia*, which I have found under the bark of old trees. It is of a dull brownish-black, and has the elytra more evenly and less densely punctured. As it lacks the yellow scutel, it is easily distinguished from the preceding species.

Many *Staphylinidæ* are found in the stalks of Toadstools and in other fungi, while those of many other families resort to these productions either for an occasional meal or for a life-long diet. Such are *Cratoparis lunatus* among the Weevils, and *Onthophagus hecate* of the Scarabeans. To even enumerate these would require much space, but I think I have already written enough to show that the young collector will find it profitable to search the different fungi for specimens, especially early and late in the year, when other feeding grounds are unproductive. I might add that many insects in turn fall victims to fungi. The house-fly is a familiar instance of this, and every fall we see great numbers of them stick to our walls and windows, their bodies distended by the fungus, which also spreads some distance around them.

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## FIELD NOTES—1881.

The earth, covered by its first mantle of snow, reminds one that the collecting season is virtually ended, and the lengthening evenings allure one to the study fireside to go carefully over note-books and collections and to read the recorded labours of fellow-Entomologists.

A few memoranda from my own note-book may perhaps not be barren of interest to some of the less experienced readers of the *Entomologist*. I find that almost the first insect of spring was the Mud-wasp (*Polestes annulatus*), which appeared with a few flies and spiders about the 15th of March. This wasp is very abundant here, and from the pulverized macadam of the streets thousands of its mud cells are constructed every summer under the window-sills and numerous cornices of the Parliament Buildings, about which the wasps linger until the end of October. Toward the end of March a few bees and a number of small beetles, as *Amara interstitialis*, appeared. *Pieris rapæ*, the cabbage butterfly, was observed on April 1st, but from this date to the 8th of the month a severe cold spell (thermometer touching zero) reduced insect appearances to the minimum again. At its conclusion they emerged in still greater variety and number; *Vanessa antiopa* flitted about in sunny glades of the wood; *Cicindela pupurea* enlivened the fields, and its relatives, *C. vulgaris* and *C. sex-guttata*, the roads. Mosquitoes came in full force a fortnight later, and on the 24th I obtained a number of *Buprestidæ* upon young pines, viz., 1 ♂ and 2 ♀ *C. virginensis*, and 14 ♂ and 13 ♀ *C. liberta*. I was somewhat surprised to find them so early in the year, yet could have taken many more. They were generally paired, in several instances copulating. Great numbers of Saw-flies were also upon the pines. A few days later I captured specimens of *A. striata*, and by the beginning of May all orders of insects were well represented. On the 6th *Serica sericea* was abundant on the foliage of wild gooseberry bushes. *Chrysomela elegans* was also unusually numerous, but I could not find upon what it fed. *Platycerus quercus* was found eating the buds of maples and other trees. The buds were often completely eaten out, and the beetles hidden from view therein. In some buds a male and female were found copulating. This beetle was new to my collection, but I found them frequently again during the summer when using a beating net. During May the curious larvæ of certain *Lampyridæ* were often seen in damp woods, crawling on the trunks of trees, such as cedar, or affixed by the tail to the bark, undergoing their metamorphoses in a similar manner to the larvæ of the *Coccinellidæ*. Some reared at home emerged as *Photinus angulatus*. The larvæ, and to a less degree, the pupæ, emitted a strong greenish glow from two of the posterior segments; the imago being, of course, one of our common "fire-flies." Some of the larvæ were thickly covered beneath with small ticks, of a bright vermilion colour, which had their pointed heads plunged between the armoured segments of the larvæ. They were not easily dislodged, but walked rapidly when free. By these little parasites the larvæ were so weakened as to perish before completing their transformations. The warm weather of mid-May brought forth increased hosts of insects, and the sultry air, especially in the neighbourhood of lumber yards, swarmed with *Scolytidæ*, etc. Toward the end of the month I took a trip, with three friends, to the Wakefield Cave, about twenty miles north of the city, and in my spare moments collected a number of insects in that vicinity. *Cicindelidæ* especially abounded on the sandy hill-side roads, and I captured three species which are rare, or not found about here, viz., *C. 12-guttata*, *C. longalabris*, and *C. limbatis*. On my way back I took a specimen of *C. sex-guttata* having only two spots (the anterior one on each elytron). Although called Six-spotted Tiger Beetles, very many have eight spots, and specimens with ten spots are frequently taken. In a beech grove at Chelsea, *Ithycerus curculionides* was very abundant; several could be seen on nearly every tree; many pairs were copulating. Where do the larvæ live? On the 31st of May several specimens of *C. Harrisii* were taken on pine saplings, and *H. Pales* and its long-snouted relatives were in full force. On June 4th, *Saperda vestita*, *Oberea amabilis*, *B. nasicus*, *C. nenuphar*, *A. quadrigibbus*, and many other weevils, elaters, etc., were noted. At an excursion of the Ottawa Field Naturalists' Club to Montebello (45 miles down the river), on 26th June, I captured 129 species of *Coleoptera*,

a considerable percentage of which were new to me. *Carabidae* were particularly abundant under drift-wood and dead leaves on the damp, shady shore, and 35 species were taken. *Chrysomelidae*, *Elateridae*, and *Curculionidae* were next in number with 15, 13, and 13 species respectively. After midsummer my opportunities for collecting were few, and my notes correspondingly scanty. I will merely mention the capture at Aylmer and Hull, on Oct. 2nd, of *Aletia argillacea argentata*, the cotton moth; both specimens were in perfect order, not in the least rubbed or worn. In October, 1880, I took several specimens about the city, also apparently recently emerged.

### CARBOLIC ACID AS A PREVENTIVE OF INSECT RAVAGES.

(Read before the Sub-Section of Entomology of the A. A. A. S.)

BY A. J. COOK, LANSING, MICH.

One year ago I gave at the Boston meeting of the Association for the Advancement of Science the results of some experiments in the use of London purple to destroy the codling moth larva, and bisulphide of carbon in fighting the cabbage maggot and squash borer. These experiments have been repeated the present season, and with results no less favourable than those reported one year ago. I think it is an established fact that the methods recommended are valuable. They not only seem reliable, but they promise to be the cheapest and most desirable modes that can be made practicable on all occasions.

As stated last year, the bisulphide of carbon will also destroy the radish maggot (*Anthomyia raphani*), but owing to the great number of plants to be treated, the amount of the liquid necessary to do thorough work is large, and so the expense is perhaps too great to warrant its use in case of this insect. The present season I tried to see if we might not make the application in a few places about the bed, at some distance apart, and still effect our purpose to destroy the maggots. The result does not recommend this liquid for the destruction of the radish *Anthomyia* with the same emphasis that we may safely give in advising its use for the cabbage *Anthomyia* and the squash *Egerian*. This fact led me to cast about for some more desirable agent to be used against the radish fly, and it occurred to me that carbolic acid, which is not only very repellent to insects, but also quite as remarkable in retaining its obnoxious odour for a long time, might be made most serviceable in this warfare.

I prepared some of this material as follows: To two quarts of soft soap I added two gallons of water. This was then heated to a boiling temperature, when one pint of carbolic acid (in a crude state) was added. This mixture is then set away in a barrel or other vessel, and is ready for use as occasion may require. I mixed one part of this liquid to fifty parts of water, to be used on the radish plants. It was used by three parties in three places. Mr. Lee used it in the College garden, a student—Mr. E. Hale—used it on a bed specially prepared, and I used it in my own garden. Mr. Lee sprinkled it on the plants, and poured it into a trench made close beside the row of plants. Mr. Hale and myself sprinkled it directly on the plants. Messrs. Lee and Hale made but one application, and found that it kept the insects at bay for about two weeks. Even this proved of no little service. I made the application once every week, and the radishes were almost entirely free from the maggots. My bed was seventy or eighty rods from the other beds. But I caught the flies about my garden, and plants near by, not treated, were badly injured by the maggots. Two cautions should be urged: first, sprinkle the plants as soon as they are up, and thereafter every week or ten days; secondly, the mixture, if sprinkled directly upon the plants, must not be so concentrated as to injure the plants. My experiments this season make me feel certain that this will prove a valuable remedy, and if cheaper, it may even replace the explosive bisulphide of carbon in fighting the cabbage maggot and the squash *Egerian*.

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About my house at the Michigan Agricultural College I have planted a little apple orchard of eight trees. The trunks and larger branches of these trees have been thoroughly washed twice each spring, the last week of May and the last week of June, with soft soap. A neighbour but a stone's throw distant set out some fine primates about the same time that I set out my trees. He does not believe in the use of soft soap, practically at least, and his trees are sorely disfigured and greatly injured by the *Saperda candida* and the *S. cretata*, while my trees are smooth and admired by all. I have some pear trees in the same orchard which were not treated with the soap, one of which has been much injured by the borers.

This year I used the undiluted carbolic mixture instead of the soft soap. I fully believe this to be an improvement on the soap alone, as in some cases, if but one or even two applications of the soap are made, the effect is not so long continued as to entirely prevent the borers from egg laying. The carbolic acid will tend to extend the period, so that I believe two applications will in every case repel the beetles.

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## ENTOMOLOGICAL PAPERS.

BY JAMES T. BELL, BELLEVILLE, ONTARIO.

### ARBOREAL AUSCULTATION.

Some time ago, while visiting the Dean and Williams Gold Mine, in the township of Marmora, I was interested in observing the proceedings of some woodpeckers which resorted to some half-dead pine trees in front of my room window. I remarked that after alighting they would run upwards in a zigzag way, stopping occasionally, and applying the side of their heads to the tree, evidently listening for the noise made by a grub while gnawing the wood. Suddenly a bird would begin to dip into the bark, the rapid strokes of its powerful bill making the chips fly faster than a lumberman's axe. On one occasion, by the aid of an opera-glass, I saw one fellow transfer something large and white from the cavity he had excavated to the interior of his craw, but the quickness of the action prevented me from ascertaining precisely what it was.

Thinking of this, it has occurred to me that the presence of a "borer" in a fruit or other tree might be ascertained in the same manner by the use of a tube of wood or tin-plate formed like a stethoscope or ear-trumpet; by applying the wide end to the tree and the small end to the ear, the exact locality of the grub could be determined, when the application of a stout brad-awl or small gimlet would put an end at once to his life and his depredations without material injury to the tree.

### HOW WE CAPTURED A HORNET'S NEST.

One fine day last October, while enjoying a ramble in the woods near Belleville, with two of my sons, one of them took hold of a knot which projected from a small half-decayed log, intending to turn it over to search for beetles beneath it. The piece, however, came away in his hand and disclosed the entrance of a nest of black hornets. Of course we retreated "at the double" before the disturbed insects recovered from their first surprise, leaving them to settle down at their leisure. A few days after, taking advantage of a cool morning, I sent my two boys to the wood with a small bottle of chloroform and a hard rubber syringe. According to directions, they injected about a drachm of the liquid into the hole, and threw a handkerchief over the entrance. In about five minutes they opened up the nest, when they found the inmates in a perfect state of slumber, and transferred them without trouble to their cyanide bottles. In about an hour they returned, bringing me forty-eight specimens of the insect.

### COLLECTION NOTES FOR 1880.

The early months of 1880 were especially favourable to the acquisition of the hibernating Coleoptera, and those which have their permanent habitat among the moss of our woods and swamps. The early disappearance of the snow laid bare their hiding places,

while the frosts which succeeded formed an ice-bridge which gave access to their places of refuge, which in ordinary seasons remain covered with snow till the general break-up of the winter, when they are rendered inaccessible by being surrounded or covered with water. Mr. J. D. Evans and myself, who are the sole representatives of the Entomological Society in this district, took advantage of these favourable circumstances and commenced a vigorous course of moss-hunting, lasting from March 1st to May 24th. During this period we collected upwards of 1,000 specimens of over 100 species, of which the following are not included in the Society's published lists. The numbers are those of Crotch's Check List, and the determinations, with few exceptions, were made by Mr. H. Ulke, of Washington, and Mr. E. P. Austin, of Boston:—

- 7496 *Anchus pusillus*.  
       *Hydrochus* (nova species, Ulke.)  
 1579 *Trichopteryx Haldemanni*.  
       " 2 sp. (nova species, Ulke.)  
 2102a *Pselaphus longiclavus*.  
 2110 *Bryaxis conjuncta*.  
 2120a *B. propinqua*.  
 2134 *Decarthron formiceti*.  
 2139 *Arthmius globicollis*.  
 2295 *Scydmaenus bicolor*.  
       " 2 species not determined.  
 2366 *Latridius deletus*.  
 2572 *Atomaria ochracea*.  
 5670 *Xanthonia Stevensii*.  
 5771 *Plagiodera cochleariæ*.  
 6294 *Paratenetus gibbipennis*.  
 9027 *Tanysphyrus lemnae*.  
 9298 *Ceutorrhyncus semirufus*.  
 1818 *Philonthus palliatus*.  
 7749 *Stilicicus biarmatus*.

All the above were taken from moss, and in addition the following, which are already registered as Canadian: 2095, 2100, 2102, 2103, 2113, 2124, 2130, 2149, 2150, 2164, 2283, 2285, and about 70 species of Carabidæ, Staphylinidæ, Chrysomelidæ, Curculionidæ, etc.

3932 *Alaus gorgops*; from a stump in Bleeker's Woods.

On June 7th we experienced a heavy gale from the S.W., and on the 12th one of my daughters, who was visiting at West Lake, Prince Edward County, went with a picnic party to the Sand Banks, on the shore of Lake Ontario. There she found the beach strewn with Calosomas and other Coleoptera. On her return she brought me 16 *C. scrutator*, 13 *C. Wilcoxi*, 1 *C. frigidum*, and many other beetles. On July 1st, Mr. W. R. Smith being at Brighton, found on the beach at Presq' Isle a similar display of Calosomas, and brought me 14 *C. scrutator*, 24 *C. Wilcoxi*, and 3 *C. frigidum*; unfortunately most of them were spoiled from exposure.

On June I had brought to me a rather fine specimen of *Eacles imperialis* and a good male of *Xyloryctes satyrus*, both taken within half a mile from the city limits.

With these exceptions, the season of 1880 has proved the least favourable to the Entomological collector, in this quarter at least, of any I have experienced in my 21 years' residence in Canada. Very few Lepidoptera were seen, either on the wing or at sugar; beating the bushes was singularly unproductive, and I have more than once picked stumps and turned over stones for a full hour without getting 20 specimens of all sorts.

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NOTES ON A PARASITE—ON THE PAINTED LADY BUTTERFLY  
(*Pyrameis Cardui*).

BY CAROLINE E. HEUSTIS, CARLETON, ST. JOHN, N.B.

I send you a few specimens of an insect which I have found parasitic on the larvæ of *P. cardui*. For several successive summers I have reared a number of these caterpillars, with which our thistles in most seasons abound. I observed variations in size and colour of the larvæ found feeding on the same plant, which led me to suppose that they might not belong to the same species. I have always observed that a large proportion were almost black, and much smaller than those from which I have obtained good specimens of *cardui*, but until the last summer my efforts to raise these were not attended with success, all the small black larvæ dying before they had attained their full growth, although they fed well for a time.

Last season I collected from a group of thistles of the same species fifteen caterpillars, and put them in breeding boxes. They all ate voraciously, and one after another went into chrysalis, except two, which died on the bottom of the box, after having made several ineffectual efforts to suspend. Those which died were black. I carefully marked those which I suppose other than *cardui* as they suspended, and watched for the advent of the butterflies. I observed that the chrysalids of the black specimens were bright golden, and smaller than those of the bright and healthy-looking larvæ. The chrysalids of the latter were grey, ornamented with white stripes along the sides. (This insect has been kindly determined by E. T. Cresson, of Philadelphia, as *Ichneumon rufiventris*).

ENTOMOLOGICAL NOTES.

BY J. ALSTON MOFFAT, HAMILTON. ONT.

*Calosoma Scrutator*.—In connection with Mr. Fletcher's interesting article on "*Calosoma Scrutator*, the Beautiful-bodied Searcher," in our last Annual Report, I desire to relate my experience with this insect during the summer of 1881. On 11th June I left Hamilton for Long Point. I had half a day to spend at Port Dover before the boat left. About noon a strong breeze sprung up from the S.W., which drove the waves up the shore. I took a stroll along the beach, and had not gone far when I saw a greenback just landed, making rapid strides with his long legs away from the water, and I seized my first living *scrutator*. I took several of them that afternoon alive, some of them simply that and nothing more. At Long Point the evidence of what had been unmistakable; the water lines of various storms of different forces were marked with bands of green wing-covers. I was too late for the harvest, very few coming ashore while I was there. When sugaring for moths we took from 2 to 5 every night, and one night 16. A large gauze-winged fly was attracted in great numbers to the sugar, and the *scrutator* was attracted by them, for in almost every instance we took them with one of these in their jaws. When seized they would drench the fingers with an acrid fluid of the most offensive odour; it was very volatile, drying rapidly with a sensation like alcohol. In one instance I took one from under a board on the beach, and in blowing off the sand that adhered to it some of the fluid struck my lip; it burned for an instant sharply. The odour from them leaves in a very short time. Does it not seem strange they should remain so scarce in the country when they are landed in such numbers on our shores alive? A friend, Mr. A. H. Kilman, of Ridgeway, writes me that they came ashore this spring after a south-west storm in hundreds, dead and alive. And we may suppose it to be about the same along the whole north shore of Lake Erie, and yet I know of but three taken in the neighbourhood of Hamilton in 20 years.

*Saperda Fayi*.—On the 11th of June I took a pair of *Saperda Fayi* upon thorn, a rather rare insect with Canadian collectors hitherto, I believe. Ten years ago or more I captured one, and had not met with it since, but this year amidst a general scarcity it seemed to be quite abundant here, the different collectors finding it well represented in

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every direction around the city. One day, coming on a favourable locality, I took 19; returning to the same place the following afternoon, I got 30, and had to leave before 4 o'clock on account of rain—going back a few days later and securing 34. I found old bushes in an exposed situation the most productive.

*Papilio Cresphontes*.—On the 6th Oct., 1880, I took six *cresphontes* larvæ feeding on prickly ash. Some of them fed for several days afterwards, and in due time they all transformed to chrysalids. Now they have all emerged as butterflies; the first appeared on the 22nd of March, the last on the 17th of April, 1881. They measure from  $3\frac{3}{4}$  to  $4\frac{1}{2}$  inches in expanse of wing, perfect in form and rich in colouring.

*Heliothis Armigera Hub.*—It seems rather strange that this, so common an insect in many parts, should have been but noticed here for the first time this season. Widespread in the range of its habitat, having been taken in England, Australia, and Japan, it is also pretty general in its feeding, accommodating itself readily to the conditions of the locality. The caterpillar known by the name of the boll-worm in the Southern States, from the vast amount of injury done by it in eating into the cotton-boll, is known in the Western States as the corn-worm, but has been found also in other countries to be very destructive in the field to green peas and pumpkins, and in the garden to tomatoes and the gladiolus. If it should become permanent amongst us and abundant, it will be no small addition to the band of enemies which our cultivators of the soil have already to contend with. The late B. D. Walsh, M.A., the much-lamented State Entomologist of Illinois, writing of it in 1869, says, "It attacks corn in the ear, at first feeding on the silk, but afterwards devouring the kernels at the terminal end, being securely sheltered the while within the husks. We have seen whole fields of corn nearly ruined in this way in the State of Kentucky, but nowhere have we known it to be so very destructive as in Southern Illinois." Again he says, "In 1860, the year of the great drought in Kansas, the corn crop in that State was almost entirely ruined by the corn-worm. According to the *Prairie Farmer* of Jan. 31st, 1861, one county there, which raised 436,000 bushels of corn in 1859, only produced 5,000 bushels of poor wormy stuff in 1860; and this, we are told, was a fair sample of most of the counties of Kansas." In these extracts we have evidence of its powers of devastation when abundant. In these States it is double-brooded; whether it is so here or not does not yet appear certain, but that it is double-brooded in New Jersey has been most conclusively proven by the careful investigations of Mrs. Mary Treat, of Vineland, N. J. It was quite plenty here in the early part of September, feeding in the daytime on the flowers of the golden-rod and in the gardens. Several of the *Agrotis* family were flying at the same time, which are known to be but single-brooded. The probabilities are that it may be the same here also. A night-flyer properly, or in the dusk of the evening, it seemed to have been tempted from its hiding-place by that peculiar dull, smoky weather we had so much of during the first three weeks of September, when even the Sphingidæ forgot their usual caution and came forth boldly to feed at mid-day, having taken a tomato-sphinx (*M. Quinquemaculata*) at 2 o'clock in the afternoon of the 14th, feeding on petunias, whilst the white-lined sphinx (*Deilephila lineata*), which, by the way, was most unusually abundant, could be seen by the half-dozen among the flowers at any time of the day. The *Heliothis* moth is a pale clay yellow on the front wings, but quite variable in depth of shading, with olivaceous markings and a conspicuous dark spot near the middle. The hind wings are paler, with a dark brownish band on the outer margin. Being about  $1\frac{3}{4}$  inches in expanse of wing, it was quite a conspicuous object while feeding, more especially as it seldom rested, but kept its wings moving the while. The caterpillar is said to vary in colour from a pale green to a dark brown, but the ornamentation is constant, which is longitudinal light and dark lines, and black spots from which rise a few soft hairs.

#### FOOD HABITS OF THE LONGICORNS.

By F. B. CAULFIELD, MONTREAL, P.Q.

In June, 1873, while collecting in a small swamp on Montreal Mountain, I caught a specimen of *Pogonocherus mixtus* (Hald.) on my coat-sleeve, and as the insect was new to

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me I commenced a search for others. Upon examining a dead branch of a small willow growing close by, I found that it had been extensively bored by some small insect. The part attacked was about three feet from the trunk, and at this place the branch, for about twelve inches, was full of holes from which the insects had escaped. Not finding them, I searched further along the branch, and near its extremity, where it was reduced to the thickness of a twig, I found a number of the above-named species. They were lying on the branch with their bodies pressed closely against it, and in this position could with difficulty be distinguished from the withered buds. I observed several pairs in coitu, but none of the females were ovipositing. They appeared to be very sluggish, lying almost motionless, although the sun was shining brightly at the time. Having bottled all that were to be seen, I cut off the branch where it had been perforated, and found a number of the beetles in it, but neither larva nor pupa.

*Gaurotes cyanipennis* (Say).—I find this insect in spring on thorn blossoms, and later in the season pairing and ovipositing on butternut.

#### CUPES CAPITATA.

BY E. BAYNES-REED, LONDON, ONT.

For some years past I have been, during the month of July, in the habit of collecting specimens of this pretty little beetle on the fence of a churchyard adjoining my residence. This year they were exceedingly numerous, and I captured in four days over 80, of which some 50 were females. It is curious to note that I have invariably found that certain pickets of the fence were selected by the beetles, and that out of a long distance of fencing round the sides of the church, these few pickets on one side would be the only place to find the beetle. I can give no reason for such selection—the trees and food plants round the fence are similar; they congregate for breeding purposes and then suddenly disappear, and can only be rarely found afterwards.

#### NOTES ON LYTTA (BLISTER BEETLES).

BY PROF. E. W. CLAYPOLE, YELLOW SPRINGS, OHIO.

During the present summer three species of *Lytta* have been very abundant and destructive here. The Striped Blister-beetle (*Lytta vittata*) in the early part of the season, about the end of June, began to do mischief to the potato plants, especially where they were weedy. Later on, about the middle of July, this species was joined by the White-edged Blister-beetle (*L. marginata*), and both together fell upon the later kinds of potato (in my garden the Buckeye). Now (August) the Black Blister-beetle (*L. atrata*) may be seen in company with the former two where a few belated plants afford them any green fodder. The last mentioned of the three, however, did not arrive in time to do any serious harm to the potato, but turned its attention to a large bed of sunflower belonging to my children, and are preying upon their yellow petals greedily. From twelve to twenty may be often seen upon a single plant.

All these three species "play possum" when frightened, but not all in the same way. The black one drops from the plant as does the Colorado Beetle (*D. 10-lineata*), but does not fold in its legs and antennae and roll about. It lies just where it falls for some seconds, with limbs in the position in which they were when it dropped. The white-edged and striped species fall as if struck dead, but always alight on their feet or gain them immediately, and stand looking warily about them. If no danger seems near, or if an attack is made upon them, they run, and having the longest legs of the group, they run fast and are difficult to catch. But their bodies being soft they are easily crushed. Their

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juices, as their name implies, are exceedingly blistering, and soon raise a water blister on the skin if applied to it. Hence they are often used locally as a substitute for the Spanish Fly.

The presence and voracity of these Blister-beetles make it very difficult to keep a bed of potatoes clean by hand-picking of any kind, but of course Paris Green or London Purple is as destructive to them as to the Colorado Beetle, and forms the best remedy. They are so wary that it is almost enough to clear the plants if one walks between the rows so that one's shadow falls on them. They may be seen dropping to the ground in a shower.

Though these three species are so abundant here, I have not seen a specimen of the fourth member of the group, the Ash-grey Blister-beetle (*L. cinerea*), this summer, and a row of English Broad Windsor Beans which I planted as an experiment were quite untouched by them. The late Mr. Walsh says he never could grow these beans at Rock Island, Ill., because of the swarms of Ash-grey Blister-beetles which ate them up. My broad beans were, however, badly injured by numbers of a small black hopping beetle, the name of which I do not know, but which treated their leaves exactly as the Turnip Flea Beetle treats the seed leaves of the young turnips. It was, however, much larger.

Not to paint the Black Blister-beetle any blacker than is just right, I must add that I not long ago found a swarm of them devouring the flowers of the great rag-weed (*Ambrosia trifida*). One of them, which I watched for some time, cleaned the whole of the flowers from one of the involucre of the raceme in a few seconds.

#### THE COLORADO BEETLE.

The following extract from an English newspaper, the *Bristol Mercury*, will show how carefully the Colorado Beetle is looked after in England, and how great a risk he runs if he sets foot within the United Kingdom. He is far more sternly outlawed than was Robin Hood or Smith O'Brien, and if only a suspicion of his presence is felt, all from the Privy Council downwards, are up in arms to crush him with all the terrors of the law. Let us hope they will succeed in making the country too hot for even the ten-lined Spearman :—

"Mr. Borlase put a question as to the discovery of a Colorado Beetle in South Devon. "Mr. Mundella answered, saying the Colorado Beetle was in his department. (A laugh.) He then gave the facts of the discovery of a live Colorado Beetle in the possession of a man at Yealmpton, who refused to give it up. Upon instructions from the department he was prosecuted under the Destructive Insects Act of 1877, and fined the mitigated penalty of £5, he pleading ignorance of the law and agreeing to the destruction of the beetle."

#### ENTOMOLOGICAL NOTES FOR THE SUMMER OF 1881.

I came only last year to the premises where I am now residing, and though I had a small crop of cherries, they were so badly infested with the weevil (*Canotrachelus nemophar*) that only a few quarts could be found free from the grub and fit for canning. This year a fair crop was promised; the spring was late and the danger of the frost little. I proposed, therefore, to make war upon the enemy, and as soon as the blossom was over prepared a large sheet of cheese-cloth, and for about three weeks jarred the trees before breakfast almost every morning. As the result, I have now nearly 2,000 weevils peacefully reposing in a bottle, after a composing draught of benzine. Only about 10 per cent. of my cherries this year were unfit for use. I carried the war into the orchard, and, simply by way of experiment, jarred some of the early apple trees and captured a great many of my enemies. I am more than repaid for my labours both on the cherry and apple trees, by the quality of the apples. When last year, with a larger crop, I only obtained knotty, gnarly fruit, I have this year round, smooth, well-shaped apples. I have never heard that anything has been done, at least in this neighbourhood, to trap the weevils on the apple trees. Those who live in the north have no idea of the mischief wrought here by the weevil in the orchards.

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A word for the mole. In digging potatoes this year, I observed the runs of a mole in all directions through the ground. It was a piece of old sod, and very much infested with white worms, the larvæ of the Cockchafer (*Lachnosterna fusca*). Many of the potatoes had been partly eaten by these worms, but I observed that wherever a mole-run traversed a hill of potatoes no white worm could be found, even though the half-eaten potatoes were proof of his former presence. The inference is fair that the mole had found him first and eaten him, and very likely the mole's object in so thickly tunnelling this piece of ground was to find these grubs.

Now, it would be very easy to trump up a charge against the mole on the evidence of these facts. There was the "run" which nothing but a mole could make, and there were the gnawed potatoes; put the two together and kill the mole. Many a man has been punished on less conclusive circumstantial evidence. But it is perfectly easy to distinguish the work of a mole from that of a white worm, if one will only take the pains. I have many times found the latter coiled up in the potato he was eating, but I have never seen the mark of teeth such as the mole possesses on a potato. Nor do I believe the mole ever meddles with potatoes or corn.

*Abundance of Certain Insects.*—The Southern Cabbage Butterfly (*P. protodice*) is exceedingly abundant here this summer. I have been able to count scores on the wing at one time.

The Potato Worm, or larva of *S. 5-maculata*, is troublesome on the late potatoes this month (September), and soon strips a plant of its leaves. However, he is easily dealt with, as he is at once betrayed by the casting on the ground, and a little "poison dust," such as I use for the beetle, soon makes an end of him. I have tried "Buhach" on this insect, but find the former much easier of application and more effective. The latter diluted with ten parts of flour had little effect on the worms, but when used neat it stopped their feeding and killed two of them in a couple of days. But there is the trouble of looking up the creature (green on a green ground) in order to put the powder "where it will do the most good," whereas one need only shake the powder-tin over the plant and pass on, leaving the worm to poison itself.

The same is true of the Cabbage Butterfly (*P. rapæ*) in the early stages of growth of the cabbage. I have used Buhach, and a friend of mine is now using it on a plot of 3,000 heads of cabbage, but the time spent in finding the green worm on the green leaf is a serious drawback, and while the plant is very young I prefer using the "poison dust." I can sprinkle a whole bed while I am finding the worm on a dozen cabbage-heads in order "to put salt on his tail." The "poison dust" to which I refer is made by mixing one part of London Purple and sixty parts of ashes, and passing the mixture several times through a fine sieve. I may add, that I find this a very efficient remedy for the turnip fly.

#### BOOK NOTICES.

##### THE CANADIAN SPORTSMAN AND NATURALIST, Vol. I., Nos. 1 to 8.

This is a monthly journal published in Montreal, and edited by William Couper, a well-known naturalist and sportsman. Each number contains eight pages of matter arranged in double columns, printed in first-class style and on good paper. The articles are short and interesting, treating mainly of matters pertaining to hunting and fishing, with brief descriptions of Canadian wild animals, birds, etc.

The editor's extensive experience and travels in the Lower St. Lawrence is manifest in his articles on the rivers of that district and their products. Entomology also comes in for a share of attention. The fifth number contains a valuable contribution from Dr. J. H. Garnier, of Lucknow, Ont., on the Reptiles of Canada, a subject to which but little attention has yet been given in this country, but one in which there is a large and promising field for the enterprising investigator. To all lovers of sport, either with the rod or gun, this journal will commend itself. It should also be of value to all who are fond of natural history in general. We hope to see it liberally supported. The subscription price is one dollar per annum.

BUTTERFLIES: THEIR STRUCTURE, CHANGES AND LIFE HISTORIES. By Samuel H. Scudder.

We are indebted to the author for a copy of this beautiful book, a well-printed octavo volume of 322 pp., illustrated with 201 figures. The work is divided into thirteen chapters, the first six of which treat of the structure of butterflies in all the stages of their growth from the egg to the perfect insect. A chapter is devoted to the internal organs of caterpillars, and another to the transformation of these organs during growth. The remaining chapters deal with the life histories of these attractive insects and the changes which they undergo under varying circumstances. Following these is an Appendix containing instructions for collecting and preserving insects, etc., a list of the common and scientific names of butterflies, and a list also of the food plants of their caterpillars, all written in a plain and popular style. It is a great pity that a work of this character, coming from so well-known and talented an author, and containing as it does so much useful and valuable information, should be marred by the introduction of a series of new names for our butterflies, which, to the great bulk of the Entomologists of America, seems to be a most unreasonable imposition, and against which there is a general feeling of revolt. That any author should persist in carrying the rules of priority so far as to resurrect old documents, the authority of which is of the most questionable value, and on the strength of these insist on the changing of nearly all the names of our butterflies, is a tax on the patience of the practical man which few can endure, and a serious bar to the progress of our favourite science. Neither do we think that the introduction of a large number of newly-invented common names will add in any degree to the popularity of Entomology; it were far better, in our opinion (with few exceptions), to use the specific name of the insect for this purpose, which is as easily learnt and conveys a more definite idea than is possible with such common names as those given by this author.

PAPILIO.

This valuable monthly serial, devoted entirely to Lepidoptera, has now reached its ninth number, with an average of about 20 pages per number. It is the organ of the New York Entomological Club, is well got up as to printing and paper, and is edited by the Secretary of the Club, Mr. Henry Edwards. A large portion of its space is devoted to descriptive Entomology, with occasional papers relating to the life history of species. In the September number, among other interesting papers, we find one by Mr. W. H. Edwards on the alleged abnormal peculiarities of *Argynnis myrina*, which was read before the Subsection of Entomology at the recent meeting of the American Association at Cincinnati. In this paper the author shows from records of careful observation that many of the remarkable statements made by Mr. Scudder on the abnormal peculiarities of this insect are incorrect. In the October number is a full description of the preparatory stages of *Thecla Henrici*, by the same author; notes on an Aquatic Noctuid Larva, by J. H. Comstock; and descriptive papers by A. R. Grote, B. Neumoegeu and Henry Edwards.

BULLETIN No. 6, FROM THE DEPARTMENT OF THE INTERIOR, U. S. ENTOMOLOGICAL COMMISSION; being a General Index and Supplement to the Nine Reports of the Insects of Missouri. By C. V. Riley; 8vo., pp. 177.

This useful pamphlet will add much to the value of the Missouri Reports, containing as it does a very complete index to all the matters contained therein. Following the introduction we have tables of the contents of the nine reports, then a list of errata, followed by a few pages of notes and additions; then follow descriptions of new species, descriptions of adolescent states, lists of illustrations, a copious general index and an index to plants and food plants.

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ON THE GENERA OF CARABIDÆ, with Special Reference to the Fauna of Boreal America.  
By George H. Horn, M.D. From the Transactions of the American Entomological Society, October, 1881 ; 105 pp., with eight plates.

In this paper the author dwells at some length on the value of the modifications of various organs of the body in the Carabidæ, for the purposes of classification, following with a complete classification of the tribes in this order, the points of difference being illustrated by examples in the excellent plates which accompany the text. Throughout this work there are many tables wherein the main points of difference are grouped in such a manner as to enable the student to readily recognize the many genera into which our numerous species are divided. This addition to our Entomological literature will prove a great help to Coleopterists, and only those who know the extent of this subject will be able to estimate the amount of labour and careful study required to produce such a work as that we have before us.

THE HONEY ANTS AND THE OCCIDENT ANTS. By Henry C. McCook, D.D. ; 8vo., pp. 188, illustrated with thirteen plates. 1882.

This work, in the words of the author, is "a monograph of the architecture and habits of the honey-bearing ant, *Myrmecocystus melliger*, with notes upon the anatomy and physiology of the alimentary canal ; together with a natural history of the Occident harvesting ants or stone-mound builders of the American plains." It is written in a charming and popular style, and the details of the curious habits of these interesting creatures are given in such a manner as to show that the author has studied them closely, and is quite familiar with every aspect of the subject treated of, while the beautiful illustrations are a material aid towards the ready comprehension of the whole matter. This work is well worthy of a place in the library of every student of nature.

A MANUAL OF INJURIOUS INSECTS, with Methods of Prevention, and Remedy for their Attacks to Food Crops, Forest Trees and Fruit, and with a short Introduction to Entomology. By Eleanor A. Ormerod, F.M.S., London, England. 1881.

It is with very great pleasure that we draw attention to Miss Ormerod's excellent work on Injurious Insects—the full title to which we have given above. It is the first effort that has been made in England to bring within the reach and comprehension of ordinary farmers and gardeners a complete account of the insect enemies that they have to deal with. The work begins with an introduction to Entomology, in which the reader is furnished with an account of the general life-history of insects during the various stages of their existence, beginning with the egg and going on through the larva and pupa to the imago. This is followed by a sketch of the classification of insects, based upon Prof. Westwood's division into thirteen orders, each of which is represented by wood-cuts of common species, in order that it may be easily recognised by the reader. The book is divided into three parts, viz., Food Crops, Forest Trees and Fruit, with the insects that injure them respectively. In each part the various crops, trees, etc., are treated of as regards their insect enemies, in alphabetical order ; for instance, the "Food Crops" begin with the Asparagus, Bean, etc., and end with Turnips, thus making it very easy to obtain information about any insect that happens to be prevalent. Every insect treated of in the book is made easily recognisable to the non-scientific reader by means of admirable wood-cuts, partly the work of the talented authoress herself, and partly reproductions of the beautiful illustrations in Curtis' Farm Insects. Each cut shows the insect in the various stages of its existence, while the letterpress gives an account of its life history. As an example of Miss Ormerod's work, we give two illustrations selected almost at random.

P. 1, ASPARAGUS BEETLE—*Crioceris asparagi*, Linn.

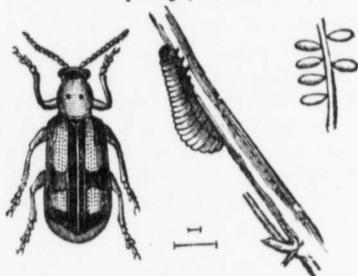


Fig. 10.  
Asparagus Beetle, larva and egg; all magnified. Natural length of egg and beetle shown by lines.

P. 123, ONION FLY—*Anthomyia ceparum*, Bouché.

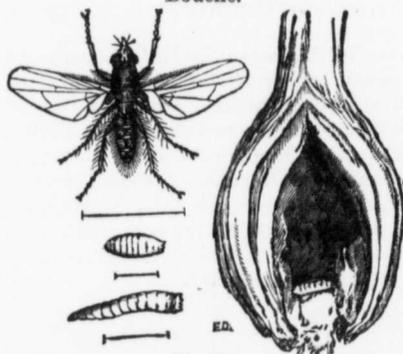


Fig. 11.  
Onion Fly, pupa and larva, all magnified. Onion-bulb showing pupa remaining in stored onion.

We cannot but congratulate Miss Ormerod upon the skilful manner in which she has accomplished her task, and we trust that her work will be fully appreciated by the farmers and gardeners of Great Britain, for whose special benefit it has been produced. The whole book is written in clear, simple language, free from all scientific terms and technicalities so far as they can be omitted, while the modes of prevention are such as have been practically tested by competent persons, and cannot fail to be beneficial if intelligently followed. We hope to see many editions of the work called for, and to learn that the authoress has been amply rewarded for her labour of love.—C. J. S. B.

#### REPORTS OF THE U. S. COMMISSIONER OF AGRICULTURE FOR 1878 AND 1879.

We have lately received copies of both of these valuable reports from the Department of Agriculture at Washington. There are in them—in addition to all the other useful papers on subjects relating to agriculture—in the reports of the Entomologist of the Department, much that is of great interest to entomologists. In the report for 1878 we have, from the pen of C. V. Riley, contributions on the insects injurious to the cotton plant; the silk worm, with instructions for the production of silk; with descriptions also of a number of insects injurious to fruits and field crops, occupying in all 50 pages, and illustrated by seven full-page plates. In 1879, papers by J. H. Comstock on the army worm, clover insects, insects injurious to the orange tree, and references to many other species which injure field crops, forest and fruit trees, covering 75 pages, and illustrated by six full-page plates. This volume also contains an extensive report on insects injurious to the cotton plant; 84 pp., with 9 plates.

**NORTH AMERICAN MOTHS**; with a Preliminary Catalogue of Species of *Hadena* and *Polia*.  
By A. R. Grote; 8vo., 20 pp., from the Bulletin of the Geological and Geographical Survey of the U. S., Vol. VI., No. 2.

In addition to the catalogues and other useful matter, this paper contains descriptions of twenty-eight new species.

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THE INSECTS OF THE CLOVER PLANT. By J. A. Lintner; 8vo., 17 pp., with 6 cuts.

This excellent paper forms part of the Fortieth Annual Report of the New York State Agricultural Society, and contains detailed descriptions of the insects most destructive to clover, with references to all the species known to feed on this plant.

OTTAWA FIELD NATURALISTS' CLUB.

The second volume of the Transactions of this active body of naturalists is at hand. It is a neat pamphlet of 44 pages octavo, with one excellent plate illustrating a new species of *Porsocrinus* from the Trenton limestone, accompanied by a description, with some remarks on the genus by Dr. James Grant. In addition to the Annual Report of the Club, the volume contains the inaugural address of the talented president, James Fletcher, Esq.; a paper on Some Coleoptera Injurious to our Pines, by W. H. Harrington; one by Prof. J. Macoun on the Capabilities of the Prairie Lands of the Great North-West, as shown by their Fauna and Flora; and other interesting contributions. We congratulate our Ottawa friends on the good work they have done this year, and sincerely hope that their active efforts may have the effect of promoting a general love for natural history among the residents of the capital of our Dominion.

INSECTS INJURIOUS TO CLOVER.

By WM. SAUNDERS, LONDON, ONT.

1. THE CLOVER SEED MIDGE—*Cecidomyia leguminicola*.
2. THE CLOVER ROOT BORER—*Hylastes trifolii*.
3. THE CLOVER STEM BORER—*Languria Mozardi*.
4. THE CLOVER LEAF MIDGE—*Cecidomyia trifolii*.
5. THE CLOVER HAY WORM—*Asopia costalis*.
6. THE CLOVER DRASTERIA—*Drasteria erectea*.
7. THE CLOUDED SULPHUR BUTTERFLY.—*Colias philodice*.

There are many insects which injuriously affect this important crop, but it is only within the past three or four years that special attention has been paid to them. Within this period they have been closely studied, both in the field and in confinement, by men in every way qualified for the work; by the Entomologists of the Department of Agriculture in Washington, Professors Riley and Comstock; by the State Entomologist of New York, Prof. J. A. Lintner of Albany, and others. From the several valuable reports issued by these Government and State officials, much of what follows has been gleaned; and the object aimed at here is to present the information obtainable in a popular manner, to incorporate with it such additional facts in reference to the occurrence of these insects in Ontario as our limited opportunities for observation have enabled us to acquire, and to present all in as convenient a form for reference as possible, so as to make this part of our report of special value to our agricultural readers.

In a late paper on Clover Insects, published by Mr. Lintner, he enumerates no less than forty-six injurious species, about half of which are known to occur in Canada. The injury done by some of these is insignificant, either on account of the insects feeding on many other plants besides clover, or else for the reason that these species seldom occur in any remarkable abundance; while, on the other hand, there are included in this list several insects which have already become, or promise to become, formidable foes to this crop; and amongst the latter, none are attracting so much attention as the Clover Seed Midge, an insect which has fairly established itself in our country, and is likely to prove a serious drawback to the growth of clover seed in our Province. This species will first claim our attention.

*Anthomyia ceparum*,  
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THE CLOVER SEED MIDGE—*Cecidomyia leguminicola*, Lint.

The first mention we have of this serious pest is in an article published in the organ of our Entomological Society of Ontario, the *Canadian Entomologist*, in March, 1879, contributed by Professor Lintner. Under the heading of "A New Insect Pest," he says: "In the summer of 1877 my attention was called to some 'worms' which had been discovered in the heads of red clover (*Trifolium pratense*), and were said to be preying upon the seeds. They were found to be minute maggot-like creatures hidden within the seed-pods, and entirely destroying the seeds which they attacked. Numbers of them were subsequently detected in the examination of heads of clover taken from several localities in the vicinity of Albany and in Warren County, N.Y. I was unable at the time to refer the insect to any described species, or to find any record of a similar depredation on clover seeds in this country or in Europe.

"The following season (1878), additional examples of infested clover heads were submitted to me which had been sent from Mr. George W. Hoffman, President of the New York State Agricultural Society, from Elmira, N.Y. A number of the larvæ were obtained from these heads, and their careful examination enabled me to refer them to the *Cecidomyiidae*—of a species probably closely related to the well-known Wheat Midge (*Cecidomyia destructor*). Several of the larvæ were preserved in alcohol, and the larger number placed in a pot of damp sand, in which they speedily buried themselves for their transformation." These larvæ were of a pinkish colour, approaching orange, and about one-twelfth of an inch long. In January of the same year, Prof. Lintner had announced the appearance of this new destructive insect at the Annual Meeting of the New York State Agricultural Society, and the discussion which followed brought out the information that this insect had committed serious depredations on clover seed in several counties in western New York during the previous summer, so that fields in some sections which had been kept for seed proved to be scarcely worth cutting. In July of the same year, Mr. Lintner, in another communication to the *Canadian Entomologist*, announced the discovery of the perfect insect which he had reared, and it proved to be—as he supposed it would—a small fly, a species of *Cecidomyia*, to which he subsequently gave the name of *leguminicola*. Observations since made enable us to complete its history.

HOW IT SPENDS THE WINTER.

The insect passes the winter in the pupa or chrysalis state either on or under the surface of the ground, and early in spring the fly escapes, when the sexes pair and the female soon becomes ready to deposit her eggs.

THE EGG.

The female, by means of a long ovipositor (see fig. 13, c), pushes the eggs down the hairy tubes of the undeveloped flowers in the young clover heads almost as soon as the flowers begin to form, which in Ontario would be during the early part of May. The eggs are so small that it is almost impossible to discover them with the naked eye, their length not exceeding the hundredth part of an inch. They are of a long, oval form, three times as long as broad, with one end slightly larger than the other. They are of a pale yellow colour when first laid, but become tinted with orange as the larva within matures; they are usually deposited singly, but sometimes in clusters of from two to five—as many as fifty eggs have been counted in a single flower head. No estimate has yet been made, to my knowledge, of the number of eggs which a single individual is capable of producing, but doubtless this insect is very prolific. In about ten days the eggs hatch, when the young larva works its way down the tube of the flower to the seed, upon which it feeds.

THE LARVA, OR GRUB.

The larvæ when full grown are about one-twelfth of an inch long, usually of a bright orange-red colour, occasionally paler and sometimes almost white. They are footless, and have a wriggling, worm-like motion; they affect the clover heads in the same manner that

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the Wheat Midge affects the wheat, and when mature they leave the clover heads, drop to the ground, and either work themselves a short distance under the ground or hide amongst dead leaves or other rubbish on the surface, and there enter upon the pupal stage of their existence. Figure 12 represents the larva highly magnified, the hair line at the side showing the natural size ; at *b* the head is shown retracted, and more highly magnified.

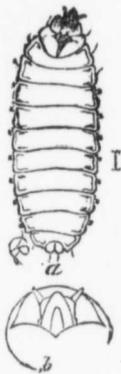


Fig. 12.

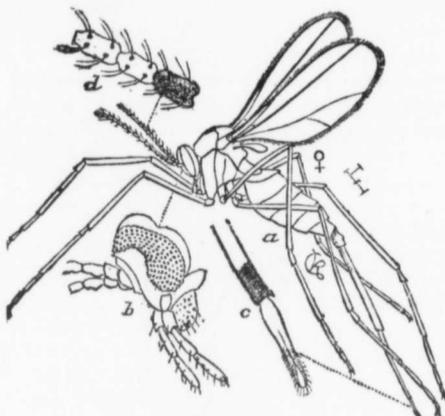


Fig. 13.

#### THE PUPA, OR CHRYSALIS.

Each larva having fixed on a suitable location, spins for itself an oval, compressed, rather tough cocoon of fine silk, with particles of earth or other material adhering to the outside, which makes it extremely difficult to discover them. Within this enclosure the larva changes to a chrysalis, which is of a pale orange colour with brown eyes ; on the front of the head are two short conical tubercles, and behind these two long bristles. The sheaths in which the antennæ are concealed are curved outward, much like the handles of an urn. The duration of the pupa state of the early brood is about ten days. When the fly is about to emerge, the chrysalis works its way out of the cocoon to the surface, and then opening the fly escapes.

#### THE FLY.

The perfect insect is a minute two-winged fly, about the size and general appearance of the common Wheat Midge. The head is black ; the antennæ long, yellowish-red, with sixteen or seventeen joints in the female and fifteen in the male. Wings nearly transparent, clothed with many short curved blackish hairs, which give them a dusky appearance ; each wing has three longitudinal veins, the third either forming a fork, or else becoming more or less obsolete towards the tip. Hairy fringe of wings, paler and composed of longer hairs than those on surface of wing. Abdomen fuscous, with black hairs above on each segment ; thorax black, and clothed with rather long hairs. The male has an extended pair of clasping organs on the hinder extremity ; the female a long pointed ovipositor, about twice the length of the abdomen.

Figure 13 represents the female fly with her four-pointed ovipositor extended ; at *c* we have a more highly magnified view of the tip of the ovipositor, clothed at its extremity with short hairs. At *b* we have the head highly magnified, to show the structure of the eye, the four jointed palpi and the basal joints of the antennæ ; at *d* we have a portion of one of the antennæ much enlarged. The small lines at the right give the natural size of the midge.

Figure 14 shows the male fly similarly enlarged, with highly magnified representations of the head at *b*, the peculiar clasping organs at *c* ; the pedunculated joints of the antennæ at *e*, which are more rounded and hairy than those of the female. At *e* the claws

at the tops of the legs are shown ; and at *f*, forms of the scales which are distributed over the wings and body.

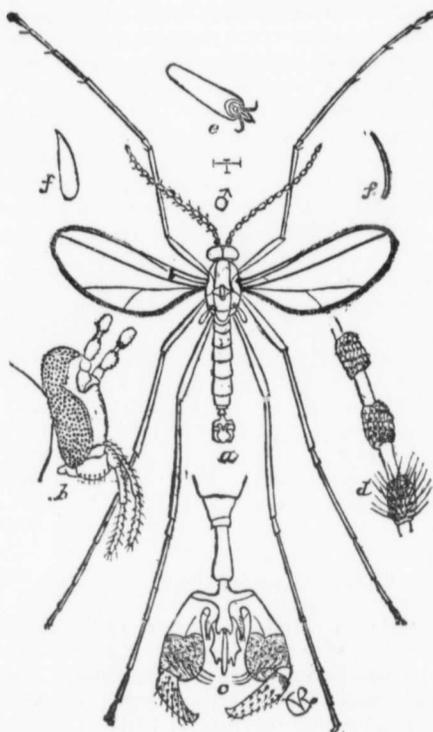


Fig. 14.

For the above figures, as also for those of 12, 15, 16 and 17, we are indebted to the kindness of Prof. J. A. Lintner, of Albany ; 12, 13, 14 and 15 are from drawings made by Prof. C. V. Riley ; 16 and 17 from drawings by Prof. J. H. Comstock.

#### NUMBER OF BROODS.

There are certainly two and probably three broods in a season in the State of New York ; flies of the first brood make their appearance in the latter part of May, and larvæ may be found full-grown in the clover heads early in July ; during August the flies are again on the wing, and the next crop of larvæ are full-grown in September. In Washington three broods have been observed in the season ; the full-grown larvæ of the first brood enter the ground by the 23rd of May, flies issuing from these early in June, which laid eggs from which larvæ matured, and flies again appeared in September. The flies of the later brood begin to issue in September, and continue to escape all through the mild autumn weather, and some remain in the chrysalis state until the following spring. From earth taken from the surface of an infested clover-field, and kept in a warm room, the flies have been found to escape throughout the winter.

#### LOCALITIES AFFECTED.

This troublesome pest is now very generally distributed over the State of New York, and has lately been observed in Vermont ; it has also been found in the district of Columbia and across the river in Virginia, where the clover crops have suffered from this cause ; it has also been found in Pennsylvania. Although not yet reported from

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such abundance her agricultural products; after supplying to repletion our own people, the excess is distributed to every quarter of the globe. Few of these varied products are native to our soil. Nearly all of our fruits, grasses, cereals and vegetables are of foreign importation, mainly from Europe. With their introduction many of the insects that preyed upon them were also introduced, or have been subsequently brought hither, but, unfortunately for us, the parasites which preyed upon them and kept them under control have for the most part been left behind. As the result, the imported pests in their new home find their favourite food-plants spread out in luxuriant growth over broad acres, where they may ply their destructive work without hindrance or molestation until some native parasites acquire the habit of preying upon them. Every crop cultivated on a large scale offers strong invitation to insect attack, and wonderfully stimulates insect multiplication."

#### HOW TO TREAT INFESTED CLOVER SEED.

Should any of our readers find themselves in possession of infested seed, the larvæ may be destroyed by heating the seed with constant agitation in a vessel freely exposed to the air for an hour or two, which will cause the grubs to dry up and perish. Seed may be heated in this way to a degree unpleasantly hot for the hand without injury. It has also been suggested to enclose the seed in tight barrels and pour some benzine on it. If the barrels were only partly full, and the seed agitated to disseminate the benzine throughout the mass, this remedy would probably be efficient in destroying the larvæ; but a little of this liquid poured on the top of a full barrel, being very light and volatile, would soon escape through the minute crevices of the barrel, and scarcely find its way to any extent through the compact mass of seed. Chloroform or bisulphide of carbon would perhaps answer a better purpose; their vapours, being heavier than the air, would penetrate downwards, while benzine, being much lighter than air, would escape upwards. Camphor has also been suggested, but it is not likely that this substance would produce any effect whatever.

#### REMEDIES.

Where this insect has become fairly established and is doing much damage, there seems to be but one method of subduing it, and that is, for the farmers in such a district to cease growing clover for a year or two, and thus in a measure starve the insect out. This plan, however, would not be likely to entirely eradicate the evil, since it is known that the insect sometimes attacks the white clover which grows everywhere as a weed. If farmers in infested districts would cut their clover earlier than usual, just as it is coming into bloom, and while the larvæ are young, most of them would perish; and this might be accomplished at the expense of but a slight reduction in the value of the hay crop, while the prospects for a crop of seed in the autumn would be comparatively good. The more generally this plan was adopted the better the results would be; indeed, united effort in this direction would be essential in order to accomplish much, and at the same time care should be taken to leave no clover uncut in fence corners or other out-of-the-way places.

#### INSECT PARASITES.

Small as this insect pest is, there are insects still smaller which are parasites on it. Two distinct species of these diminutive friends have been observed and their work recorded by J. H. Comstock, in the Report of the Commissioner of Agriculture at Washington. They are both very minute four-winged flies; one is very nearly related to the celebrated Joint Worm Fly (*Isosoma hordei*), and has received the name of the Funereal Eurytoma (*Eurytome funebris*); the other is a species of *Platygaster*, known as *Platygaster errorq*, Fitch. The first feeds on the larva of the clover seed midge while it is in the clover seed capsule; undergoes all its transformations within the seed vessel, making its exit as a fly through an irregular hole gnawed through the side, just large enough to permit of its escape. This parasite is found emerging just about or shortly after the time when the crop of midge larvæ leave the clover heads to go into the ground. It has been found in abundance about Washington, where the first specimens were observed on the

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3rd of May; from that date until the end of June they were very abundant, and from the careful examination of many seed-heads towards the end of that month it was estimated that, while five-sixths of the clover seed had been destroyed by the midges, four-fifths of the midges had been destroyed by this parasite. Thus through the good offices of this one species of parasite the prospective numbers of the next brood of midges were reduced to the extent of 80 per cent.

The second parasite, *P. error*, develops more slowly, and remains within the body of the midge larva until after it has escaped from the clover head, entered the ground, and spun its cocoon; then the full-grown parasite, having destroyed its host, eats its way through the cocoon and escapes. This has been found as yet only in specimens of the midge larva received from Yates County, New York State.

#### THE CLOVER ROOT-BORER—*Hylastes trifolii*, Muller.

This is another new pest—a small beetle about one-twelfth of an inch long, belonging to the family usually known as Bark-borers, *Scolytidae*, from their habit of boring irregular channels through the inner bark of various trees. This species, however, is a root-borer. The beetle is of a reddish-brown colour, coarsely punctured on the body, not so coarsely punctured on the head and thorax, with the whole body more or less hairy. They usually reach maturity in October; and the beetles hibernate in the root and probably live upon the root. Early in spring they leave their hiding-places, and, after pairing, the female proceeds to deposit her eggs.

The insect in its various stages is represented in the accompanying figure, 15: *a* shows the beetle; *b*, the larva as found in the burrows; *c*, the pupa, which is usually found lodged in a cavity at the bottom of the burrow; the figures are about ten times their natural size. At *a a a*, the destructive work of the larvæ on the roots of the clover is shown.

#### HOW AND WHERE THE EGG IS DEPOSITED.

The female bores a large cavity in the crown of the root, and there deposits from four to six pale-whitish elliptical eggs, which hatch in about a week.

#### THE LARVA, OR GRUB.

The young larvæ at first feed in the cavity made by the parent until it is enlarged to the size of a small pea; then they begin to gnaw sideways and downwards, probably because the lower and more tender portions of the root are more suitable for their nourishment than the upper woody portions. The burrows run in a nearly straight line, and lie between the outer skin and the woody centre of the root, and are filled with black excremental dust. When full-grown the larva (*b*, fig. 15) is a little over one-eighth of an inch long, of a dingy white colour, with a pale yellow head and brown mandibles. Although the perfect beetle is believed to feed on the clover roots, it is in the larval condition that this insect is most destructive, working more particularly on the larger roots—in many instances entirely severing them at the surface of the ground—and this to such an extent that at times it is found extremely difficult to cut the clover, owing to the ease with which the plant is pulled up before the mower. Up to the time of frost Prof. Riley has found the insect in all stages of growth, but at this time the perfect beetles are most numerous.

#### THE PUPA, OR CHRYSALIS.

The pupa (*c*, fig. 15) occupies a smooth cavity at the end of the gallery or chamber excavated by the larva. Here, at the end of September, it is to be found with its head upwards, and if the season is favourable most of the beetles escape in October.



Fig. 15.

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## LOCALITIES INFESTED.

This insect is found in Europe, from whence it has probably been brought to this country, but it is not very common there, and is not usually spoken of as a serious clover pest. In America, however, it has become quite formidable. It was first brought to the notice of Prof. Riley in the autumn of 1878, from specimens discovered in Yates County, N.Y., and has proved quite destructive there as well as in several other counties in that State. A correspondent in the *American Entomologist*, Vol. III., p. 227, writing in 1880, says: "It has taken all the clover in parts of Genessee County. In half a dozen clover fields examined within a ride of ten miles, every plant pulled up was found to be more or less injured by it." It is during the second year that injury to the clover plant by this insect is most observed.

## REMEDIES.

No better remedy is yet known than to plough infested fields in the spring of the third year of the clover, at which time the insect is most abundant, and by general agreement throughout the more seriously infested districts to refrain from the culture of clover for two or three years. It is not as yet known that any special parasite is attacking this insect, but Mr. Riley on one occasion found the larva of a beetle, a species of *Telephorus*, preying on it. We have not yet heard of this pest occurring in Ontario, but we cannot expect to be long free from it if it continues to spread among our near neighbours.

THE CLOVER-STEM BORER—*Languria Mozardi*.

This insect infests the stem of the clover plant, burrowing in it, and either materially weakening it or killing it outright. It occurs throughout the greater portion of the United States, and is also found in Canada. It is, however, a rather rare insect, and one scarcely likely to prove very troublesome, on account of its rarity. It has been bred by Prof. Comstock, of the Department of Agriculture in Washington, who has carefully recorded its habits and changes in the several stages of its existence, and to him we are indebted for the following facts in its history:—

The eggs are laid in the stems of the clover, in holes gnawed by the parent insect; they are about one-sixteenth of an inch long (see fig. 16), of a yellowish colour, rounded at both ends and somewhat curved. They will usually be found imbedded in the pith of the stem. The egg is generally laid high up in the stem, and the young, slender, worm-like larvæ burrow downwards, consuming the central substance of the stem during their growth to the extent of from six to eight inches. The full-grown larva (shown at the extreme right in fig. 16) is more than three-tenths of an inch long, of a yellow colour, with six prominent thoracic legs and a prop-leg at the posterior end of the body. The last segment of the body has two stiff spines above, slightly curved upwards.

The larva changes to a chrysalis (see fig. 16) in the lower part of its burrow. The time of the pupal state varies much in its duration; the beetles begin to issue in August, and continue to emerge until late in October. There is probably but one brood of the insect in a season, the insect hibernating for the winter in the beetle state.

The beetle (fig. 16) is slender and cylindrical, with a yellowish-red thorax. The wing-covers are bluish-black with a green tinge, and are marked with deeply-impressed punctures arranged in regular rows. In fig. 16 the insect is represented in its various stages, together with the work of the larva within the stem. Prof. Comstock has found two species of parasites within the burrows of the stalk-borers—the one a small, black chalcid fly, the dark, naked pupa of which was often met with; and the other a yellowish ichneumon, the pupa of which was enclosed in a delicate white silken cocoon. Possibly

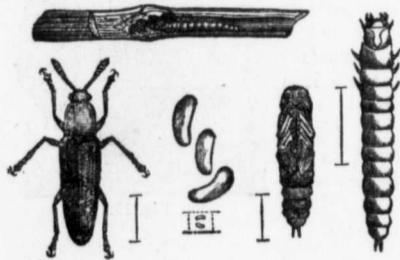


Fig. 16.

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we are indebted to the unceasing vigilance of these tiny insect friends for the comparative rarity of this insect pest.

#### THE CLOVER-LEAF MIDGE—*Cecidomyia trifolii*.

This is a European insect which has been recently discovered in this country. It has been studied at the Department of Agriculture in Washington, and reported on by Prof. Comstock. Although we are not aware of its occurrence as yet in Canada, we submit a brief sketch of its history condensed from the report of the entomologist at Washington.

It attacks the leaf of the clover, and in fig. 17 we have represented the folded leaves containing the larvæ, a partially-opened leaf-case showing the cocoons attached to the leaf, and the larva and female midge both enlarged.

The fly so closely resembles the clover seed midge that it can scarcely be distinguished from it excepting by critical examination; it is a little smaller in size, and the female has two joints less in her antennæ. It attacks both the red and white clover.

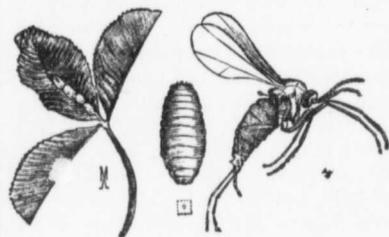


Fig. 17.

About the middle of June is the time when the larva is found; it folds the leaflets together upon the mid-rib so that the two edges almost coincide. The under side of the folded leaves turn yellow or brownish, and upon opening them they are found to contain from one to twenty whitish or pale orange-coloured larvæ, much like those of the clover seed midge, but somewhat smaller and paler in colour, with the whole surface of the body coarsely granulated. Within the folds the larvæ change to chrysalids, enclosed in delicate white oval cocoons fastened to the sides of the leaf. The enclosed chrysalis is of a pale orange colour, with a median ventral stripe of a darker shade.

This insect is not yet reported as occurring in any other locality than Washington; should it much extend its operations and become generally common, or even abundant, it is not likely, from the nature of the injury it causes, ever to become a serious injury to the clover crop. It has never been known to injure clover to any serious extent in Europe.

#### THE CLOVER HAY WORM—*Asopia costalis*.

This pretty little moth, which is represented of natural size in fig. 18 at No. 5, with its wings expanded (No. 6 wings closed), is frequently seen during the summer months, often finding its way into our dwellings. It is not active during the middle of the day unless in very dull and cloudy weather, but towards evening it is on the wing, and then may often be met with in numbers, flitting around in the neighbourhood of clover stacks. When its wings are spread it measures about eight-tenths of an inch across. The fore wings are of a reddish or purplish-brown hue, with a greyish tint over all and a silky gloss. Along the front margin there are two large, bright golden-yellow spots, dividing each wing into three nearly equal parts; the outer spot is the larger of the two, and from each there extends a lilac-coloured line back to the hind margin; the hind-wings are lighter in colour, with two pale, wavy, transverse lines; both wings margined with deep orange and fringed with golden-yellow; under surface paler, with the markings less distinct. In fig. 18 the

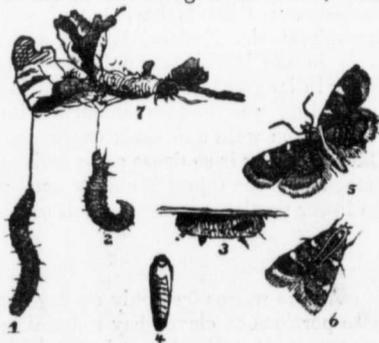


Fig. 18.

larva is shown at the top of the page, and the pupa and cocoon are shown below it. The adult moth is shown at the bottom right of the page, with its wings expanded (No. 5) and wings closed (No. 6).

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larva is shown at 1 and 2, at 7 the same enclosed in its silken web, the cocoon at 3, the chrysalis at 4, and the perfect insect at 5 and 6.

#### THE EGG.

The eggs are fastened to such clover as the females can find access to by creeping into the crevices and small openings in the stack. In a few days during the summer the larva is hatched.

#### THE LARVA.

The full-grown larva measures nearly three-quarters of an inch in length, tapering each way, with the body much wrinkled, and is of a dark, olivaceous-brown colour, with several smooth, shining dots on each segment, each giving rise to a fine, whitish hair. The young larvæ are paler in colour, and occasionally specimens will be found which, even at maturity, retain this lighter colour. They usually dwell within a cylinder of silk of their own constructing, and from this issue to feed on the dry clover. They are very active in their movements, wriggling briskly backwards as well as forwards, and are often found lively late in the season, with the thermometer down to the freezing point. Each larva has the power of readily spinning a silken thread, by means of which it suspends itself in mid-air, and where these larvæ are abundant in a barn, they sometimes hang in this way in such numbers from the timbers of the building as to be a source of great annoyance to passers-by.

#### THE PUPA.

When full-grown, the larva seeks some sheltered spot in which to pass the chrysalis state of its existence, and often selects the under side of a piece of board or other sheltering substance for this purpose, and there constructs an oblong oval cocoon of silk intermixed with particles of excrement and other foreign matter, and in this passes the next stage of its existence. The chrysalis is about one-third of an inch long, and of a pale yellow colour, with markings of a deeper shade.

#### NUMBER OF BROODS.

There are doubtless two or more broods of this insect each year.

#### PAST HISTORY AND MODE OF OPERATION.

This insect is one which is widely distributed. It is common in Europe, from whence it has probably been brought to this country. In Europe, however, it does not appear to have ever attracted attention as an insect injurious to clover. In this country its destructive habits have long been known and often commented on. It is abundant throughout the Eastern, Middle, and some of the Western States, as well as in Canada. It is in the larval state only that the insect is injurious. The larva does not feed on clover in its green or growing condition, but infests it in the stack or barn, and spoils it for feeding purposes by devouring its substance, interweaving it, and covering it with white silken webs and black excrement resembling grains of gunpowder. Sometimes the silken webbing is so dense as to make the hay look mouldy. It is towards the bottom of a stack that the injury is chiefly done; instances are on record where two feet or more of the lower portion has been so full of worms and cocoons as to be rendered worthless.

#### REMEDIES.

As the worms feed only on dry clover, they must be confined during the summer to those portions of clover hay remaining over from the previous year's making; on this account new hay should not be stacked with the old. Where clover is stacked for several years on the same foundation, the bottom layers, coming in contact with the infested leavings of the previous year, will be sure to suffer. It is also recommended to put a good log or rail foundation under the stack, so as to raise it above the surface.

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THE CLOVER DRASTERIA—*Drasteria erectea*.

This is a very common clover insect, very generally distributed, but never, as far as we know, yet reported anywhere as doing much injury to the crop. The moth is well

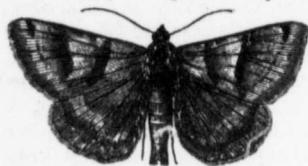


Fig. 19.

represented in fig. 19. The moth, when its wings are expanded, will measure from an inch and a quarter to an inch and a half across. The fore wings are greyish-brown, with bands and dots of dark brown—one band crossing the wing about an eighth of an inch from the base; a second, which does not always extend entirely across, is placed midway between the first and the outer edge of the wing, between the first and second bands, and two or three prominent black dots similarly situated between the second band and the apex; the outer edge is also widely margined with brown.

The inner portion of the hind wings is of a similar colour to the front pair, the outer half being crossed by two darker bands irregular in outline, the space between them paler, as also is the space between the outside band and the hind margin. The markings on both wings vary much in intensity, being sometimes almost black, in other instances very pale. The under surfaces of both wings are much paler than the upper, with the markings of the upper side partially, but indistinctly, produced.

This insect passes the winter in the chrysalis state, and is among the earliest on the wing in spring; it is also found up to a late period in the autumn. It frequents fields, meadows, and other open grassy spots. Its flight is sudden, and after a short but rapid course it as suddenly alights.

It is in the caterpillar state that this insect feeds on clover. When full grown it measures an inch and a quarter or more. It has a medium-sized head of a reddish-brown colour, with darker longitudinal lines. The body is reddish-brown above, with many longitudinal lines, and stripes of a darker shade. There is a double whitish line down the back, with a stripe of the darker shade of brown on each side, and lower down close to the spiracles is another stripe of the same dark hue, while between these two are faint longitudinal lines. The spaces between the segments, from the fifth to the eighth inclusive, are nearly black above, a feature only seen, however, when the larva is coiled up, a position it readily assumes when disturbed. The under surface is a little darker than the upper, with many longitudinal lines of a still deeper shade, and a central stripe of blackish green from the sixth to the ninth segments. Having but three pairs of pro-legs, it alternately arches and extends its body in progression.

THE CLOUDED SULPHUR BUTTERFLY—*Colias philodice*.

The common Yellow, or Clouded Sulphur Butterfly, is found almost everywhere in its season—in fields and on roadways, often congregating in groups on the borders of streams and muddy pools, where they seem to enjoy settling on the cool moist ground.

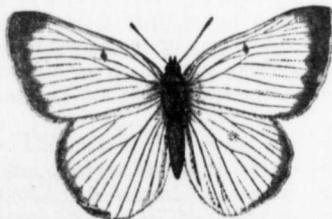


Fig. 20.

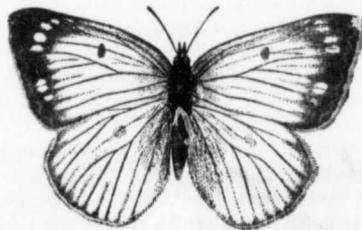


Fig. 21.

As the summer progresses, they are usually very abundant in clover fields. Figure 20 represents the male of this butterfly; fig. 21, the female—it will be seen that the sexes

differ somewhat in their markings. The ground colour of the wings in both is bright yellow, with a dark brown or blackish border, which is narrow in the male but wide in the female, and enclosing in the latter a broken row of irregular yellow spots. There is also a spot of black placed near the front edge of the fore wings, about half-way between the base and the tip, varying in form and distinctness. The hind wings in both sexes are about equally dark margined, and near the middle is a dull pale orange-coloured spot. Both wings are dusky towards the base, and the fringes are pink. The antennæ are pink, with the knobs at their tips darker. The body above of a dark colour, paler at the sides and underneath.

On the under side the yellow colour is less bright, while the dark margins are either entirely wanting or represented by faint dusky shadings. The spot on the fore-wings is distinct, but paler and usually centered with a small silvery eye; that on the hind-wings is much more distinct than above, being composed of a bright silvery spot in the centre defined by a dark brown line, which is in turn encircled with dull orange. The butterfly first appears on the wing about the middle of May, but the time of its greatest abundance is during the latter part of July and throughout August.

The eggs are deposited on clover, and also on the cultivated pea and blue lupin; they are long, tapering at each end, and ribbed; of a pale lemon-yellow colour, which changes in three or four days to a pale red, then gradually to a bright red, and from that to dark brown just before hatching. The young caterpillar is of a dull yellowish-brown colour, becoming dark green as it grows older. When full grown it is about an inch long, with a dark green head and body of the same colour; the latter with a yellowish-white stripe on each side close to the under surface, with an irregular streak of bright red running through its lower portion. The body is thickly clothed with very minute hairs, giving it a downy appearance.

The chrysalis is about seven-tenths of an inch long, attached at its extremity to a mass of silken fibres spun by the caterpillar, and girt across the middle with a silken thread. Its colour is pale green with a yellowish tinge, with a purplish-red line on each side of the head, darker lines down the middle both in front and behind, and with a yellowish stripe along the sides of the hinder segments. During the warmer summer weather the chrysalis state usually lasts about ten days; a day or two before the butterfly escapes the chrysalis becomes darker and semi-transparent, the markings on the future wings showing distinctly through the enclosing membrane.

This, like the insect last described, although always common, has never yet been known to seriously injure the clover crop. There are also a number of other species which feed on clover, but as they are none of them especially injurious, it is not necessary to refer to them at present.

## SPHINGIDÆ—HAWK MOTHS.

BY EDMUND BAYNES-REED, LONDON, ONT.

This family comprises some of the largest, most robust and powerful of the moths. From the strength and swiftness of their flight, they have acquired their English name of Hawk Moths. The peculiar attitude which is assumed by many of the caterpillars of the various species of these moths, gave rise to the curious supposition of a fancied resemblance to the famous Egyptian Sphinx, and hence the family received its generic name of Sphingidæ.

Dr. Thaddeus Harris, the veteran Entomologist of the State of Massachusetts, and the author of an admirable "Treatise on Some of the Insects Injurious to Vegetation," thus vividly portrays these lively denizens of the insect world:—"In the winged state the true Sphinges are known by the name of Humming-bird Moths from the sound which they make in flying, and Hawk Moths from their habit of hovering in the air while taking their food. These humming-bird or hawk moths may be seen during the morning and evening twilight flying with great swiftness from flower to flower. Their wings are

long, and uncoiled from the tip. Other species that occur themselves their situation which they might reach.

The caterpillar often becomes transparent there is a horn which is naked and elongated to the peristome. A number of their larvae. The number, however, in consequence of their trust, makes themselves comprehensible of Easton published and compiled the properological of Mr. J. publicatio many of the

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long, narrow and pointed, and are moved by powerful muscles. Their tongues, when uncoiled, are for the most part excessively long, and with them they extract the honey from the blossoms of the honeysuckle and other tubular flowers while on the wing. Other Sphinges fly during the day-time only, and in the brightest sunshine. Then it is that our large clear-winged *Sesiæ* make their appearance among the flowers and regale themselves with their sweets. The fragrant Phlox is their especial favourite. From their size and form and fan-like tails, from their brilliant colours and the manner in which they take their food, poised upon rapidly-vibrating wings above the blossoms, they might readily be mistaken for humming-birds."

The perfect insect lays its eggs singly on the leaves of the food plants of the larvæ, or caterpillars. These, when full grown, are generally of a large size; their colours are often bright, and in the several species there is a great variety and difference of ornamentation. They have eight pairs of feet, and on the back of the last segment but one there is generally a rigid spine, called the caudal horn, and in those species, where this horn is wanting, its place is taken by a tubercle. Their bodies are cylindrical, smooth and naked, and in some species are remarkable for the faculty they possess of contracting and elongating the first three segments of the body. Reference has already been made to the peculiar sphinx-like position assumed by some species of these caterpillars when at rest. Although these larvæ lead a solitary life, and do not live and move about in large numbers like the processionary caterpillars of the army worm and lackey moths, yet, from their large size, they are often capable of doing considerable injury to shrubs and plants. The number of species known is said to be between 300 and 400, most of which, however, inhabit tropical America; and as some 32 of these are known to inhabit our Province of Ontario, we have thought it desirable to give an account of each, which, we trust, may be found useful and interesting. In doing this, we have gladly availed ourselves of the various authorities on this family of moths, especially acknowledging the comprehensive monograph of the late talented Entomologist, Dr. Brakenbridge Clemens, of Easton, Pennsylvania, and the synonymical catalogues of North American Sphingidæ published by Messrs. A. R. Grote and the late Coleman T. Robinson, and finally revised and completed by Mr. Grote. To this last-named gentleman our Society is indebted for the proper determination of a good many of the Sphingidæ in the collection of our Entomological Society of Ontario. Reference, moreover, must not be omitted to the labours of Mr. J. A. Lintner, the State Entomologist of New York, who has done much by the publication of his observations to promote a knowledge of the habits and life history of many of the larvæ of our Sphingidæ.

#### CATALOGUE OF ONTARIO SPHINGIDÆ.

##### Genus *HEMARIS*, *Dalman*.

1. *Diffinis*, *Boisduval*.
2. *Tenuis*, *Grote*.
3. *Marginalis*, *Grote*.

##### Genus *HÆMORRHAGIA*, *Grote* and *Robinson*.

4. *Uniformis*, *Grote*.
5. *Thysbe*, *Fabricius*.

##### Genus *LEPISIESIA*, *Grote*.

6. *Flavofasciata*, *Barnston*.

##### Genus *AMPHION*, *Hubner*.

7. *Nessus*, *Cramer*.

##### Genus *THYREUS*, *Swainson*.

8. *Abbotii*, *Swainson*.

##### Genus *DEILEPHILA*, *Ochsenheimer*.

9. *Chamænerii*, *Harris*.
10. *Lineata*, *Fabricius*.

##### Genus *CHÆROCAMPA*, *Duponchel*.

11. *Tersa*, *Linnaeus*.

##### Genus *DARAPSA*, *Walker*.

12. *Chærilus*, *Cramer*.
13. *Versicolor*, *Harris*.
14. *Myron*, *Cramer*.

##### Genus *PHILAMPELUS*, *Harris*.

15. *Pandorus*, *Hubner*.
16. *Achemon*, *Drury*.

##### Genus *PAONIAS*, *Hubner*.

17. *Myops*, *Abbot* and *Smith*.
18. *Excæcatus*, *Abbot* and *Smith*.

## Genus SMERINTHUS, Latreille.

19. Geminatus, Say.

## Genus CRESSONIA, Grote and Robinson.

20. Juglandis, Abbot and Smith.

## Genus AMORPHA, Hubner.

21. Modesta, Harris.

## Genus CERATOMIA, Harris.

22. Amyntor, Hubner.

## Genus DAREMMA, Walker.

23. Undulosa, Walker.

## Genus SPHINX, Linnæus.

24. Quinquemaculata, Haworth.  
 25. Chersis, Hubner.  
 26. Drupiferarum, Abbot and Smith.  
 27. Kalmiæ, Abbot and Smith.  
 28. Gordius, Cramer.  
 29. Eremitus, Hubner.  
 30. Luscitiosa, Clemens.

## Genus DOLBA, Walker.

31. Hylæus, Drury.

## Genus ELLEMA, Clemens.

32. Harrisii, Clemens.

## 1. HEMARIS DIFFINIS, Boisduval.

*Sphinx fuciformis*, Smith, Ab. and Sm., Ins. Ga., Vol. I., p. 85.

*Macroglossa diffinis*, Boisduval, Sp. Gen., Plate 15, fig. 2.

*Sesia diffinis*, Walker, C. B. M. Lep., Part VIII., p. 81.

*Sesia diffinis*, Morris, Syn. N. A. Lep., Sm. Ins., p. 148.

*Sesia diffinis*, Harris, Ins. Inj. Veg., p. 328.

*Sesia diffinis*, Clemens, Syn. N. A. Sph.

*Hemaris diffinis*, Grote, 1875.

*Mature Larva*.—Bright blue above, with the sides pale green; the under part dark reddish colour; a dark green dorsal line; a pale yellow stripe on each side. On the first segment is a transverse gold ridge, and a row of black dots on each side; the head palish blue; length, one inch and a half; caudal horn black and sharp-pointed. Feeds on the bush honeysuckle (*Diervilla trifida*) and fever wort (*Triosteum perfoliatum*), found about June and the beginning of July; spins cocoons on the ground from the leaves of their food plants, and the moths appear about a month later. The moth has the head and thorax pale yellowish-green; the breast pale yellow, with blackish hairs beneath the legs, and all the legs black; the upper part of the body has the same pale yellowish hue, inclining to black towards the extremity, which is tufted with a blackish fringe; the under side of the body is bluish-black, with pale yellow patches. The wings are transparent in the middle (from this fact these moths are known as bee-moths or clear-wings); in the fore-wings there is a narrow, dark-brownish border, the inner edge of which is very slightly rounded and evenly scalloped on the interspaces; the apex of the fore-wings has a red stain on the marginal band; the hind-wings are bordered with dark brown near the base, broadly on the inner margin. The colour of this species varies considerably, a warm, reddish tint being very frequently observed. Expanse 1.75 to 1.80 inch; length of body, about an inch; very common; the larvæ often stripping entirely bare the leaves of the bush honeysuckle.

Mr. Grote thus describes his definition of the species: "The species for which I use the name *Hemaris* are black and yellow-bodied, more or less fuzzy; they look like Humble-bees."

## 2. HEMARIS TENUIS, Grote.

The larva is, we believe, at present unknown. The species is one of Mr. Grote's determination, and very similar to *diffinis*. The moth is pale yellowish and black—the tuft at the extremity black, divided by yellow central hairs; legs black; breast pale yellowish-white; wings largely vitreous (clear), with very narrow, dull blackish borders; blackish at base, as usual, and partially overlaid with yellowish scales; costal edging narrow; the band along the external margin is even on its inner edge and narrower throughout than in any species hitherto described from the Atlantic District. There is

no perceptible red apical shading. The body squamation (or scaling) is rather rough, and in size it is the *smallest* of our species yet described. The external margins of the wings are more rounded and full than in any of our other known species of *Hemaris*. Expanse 1.50 inch; length of body .80 inch.

### 3. HEMARIS MARGINALIS, Grote.

The moth has the upper side of the thorax of a yellowish olive-coloured shading, the scaling becoming deep yellowish over the basal abdominal segments dorsally; middle segments black—the two last deep yellowish. The anal tuft black, with central yellowish hairs; the abdomen black; legs black; the thorax underneath is sulphur white. The body seems narrower, more fusiform, than in the other species, and the scales more depressed. Wings largely vitreous, ornamented as usual, but with a wider terminal band on the front wings than is seen in *H. diffinis*. *The inner edge of this marginal band is plainly dentate or toothed inwardly on the upper spaces.* There is a reddish apical stain as in *diffinis*. Expanse 1.65 to 1.70 inch; length of body .95 inch.

Mr. Grote thus separates these three northern species of *Hemaris* :—

Terminal band of front wings even on its inner edge—*tenuis*.

“ “ interspaceally roundedly exerted on its inner edge—*diffinis*.

“ “ interspaceally dentate on its inner edge—*marginalis*.

### 4. HEMORRHAGIA UNIFORMIS, Grote and Robinson.

*Sesia ruficaudis*, Walker, C. B. M. Lep., p. 82, Part VIII.

“On the other hand, the species of *Hemorrhagia* are Indian red and olive, with flattened body hairs, and by their form prepare us for the still more compressedly-shaped species of the genus *Aellopos*.” (Grote.)

*Moth*.—“Fawn colour; head whitish about the antennæ and beneath, with a brown band in front; the breast testaceous; abdomen deep red fawn colour at the base, with testaceous spots along each side; hind borders of segments black; apical tuft red, with some black hairs on each side; wings limpid deep red at the base, and with broad deep red borders; fore-wings deep red at the tips and with a blackish discal streak. Length of the body, 9-12 lines: of the wings, 18-24 lines.” (*Walker's description*.)

### 5. HEMORRHAGIA THYSBE, Fabricius.

*Sphinx Thysbe*, Fabricius.

*Sphinx Pelasgus*, Cramer.

*Sesia Thysbe*, Fabricius.

*Sesia Cimbiciformis*, Stephens, Ill. Brit. Ent. Haust., Vol. I., p. 135.

*Sesia Thysbe*, Walker, C. B. M. Lep., Part VIII., p. 82.

*Sesia Thysbe*, Clemens, Syn. N. A. Sph.

*Sesia Thysbe*, Morris, Syn. N. A. Lep., Sm. Ins., p. 149.

*Sesia Pelasgus*, Harris, Ins. Inj. Veg., p. 328.

*Hemorrhagia Thysbe*, Grote and Robinson, 1865.

*Mature Larva*.—The body tapers towards the front and is of a light yellowish-green colour, deepening on the sides; the body studded with green and yellow granulations; underneath the colour is dull rose, bordered by a buff stripe; a reddish stripe on the upper side of the body and white yellowish-green stripes on the side; the stigmata are red, with a white dot at each extremity; head granulated, dull green; when at rest partially buried beneath the first segment; caudal horn two inches long, curved, light blue, tipped with yellow and with black and white granulations; legs black, prolegs green; found in August and September; feeds on the snowball (*Viburnum Opulus*), the snow berry (*Symphoricarpos*) and hawthorn (*Crataegus*). Before going into the chrysalis state, it undergoes a marked change of colour, inclining to purplish-red and ochre-yellow. The cocoon is formed of a few leaves drawn together by a very slight spinning.

The moth has the thorax deep olive-green, mixed with brown; the breast and legs

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of a light cream or yellowish-white hue; the under surface of the abdomen is bright ferruginous (rusty red), with three or four small yellowish tufts between the segments on the line separating the dorsal and ventral segments; the lateral anal tufts are black, the central reddish-brown and ferruginous beneath; the front wings are ferruginous and olivaceous towards the base; the disk is divided by a dark brown line: the broad terminal band is dark brown, with a ferruginous patch in the apical interspace; the hind wings have a bright ferruginous broad inner border, a moderately broad duller terminal band, the nervules in which are blackish. The moth appears about the same time as *H. diffinis*; it is often seen in the hot sun, and at twilight flying about the blossoms of the garden phlox, the common lilac, and *Rhodora Canadensis*.

6. *LEPISIESIA FLAVOFASCIATA*, Barnston.

- Macroglossa flavofasciata*, Barnston, Walker, C. B. M.  
 " " Clemens, Syn. N. A. Sph.  
 " " Morris, Syn. N. A. Lep., Sm. Ins., p. 151.  
*Lepisesia* " Grote, 1865.

We give Mr. Grote's description of this moth:—

"The peculiarly neat and elegant little species, of which this genus is composed, has not been very clearly described by Mr. Walker, and we give here its more detailed description, as follows:—Black. Above the thorax and head are clothed with pale yellowish sericeous (silky), erect hair, mingled with blackish scales; laterally the palpi and the orbits of the eyes are deep black; abdomen black, with sericeous hairs above on the basal segment; anal tuft black, with lateral sericeous sub-tufts; the anterior (front) wings are blackish, with obsolete (indistinct) ornamentation; a rather broad semi-diaphanous (transparent) sub-terminal band, composed of sparse and whitish scales, extends evenly and obliquely from costa to internal margin; the terminal portion of the wing is less thickly covered with scales, acquiring a paler tinge than the basal portion; posterior (hind) wings, with a broad central fulvous fascia (tawny stripe), which contracts triangularly towards internal margin, before anal angle becoming somewhat linear and sinuate (scooped out). Beneath, the anterior wings at base are largely covered with bright fulvous squamation (scales); the central fascia on posterior wings is whitish; legs and under thoracic and abdominal regions black. Expands—male, 1.60 inch; length of body, .80 inch."

7. *AMPHION NESSUS*, Hubner.

- Sphinx Nessus*, Cramer.  
*Sphinx Nessus*, Fabricius.  
*Thyreus Nessus*, Walker, C. B. M. Lep., Part VIII., p. 99.  
*Thyreus Nessus*, Clemens, Syn. N. A. Sph.  
*Thyreus Nessus*, Morris, Syn. N. A. Lep., Sm. Ins., p. 157.

The following description by Mr. W. V. Andrews appeared in Vol. IX. of *Canadian Entomologist*, p. 19:—

"*Mature larva*, two and a half to three inches in length, tapering gently from the fourth segment to the head; colour, uniform chocolate brown, thickly dotted over the body, and particularly along the dorsal line, with dark umber, of which colour are also the right lateral or stigmal stripes; anal horn on eleventh segment very short, one-fifth of an inch in length; very sluggish in its movements, showing none of the irritability of *T. Abbotii* when touched. When at rest it stretches itself at full length along the leaf or leaf stem of the plant on which it feeds, never raising or retracting the anterior segments. *Pupa* dark brown; found either among rubbish on the surface of the ground or slightly beneath the surface; tongue case internal, not visible; feeds on fuchsia. Pupa 11th, 12th, 13th July, one moth on 8th August, two others not yet emerged, and probably will winter in the pupa state."

*Moth*.—Head and thorax dull ferruginous brown; breast somewhat reddish; a yellowish-white streak on the sides of the head and thorax; the abdomen a dark chestnut-

brown, with the hind margins of third and fourth segments pale yellow; three or four bright ferruginous spots on the sides; the triple anal tuft deep chestnut; the under part of the body somewhat reddish, with three white dots on the last part of the hind segments; the fore wings brown, with a purplish hue; a dark chestnut broad middle band containing a lighter coloured discal spot; dark chestnut, ferruginous, and dark brown patches; the fringes dark brown in the middle, pale yellow in the excavations and bordered by dark brown; hind-wings bright red, with a dark brown terminal band; fringes from the tip to the centre brownish, and thence to the anal angle pale yellow; flies generally at twilight, and may be seen hovering over lilac blossoms. In the *Canadian Entomologist* of August, 1874, Mr. F. C. Lowe, of Dunnville, reported that this moth was common in clover fields.

The Rev. C. J. S. Bethune, the former editor of the *Canadian Entomologist*, in the month of June, 1868, in the middle of a very hot day, observed a beautiful specimen of this moth feasting on the carcase of a dog which was floating in a filthy pool.

8. *THYREUS ABBOTII*, Swainson.

*Thyreus Abbotii*, Walker. C. B. M. Lep., Part VIII., page 99.  
 " " Clemens. Syn. N. A., Sph.  
 " " Morris. Syn. N. A. Lep., Sm., Ins. page 156.



Fig. 22.

As has been pointed out by Mr. Lintner, the larva of *Thyreus Abbotii* is exceedingly interesting from the fact that its two styles of ornamentation, in marked contrast one with another, indicate the sex of the insect; being the only instance of the kind known among the butterflies and moths.

It will be noticed that the caudal horn is wanting, but its place is occupied by a polished tubercle. The larva does not assume the usual peculiar semi-erect attitude of the sphinges, but rests stretched at length, though when disturbed it shortens the front segments and throws the head from side to side, making at the same time a crepitating noise. Dr. Clemens states that when on the ground its motions under irritation are often violent. The characteristic marking of the head in both sexes distinguishes it easily, according to Mr. Riley, from its allies, being slightly roughened and dark, and a central mark down the middle often assuming the shape of an X; there being also a light broad band on each side.

The male larva is reddish-brown body, with numerous patches of light green, sometimes yellow, and on the sides a chocolate-coloured line. The tubercle is black, encircled by a yellowish line; the anal shield is pale green and brown.

*Female* larva has uniform reddish-brown body without any patches, so conspicuous in the male, but with broken subdorsal lines, and numerous transverse striae.

The larva feeds on the various kinds of grape vines, and on the Virginia Creeper—*Ampelopsis quinquefolia*. When full-grown it measures about three inches in length.

The larva enters the pupa state about the end of July, the moth appearing the following spring.

As a general rule, the larva undergoes the transformation into the pupa state in a superficial cell on or near the surface of the ground, although instances are recorded of its burying itself altogether, as is the case with many other sphinges.

The moth, of which there is but one annual brood, is described by Riley as being 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.

This insect is tolerably common, especially in the neighbourhood of Hamilton.

#### 9. DEILEPHILA CHAMENERII, HARRIS.

- Deilephila Galii*, Walker, C. B. M., Lep. Part VIII., page 166.  
 “ “ Clemens, Syn. N. A. Sph.  
 “ *Chamenerii*, Morris, Syn. N. A. Lep., Sm. Ins., page 165.  
 “ “ Harris, Ins. Inj. Veg., page 328.  
 “ “ Grote, 1865.

The following description of the larva, by Mr. Wm. Saunders, is taken from the April number of the *Canadian Entomologist* for 1877, and was made from three examples found feeding on grape leaves, 5th July:

“Length two and a half inches, tapering towards each end; head small, rather flat in front, slightly bilobed, and of a dull pinkish colour, with a black stripe across the front at the base; basal half of palpi yellow, upper half black; mandibles black, with a patch of yellow between them and the black stripe. Body, above, deep olive green, with a brownish tinge and a polished surface. Second segment with a cervical shield similar in colour to head, its sides dull greenish with two yellow dots. There is a pale yellowish dorsal line terminating at the base of the caudal horn; each segment from 3rd to 12th inclusive has a pale yellow spot on each side of the dorsal line, about half way towards the stigmata thereon; 3rd segment small and almost crescent-shaped; on the 4th, larger and nearly round; 5th still larger, nearly round; 6th, 7th, 8th, 9th, 10th and 11th, about equal in size, nearly oval, and larger than those on 5th. On 12th segment the spot is more elongated, and, extending upwards, terminates at the base of the caudal horn. There is a wide but indistinct blackish band across the anterior part of each segment, in which the yellow spots are set; the sides of the body below the spots are thickly sprinkled with minute raised yellow dots. Caudal horn long, curved backwards, red slightly tipped with black, and with a roughened surface; terminal segment dull pinkish; stigmata oval, yellow, shaded round with dull black. Under surface much paler, colour dull pinkish-green, the pink colour predominating from 5th to terminal segments inclusive, and with a number of very minute raised yellowish dots placed chiefly along the sides. Feet black; prolegs pink, with a patch of black on the outside of each. One specimen spun a light web, binding a portion of the leaf, within which it changed to chrysalis on the 10th of July, and from this the moth appeared on the 28th of the same month. The other two larvæ died before completing their transformation.”

The larva feeds on the grape-vine, and the great willow herb *Epilobium angustifolium*, and on purslane.

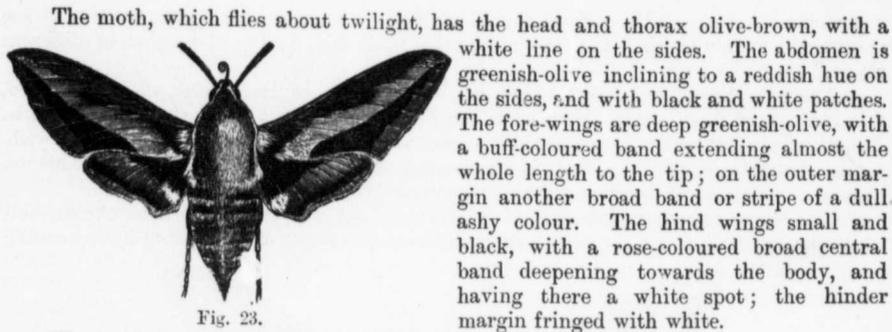


Fig. 23.

The moth expands about two and three-quarter inches.

10. DEILEPHILA LINEATA, Fabricius.

*Sphinx lineata*, Fabricius.

“ *daucus*, Cramer.

“ *lineata*, Smith & Abbot, Ins. Ga.

“ “ Donovan.

*Deilephila daucus*, Stephens.

“ “ Walker, C. B. M. Lep., Part VIII., page 171.

“ *lineata*, Clemens, Syn. N. A., Sph.

“ “ Morris, Syn. N. A., Lep. Sm. Ins., page 164.

“ “ Harris, Ins. Inj. Veg., page 328.

“ “ Grote, 1865.

Mr. Riley's description is given of this larva, which seems to vary exceedingly :



Fig. 24.

“The most common form is given at figure 24. Its colour is yellowish-green, with a prominent subdorsal row of elliptical spots, each spot consisting of two curved black lines, enclosing superiorly a bright crimson space, and inferiorly a pale yellow line—the whole row of spots connected by a pale yellow stripe edged above with black. In some specimens these eye-like spots are disconnected, and the space between the black crescents is of a uniform cream colour. The breathing holes are either surrounded with black or with black edged with yellow. The other form is black, and characterized chiefly by a yellow line along the back, and a series of pale yellow spots, and darker yellow dots as



Fig. 25.

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represented in figure 25. Even this dark form is subject to great variation, some specimens entirely lacking the line along the back, and having the spots of different shape."

The body tapers as in *D. Chamænerii*. The larvæ of this genus, when disturbed, fall from their food plants, shorten the anterior segments, and bend the head inwards. Length when full-grown is about three inches; the caudal-horn is rough, and yellowish-orange towards extremity. It is rather a general feeder, being found on the common purslane—*Portulacca oleracea*—turnip, buckwheat, apple, grape and watermelon.

The larval transformation is made in a superficial cell excavated from the surface, where it changes into a light brown chrysalis from which the moth appears in September.



Fig. 26.

This moth (figure 26) is known as the white-lined morning sphinx. It is very common, and has a wide range, being found in all parts of the United States, Mexico and the West Indies, as well as in Canada. Of the two species of *Deilephila*, *lineata* is more common in this Province, and *Chamænerii* in Quebec.

It flies generally at twilight, although it may be occasionally noticed in the early part of the afternoon, in the sunshine, hovering like a humming-bird over the verbenas and phlox.

The moth has the head and thorax dark olive, with a white line on each side. The general ground colour is a rich greenish-olive, tinged with reddish at the sides; on the front part of the body are six longitudinal stripes, while the hinder part is spotted laterally with black and white. The fore-wings deep olive colour, with a straight buff-coloured band extending from the base to the tip; on the outer margin another band of nearly same width, but less distinct colour; the veins are lined with white; the hind-wings black, small, with rose-coloured central band, including a white spot near the inner margin, and a marginal reddish line; fringes white. Expands about three and a half inches. May be readily distinguished from *D. Chamænerii* by its larger size, and by the white veins in the fore-wings.

11. *CHÆROCAMPA TERSA*, Linnaeus.

*Sphinx tersa*, Drury.

" " Fabricius.

" " Cramer.

" " Smith & Abbot, Ins. Ga.

*Chærocampa tersa*, Walker, C. B. M. Lep., Part VIII., p. 131.

" " Clemens, Syn. N. A. Sph.

" " Morris, Syn. N. A. Sph. Sm. Ins., p. 171.

" " Grote, 1865.

*Mature larva*.—Light green, with a large subdorsal crimson ocellus on the fourth segment, containing a blue ring and edged with black and white rings, with six others

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smaller and similar placed on a white subdorsal line, which begins on the second segment, and extends to the crimson horn. The back is dashed with brown points; breathing places yellow, dotted with black points above and below. (Abbot and Smith.)

The larval transformation takes place in an imperfect cocoon spun on the surface of the ground.

*Moth.*—Head and thorax brownish-olive, with a lateral whitish line, inclining to roseate at the sides. The body has a broad dorsal dusky band, containing five indistinct darker lines and band of dusky yellow on each side. Fore wings greenish brown, with a small dark brown discal spot and numerous oblique alternate dark brown and yellowish lines, extending from near the base and middle of inner margin to the tip, with a straight brownish sub-marginal line. Hind wings black, with a row of sub-terminal yellow spots. (Clemens.)

Expands 2.70 to 2.80 inches. Length of body 2.55 inches.

## 12. DARAPSA CHÆRILUS, Cramer.

*Sphinx chærilus*, Cramer.

" *azaleæ*, Smith and Abbot, Ins. Ga.

*Otus chærilus*, Hubner.

*Darapsa chærilus*, Walker, C. B. M., Part VIII., p. 183.

" " Clemens, Syn. N. A. Sph.

" " Morris, Syn. N. A. Lep. Sm. Ins., p. 168.

*Chærocampa chærilus*, Harris, Ins. Inj. Veg., p. 328.

*Otus chærilus*, Grote, 1865.

*Mature larva.*—Head green, with a narrow, central brownish line. Body green, deepening on the sides and whitish on the dorsal region, with six oblique irregularly oval whitish bands; breathing places orange; caudal horn bluish-green. (Abbot and Smith.)

Undergoes the pupation in an imperfect cocoon on the surface of the ground. Larva feeds on *Azalea nudiflora*, and, according to Dr. Harris, on *Tradescantia virginica*, Spiderwort.

In this species it is said that during the day the larva conceals itself beneath a leaf, stretching out the body on the mid-rib.

*Moth.*—Head and thorax ferruginous brown. The abdomen fawn colour, with hairs of the hind portions of segments whitish. The fore wings fawn colour, tinged with reddish from base to middle; a broad ferruginous brown shade crossing the nervules, and composed of three lines, having between them two rows of indistinct fawn-coloured spots; a brown line across the middle of the disk. Hind wings ferruginous, deepening to a ferruginous brown narrow border on the excavated portion of the hind margin; fringes whitish.

## 13. DARAPSA VERSICOLOR, Harris.

*Chærocampa versicolor*, Walker, C. B. M., Part VIII., p. 131.

*Darapsa versicolor*, Clemens, Syn. N. A. Sph.

" " Morris, Syn. N. A. Lep. Sm. Ins., p. 169.

*Chærocampa versicolor*, Harris, Ins. Inj. Veg., p. 378.

*Otus versicolor*, Grote, 1865.

We have not seen any description of the larva, though in the *Canadian Entomologist*, Vol. II., 1870, Mr. W. H. Edwards states that it feeds on the Button Bush, *Cephalantus occidentalis*; and Dr. Harris states that it feeds on *Azalea*, Swamp Pink.

*Moth.*—Pale green, varied with olive and whitish; a white line on each side of the head, a dorsal white line tinged with reddish, and extending from the head to the tip of the abdomen. The abdominal segments tinged with dark buff, with hind margins dark

green and reddish-brown. The fore wings slightly rusty red at the base, with narrow olive-green and dull white bands, the latter tinged with rusty red; an oblique whitish apical line with an olive-green patch adjoining. Hind wings rust coloured, with indistinct greenish terminal margin.

*Under-surface* of fore wings pale sulphureous, toward the base pale ferruginous; hind wings olive-green, powdered with white at the base.

14. DARAPSA MYRON, Cramer.

*Sphinx myron*, Cramer.

" *pampinatrix*, Abbot and Smith, Ins. Ga.

*Otus myron*, Hubner.

*Darapsa myron*, Walker, C. B. M., Part VIII., p. 183.

" " Clemens, Syn. N. A. Sph.

" " Morris, Syn. N. A. Lep. Sm. Ins., p. 168.

*Cherocampa pampinatrix*, Harris, Ins. Inj. Veg., p. 327.

This moth has already been so fully described in previous reports, that we shall only briefly refer to it here.

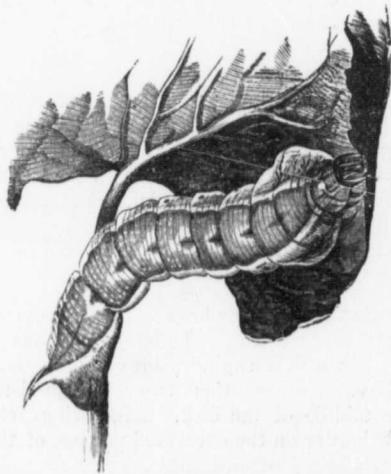


Fig. 27.

The full-grown caterpillar (see fig. 27) is about two inches long, of a pea-green colour, wrinkled transversely, with a pale yellow stripe on each side, and covered with numerous pale yellow dots; the caudal horn sharp and curved backwards. The accompanying figure (27) gives a very good idea of the larva, which has the power of drawing the head and the first two segments of the body within the third segment.



Fig. 28.

The larva is double-brooded, and feeds on the vines and Virginia creeper, *Ampelopsis quinquefolia*. It is much infested by a small ichneumon fly (see fig. 28), which lays its egg in the larva. The larva thus infested always dies. Fig. 29 gives a capital representation of a larva thus attacked.



Fig. 29.

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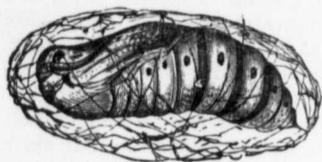


Fig. 30.

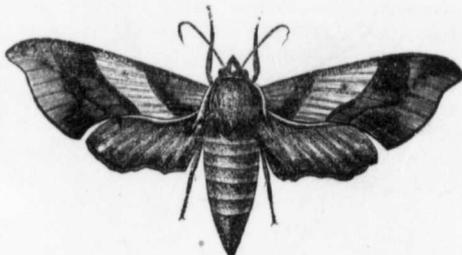


Fig. 31.

The larva forms a loose, brown, silken cocoon (figure 30), among the rubbish on the ground.

The moth (fig. 31) expands from two and a half to three inches, is of an olive-grey colour, except the hind wings, which are rust-coloured; and the fore wings and shoulder covers are traversed with olive-green bands. (Harris.)

#### 15. PHILAMPELUS PANDORUS, Hubner.

*Sphinx satellitia*, Linnæus.

“ “ Drury.

“ “ Fabricius.

*Daphni pandorus*, Hubner.

*Philampelus pandorus*, Walker, C. B. M., Part VIII., p. 174.

“ *satellitita*, Clemens, Syn. N. A. Ph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 176.

“ “ Harris, Ins. Inj. Veg., p. 325.

“ “ Grote, 1865.



Fig. 32.

The larva (fig. 33) has been well described by Mr. Riley. When first hatched, and for some time afterwards, it is green with pinkish tinge on the sides, and an immensely long straight pink caudal horn. This soon begins to shorten, and finally turns round

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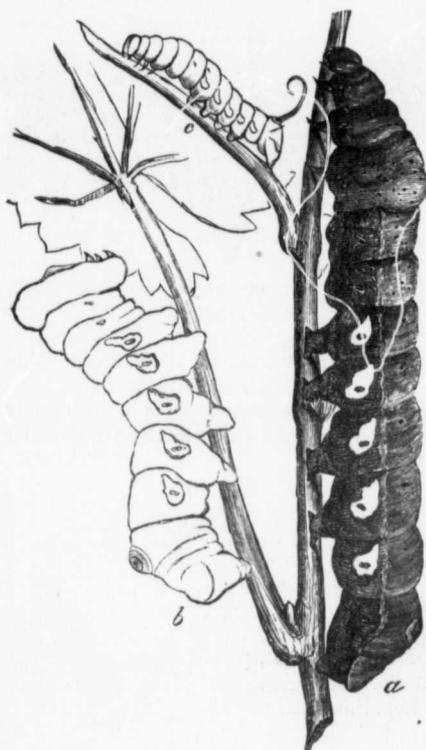


Fig. 33.

## 16. PHILAMPELUS ACHEMON, Drury.

*Sphinx achemon*, Drury." *crantor*, Cramer.

" " Fabricius.

" " Abbot and Smith.

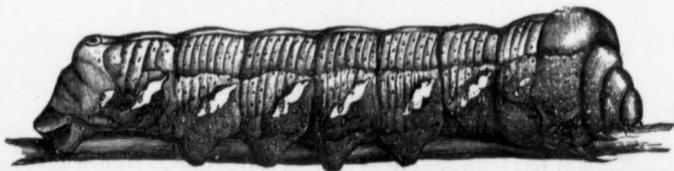
*Pholus* " Hubner.*Philampelus achemon*, Walker, C. B. M.

" " Clemens, Syn. N. A. Sph.

" " Morris, Syn. N. A. Lep. Sm. Ins., p. 177.

" " Harris, Ins. Inj. Veg., p. 325.

Like its congener, *P. pandorus*, the young larva in its earlier stages is green, and has the caudal horn, which it eventually loses.

a  
Fig. 34.

like a dog's tail; as the larva grows older it changes to a reddish-brown, and by the third month it entirely loses the caudal horn. It measures when full-grown nearly four inches; it crawls by a series of sudden jerks, and flings its head savagely from side to side when alarmed. The body is pinkish on the back, the sides a darker shade. On the segments six to ten inclusive are five cream-yellow patches, with a black annulation; on segments two to six are numerous small black dots, but on the remaining segments only two; the head reddish-brown. The most common general colour of the full-grown larva is a rich velvety brown—vinous brown.

It feeds on the leaves of the grape vine and Virginia creeper. They consume great quantities of leaves, often stripping bare the branches they attack.

The pupation occurs, according to Mr. Lintner, in a ground cell, constructed at a very moderate depth. The chrysalis is chestnut-brown, about two inches long, with a long thick terminal spine, slightly forked; the moth generally appears the following June. The moth (fig. 32) expands from four to five inches, and is of a light olive colour, variegated with patches of darker olive-green; the antennæ long, slender, and tapering at the extremity into an ample hook, with seta or bristles. This form of the antennæ is characteristic of the genus.

The full-grown larva is brown; the body is reddish-subscalloped creases or stigmata, and caudal spots, which is smeared with the prolegs.



in the back. The color is a dish ash color.

nous on the tip of the hind wings are a light shade, and a light blue. It is usually found in winter and spring.

## 17. PAON

*Sphinx**Paon**Smei*

Mature larva is bluish-green, with lateral bright spots on the sides."

The full-grown larva (fig. 34) is about three inches long, and has the head reddish-brown; body pale reddish-brown on the back, with a darker vascular line, and pale reddish subdorsal line on each side, and the general colour deepened laterally. It has six scalloped cream-coloured patches, bordered with white, containing the breathing places or stigmata. There are from six to eight transverse wrinkles on all but the thoracic and caudal segments. The lenticular caudal tubercle is black, polished, and contained in a brown patch edged with black and white lines. The larva is covered with minute spots, which are dark on the back, but are light and annulated on the sides. The head, which is small, the front segments and breathing holes are somewhat flesh-coloured, while the prolegs and caudal plate are deep brown. Feeds on the vine and Virginia creeper.

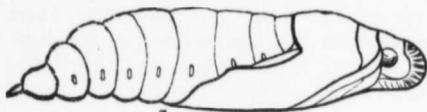


Fig. 35.

Before going into chrysalis it often changes to a beautiful pink or crimson colour. It burrows in the ground, and after making a smooth cavity, undergoes its pupa state. The chrysalis (fig. 35) is of a dark shining mahogany-brown colour, roughened, especially on the anterior edge of the segments in the back. The moth (see fig. 36) expands from three to four inches; it is of a reddish ash colour, variegated with light brown, with two triangular patches of deep ferrugi-



Fig. 36.

nous on the thorax, margined with whitish, and two square ones on each fore wing; the hind wings are pink, with a dark shade across the middle, still darker spots below this shade, and a broad ash-coloured border behind.

It is usually single brooded, the chrysalis remaining in the ground during the fall, winter and spring, and producing the moth about the end of June.

#### 17. PAONIAS MYOPS, Abbot and Smith.

*Sphinx myops*, Abbot and Smith

*Paonias myops*, Hubner.

*Smerinthus rosacæurum*, Boisduval.

" *myops*, Walker, C. B. M.

" " Clemens, Syn. N. A. Sph.

" " Morris, Syn. N. A. Lep. Sm. Ins., p. 207.

" " Harris, Ins. Inj. Veg., p. 328.

*Mature larva*.—"Head bluish-green, with a bright yellow line on the sides. Body bluish-green, with a row of subdorsal and stigmatal reddish-brown spots; six oblique lateral bright yellow bands, with two thoracic subdorsal yellow lines; caudal horn yellow on the sides."

Mr. G. W. Peck, of New York, found that the red blotches on larvæ are not uniform, and are more prevalent on the late brood, though some are entirely green and correspond in colour to similar spots found on the leaves of the wild cherry at that season.

The larva feeds on the leaves of the wild cherry, and undergoes transformation in the earth; the chrysalis is smooth and of a deep brown colour.

*Moth.*—Head and thorax chocolate-brown, the two latter portions with a purplish or rosy tinge; the sides of the palpi, and a stripe in the middle of the thorax, tawny-yellow; abdomen brownish, with tawny-yellow spots, and the hind portions of the segments dark brown; fore wings angulated and excavated on the hind margin; chocolate-brown colour, with a faint purplish or reddish-grey tinge towards the base; black and chocolate-brown bands and patches; hind wings dull yellow, with the outer half chocolate-brown; short bluish lines above the tips, and a dull yellow spot upon it; the ocellus (or eye-shape spot) black, with a large pale-blue pupil.

This moth is double brooded.

18. PAONIAS EXCÆCATUS, Abbot and Smith.

*Sphinx excæcata*, Abbot and Smith.

*Paonias excæcatus*, Hubner.

*Smerinthus excæcatus*, Walker, C. B. M.

“ “ Clemens, Syn. N. A. Sph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 208.

“ *excæcata*, Harris, Ins. Inj. Veg., p. 327.

*Mature larva.*—Head apple-green, granulated, flattened, and triangular, with bright yellow side lines; body light-green, studded with pointed white granulations; seven oblique yellowish lines on each side; caudal horn nearly straight, rose-coloured, yellow at sides and sometimes at tip; legs at tips reddish-brown; breathing places reddish-brown. Larva undergoes transformation in the ground. The chrysalis is dark chestnut-brown, tolerably smooth, and with a short triangular rough terminal spine, which is more prominent in the male.

Feeds on the leaves of the apple tree and plum; has also been found on the elm, and is said to feed on the swamp rose, *Rosa Carolina*.

The larva, when irritated, emits a musical chirping sound.

*Moth.*—Head and thorax fawn colour, with a roseate tinge; body fawn colour, with a dark-brown dorsal line; fore wings denticulated on the hind margin; fawn colour clouded with brown, with black and brownish-red spots and patches; hind legs rose colour in the middle, with a brownish patch at the tip, crossed by two or three short whitish lines; ocellus (or eye spot) black, with pale-blue centre and short whitish lines between the ocellus and the inner margin.

19. SMERINTHUS GEMINATUS, Say.

*Smerinthus geminatus*, Say, Am. Ent. Lec. Ed.

“ “ Walker, C. B. M.

“ “ Clemens, Syn. N. A. Sph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 210.

Larva in earlier stages uniform pale-green; when full grown measures about two inches in length. Colour pale-green, whitish dorsally; head, triangular, granulated in pale-green in front, and in white at the sides; body tapering slightly in front segments; seven lateral pale-yellow bands, the last much brighter; a whitish stripe down the centre of the back; anal shield granulated, and of the same dark-green colour as the under surface. Caudal horn straight, granulated and violet-coloured. Breathing places elliptical and reddish; legs, reddish; prolegs, green. Feeds on willow.

Dr. Clemens states that he has secured numbers of the pupa from the middle of October to beginning of November at the base of willows.

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*Moth.*—Palpi reddish-brown; head, thorax, in front and tegulae (shoulder covers) whitish or pale-grey, with a large deep chestnut semi-oval patch on top of the thorax; body brownish-grey; fore wings angulated and excavated on the hind margin; grey colour fringed with rosy and with dark-brown streaks and patches; hind wings rosy, along exterior and terminal border yellowish-grey. The ocellus (or eye spot) is black, emitting a short broad line to inner angle, and with two or three blue pupils; these last give rise to the name *geminatus*, or twin-spotted, and cause the moth to be readily distinguished from the preceding one, *S. excecatus*.

20. *CRESSONIA JUGLANDIS*, Abbot and Smith.

*Sphinx juglandis*, Abbot and Smith.

*Amorpha dentata juglandis*, Hubner.

*Smerinthus juglandis*, Walker, C. B. M.

“ “ Clemens, Syn. N. A. Sph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 213.

“ “ Harris, Ins. Inj. Veg., p. 328.

*Cressonia* “ Grote and Robinson. 1865.

*Mature larva.*—Head large, pointed apex, colour light-green, with white granulations on the sides; body slender, tapering towards the extremities; pale apple-green, granulated regularly on the transverse wrinkles, seven oblique lateral bands, lighter green, approaching white (Lintner), or crimson-edged beneath, with pale-yellow (Clemens), or bright-yellow (Packard). Caudal horn brownish, with dense blackish spinules; feet dark reddish-brown. Length about two and a quarter inches.

Feeds on Black Walnut, *Juglans nigra*, Hickory, *Carya alba*, Iron Wood, *Ostrya Virginica*, and Wild Cherry.

According to Dr. Clemens, the position of the larva when at rest is not sphinx-like; it is extended along the mid-rib of a leaf, and when disturbed throws its head from side to side, making a crepitating noise. It attains its growth about the middle of September, and undergoes its transformation in a cell just beneath the surface.

*Pupa* is blackish-brown, with the terminal segments of the abdomen flattened; several conical granulated projections or prominences on the front of the head case and on the leg cases.

*Moth.*—Head and thorax pale fawn colour or greyish, with a dorsal brownish stripe; abdomen fawn colour; front wings, pale grey, with lilac tinge, with broad yellowish-brown shade across them; hind wings ochraceous-brown, or dull fawn colour, with a central light-coloured band edged by dark lines on each side. No eye spots, or ocelli on the wings.

21. *AMORPHA MODESTA*, Harris.

*Smerinthus modesta*, Harris, Agassiz, Lake Sup.

“ *modestus*, Walker, C. B. M.

“ *modesta*, Clemens, Syn. N. A. Sph.

“ *modesta*, Morris, Syn. N. A. Lep. Sm. Ins., p. 210.

*Amorpha modesta*, Hubner.

*Larva* when young is green-coloured, and has a short purple caudal horn, which it loses almost altogether at maturity. It measures when full-grown about three inches, being three-quarters of an inch in diameter. The breathing places small and rust red. Legs brown; prolegs brownish-yellow; yellowish-white oblique lines on the side, which are much more visible in the earlier stages of the larva.

Feeds on the Lombardy poplar.

*Pupa* two inches long, cylindrical and dark chestnut-brown, terminating in a point or thorn.

Mr. R. Bunker, of Rochester, who has reared this larva from the egg, states that "the habits of the larva are singular; before the first moult it is much inclined to wander, and goes looping along after the manner of the Geometers; after the second moult it becomes sluggish. It is a voracious eater—in short, an accomplished gastronome. Its manner of feeding differs from that of any larva I have had the pleasure of rearing. It rests with its body stretched out at right angles to the edge of the leaf, and eats with its feet fixed on the side of the leaf, and as the food is consumed moves backward, and when the leaf is consumed to the mid-rib, leaves it to try its gormandizing propensities on a fresh one. As the worm, while feeding, rests as above mentioned, the reason of its leaving the leaf half consumed will be obvious—it would otherwise have no surface to hold on to."

*Moth* is very large, expanding nearly six inches. The palpi, head, thorax, and abdomen, olive-coloured; fore wings denticulated on hind margin; pale olive colour, with an indistinct irregular darker streak across the middle, and margined towards the base of the wing with a still paler hue; a broad, deep olivaceous median band, containing a pale angular discal spot, and darkest at base of wing; two other bands of same colour but different shades across the wings; hind wings purplish-red in the middle, with a transverse black spot above inner angle, and a blackish olivaceous patch beneath it. In the male, the wing is olivaceous exteriorly and along terminal border.

## 22. CERATOMIA AMYNTOR, Hubner.

*Agrius Amyntor*, Hubner.

*Ceratonia quadricornis*, Walker, C. B. M.

" " Clemens, Syn. N. A. Sph.

" " Morris, Syn. N. A. Lep. Sm. Ins., p. 205.

" " Harris, Ins. Inj. Veg., p. 323.

" *Amyntor*, Grote and Robinson, 1865.

*Larva*.—When full grown is about three and a half inches long, of a pale green colour, sometimes deep brown, seven oblique greenish-white lines on each side of the body, and a row of little notches like saw teeth on the back; body strong, shagreened or granulated; on the shoulders are four short, obtuse, fleshy notched horns; caudal horn greenish and of medium length, slightly curved; stigmata, or breathing places, black, encircled with yellow and divided by a yellow line; feet reddish; found in May and June; feeds on the American elm (*Ulmus Americana*); undergoes pupation in the ground; pupa dark brown, smooth; tongue-case not apparent.

*Moth*.—Expands nearly five inches; head grayish; thorax with the top fawn colour or greenish-brown, whitish at the sides; abdomen fawn-coloured or brownish, with a slender black dorsal line and two black stripes at each side; fore-wings fawn colour, varied with blackish-brown, three or four blackish irregular lines across the inner margin to about the middle, a white discal spot with a black discal dash resting on the median nerve (in the males the discal spot is fawn colour); hind-wings pale brownish, with a sub-terminal blackish or dark brown band and shaded with blackish in the middle, or forming indistinct dark-coloured lines.

## 23. DAREMMA UNDULOSA, Walker.

*Sphinx Brontes*, Boisduval.

*Daremma undulosa*, Walker, C. B. M.

*Ceratonia repentinus*, Clemens, Syn. N. A. Sph.

" " Morris, Syn. N. A. Lep. Sm. Ins., p. 206.

*Sphinx* " Grote, 1865.

*Daremma* " Grote and Robinson, 1865.

*Larva*.—Full grown, about one and a half inches long; head light green, with broad lateral whitish stripes; body pale green, with seven oblique whitish-green bands on the sides, bordered with darker green; caudal horn green, rose-coloured at base tipped with yellow, slightly curved and covered with black spinules; the breathing pores have a white

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dot at each extremity and are bordered with orange; legs rose-coloured; prolegs green; feeds on ash (*Fraxinus*) of different species and the lilac (*Syringa vulgaris*); enters the earth and undergoes the pupal state about four inches below the surface; pupa about one and three-quarter inches long, dark brown colour, much granulated or shagreened, with triangular rough terminal spine.

*Moth*.—Head and thorax dark grey, paler on the side; shoulder covers with central black stripe; abdomen dark grey, paler on the sides, with slender black dorsal line with two black stripes on each side; fore-wings pale, or rather deep ash colour varied with black and white; discal spot white and black margined; black wavy lines across wings with white spaces between; hind-wings blackish-grey, with three parallel narrow, wavy black bands; fringes white, spotted with dark brown.

24. SPHINX QUINQUEMACULATA, Haworth. (See Fig. 37).

*Sphinx quinquemaculatus*, Haworth.

*Phlegthontius Celeus*, Hubner.

*Sphinx quinquemaculatus*, Stephens.

“ “ Wood.

“ *quinquemaculata*, Walker, C. B. M.

*Macrosila* “ Clemens, Syn. N. A. Sph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 190.

*Sphinx quinquemaculatus*, Harris, Ins. Inj. Veg., p. 322.

“ *quinquemaculata*, Fitch, 9th Report.

*Larva* known as THE Tomato or Potato Worm; has been so often described that it must be familiar to most:

It measures about three inches in length, is smooth and wrinkled transversely; head green, small and shining, with a black stripe on each side; the breathing pores black, except the two last, which are yellow; the usual colour bright green marked with white, with seven straight oblique greenish-yellow stripes; body dotted with numerous greenish-yellow spots.

Caudal horn long, slightly curved backward and granulated; variations of colour are very great; common colour is leek-green, from this it varies to lighter green, and to various shades of darker brownish and blackish green; in other instances the green wholly vanishes and the worm is pale or deep amber-brown, blackish-brown, purplish-black or pure black; a voracious feeder and does much damage to the tomatoes and potatoes.

*Pupa* is a bright glossy chestnut colour, with a long and slender tongue case bent over from the head so as to touch the breast only at the end, and somewhat resembling the handle of a pitcher.

The *Moth* expands about five and a half inches, is of a grey colour, variegated with blackish lines and bands; on each side of the body are five round orange-coloured spots encircled with black. Its tongue when unrolled is nearly six inches long, but when not in use is concealed, like that of all the Sphingidæ, between the palpi, coiled like a watch-spring.

25. SPHINX CHERSIS, Hubner.

*Lethia chersis*, Hubner.

*Sphinx cinerea*, Walker, C. B. M.

“ “ Clemens, Syn. N. A. Sph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 194.

“ “ Harris, Ins. Inj. Veg., p. 328.

“ *chersis*, Grote and Robinson, 1865.

*Larva* bright green colour; head bluish, with two pale side bands; seven bright yellow oblique bands on each side, edged above with bluish-green; caudal horn medium length, pale blue colour, sometimes rose, and curved at the tip; anal plate triangular, dotted with black points; legs blackish-blue; prolegs green with black tips; breathing

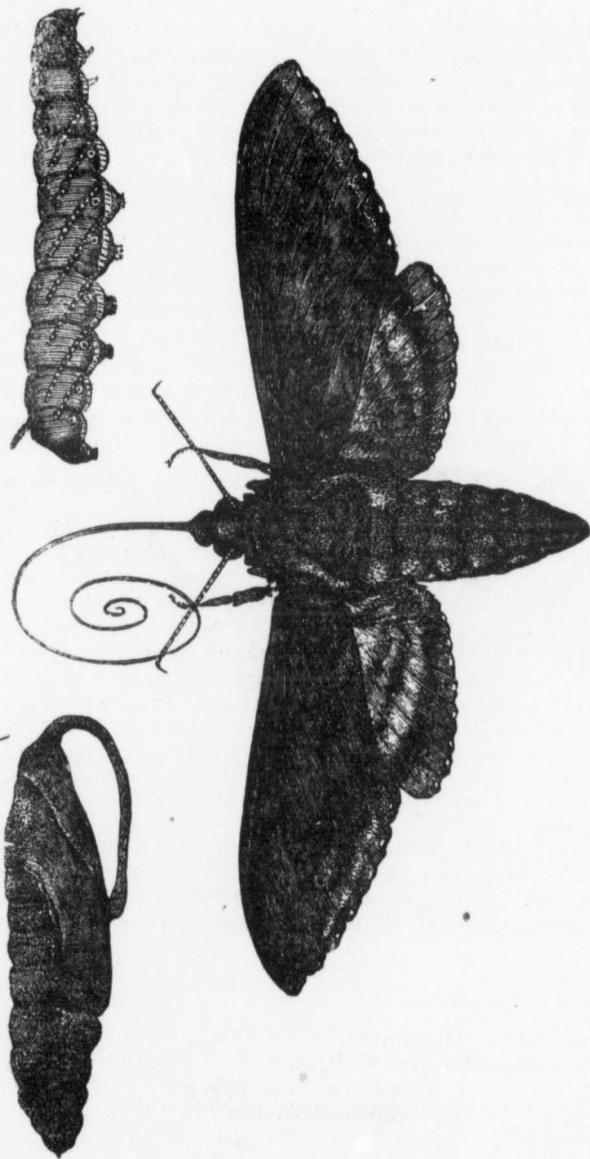


Fig. 37.

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pores orange; length, two and a half inches; feeds on lilac, *Syringa vulgaris*; has been also taken on the white ash, *Fraxinus Americanus*, and privet, *Ligustrum vulgare*.

*Pupa* has tongue case detached and is contained in subterranean cell; chestnut-brown colour.

*Moth*.—Head and thorax dark grey; shoulder cases tipped with whitish with a black line and a spot on each side; abdomen dark grey, with a black dorsal line and alternate black and white lateral demi-bands; fore-wings dark grey, with black spot at base, a fine black discal line and blackish lines across the wings; hind-wings sordid grey, with a broad median and a terminal black band.

26. SPHINX DRUPIFERARUM, Abbot and Smith.

<i>Sphinx drupiferarum</i> ,	Abbot and Smith.
<i>Lethia</i>	“ Hubner.
<i>Sphinx</i>	“ Walker, C. B. M.
“	“ Clemens, Syn. N. A. Sph.
“	“ Morris, Syn. N. A. Lep. Sm. Ins., p. 197.
“	“ Harris, Ins. Inj. Veg., p. 328.

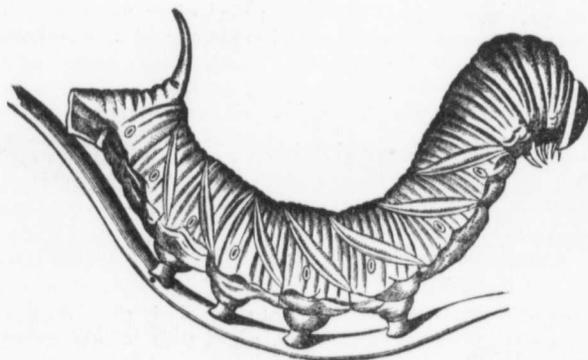


Fig. 38.

*Larva* (fig. 38) when full-grown measures about three inches, apple-green colour; head green, with lateral brown or black stripes; on the sides are seven broad oblique bands, white, bordered in front with light purple or mauve; breathing pores distinct and of a bright orange colour; caudal horn long, dark brown, yellow at base; body cylindrical and smooth; feeds on the plum and hackberry (*Celtis occidentalis*.) Appears in July and August. Enters the ground for transformation.



Fig. 39.

*Pupa* (fig. 39) about one and a half inch long, dark reddish-brown; has a short thick projecting tongue case.

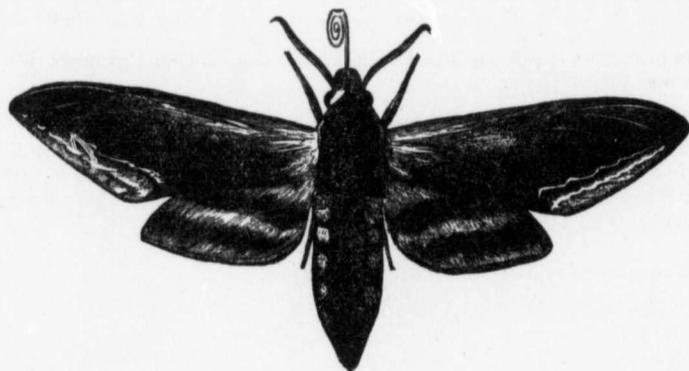


Fig. 40.

*Moth* (fig. 40) expands about four and a quarter inches; head and throat blackish-brown, whitish-fawn colour at sides; abdomen brown, with a slender dorsal line and a lateral black band on each side containing brownish-white spots; fore-wings dark purplish-brown, with whitish lines on margin; hind-wings whitish, with broad median black band enlarged towards the margin, and sub-terminal black band and fawn-coloured margin.

## 27. SPHINX KALMLÆ, Abbot and Smith.

<i>Sphinx</i>	<i>Kalmiæ</i> ,	Abbot and Smith.
<i>Lethia</i>	"	Hubner.
<i>Sphinx</i>	"	Walker.
"	"	Clemens, Syn. N. A. Sph.
"	"	Morris, Syn. N. A. Lep. Sm. Ins., p. 196.
"	"	Harris, Ins. Inj. Veg., p. 328.

*Larva*.—Head green, with black stripe at side; body pale green, or yellowish-green; seven oblique pale yellow bands on the sides, edged with blackish-green, and with pale blue above that; breathing pores orange-yellow; caudal horn blue, covered thickly with black tubercles, slightly curved; length about three inches; feeds on lilac or mountain laurel (*Kalmia latifolia*) and ash; undergoes pupation in the ground; pupa dark brown, tongue case exerted with bulbous extremity; goes into pupa about August or September, moth appearing in June or July.

*Moth*.—Head and thorax rusty brown, paler on the sides; shoulder covers with black lines and patches; abdomen rusty brown with central black line and alternate whitish and black demi-bands; fore-wings rusty brown, paler in the middle, rusty brown streaks, a whitish line near margin; small rusty discal spot, reddish-brown fringes; hind-wings, brownish-white, with broad central and terminal black bands; outer margin and fringes reddish-brown.

## 28.—SPHINX GORDIUS, Cramer.

<i>Sphinx</i>	<i>gordius</i> ,	Cramer.
<i>Lethia</i>	"	Hubner.
<i>Sphinx</i>	<i>pæcila</i> ,	Stephens, Ill. Brit. Ent.
"	"	Wood.
<i>Sphinx</i>	<i>gordius</i> ,	Walker, C. B. M.
"	"	Clemens, Syn. N. A. Sph.
"	"	Morris, Syn. N. A. Lep. Sm. Ins., p. 198.
"	"	Harris, Ins. Inj. Veg., p. 328.

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*Larva* said to be very like that of *S. drupiferarum*; feeds on the apple-tree. Larval transformation is subterranean; pupa with short detached tongue case.

*Moth*.—Head and top of the thorax blackish-brown, or black and reddish-grey on the sides; abdomen dark grey, with a dorsal black line and alternate black and greyish demi-bands; fore-wings blackish-grey with a roseate hue, white, conspicuous discal spot, blackish streaks and lines; fringes dark brown, spotted with white; hind wings grey, with a black median and a broad black marginal band, the fringes white.

29. SPHINX EREMITUS, Hubner.

*Agrius eremitus*, Hubner.

*Sphinx sordida*, Walker, C. B. M.

“ “ Clemens, Syn. N. A. Sph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 194.

“ *eremitus*, Grote and Robinson, 1865.

*Larva* three and a half inches long, sepia coloured, slightly granulated like “shagreen,” having a varnished appearance; caudal horn black, rather small. The first segments (*i.e.* to which the prolegs are attached), horn coloured and semi-transparent, having two black shield-shaped blotches upon them, of which the hinder is much larger than the former; prolegs black; seven oblique whitish lateral bands, the hindmost of them broader than the others; breathing pores black; head greenish-brown, with distinct white stripe on each side. (Fyles.) According to Prof. Snow the general colour of body is pale green; this may be only a variation like that of *S. 5 maculata*. Found in September and October, feeding on *Salvia officinalis*, common sage; moth appears in May or June; said to be double brooded.

*Moth*.—Brownish-cinereous or ash colour; head and thorax paler at sides; broad blackish stripe on shoulder covers; brown dorsal line on top of thorax and black spots; abdomen with dorsal black line and alternate black and whitish demi-bands on the sides; beneath, white with central blackish spots; fore-wings brownish-ash colour, with a black margined white discal spot with short blackish dash through it, blackish streaks across wings; a short blackish-brown line edged on the outside with greyish near the terminal margin; hind-wings yellowish-white, with black spot at base, and a median and broad marginal black band; length of body sixteen lines; expansion of wings thirty-five lines.

30. SPHINX LUSCITOSA, Clemens.

*Sphinx luscitiosa*, Clemens, Syn. N. A. Sph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 197.

*Larva* and pupa undescribed.

*Moth*.—Antennae and palpi blackish-brown; head and thorax blackish-brown or blackish and white at sides; abdomen brown, with a black stripe on each side; fore-wings, pale brown with a rusty hue, the inner border dark smoke colour; a terminal smoky band tapering to the tip of the wing, with a wavy outline in front; a slender black discal line and black lines and streaks across the wings; fringes blackish; hind-wings yellowish, with a broad terminal black band and the fringes whitish.

31. DOLBA HYLÆUS, Walker.

*Sphinx Hylæus*, Drury.

“ “ Cramer.

“ “ Fabricius.

“ *Prini*, Abbot and Smith.

*Hylœicus Hylæus*, Hubner.

*Sphinx Hylæus*, Walker, C. B. M.

*Dolba Hylæus*, Clemens, Syn. N. A. Sph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 203.

*Sphinx Hylæus*, Harris, Ins. Inj. Veg., page 328.

*Mature larva*.—Head green, with a pale blue line on each side; body pea-green, with lateral oblique pink bands edged below with white; caudal horn crimson; *pupa* reddish-brown; tongue case not apparent. (Abbot and Smith.) Feeds on black alder (*Prionus glaber*) and whortleberry.

*Moth*.—Head and thorax brownish rust-colour, whitish on the sides; two white spots on top of thorax, two black ones below it; abdomen brownish rust-colour, with a row of dorsal brown spots and a double row of white spots, and with lateral alternate black and narrow white demi-bands; fore-wings dull rust-colour or dark brownish, varied with white and blackish-white spot at base, discal spot white and black margined, a band of blackish lines crossing the middle of the wing, margined at the end broadly with whitish, and black circlelets on the hinder ends of the middle veins; hind-wings whitish, with an indistinct double median blackish band, a broad terminal dark brown band edged above with blackish.

32.—ELLEMA HARRISII, Clemens.

*Anceryx coniferarum*, Walker, C. B. M.

*Ellema Harrisii*, Clemens, Syn. N. A. Sph.

“ “ Morris, Syn. N. A. Lep. Sm. Ins., p. 216.

*Sphinx coniferarum*, Harris, Ins. Inj. Veg., p. 328.

*Larva* two inches long, the body being smooth and nearly cylindrical, and thickest in the middle; the head is large, pointed above, flat in front, and green, with a yellow stripe on each side; body bright green, with a dorsal row of dark-red spots on the fifth to the twelfth segments inclusive, with a bright yellow stripe on each side of the reddish spots, and a lateral white stripe mixed with yellow; prolegs rose-coloured, and a ventral stripe of same colour; has no caudal horn. Found in September feeding on the white pine.

*Pinus strobus*.—Dr. Guthrie says, “I have taken the larva about the middle of September beneath or ascending the trunks of the white pine, from the leaves of which it seems liable when near maturity to be shaken by the high winds.”

*Pupa*.—Chestnut brown; tongue case buried; very difficult to rear in confinement.

*Moth*.—The palpi, head and thorax pale-umber, with the sides of the thorax at base of fore wings, and the lower portion of shoulder-cases greyish. Abdomen brownish-gray. Fore wings umber-coloured, varied with pale grey; blackish-brown lines crowning the wings, with blackish moon-shaped spots between the veins; ends of veins tipped with dark-brown; fringes brown, spotted with white; lighter towards the base.

## NECROPHORI—BURYING BEETLES.

By J. FLETCHER, OTTAWA.

The several classes of beneficial insects may be grouped under two heads:—First there are those which do actual good themselves; and, secondly, those which prevent others from doing harm. It is of the utmost importance that the appearance of all these beneficial insects should be known to those engaged in agricultural pursuits, or many of the most useful of man's auxiliaries, will, without doubt, be frequently destroyed. This is a very easy matter, for the members of the different families, into which insects are classified by entomologists, may nearly always be recognized as such, at a glance, and with very few exceptions the different genera of any family have the same habits.

From the small size of insects, the enormous benefits and injuries which man experiences at their hands, are apt to be underrated or even overlooked altogether. They are, however, becoming more appreciated, day by day, as the labours of specialists are made

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known to the world; a remarkable illustration of this may be found in the publication of Mr. Darwin's last work, "Vegetable Mold and Earth Worms." Notwithstanding the vast amount of original investigation, of the utmost importance, on other scientific subjects undertaken by this gentleman, the fruits of which have from time to time appeared in his invaluable works, ever since 1837, when he read a paper on "The Formation of Mold," to the Geological Society of London, he has been accumulating facts and making observations, the results of which are set forth in this fascinating work. Some of the experiments are most remarkable, and the care and patience exhibited by this great worker in carrying them out, are very characteristic of the man; and are so graphically narrated that one who reads the book can almost fancy he has seen them performed. The modifications of the earth's surface by the agency of these small creatures is so great as to be almost incredible, were they vouched for by a less accurate experimentalist than Dr. Darwin. As the result of various careful observations he found that, on one acre of old pasture ground no less than fifteen tons of earth are annually swallowed by worms below the surface, and thrown up above it in the shape of castings.

He points out, too, that the burial of ancient Roman and other remains, scattered over the country, in England, is due to worms, which keep continually throwing up the soil from underneath them, and so let them sink.

Among the insects which do actual good, those which perform the office of scavengers are entitled to more than a passing consideration. These useful insects will be found almost entirely among the Coleoptera or beetles, and the Diptera or flies. As Kirby and Spence's valuable work, "Introduction to Entomology," is not easily attainable in this country, I cannot do better than insert what they have written so well on this subject:—"All substances must be regarded as nuisances and deformities, when considered with relation to the whole, which are deprived of the principle of animation. In this relation stand a dead carcass, a dead tree, or a mass of excrement, which are clearly encumbrances that it is desirable to have removed, and the office of effecting this removal is chiefly assigned to insects, which have justly been called the great scavengers of nature."

"How disgusting to the eye, how offensive to the smell, would be the whole face of nature were the vast quantities 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 ten-fold 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." Many of the Scarabæidæ or Diggers not only live on this filthy material, but dig galleries below the mass into the soil and carry down portions of it, to be food for the young larvæ; the benefit thus conferred is two-fold: not only is the nuisance removed, but a fertilizer is carried down into the soil, and canals are opened by which more may find its way in the same direction, whenever rain falls. The beetles living in dung inhabit it in their perfect as well as larval states; and it is a curious fact, but they are very seldom found to have any of it adhering to them.

"Of the diptera, the larvæ alone derive their nutriment from this source; the imago, which would be suffocated did it attempt to burrow into a material so soft, only lays its eggs in the mass. The members of this order, too, are more select in their choice than the coleoptera—not indeed as to delicacy—but they do not indiscriminately oviposit in all kinds, some preferring horse-dung, others cow-dung, and others that of birds, etc.

"Still more would our olfactory nerves be offended, and our health liable to fatal injuries, if the wisdom and goodness of Providence had not provided for the removal of another nuisance from our globe—the dead carcasses of animals. When these begin to grow putrid, everyone knows what dreadful miasmata exhale from them, and taint the air we breathe. But no sooner does life depart from the body of any creature than myriads of different sorts of insects attack it in various ways. First come the Histers,

and pierce the skin ; next follow the flesh-flies some (*Sarcophaga*), so that no time may be lost, having the remarkable characteristic of depositing their young alive ; others covering it with millions of eggs, whence in a day or two proceed innumerable devourers. An idea of the despatch made by these gourmands may be gained from the combined considerations of their numbers, voracity, and rapid development. One female of *Sarcophaga carinaria* will give birth to 20,000 young ; and the larvæ of many flesh-flies, as Redi ascertained, will, in twenty-four hours, devour so much food, and grow so quickly, as to increase their weight two hundred-fold. In five days after being hatched they arrive at their full growth and size, which is a remarkable instance of the care of Providence in fitting them for the part they are destined to act : for if longer time were required for their growth, their food would not be a fit aliment for them, or they would be too long in removing the nuisance it is given in charge to them to dissipate."

As soon as the various tribes of flies have opened the way, and devoured the softer parts, a whole host of beetles actively second their labours. Wasps, hornets and ants claim a share, and before long what was a putrifying mass is only a heap of dry bones, which are soon covered by decaying vegetables and soil thrown up by worms.

Of these scavenger-beetles, none, perhaps, are more interesting than the *Necrophori* or Sexton Beetles, or, as their name denotes, corpse-bearers, in allusion to the singular habit possessed by all the beetles of this genus. They are not content with merely eating their food when they find a supply, but lay eggs in it and then bury it so that no other insects may get it, but that it may be a provision for their future progeny.

These insects may easily be known ; they are almost all bright coloured, being of a shining black, ornamented with bright orange markings and fulvous-down underneath, the under side of the elytra is often of a bright yellow colour, which is very conspicuous when they are flying, these organs then being held erect. They fly and run with great rapidity. When flying they are very difficult to distinguish from Humble-Bees, and have very much the same oscillating mode of flying backwards and forwards before any one trying to catch them. The antennæ are very peculiar, consisting of a slender jointed stem, bearing at its end a round knob composed of four flattened joints joined together. There are several species found in Canada, the largest and handsomest of which is *Necrophorus Americanus*, Oliv. I have never been able to observe this species working ; but some of the other species may be easily watched if a trap is set for them in the shape of some small animal or bird

Represents one of our commonest species (*Necrophorus Velutenus*).



The rapidity with which these small creatures will bury a bird many times larger and heavier than themselves, is astonishing. They seem, too, to be gifted with the same instinct as the vulture, for although they are very seldom found hidden like other insects, no sooner is a small dead animal exposed than some of these insects very soon appear, and, after a short survey of the "subject," soon commence operations. If the ground is soft and suitable, they begin at once by making a furrow all round, about the length of their bodies from the animal ; the greater part of this work of burying is said to be performed by the male, but I have been unable to verify this. They nearly always work at night, and stop and run under the body whenever a light is brought near them. As soon as the first furrow is completed, another is begun inside this, and the earth is then pushed out into the outside one ; the next furrow is beneath the body, and the progress can be marked by the earth that is pushed out all round it from underneath. There is a good deal of running about and inspecting all the time the work is going on, and frequently the workmen will refresh themselves with a meal from the object of their attentions, after which they will take a rest and then will start again, and work away until nothing is visible. They are not even then content, for they will sink small bodies to the depth of a foot from the surface. In this storehouse they deposit their eggs, and then leave them to take care of themselves, and set off in quest of more work to do. If by chance the object they wish to bury is in an unsuitable place, they will accomplish comparatively enormous feats rather than give up the object. Last summer, I noticed one evening a dead swallow lying on a stone pavement close against a building. As I passed I pushed it up against the wall so as to be out of the

time may be seen covering the carcass. An idea of the consideration of *Sarcophaga* is, as Redi quickly, as they arrive at the rovidence in required for it to be too long and the softer parts and ants feed on dry bones, and *Necrophori* the singular with merely it so that no enemy. It, being of a kind and fulvous-of a bright flying, these eat rapidly. Fumble-Bees, backwards and forwards and are very and a round they are several which is *Necro-* and this species is used if a trap a bird many to be gifted found hidden these insects e operations. w all round, this work of verify this. ver a light is begun inside w is beneath all round it the time the a meal from ll start again, for they will rehouse they t off in quest in unsuitable ap the object. vement close e out of the way; the next morning as I went by the same place I looked if it were still there; but not seeing it, was passing on again, when, on the opposite side of the path, and half buried behind a tuft of grass, I found it, and in the feathers and underneath the bird were at least half a dozen *Necrophorus velutinus*, four of which I secured. The distance this had, to all appearances, been dragged in one night, was over six feet four inches. Soon after the eggs and their decomposing receptacle are buried, the young larvæ hatch and begin to devour. They soon grow into long, fleshy grubs, narrowed at each end and having the segments distinctly marked, and the upper surface of each one armed with a horny plate, which has strongly toothed edges. These plates serve the larva in the stead of legs, of which it has only three very weak and small pairs. With the assistance of the horny segment-plates, it is enabled to force its way through the soft material in which it lives by alternately lengthening and shortening its body. As these insects during this period never change their locality, legs are useless; but when, after having spun a cocoon, in the earth laid dormant all the winter, and emerged the following spring as perfect insects, they lead an active, roving life, strong and slender legs, suited to their requirements, are provided, showing how nothing useless is created in nature, and how no necessary is found to be wanting.

There are many curious instances on record of the instinct displayed by these insects in providing food for their future young. In Westwood's "Modern Classification of Insects," mention is made of an instance in which some of these insects, in order to get possession of a mole fastened to a stick stuck upright in the ground, undermined the stick so that it soon fell to the earth. From an observation by M. Cadet de Vaux, it appears that while several individuals of some species of *Necrophorus* labour in concert, those of others work alone.

Latreille states that the larvæ of *Necrophorus* entirely consume the buried carcass, leaving neither skin nor bone. Hence it seems that the number of workers is proportioned to the quantity of food necessary for the support of their progeny.

One of the most objectionable features about these handsome and interesting insects is a habit they have of exuding a most fetid fluid, which is derived from the putrid food they feed upon. Unluckily, none of their tribe are free from this objectionable habit, and they never entirely lose the odour.

Among those insects which do good by preventing others from doing harm are found those predacious kinds which live on other insects, and they adopt the most effective means, viz., killing and eating all they find. They belong chiefly to the following families: *Cicindelidæ*, or Tiger-Beetles, are bright metallic-tinted, merciless freebooters, armed with sharp, cruel jaws, and furnished with powerful wings and legs. In the larval state, too, they are very rapacious, living in holes in the ground, and only leaving their heads out; they seize and devour every insect which is unlucky enough to come within their reach.

The *Carabidæ* are a large family of most useful insects, which destroy innumerable destructive larvæ of *Lepidoptera* and other insects. *Calasomas* are particularly active in killing the different species of cut-worms which work such havoc among all spring crops. There are many most valuable and beautiful insects among the *Carabidæ*, the general appearance of which should be known to all, as both in the larval and perfect states they do an incalculable amount of good by keeping down insect enemies.

A very useful family of beetles, because they keep in check the destructive *Aphides*, is known by the name of *Coccinellidæ*, or Lady-birds, and it would be well if the good they do were as well known as they are themselves.

## NOXIOUS INSECTS IN ENGLAND AND CANADA.

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

In our last year's Report on Insects, I gave some extracts from Miss E. A. Ormerod's "Notes of Observations of Injurious Insects" in England during the preceding three years, noticing especially those that are familiar to us on this side of the Atlantic. Since the publication of our Report, Miss Ormerod (whose personal acquaintance I had the pleasure of making last summer) has issued her series of "Notes" for 1880, and has published an admirable "Manual of Injurious Insects and Methods of Prevention" illustrated volume of nearly 400 pages—that must prove of immense practical value to the farmers and gardeners of Great Britain. I have also recently received from her a copy of a Lecture on Injurious Insects, that she delivered in October last before the professors and students of the Royal Agricultural College at Cirencester. From all these materials supplied by our indefatigable and talented authoress, I propose to give this year an account of some of the most important of the insect enemies that trouble the fruit-growers alike in England and in this country, from which I hope that some useful lessons may be derived for our information and guidance here. Several of the woodcuts with which this paper is illustrated are reproductions of Miss Ormerod's own drawings in her "Manual of Injurious Insects."

## I.—THE WOOLLY APHIS OF THE APPLE.

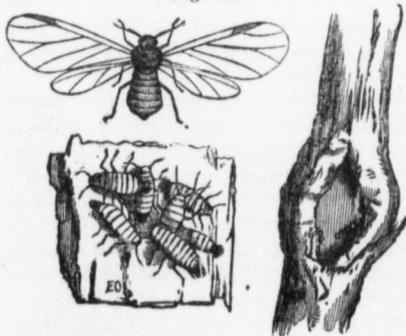
This insect is familiarly known in England by the name of the "American Blight," because it is believed to have been introduced from this continent in the year 1787. Much doubt has been expressed regarding the correctness of this opinion, and for a long time most of our entomologists considered that the European insect was quite a distinct species from the American, and accordingly described the latter under a separate name. The European insect was called *Eriosoma lanigera*, Hausm., and the American, *Eriosoma pyri*, Fitch; now it is agreed on almost all sides that the two insects are identical, though their habits differ very much, and that they should both be known as the Woolly Aphis of the Apple—*Schizoneura lanigera*, Hausm.

In England this creature attacks the branches and twigs of the apple tree, and may be at once "detected by the woolly or cottony growth on the insects, giving the appearance

of a white film growing at the bottom of the crevices where a few of them are lurking. Where there are many, the spot appears as if a knot of cotton-wool was sticking to the bough, or even hanging down in pieces several inches in length, ready to be wafted by the first gust of wind, with all the insects in it, to a neighbouring bough."

"The 'Blight' is chiefly to be found in neglected apple orchards. Its headquarters are in crevices in the bark, or in hollows where young bark is pressing forward over the surface where a bough has been cut off, or broken by accident so as to leave a shelter of the old dead bark outside; it may, however, be found on almost every part of the tree into which the Aphis can pierce with its sucker; and the harm caused by the attack is not only from the quantity of sap drawn away from the bark or young shoots, is thus set up. The bark is at first not much affected by the punctures, but the woody layers beneath become soft, pulpy and swollen. The cells and fibres divide and subdivide, and the bark splits open over the swelling, showing the tissue beneath, which is thus exposed for a fresh attack.

Fig. 42.



Winged Woolly Aphis, magnified; larvæ much magnified. Apple twig, with the same larvæ nat. size at the lower part of the infested spot.

but also from the diseased growth which is thus set up. The bark is at first not much affected by the punctures, but the woody layers beneath become soft, pulpy and swollen. The cells and fibres divide and subdivide, and the bark splits open over the swelling, showing the tissue beneath, which is thus exposed for a fresh attack.

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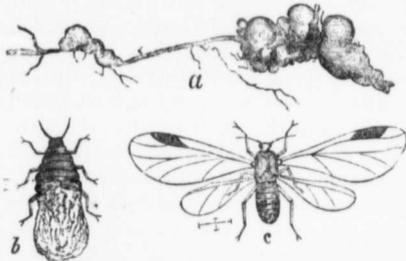
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"At the end of summer these watery, swollen growths dry up and die, and thus form deep cracks. With the return of spring (as in other cases of injury) a new growth forms round the dead part, and this soft tissue is ready for the young Aphides. Thus, from the swollen diseased growth partly caused by the Aphides, partly by the natural attempts of the tree to repair damage, a constantly increasing diseased mass arises, which shelters the insects in its crevices and finds food for them in its young hypertrophied formations."

In America, on the other hand, this minute insect works under ground, and produces upon the roots swellings and excrescences of all sorts of shapes and sizes. These materially

Fig. 43.



*a*, The swellings on the root; *b*, the larva, with the woolly matter attached to its back; *c*, the perfect winged insect.

interfere with the tree's supply of nourishment, and when very numerous occasion its death, especially if the tree be very young. In Canada we are not aware that this insect has been ever observed, though a similar cotton-covered insect is very common on the branches of the alder, nor does it prevail in the more northerly parts of the Northern States, but further south, especially in Southern Illinois and in Pennsylvania, it has been regarded as one of the worst enemies against which the apple trees have to contend. In 1848 it was found to be so abundant on the roots of nursery trees in Chester County, in the latter State, that thousands of young trees had to be thrown away. In the Eastern States it has frequently been found upon the branches of trees above ground, while working at the same time beneath the soil, and on the continent of Europe it has occasionally been found under ground, producing the same swellings upon the root as in America. It is evident, then, that the habits of the insect are governed by the nature of the climate and the character of the soil.

This insect, to quote Miss Ormerod's Manual, "may be known at a glance from the common Apple Aphid (*Aphis mali*), which is injurious to the leaves, by the white wool with which it is more or less covered, and from which it takes its name of 'Woolly Aphid,' and an examination of the wings through a magnifying-glass will show that they are differently veined. A strong vein runs down the fore wing near the front edge, and from this three veins turn off towards the hinder edge. The third of these veins from the body has only one fork in the American Blight or Woolly Aphid. By this the *Schizoneurinae*, to which division it belongs, are distinguished from the *Aphidinae*, which have two forks to this vein (as in the Hop Aphid); from the *Pemphiginae*, which have this third vein without a fork (as in Lettuce Aphid); and from *Chermisinae*, in which this third vein is absent (as in Larch Aphid and Spruce Aphid). This difference in the veins of the fore wings is one clear distinction between the above-mentioned four tribes, of which the great family of *Aphididae* (which includes all the various kinds commonly known as *Aphides*) are composed.

"The Woolly Aphides are without honey-tubes, and underneath the wool are mostly of a yellowish, reddish, or reddish plum-colour. The winged specimens are described as pitchy between the wings, and green, or with the abdomen of a chocolate-brown. The wingless females may be found packed closely together in the cottony masses, with the pale reddish young moving about amongst them. Winged specimens may be found in July and August."

When attacking the roots, the easiest mode of getting rid of this insect is to drench the infested locality with very hot water, which, though hot enough to destroy the life of the insect, is not injurious to the vegetable organization. In the case of young trees that are being transplanted the pest may be got rid of by dipping the roots in strong soap-suds or tobacco water.

When, however, as in England, the insect affects the branches, "its great harbouring points and the nooks from which the broods come forth in spring and infest the trees, are crevices, especially such as are formed of young bark sheltered under old dead masses. It is, therefore, very important to keep up a clean, healthy, well-trimmed state of the branches, such as will not allow of lurking places, or, if they do exist, will allow of these

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points of attack being carefully watched. Boughs must be removed in pruning sometimes, and where the Woolly Aphis exists it is certain to try and effect a lodgment under the ring of young bark that grows forward over the stump, but an eye to this matter and a few strong soap-suds brushed on the first bit of wool seen will keep all right. For the same reason the bark should be kept clear of lichens and moss, which form excellent lurking places for the Aphides. In fact, a clean, healthy bark, with a proper allowance of air, light and drainage, is the best of all means of prevention.

"With regard to remedies:—The colonies of insects remain in one place, and soon die if their food is cut off or their breathing pores choked; so that anything which will give such a taint to their harbouring places that they cannot feed, will do good. Soft soap, tar, or in fact anything oily, greasy or sticky that can be well rubbed on, and which by adhering for a time will choke all the Aphides that it touches, will be of use. In the case of an orchard so badly infested that the owner had begun to clear the trees, an application of coal-tar, well rubbed into the infested spots with a hard brush, was tried and succeeded well. The trees were cured of the attack and became healthy. Another observer mentions that his trees on which this was tried were injured and some killed. Probably this different result was from the state of the trees. An application that would be perfectly safe on the blight-tumours of old trees, would be very injurious on young bark that was still living and in an active state."

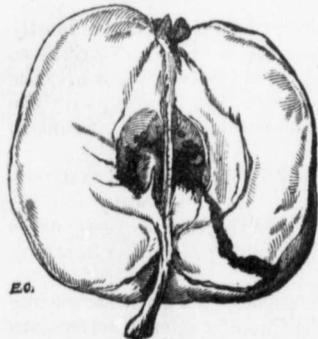
## 2.—THE CODLING MOTH—*Carpocapsa pomonella*.

While the English fruit-growers complain of the "American Blight" sent from this side of the Atlantic, we have a much more serious charge against them for sending to us the very destructive "Codling Moth." It is satisfactory to find that this nuisance has not been so injurious during the last few years in Canada as in some previous seasons—though it is always more or less prevalent throughout the country—and that its absence was particularly noteworthy in England during 1880.

It is not necessary to enter into any detailed account of this insect, as it must be perfectly well known to all our readers, and has been described in our Reports for 1870, 1871 and 1874. I would particularly refer the reader to Mr. Saunders' admirable account of the insect, and the best modes of getting rid of it, in the Report for 1874. As a fresh description, however, is interesting, I shall briefly quote Miss Ormerod's account of the insect:

"The caterpillar of this moth causes what are called 'worm-eaten' apples, which, falling a little before they are ripe, may be known by having a small discoloured spot with a hole in it on the lower side; from this a gnawed passage leads to the middle of the apple, which is commonly nearly filled with dirt.

"The method of attack consists in the moth (when the young apples are beginning to form in the early summer) laying one egg in each fruit, usually in the eye of the apple; from this the caterpillar or maggot hatches, and gnaws its way downwards, taking a direction so as not to hurt the core.



Apple injured by caterpillar of Codling Moth.

"The caterpillar is about half an inch long, and slightly hairy; whitish, with a brown or black head and dark markings on the next ring, and about eight dots on the others; the food-canal shows as a dark line along the back. As it grows it continues its gallery towards the stem, or the lower side of the apple, where it makes an opening through the rind, and thus is able to throw out the pellets of dirt which could not be got rid of by forcing them upwards through its small entrance-burrow. After this opening is made, it turns back to the middle of the apple, and when nearly full grown pierces the core and feeds only on the pips; and as a result of this injury the apple falls. After this the caterpillar leaves the fruit, crawls up a tree, and, when it has found a convenient

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crevice in the bark, gnaws a little more of it away so as to form a small chamber, where it spins a white web over itself.

"Here in some cases (according to German observations) it turns to the chrysalis immediately, from which the moth comes out in a few days to begin a new attack on the fruit; or (as recorded in this country) it lives still as a caterpillar for several weeks, and then changes to the chrysalis, in which state it usually passes the winter; and from this the moth comes out in the following June.

"The moth is about three-quarters of an inch in the spread of the fore wings. These have a light grey or ashy brown ground, with delicate streaks, and broader markings of a dark tint, giving a kind of damasked appearance; and at the hinder corner is a large spot of a brownish red or gold-colour, with paler markings on it, and a border of coppery or golden colour around it. The hinder wings are blackish."

The following mode of dealing with this pest is so practical, and has been found so serviceable, that I cannot forbear quoting it for the benefit of those readers who have not the opportunity of referring to the Reports for former years. It is taken from Mr. Saunders' paper on the Codling Moth in the Report for 1874:—

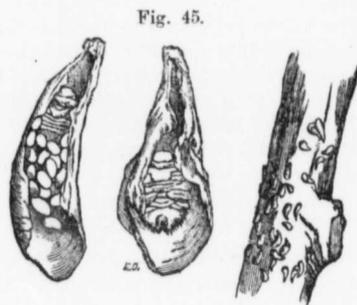
"While all other available means tending to the lessening of the numbers of the Codling Moth worms should be unhesitatingly employed, the chief reliance should be placed on the bandages; use strips of cloth—old carpet or sacking where these can be had—but if these materials are not readily procurable, use paper or cotton. Bandages should be from four to eight inches wide, and either fastened with a string or with a tack at the end, and will be all the better if long enough to go twice around the tree; they should be fastened about half-way up the trunk of the tree some time during the latter part of June, and be examined every ten days from the first of July until the last of August, and at least once after the crop is secured. Care must be taken in unwinding the bandages to prevent the worms from escaping by dropping to the ground, which they readily do when the cocoons are thus torn asunder. A common clothes wringer to pass the bandages through, is one of the readiest and surest methods of destroying the worms, and in this way the bandages can be rapidly handled and re-applied. Be careful and scrape the rough bark off the trees, so that the worms may not find suitable hiding places either in descending or ascending the trunk until they reach the bandage. Attend to these instructions regularly and thoroughly, and try and induce all your neighbours to follow your example, and rest assured that good results will attend united effort."

### 3.—THE OYSTER-SHELL BARK LOUSE.

This well-known insect is the only other one common to the two countries—except the familiar Apple Aphis (*A. mali*)—which affects the apple to any conspicuous extent. In England it is usually called the "Mussel-Scale;" with us it is familiarly known as the "Oyster-Shell Bark Louse." It has long been termed scientifically *Aspidiotus conchiformis*, Curtis, but is now, in consequence of fuller knowledge of the subject, described under different generic and specific names, as *Mytilaspis pomicorticis*, Riley (see his 5th Report, 1873, pages 91-96).

In our Reports for 1870 and 1871 we gave some account of this insect, but have not referred to it since; some description of it, therefore, familiar though it may be, will probably be of interest. The common names of the insect, both English and American, are derived from the shape of the scales produced by the creature, and which may be found adhering in enormous numbers to the bark of neglected apple trees. "The scales are about an eighth of an inch long, dark brown, slightly curved and rounded at one end, much smaller and of a rusty colour at the other, and wrinkled across. They adhere firmly to the bark, and on lifting full-grown specimens the females will be found inside the smaller end of the scale (sheltered by it, not fastened to it), the larger end of the scale being filled with fifty or more white oval-shaped eggs. The young scale-insects that hatch from these eggs are very small, flat, and white, furnished with eyes, horns, six legs, and a sucker. These run about with great activity for a few days, but after a while fix themselves and begin to grow, and gradually change in appearance and turn to pupæ.

The female resembles a fat fleshy maggot, of a greenish colour, globular, somewhat flattened, and with lines across showing a division into rings, but without articulated limbs; after depositing her eggs she dies, and may be found shrivelled inside the scale."



Apple scale; with female; female and eggs, magnified.

Fig. 46.



Infested twig.

Up to 1873 the male insect had not been discovered, but in June and July of that year Mr. Riley reared a number from scales, and thus describes them: "The wings appear whitish, and under a high magnifying power are seen to be covered with infinitesimally small hooks or bristles. The general colour of the body is pale purplish-brown—not unlike the colour of the shield which protected him,—and like other gentry of his family, he has no proboscis (having lost it when shedding the larval skin), but near the place where it naturally would be are a couple of ocular tubercles, which give him the appearance of having four eyes—two above and two below. The hind wings are replaced by two fusiform balancers, which terminate in a long, delicate hook, and which hold and give strength to the front wings, which are spatulate in form and traversed with but two veins. Frail and delicate as these little beings appear, they are yet possessed of wonderful nerve-force and wing-power; for the few days of life allotted to them are days of great activity, and in the breeding-jar they keep up an almost constant wing-vibration, and are never at rest except when the temperature is unusually low."

As regards prevention and remedies for this insect, Miss Ormerod mentions, among other plans, that "Scale may be removed at any time of the year, but the best season for destroying it or applying dressings is in spring, so as to clear it away before the young insects—which creep out in May from under the old dead shells—have appeared, to begin the new attack. It may be removed by thoroughly moistening the surface of the infested bark with lathers of any kind of soap (or any dressing that may be preferred), and then scraping the surface with a blunt knife, or rubbing it with pieces of coarse canvas, or well brushing it, so as to clear off the scale without hurting the bark. Scraping with a blunt knife is a good plan, as in this way the scales, moss, and everything on the surface are mixed up in a plaster with the soapy lather and got thoroughly rid of together. If brushing is preferred, good drenchings of soap and water, or of dressings poisonous to the scale, should be given in addition to the first thorough moistening, so as to wash down or kill all that may have only been disturbed or be lodged in crevices. Soft soap or common coarse household soap are useful for this purpose."

Mr. Riley gives the following advice on the subject:—"The importance of critical examination, before planting, of all young trees and scions, or of applying some simple remedy when the young lice are hatching, cannot be too strongly urged; and, as a rule which will hold very generally true, it may be stated that the young begin to hatch just about the time the blossom falls and the fruit begins to set. Let those who prefer to work toward eradicating the pest in winter-time (as many no doubt will, on account of

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the leafless state of the trees and the greater leisure which most fruit-growers have at that season), vigorously prune and scrape the infested trees, and afterwards apply some of the oily applications usually recommended. As a remedy not previously named, I would mention linseed-oil, which has been used with marked and beneficial results. Many persons have been deterred from using greasy or oily substances on their trees from a fear of evil consequences resulting to the trees; but there is nothing more certain than that judiciously applied in early spring, after the sap begins to flow, these applications do not injure trees, while they are effectual, more especially when applied at such season or during thawing weather, in killing the eggs under the scales, the oily particles being absorbed through and under the scales and destroying the eggs as soon as touched." Crude petroleum I have known to be employed with excellent effect, but of course care must be taken not to apply it to tender shoots or young branches.

#### 4.—THE GOOSEBERRY AND CURRANT SAWFLY—*Nematus ribesii*, Curtis.

This is another very familiar pest on both sides of the Atlantic, and is only too well known to gardeners, both here in and in England, from the havoc its caterpillars cause every year to the leaves of currant and gooseberry bushes. It has been fully described in our Reports for 1871, 1874 and 1875, by Mr. Saunders.

Fig. 47.



A leaf with eggs on the under side.

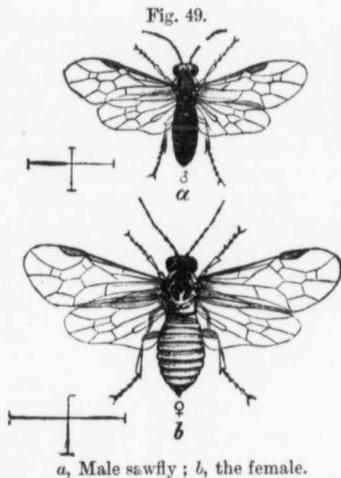
Fig. 48.



Caterpillars of the Sawfly.

The parent sawflies appear, in this country, about the end of April or beginning of May, and lay their eggs on the under side of the leaves of the currant and gooseberry almost immediately after they expand in the spring. The eggs are deposited in rows, usually along the mid-rib and larger ribs or veins of the leaf, as shown in the figure above; the female generally selects for the purpose leaves that are low down in the middle of the bush. The larvæ hatch out in about a week, and begin at once to feed by eating small round holes in the softer parts of the leaf; as many as sixty or seventy have sometimes been found on a single leaf. The attack of the caterpillars may be discovered at once by the appearance of a number of small holes eaten through the leaves. Each brood feeds on the leaf on which it was hatched until it is completely stripped of all that is eatable, and nothing but the hard ribs remain; the individuals then scatter over the bush, half a dozen or more being found on a single leaf, and in a bad attack soon completely denude the bush of its foliage.

"These grubs," to quote Miss Ormerod, "are of a bluish-green, with black head, feet, tail, and also black spots on each segment, and with a yellowish space just behind



a, Male sawfly; b, the female.

the head and another just before the tail. When full grown, and after changing the skin for the last time, these yellow patches still remain, but they are otherwise of a delicate pale green, with sometimes two little black dots on the head, and are about three-quarters of an inch in length. After the operation of casting the skin they rest awhile, and then crawl down the stem of the bush or drop from a bough, and at once begin to bury themselves. When deep enough, which may be from two to eight inches, according to the nature of the soil, they form a cocoon of a gummy secretion, in which they turn to chrysalids. This takes place in about three weeks during summer; in the case of the late broods the grub remains unchanged in the cocoon during winter, and does not turn to the chrysalis till spring, in time for the gooseberry sawfly to make its appearance as the gooseberry and currant bushes are coming into leaf.

"The sawfly is of the shape figured above, and of the length marked by the straight lines; the head and body between the wings are ochre-colour or yellow, variously marked with black; abdomen yellow or orange; legs yellow, with brown or black tips to the feet and hinder shanks; horns brown or black. The four wings are transparent and iridescent.

"An excellent and effectual method of preventing attack in the coming season is to remove the soil from beneath the bushes to the depth of a few inches early in spring, and give a good sprinkling of lime; by this means the caterpillars which winter in the ground are completely cleared away. A slightly different method, but thoroughly successful, is to remove the surface soil below the bushes in winter, dig a deep hole, and bury the whole of the removed soil, cocoons and all (so deeply as to ensure having no further mischief from them), and replace the earth removed with manure and the soil dug from the hole.

"This complete removal of the soil with the cocoons is quite worth while wherever the gooseberry caterpillar is prevalent, and a layer of unslacked lime, well mixed with the soil as deep as the cocoons are, would be highly beneficial in case of the surface-soil not being removed. Gas-lime also would be of service, well sprinkled on the surface, if fresh, or lightly pricked into the surface-soil beneath the bushes after it had been aired for a few weeks, taking care not to lay it against the stem.

"When the caterpillars appear on the bushes, it is of great importance to attend to them at once; whilst still very young two or three dozen may be found on one leaf and got rid of together, which in a few days would have spread themselves over the bush. This early stage of attack may be known by the leaves appearing as if riddled with dust-shot. At a later stage thorough hand-picking, or shaking the bushes so as to make the caterpillar fall, is of service. If the caterpillars are allowed to drop on the ground, they should be crushed with the foot, or with the back of the spade; but a surer plan, with little more trouble, is to spread cloths or put some tarred boards under the trees, and thus collect and kill them."

The plan of removing the surface-soil from beneath the bushes, which is new to us, has been adopted with great success during the last twenty years (Miss Ormerod records in her Report for 1880) at Oxenford Castle. The soil is annually removed in winter, a deep hole is dug in some part of the garden, and in this the removed soil, with whatever may be in it, is buried. The soil under the bushes is replaced by that out of the hole, with the addition of some manure. It is important that the hole should be *deep*, as if there was only a light covering many of the larvæ and pupæ would not be the worse for being moved, and would emerge in the spring to inflict as much damage as usual.

In this country we have no doubt that our small-fruit-growers will adhere to the use of powdered white hellebore, which has proved so effective in the past, is so easy to apply, and from the use of which no evil consequences have ever resulted to our knowledge.

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5.—THE PEAR-TREE SLUG-WORM.—*Selandria cerasi*, Curtis.

In 1874, as Mr. Saunders relates in his very complete account of this insect in our Report for that year, the slug-worms were unusually abundant on pear-trees in the neighbourhood of London, Ontario, in many cases destroying the foliage so thoroughly, that "they looked as if they had been scorched by a fire, every leaf in some instances dropping from the trees, so that for a time they were as bare as in mid-winter." Such a visitation, happily, is not common; still these disgusting creatures are usually to be found more or less every year on our pear and cherry trees. In Scotland, in 1880, they appear to have been numerous and destructive both at Dalkeith and Dumfries.

Fig. 50.



A leaf attacked by slug-worms.  
a, Magnified specimen.

The slug-worms feed on the upper surface of the leaves of the pear and cherry, eating away the whole of the soft substance of the leaf, so that the veins and the skin of the lower side are all that remain. They may be recognized, when at their work of destruction, by their blackish or bottle-green colour, together with their peculiar shape, and the covering of slime or moisture exuding from their skin, which gives the worms the appearance of a slug, or rather that of a lump of wet black dirt fallen on the leaf and run together at one end. They may be at once recognized also, when very numerous, by their disgusting and sickening smell.

Miss Ormerod relates that, in England, "the sawflies appear in July, and deposit their eggs on or in the upper side of the leaf; these eggs are oval, and hatch in a few days. The larvæ are of the lumpy shape figured above, much the largest at the back of the head; they are furnished with ten pairs of feet—that is, one pair on each of the three segments next to the head, and a pair of sucker-feet on each of the other segments, excepting on the fourth from the head and the tail segment, which are footless. When feeding, they keep the end of the tail a little turned up. In four or five weeks these slug-worms arrive at their full growth, which is about half an inch in length, cast their dark bottle-green skins, and appear as yellow or buff caterpillars, free from all shine, and transversely wrinkled, instead of being perfectly smooth. In the instance noted this happened at the beginning of October, and the caterpillars shortly after left the leaves and went down into the ground, where they spun an oval brown silken cocoon covered outside with earth, from which the sawflies came up in July in the following year. The female fly is of a shining black, tinged with violet; the wings often stained with black, with dark nerves, and a dark brown mark (the stigma) along the fore edge. The four anterior legs are brownish ochre, and the others are more or less of that colour, but generally much darker; and the thighs, or at least the base, are pitch colour."

In Canada these saw flies are double-brooded. The winged flies appear in May; the eggs are deposited singly in little slits cut for them in the skin of the leaf by the ovipositor of the female, and these produce a brood, coming out in the perfect state in July; from which a second brood arises, which is full grown in September or October. These remain in the ground during the winter, and for the most part appear (as above mentioned) fully developed in the following May; but some remain in the ground unchanged till the following year.

As a prevention, Miss Ormerod recommends the same plan as in the case of the gooseberry saw fly, viz., to skim off the surface soil beneath the infested trees, and get rid of it so as to destroy the contents. The cocoons are stated to be at a depth of from one to three or four inches below the surface, according to the nature of the soil. She suggests as remedies, (1) Shaking the flies down from the trees early in the morning or late in the evening (or at whatever time it was found they were collected on the leafage), and catching them on boards covered with wet tar, or cloths, taking care that they were destroyed before they could escape; (2) Dusting with caustic lime two or three times; (3) Syringing with tobacco water, strong soapsuds, etc.; and (4) Showering the trees with a solution of hellebore.

A most effective plan for getting rid of the pest is thus described by W. Saunders (Report for 1874):

"On the 29th of July, when going through the orchards in the afternoon, the new brood of flies were found in the greatest abundance, resting on the young leaves, or on those portions of green which still remained on the leaves partially eaten by the last brood; they were congregated, however, more especially on those trees where green leaves were most abundant. On disturbing them they would fall to the ground with the antennæ bent under their bodies, and the head bent forward. On half a dozen trees were caught about 60 specimens, and might have taken hundreds, they were so thickly spread that in many instances there were two and three on a single leaf. By the last week in August, the second brood of slugs were hatched; some very tiny creatures, others by this time half grown. Now, those trees which had previously escaped were all more or less covered, and would no doubt soon have been stripped, had not some measures been at once taken to destroy them. A raised platform was rigged up in a one horse cart in which was placed a barrel of water in which a pound of powdered hellebore had been mixed, and from the elevated stand this mixture was showered lightly on the trees from the rose of a watering-pot. It was astonishing how quickly the trees were cleaned, scarcely one could be found on a tree the morning after the application had been made, and ten pounds of hellebore with five or six days work of man and horse served to go over the whole ground, the work being completed in much less time than we had supposed it could."

With the exception of some species of Aphis, or Plant Lice, which affect many kinds of trees, the foregoing are the only species of insects attacking fruit trees that appear to be common to this country and England. There are, however, some species very similar to well-known pests here that cause trouble and anxiety to the old country gardener. Among these we may mention

#### 6. THE LACKEY MOTH—*Clisiocampa neustria*, Curtis,

which is very closely allied in appearance and habits to our familiar "Tent Caterpillars" (*Clisiocampa Americana* and *Sylvatica*), as may be learnt from the following description, which would almost answer for our own species:—

"The caterpillars of the Lackey Moth are injurious to oak, elm, birch, etc, but are especially pests when they attack the apple. The eggs are to be found in winter and spring, laid on naked twigs, in compact spirally-arranged rings about half an inch long. From these eggs small black hairy caterpillars hatch about the beginning of May, and immediately spin a web over themselves, which they enlarge from time to time as needed for their accommodation. In these webs they live in companies of from fifty to two hundred, and from them the caterpillars go out to feed on the leaves, returning for shelter in wet weather or at night. When alarmed, they all let themselves down by threads, either to the ground, or else, after hanging in the air till the alarm is past, they go up again by their threads to the tree.

"When full fed, which is about midsummer, they are an inch and a-half in length, and hairy; of a bluish-grey colour, marked with two black eye-like spots on the head, two black spots with a scarlet space between them on the next ring, and three scarlet stripes on each side and a white one on the back, all bordered with black along the rest of the caterpillar. At this stage the caterpillars no longer live in companies, but each finds some sheltered spot, between leaves, in hedges, beneath the bars of railings, under roofs of sheds, or even on the tops of walls, where it spins a sulphur-coloured silken cocoon, mixed with sulphur-coloured powder and with hairs from the skin woven into it, from which the moths hatch in July.

"The moths are variable in colouring, mostly with rusty-fox or ochrey markings, but some have the fore wings of a red-brown, with two pale ochreous streaks; others yellowish, with dark brown bars; and others are variously tinted: the hinder wings are reddish-brown. It is stated that the moths, and especially the females, seldom fly, but remain concealed by day under leaves and in long grass, and come out at night.

"The caterpillars seldom do the enormous quantity of mischief with us in England

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that they are noted as causing in France, where, according to the old law, it was compulsory on proprietors to have the webs on the shoots cut off with shears and destroyed, in consequence of the ravages of the caterpillars (if left unchecked), ruining the apple leafage over an extent of miles of country."

7. THE MAGPIE MOTH OF THE GOOSEBERRY—*Abraxas grossulariata*, Stephens,

is another English insect that may be mentioned on account of its resemblance in its caterpillar state to our Geometer Currant and Gooseberry worm (*Abraxas ribearia*, Fitch), represented in the annexed wood-cut, which will almost serve for its English relative, though the moths are totally different in their markings.

Fig. 51.



1 and 2, Caterpillars; 3, chrysalis of *Abraxas ribearia*.

Fig 52.



Moth of *Abraxas ribearia*.

The English insect—the Magpie Moth—is thus described:—"The caterpillars of this Moth are not so injurious as those of the Gooseberry Sawfly, but they occasionally occur in sufficient numbers to strip the bushes of their leaves. They frequent the Gooseberry and the Black and Red Currant, and also the Common Sloe, or Blackthorn. The egg—one or more—is laid on the leaves towards the end of summer; the caterpillars hatch in September, and feed for a short time; and then either fall to the ground with the fall of the leaves in autumn, and remain sheltered amongst them for the winter, or they spin the edges of a leaf together, which they have previously fastened by threads to the bough, and inside this protection remain until the return of spring. When the new leafage unfolds, the caterpillars come out and feed till May or the beginning of June, when they change to chrysalids. The caterpillar is one of the kind known as "loopers," from the peculiar looped shape it draws itself up into when alarmed (see fig.); the head is black; body cream-coloured, with a reddish-orange stripe along the sides; the whole of the second ring, and the under side of the third and fourth, and of the four nearest the tail, are also reddish-orange. A row of large irregular black spots runs along the middle of the back. When full fed it spins a light transparent cocoon attached to twigs, or palings, or in crevices of walls; and in this it changes to a chrysalis, yellow at first, but afterwards shining black, with orange-coloured rings.

"The Moth is very variable in appearance; commonly it has a black head, yellow body between the wings, with a large black spot in the middle; the abdomen also yellow,

with five rows of black spots. The wings are white, spotted with black, and the forewings have a yellow blotch at the base and a yellow band across them. There are, however, almost endless varieties of markings, from black of different shades, to white; some have the upper half of the wing white and the lower black, or the reverse; some have the ground colour of the wing (instead of merely a band) yellow; and in some cases the hinder wings are striped with black. The Moths appear about midsummer or rather later."

#### 8. THE WINTER MOTH—*Cheimatobia brumata*, Stephens.

This insect resembles very much our species of canker worms (*Anisopteryx vernata* and *Pometaria*), which have been described by Mr. Saunders in the Report for 1875:

"The caterpillars of this moth are injurious to almost all fruit and forest trees. They feed on the young buds and leaves of the plum, apple, pear, elm, lime, willow, hawthorn, and many others, and occur at times in such great numbers as to cause a very serious amount of damage. The moths (known as "Winter Moths," from the season of their appearance), come out about the end of October. During November and December the females, which have only abortive wings, creep up the trees and lay their eggs on the leaf or flower buds, on the twigs, or in crevices of the bark.

"The eggs are greenish at first, and gradually change to brown or red. They are very minute, and very numerous (a single moth laying as many as two hundred), and they hatch about the beginning of April. The newly-hatched caterpillars are only about as thick as a horse-hair, greyish in colour, and may be seen swinging in the air at the end of their threads; when full-grown they are half an inch long, of a yellowish-green, with pale green head, black or blue line down the middle of the back, and whitish lines on each side. When walking they form a kind of upright loop, whence the name "Looper caterpillars." They feed first on the young unopened buds, and, as the leaves expand, they draw two or three together with their webs, and shelter themselves within when not feeding. When full-fed, towards the end of May (by which time they have often caused great damage), they let themselves down by a thread to the ground, bury themselves, and turn to chrysalids about two or three inches below the surface, from which the moths come up towards the end of October.

"The male moths have the fore wings of an ash-grey, with various transverse markings, and the hind wings of a greyish-white. The females have a most extraordinary appearance, from the great size of the abdomen and the small size of the abortive wings; they have no powers of flight, but fall down as if dead when alarmed, or run with some speed to hide themselves. In November the males may be seen, after sunset, flying from tree to tree, and the females creeping up the stems to deposit their eggs."

The same method of prevention is recommended in England as in this country, viz.: to encircle the trunk of the tree with some obstacle which the female cannot pass, and so prevent it from depositing its eggs upon the foliage.

#### 9. THE GREEN ROSE CHAFER—*Cetonia Aurata*, Curtis.

This is the only other English insect injurious to fruit that remains to be mentioned, as it resembles in its habits our common May-beetle, or "June-bug" (*Lachnosterna fusca*), which often grievously injures the roots of strawberry-plants in its larval state, when it is familiarly known as the "White Grub." Both belong to the Scarabaeidae, or Digger family of beetles, described by Mr. Fletcher in the Report for 1879.

Miss Omerod thus describes the English insect:

"This chafer is injurious both in the larval and perfect state. In the first—that is, as a grub—it feeds on the roots of strawberries, grass, and other plants; as a beetle it frequents many kind of flowers, including the rose, from which it takes one of its names; but is more especially injurious by its attacks on strawberry-blossoms, and to the flowers of turnips left for seed, where it eats off the anthers from the stamens and thus renders the flowers abortive."

"The eggs are laid in the ground, where the maggots hatch and feed for two or three years. When full-grown they are upwards of an inch and a half in length, thick and

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fleshy, of a whitish colour, with an ochreous head armed with strong jaws; the pairs of short feet are of a rusty ochreous colour, and the hinder portion of the grub or maggot is enlarged, curved towards the head, and of a lead colour. These grubs are much like those of the cockchafer, but are distinguished by having a horny rusty spot on each side of the segment behind the head, and by the body being clothed with transverse rows of rusty-coloured hairs; whereas the grub of the cockchafer is almost hairless, and is without the rusty spots.

"When full-fed they make earth-cases 'as large as a walnut,' at a considerable depth beneath the surface, which are smooth inside, but covered outside with pellets of soil which have passed through their own bodies; and in these cocoons they turn to ochre-coloured pupæ.

"The Chafers, which sometimes appear as early as the beginning of May, are of a rich metallic golden-green above, with white or ochreous spots or streaks looking like cracks running across the bright green of the wing-cases; beneath they are coppery, with a rose-coloured tint. The horns are much like those of the cockchafer, excepting that the club is formed of only three leaves. Beneath the wing-cases are large brown membranous wings, by means of which, when they have finished whatever is eatable in one place, they can fly with ease to another; it may be a strawberry-bed, or may be field of turnips in blossom; and thus, if the weather is fine, they continue to attack whatever may attract them throughout the summer; in wet weather they die earlier in the season."

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