

TWENTY-THIRD ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY
OF
ONTARIO
1892.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.



TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST.
1893.

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TWENTY-THIRD ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO

To the Honorable the Minister of Agriculture :

SIR,—I have the honor to present herewith the annual report of our Society for its twenty-third year under the auspices of the Department of Agriculture of Ontario.

The report contains an account of the proceedings at our annual meeting, which was held in London on the 31st of August and the 1st of September, 1892—including the election of officers for the ensuing year, the reports of the Council, the Treasurer, the Librarian and Curator, the Montreal branch and the various Sections of the Society, the President's annual address and the various papers read at the meeting.

The President's address will be found to contain references to all the principal insect attacks of the year. Most of these were, happily, not very formidable, but we regard the arrival from the United States of the Horn-fly pest, during the past season, as a very serious matter. In addition, therefore, to the President's remarks upon it, an illustrated account of its life-history and the best methods of dealing with it has been specially prepared for the report by Mr. Fletcher. Other papers of a practical and more or less popular character are also presented herewith, and will, it is trusted, be found interesting and useful to the general reader.

Our monthly magazine, the *Canadian Entomologist*, has been regularly issued during the past year, and has now almost completed its twenty-fourth volume. A larger number of writers than ever before have contributed to its pages, and its high scientific character has been ably maintained.

I have the honor to be, Sir,
Your obedient servant,

W. E. SAUNDERS,
Secretary.

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London, Ontario
August 30th,

ANNUAL MEETING OF THE SOCIETY.

The thirtieth annual meeting of the Entomological Society of Ontario was held in its rooms in Victoria Hall, London, on Wednesday, August 31st, and Thursday, September 1st, 1892, the President, Rev. C. J. S. Bethune, Port Hope, occupying the chair.

A Council meeting was held on Wednesday morning at 10 o'clock, at which their annual report was drawn up, and various matters of business pertaining to the society were transacted.

At 3 p.m. a general meeting of the Society was held. Letters of regret for their inability to attend were read from Messrs. H. H. Lyman, Montreal; A. H. Kilman, Ridgeway; J. D. Evans, Sudbury; Gamble Geddes, Toronto. A letter was read by Mr. Moffat from Mr. F. G. Buckell, of London, England, upon the expansion of the wings of Lepidoptera with reference to Mr. Moffat's paper upon this subject in the annual report for 1891, p. 32. A letter was also submitted by Mr. Harrington from the Rev. G. W. Taylor, of Victoria, Vancouver Island, stating that Aphides of all kinds had been extremely abundant during the present season, but that they had been very much parasitized by Hymenoptera.

REPORT OF THE TREASURER.

The Treasurer, Mr. J. M. Denton, presented his annual statement of the finances of the Society and explained the various items of receipts and expenditure. He stated that the balance on hand, \$319.13, was somewhat larger than usual, but it would all be required to meet the expenses of the remaining four months of the year, during which there was very little income to be expected.

RECEIPTS, 1891-92.	EXPENDITURE, 1891-92.
Balance from last year..... \$ 239 93	Printing <i>Canadian Entomologist</i> , etc.... \$ 509 77
Membership fees..... 335 22	Report and meeting expenses..... 226 12
Sales of <i>Canadian Entomologist</i> 99 44	Library..... 44 25
“ Pins, Cork, etc..... 47 18	Purchase of collection..... 50 00
Government grant..... 1,000 00	Expense account (postage, stationery, etc.) 107 54
Interest on current account..... 3 55	Rent and fuel..... 116 00
\$1,725 32	Insurance..... 35 00
	Pins, cork, etc..... 17 51
	Salaries of officers..... 300 00
	Balance..... 319 13
	\$1,725 32

Audited and found correct,

London, Ontario,
August 30th, 1892.

(Signed.)

W. E. SAUNDERS, }
JAS. H. BOWMAN, } Auditors.

REPORT OF THE LIBRARIAN AND CURATOR.

Mr. J. A. Moffat presented and read his report as follows :

The number of volumes added to the library during the year is 46, made up thus: Periodicals and reports of Societies received in exchange, which have been bound since last report, 37. Bound volumes which have been received as gifts from various public institutions, 8. By purchase, 1. The whole number on the register is now 1,214.

The number of volumes issued to local members during the year was 55.

The Society's collection of native Lepidoptera has received several valuable additions by gift, exchange and capture. This department now numbers 935 species and varieties, mostly taken in Ontario.

The Toronto list of 1883 contained 930 names, many of which were not then, and some of them not yet represented in the Society's drawers. Six or seven years ago when I first turned my attention to the micros there were not a hundred names of these in all our lists, now there are representatives of two hundred and twenty-four species in the Society's drawers, and a quantity of unnamed material on hand besides. It is quite evident that our field in Ontario is not half worked, whilst some of those that are engaged in it fail to make their success known.

The arrangement of the European beetles has been completed, and they occupy fourteen drawers, numbering 952 species. There is a large number of duplicates for disposal; some of them are very attractive specimens.

Respectfully submitted,

(Signed.)

J. ALSTON MOFFAT,

Librarian and Curator.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

BY THE REV. C. J. S. BETHUNE, D.C.L., DELEGATE.

On behalf of the Entomological Society of Ontario I have the honor to report that it continues to prosper and to perform much useful work. During the past year the ordinary membership was well maintained, while the number of associate members (who are not resident in Canada) was largely increased.

The *Canadian Entomologist*, the monthly publication of the Society, continues to attract contributions from all the leading Entomologists of North America, and to maintain its well established reputation. The 23rd volume was completed in December last, and consisted of 292 pages, instead of the usual 240. Its contributors numbered fifty-one, of whom fourteen were residents of Canada; thirty-five, of the United States; one, of England; and one, of Germany. No less than sixty-one new species of insects were described in its pages, and the life histories of twenty-one species were recounted. Among the more important papers, besides those of a descriptive character, may be mentioned, "Notes on Canadian Rhyncophora," by W. H. Harrington; "The Position of *Limenitis Proserpina*," by W. H. Edwards; "Notes on Coleoptera," by Dr. J. Hamilton; "Silver-top in Grass and the Insects which may produce it," by H. Osborn; "Some Indiana Acrididae," by W. S. Blatchley; "North American Chernetidae," and "The Dysderidae of the United States," by Nathan Banks; "Some Destructive Locusts of North America," by Lawrence Bruner; "A Catalogue of the Thysanoura of North America," by A. D. Macgillivray; and the official report of the meeting in Washington of the Entomological Club of the American Association for the Advancement of Science.

Five numbers of the 24th volume have been issued during the current year, each of them with an increased number of pages; fifty-nine new species of insects have already been described, and several papers of more than ordinary value and interest have been published.

In addition to the meeting of the Legislature of Montreal in January last.

The President of the Montreal Branch reported on insect attacks by a moth (*Tmetoblique-bande vernata* and *pa beetle*), "the injurious insect the following Varieties," by destructive ravages by the Rev. T. *Callosamia pro Insects in En Cricket*," by M. "The Moose F

The various reports were very satisfactory while not large annual report, other species of insects were being there. The account of their doubt as being

The Microscopical exhibitions; the relation of the microscope including the details

The Botanical gardens and have begun rooms of the Society been discovered list.

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The annual meeting of the Society under the presidency

In addition to the monthly magazine, the Society presents an annual report to the Legislature of Ontario. The 22nd was published by the Department of Agriculture in January last. This report for 1891 contains an account of the proceedings at the annual meeting of the Society, the President's annual address and the reports of the officers, the Montreal Branch and the Sections, and the papers read on the occasion.

The President in his address drew the attention of the Society to the most serious insect attacks of the year, and gave an account of the ravages of "the Eye spotted bud moth" (*Tmetocera ocellana*), "the Lesser Apple-Leaf Folder" (*Leras minuta*), "the Oblique-banded Leaf-roller" (*Cacasia rosaceana*), "the Canker-worms" (*Anisopteryx vernata* and *pometaria*), "Cut-worms," the "Pea-weevil" (*Bruchus pisi*), "the turnip flea-beetle," "the Striped Cucumber Beetle" (*Diabrotica vittata*), and other more or less injurious insects. Among the papers published in the annual report may be mentioned the following: "Can Insects Survive Freezing?" and "Pamphila Manitoba and its Varieties," by Mr. H. H. Lyman; "*Nematus Erichsonii*," the Larch Saw-fly, whose destructive ravages among the tamarac swamps of the Province of Quebec are fully related by the Rev. T. W. Fyles; "a Microscopical Examination of an Unexpanded Wing of *Callosamia promethea*," by Mr. J. A. Moffatt; "an Account of some of the Collections of Insects in England and Germany," by Capt. Gamble Geddes; "the Northern Mole Cricket," by Mr. J. Fletcher; "Notes on Japanese Insects," by Mr. W. H. Harrington; "The Moose Fly," by Prof. W. A. Snow.

The various Sections of the Society, which were organized about two years ago, report very satisfactory progress. The Ornithological Section state that their "membership while not large is enthusiastic;" they have prepared a list, which is published in the annual report, of 97 birds known to breed in the county of Middlesex, Ontario, and of 20 other species observed in the same neighborhood and which will probably be found breeding there. The species are distinguished into those which are decidedly beneficial on account of their feeding habits, those which are neutral, and those which are open to doubt as being possibly injurious.

The Microscopical Section have held numerous regular meetings and several popular exhibitions; the subjects to which their attention was chiefly devoted were the manipulation of the microscope and the preparation of objects, and the examination of *algae, fungi*, including the destructive Black-knot on fruit trees, ferns, etc.

The Botanical Section held weekly meetings throughout the greater part of the year, and have begun the formation of a collection of native plants, which is deposited in the rooms of the Society; a floral calendar has been kept; two mosses new to Canada have been discovered, and seventy species of fungi have been added to the North American list.

The members of the Geological Section have held evening meetings every week, at which they applied themselves to the serious and methodical study of the science, and when the season admitted, frequent field-excursions were made for practical work. During these they covered a large area of country and gathered many rare and valuable specimens of fossils.

The formation of these Sections of the Entomological Society for the encouragement of work in other departments of science, has thus been amply justified. The results have been most satisfactory, and the cheerful assistance given by the members of one section to those of another has been most useful. While occupying widely different fields of study they are constantly brought into contact with one another and find the benefit of co-operation as members of one Society, as well as the advantage to be derived from its library and rooms, and complete organization. The result is to make London, the headquarters of the Society, a centre of scientific work for the peninsula of Ontario, and to attract its residents, especially the young, into the delight-giving paths of Natural Science.

The annual report of the Society contains also a full record of the very important meeting of the Association of Economic Entomologists held in Washington in August last under the presidency of our colleague, Mr. James Fletcher, of Ottawa. This Society was

first organized in Toronto in 1889, and has already become a very influential body, including amongst its members all the leading scientists in North America who are engaged in the study of practical Entomology. Its proceedings are accordingly of great scientific value as well as of immense practical value to farmers, gardeners and fruit-growers everywhere. The President, in his opening address, drew special attention to the want of reliable statistics concerning the ravages of destructive insects and the consequent financial loss to the community; a committee was accordingly appointed to prepare a report upon the subject. During the meeting, which occupied two days, a large number of papers on injurious insects were read and discussed, and much useful information was thus brought forward and made public.

While technical investigations in Entomology are by no means neglected, it is evident that our Society is becoming increasingly devoted to practical work, and is thus conferring very great benefits upon the agricultural interests of the country. Every fruit-grower and gardener is obliged to wage unceasing war against the infinite variety of injurious insects, and he can only do so with any hope of success when he has been taught by experienced scientists what methods to adopt and what means to employ. The publications of the Society from year to year set forth the best methods, and furnish instruction as to the best means for carrying on this warfare. The good work thus done will, we trust, be continued with unflagging zeal in the future.

The President gave an account of the meetings held at Rochester, N.Y., during the third week of August, of the Association of Economic Entomologists of North America and the Entomological Club of the American Association for the Advancement of Science, which he and Mr. Fletcher had attended as representatives of the Society.

The Rev. T. W. FYLES read a paper on *Zarca Americana* which he found feeding on the Buck Bean, *Menyanthes trifoliata*. He also read an interesting account of some of the rarer butterflies found in the Province of Quebec. Mr. Fletcher remarked upon the paper and gave some further information regarding the life-history of some of the species referred to.

Mr. FLETCHER then gave an account of a parasite of the Currant-worm. This, he described, as an exceedingly small insect which lives inside the egg of the Saw-fly, from which the Currant-worms hatch. He also mentioned that two species of Mud-daubers (*Pelopæus cementarius* and *cæruleus*) had been bred by him from the same mud nest.

The Rev. T. W. FYLES gave a most interesting account of a visit which he had paid to the home of the late Philip H. Gosse, author of the "Canadian Naturalist," who resided many years ago near Compton, in the Eastern Townships, P.Q.

The meeting adjourned at 5.45 p.m.

EVENING SESSION.

In the evening the Society held a public meeting in its rooms in Victoria Hall which was largely attended by members and other friends from London and the neighborhood, amongst whom the following were noticed: Mr. W. H. Harrington (Vice-President) and Mr. James Fletcher, of Ottawa; Rev. T. W. Fyles, South Quebec; Messrs. J. M. Denton, W. E. Saunders, J. Alston Moffat, J. A. Balkwill, R. W. Rennie, F. W. Hodson, John Weld, W. Stevenson, H. Stevenson, J. H. Bowman, J. Dearness, Dr. Gardiner, Rev. W. M. Rogers, Dr. Woolverton, C. B. Edwards, W. Foot, of London and others.

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THE PRESIDENT'S ANNUAL ADDRESS.

The Rev. Dr. BETHUNE, Warden of Trinity College School, Port Hope, President of the Society, took the chair at 8 o'clock, and proceeded to deliver his annual address, as follows :

GENTLEMEN : The pleasant duty once more devolves upon me of welcoming you all to our annual meeting. It is with great gratification that I do so, inasmuch as all goes well with our Society, and the reports of the council and officers, and also of the sections, record a steady progress and a continued prosperity. It is now thirty years since Mr. Saunders and I issued a circular to the collectors of insects in Canada, who were at that time very few indeed in number, and by this means obtained the names and addresses of all who were interested in Entomology. After some correspondence had taken place, it was decided to call a meeting at Toronto for the purpose of forming a Canadian Entomological Club. A meeting was accordingly held in the rooms of the Canadian Institute in Toronto, on the 16th day of April, 1863, at which nine gentlemen were present, and resolutions were drawn up for the formation of "The Entomological Society of Canada." It will interest you, no doubt, to hear the names of these pioneers of the science in this country. They were the Rev. Prof. Hincks and Prof. Croft, of the University of Toronto ; Mr. J. H. Sangster, Dr. Beverley R. Morris and James Hubbard, of Toronto ; Dr. Thos. Cowdry * and his son, Mr. H. Cowdry, of York Mills ; Mr. Saunders, of London, and myself. We had also letters of sympathy with the project from Mr. E. Billings, of the Geological Survey, Montreal ; Mr. R. V. Rogers, Kingston ; Mr. F. Reynolds, Hamilton ; Mr. B. Billings, Prescott ; Rev. V. Clementi, Peterborough ; and Mr. E. Baynes Reed, of London. These gentlemen all co-operated very heartily in the work of the Society and largely contributed to its success. From this beginning of fifteen members the Society has gone on, grown and prospered, and it has now become a large and influential body, with a well-established reputation and a recognized scientific status. It becomes us all then, and especially the younger members, to keep up the good work and to do all in our power, both individually and collectively, for the well-being and prosperity of our beloved Entomological Society of Ontario. There is an unlimited field for work in this country, both in practical and scientific entomology. The life-histories of countless insects remain to be investigated, large areas of our country have never been explored, and in some orders of insects almost nothing has been done. In some department or other, each of us may do some good work even though our opportunities may be few and our time limited.

In accordance with our long established custom it now devolves upon me to bring before you some account of the chief insect attacks of the year in this province. Among those that I referred to last year, "the Eye-spotted bud-moth" (*Tmetocera ocellana*, Schiff) Fig. 1, continues to be very injurious to apple-trees in many parts of the country. Canker-worms have been very abundant and destructive in various places. (Fig. 2 represents the male and wingless female of *Anisopteryx Vernata*.) At Ottawa, on the first of June, I observed them in vast numbers upon forest trees in the neighborhood of the city, and have since been informed that they stripped them of their foliage ; they especially attacked the elm, bass-wood and ash, but were rarely seen upon the apple, which is the usual food of the insect. At Winnipeg also, as no steps were taken to check their ravages last year, they have continued the work of destruction upon the shade trees of the city. It is much to be deplored that the municipal authorities have not taken the trouble to protect their trees and keep the insect within due bounds.



Fig. 1.

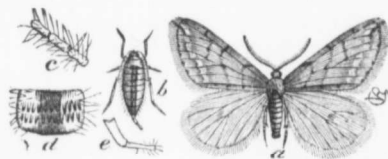


Fig. 2.

* We regret to have to record that Dr. Thomas Cowdry died on the 16th of October, 1892, at the residence of his son, Mr. E. Cowdry, Simcoe, Ont., in the 80th year of his age. Dr. Cowdry had been in poor health for some time and resided of late years in Bermuda for the sake of the genial climate. He returned to Canada in the spring and died at a good old age, much beloved and respected by all who knew him.

Cut-worms have, upon the whole, been less abundant this year. Mr. Moffat tells me that they were very injurious in gardens about London this spring, but owing to the long continued wet weather most of them had failed to mature, and consequently there were very few of the moths to be seen. Early in the season they were reported to have been very abundant in Alberta, but I have heard no particulars since. At Port Hope they were troublesome as usual when the young plants were first set out in the spring. Lately the moths of several species, especially *Hadena devastator* and *sputatrix* *Agrotis jaculifera* *ypsilon* (Fig. 3) *herilis* and *tricosa*, have been very abundant, and will probably produce a large crop of worms for next year.



Fig. 3.

The Zebra caterpillar (*Mamestra picta*, Harris) (Fig. 4), has been unusually abundant this year. Its favourite food is cabbage, but I have found it injurious to salsify, beets, spinach, lettuce and other vegetables, and common also upon many weeds. The caterpillar (Fig. 4, a) is easily recognized, being more than ordinarily hand-

some. When fully grown it is about two inches long, of a velvety black colour, with the head and legs red, and two bright yellow stripes along each side; between these stripes there are numerous cross bars of yellow, which are so striking that they have caused the worm to be known as the Zebra caterpillar. The moth (Fig. 4 b.) does not compare with it in beauty, being dull and inconspicuous in colour; its fore-wings are deep brown, shaded with purple and marked with paler spots in the middle; the hind wings are white, faintly edged with brown on the outer margin. It is apparently double-brooded, as we have found the caterpillars in July and August and also in October. When young the caterpillars are gregarious and feed all together on the underside of a leaf. In the case of the cabbage they thus make a conspicuous white spot, and the whole brood can easily be picked off and crushed under foot, but when they are older they scatter over the leaves and are much more difficult to deal with.

The Cabbage butterfly (*Pieris rapae*, Linn) Fig. 5 represents the male and Fig. 6 the female, has been remarkably abundant about Port Hope this year, and very common in

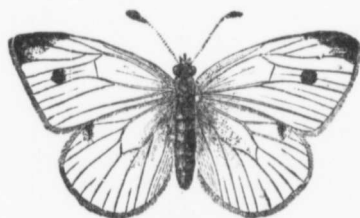


Fig. 5.

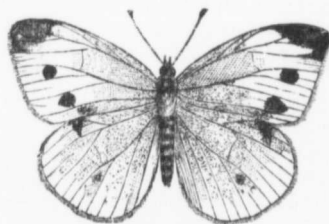


Fig. 6.

the various parts of the province that I have chanced to visit. Its injuries must be very considerable, judging from what I have observed myself. The most satisfactory method

of dealing with it should be used in its early stages, and the use of lime powder should be applied as soon as the caterpillars are seen.

Another species, *Bouché* which is common in Ottawa. It is injured by it, a species mentioned in the trouble to the country from small two-winged plants, deposit ovipositor, or out, feeding a the stem. With a few of them the dry weather and application of water, and after the plant with have, so far, been with lime water.

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of dealing with it is the application of Persian Insect Powder (Pyrethrum.) This may be used in its pure state or mixed with four times its weight of common flour. The powder should be puffed with a small bellows into the heads of the infested cabbages as soon as the caterpillars are observed, and at different times during the season. A few applications usually suffice to destroy the insect.

Another serious enemy to the cabbage is the Root Maggot (*Anthomyia brassicae* Bouché) which is reported as being specially injurious this year in the neighbourhood of Ottawa. In 1885 Mr. Saunders stated that the cabbage crop had been materially injured by it, and in 1890 Mr. Fletcher gave an account of it in his annual report, and mentioned that "in most parts of Canada it was the insect which gave the greatest trouble to the cabbage grower." Like most of our pests it has been imported into this country from Europe, but has long been naturalized amongst us. The perfect insect is a small two-winged fly, of a grayish colour. It lays its eggs in the spring upon the young plants, depositing them beneath the surface of the ground as far down as it can reach its ovipositor, or creep in some convenient crevice. In a few days the young maggots hatch out, feeding at first upon the outside, and subsequently as they grow larger boring into the stem. When there are many about the same plant, as is commonly the case, only a few of them penetrate the root, while the remainder live in the soil upon the exuding juices of the injured plant. The effect of the attack is the death of the plant as soon as dry weather sets in. Mr. Fletcher has found that the maggots can be destroyed by the application of a decoction of white hellebore. He used two ounces to three gallons of water, and after drawing away some of the surface soil forced the liquid about the roots of the plant with a garden syringe and then replaced the soil. The results of this treatment have, so far, been very satisfactory. Nitrate of soda as a surface dressing and watering with lime water have also been recommended as effective remedies.

The Pear-leaf blister (*Phytoptus pyri*, Sheuten) has been spreading over Ontario and the Maritime Provinces during the present season. It is a tiny mite which forms a gall on the leaf, and from the parent gall the young mites spread and form new ones, which soon give a blistered appearance to the leaf. In the autumn they remove to the leaf buds at the ends of the twigs and pass the winter beneath the leafy scales. Spraying with kerosene emulsion in the spring when the buds first open is recommended as a remedy, but nothing has as yet been found to exterminate the creature. It should be watched by our fruit growers and experiments made for its destruction.

The Fall Web-worm (*Hyphantria textor*, Harris) Fig. 7, to which I find it necessary to make an annual allusion, is this year more abundant and wide-spread than ever. Though so conspicuous and so easily dealt with, I find that few people will take the trouble to destroy it, and consequently it is rapidly becoming a most serious pest. It attacks deciduous trees of every description and also shrubs and herbaceous plants. It is especially injurious to young trees, which it soon strips of every vestige of foliage. Several young elm trees planted along the streets of Port Hope were rendered quite bare a few weeks ago by this caterpillar, whose work was done in a few days and thus escaped notice at first. These trees have put out a fresh crop of leaves, but I fear

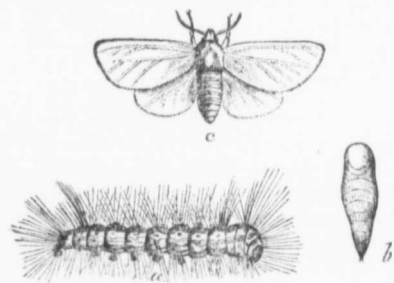


Fig. 7.

that they will be seriously exhausted of their strength, if not finally killed. Mr. Fletcher drew attention recently in the *Ottawa Field Naturalist* to the ravages of this insect, with very good results, as many people were led by his remarks to destroy the webs and their inmates wherever they found them. It is to be hoped that all the members of this Society will use their influence in the same way in any part of the country where they may be.

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Among insects noticeable for their abundance this year, though not especially injurious. I may mention the Green grape-vine Sphinx (*Darapta myron*, Cramer)



Fig. 9.

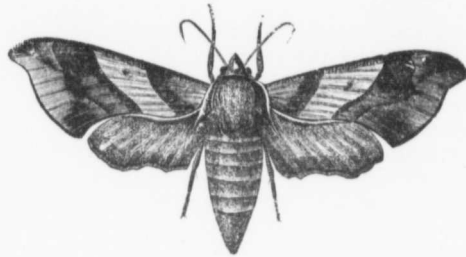


Fig. 8.

which is very numerous on the foliage of the Virginia creeper. Fig. 8 represents the moth and Fig. 9 the caterpillar. Many of the caterpillars, however, are

attacked by its well known parasite, Fig. 10, and it is not likely that the insect will gain too much headway.

Another grape insect is much more injurious both to the vine and the Virginia creeper. I refer to the grape vine Flea-beetle (*Graptodera chalybea*, Illig) which is a serious pest in many parts of the country. This insect passes the winter in the perfect state, and in the spring the beetle attacks the buds of the vine as soon as they begin to swell, thus destroying the future foliage and fruit in their embryo condition.



Fig. 10.

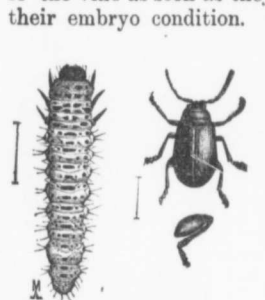


Fig. 12.

Fig. 11.

It is a small, polished steel-blue beetle, varying in colour to green and purple, about three-twentieths of an inch in length, dark green beneath, with brownish-black antennae and feet. It is called a "flea-beetle" from its immensely developed thighs (Fig. 11) which enable it to jump long distances in the same manner as the familiar insect from which it takes its name. After a few weeks the first crop of beetles disappears, and is soon followed by colonies of little worms (Fig. 12, much magnified) dark-brown or blackish in colour, which speedily make their presence known by riddling the leaves with small holes. (Fig. 13.) These attain their full growth in July, descend to the earth to assume the pupa state, and after a week or two come out as perfect beetles. They do the greatest amount of injury in early spring, but in the summer also they are frequently very injurious by entirely stripping the vine of its foliage. I am informed by the Rev. W. J. Mackenzie that the vines in the neighbourhood of Milton have been so seriously injured by this insect, especially in the spring, that they have produced very little fruit during the last three years. The most effective remedies, so far as known, are, first, to remove and burn all fallen leaves and other rubbish about the vines in the autumn, and secondly, to syringe the canes and young foliage with a weak mixture of Paris green and water in early spring. Strong soap suds or powdered hellebore might be employed against the larvæ in the summer time, when the use of Paris green would be dangerous.

Turning from the garden to the field, I find that "Silver-top" is still very common in meadows. At the recent meeting of Economic Entomologists in Rochester, N. Y., Mr. H. Osborn, of the Iowa Experiment Stations, gave an account of his method of dealing

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with this injury. It is mainly caused by small leaf-hoppers (*Jassidæ*). These are collected and destroyed by the use of a "hopper-dozer." This is a thin sheet-iron pan, about three feet in width, and of any length that may be found convenient; the back and sides of the pan are turned up about five or six inches, and the front is bent over about half an inch in order to form a smooth edge; the pan is mounted upon low wooden runners, about two inches in height, and is drawn by means of a rope attached to either end. When ready for use the pan is smeared over with coal-tar to the depth of quarter of an inch or more, and is then dragged over the infested fields. The front of the pan, as it strikes the grass, causes the hoppers to spring into the air when most of them alight on the pan and are caught in the tar. A large area can be gone over very quickly and myriads of the insects thus destroyed. A field treated in this way before the grass has



Fig. 13.

become too long, and again when it has begun to grow after cutting, will be easily kept clear of this pest. Mr. Osborn found it advantageous to keep the infested meadow closely cropped by enclosing a larger number of cows upon it than usual. This simple machine—"the hopper-dozer"—can also be used with great advantage for the destruction of grass-hoppers or locusts.

The Clover-root borer, (*Hylesinus trifolii*, Müller) is reported by Mr. Kilman to be troublesome in the neighbourhood of Ridgeway, Ont. He says that "it literally honey-combs the clover roots in all fields here during the second season of the plant's growth, and the weakened plant rarely survives the winter following. The farmers then say that their clover is 'winter-killed.'" Mr. Fletcher in his last year's report (1891) drew attention to the occurrence of this insect in Canada, and recommended as a remedy the plowing under of the clover when it is found to be infested.

The Common red-legged Grass-hopper (*Melanoplus femur-rubrum*, Burm), is very abundant just now in many parts of the Province and is doing a considerable amount of damage. It is especially injurious to oats, as it has a habit of climbing up the stalk and biting off the ear. I have been informed that a field of ten acres in the neighbourhood of Port Hope was severely damaged in this way. It would be quite worth the farmers' while to use "hopper-dozers" for these insects, as already described. By making the coating of tar about half an inch thick it would securely hold the grass-hoppers.

The Wheat-stem maggot (*Meromyza Americana*, Fitch), which is also known as "the Wheat bulb-worm" when it infests the roots of the plant, has been reported as injurious in some localities. Early in the spring the pupæ of this insect are found in the roots of wheat and grasses; these are the pupæ of the last brood of the previous year and have passed the winter in this state. The flies emerge from these at the end of May and proceed to lay their eggs on the leaves of many kinds of grass, and also upon the leaves of the forming stems of wheat, which has been sown in May and is well up by the first of June. These eggs produce a small glassy green maggot which eats into the base of the top joint of wheat, barley and grasses, and causes the ear to turn prematurely white before the rest of the crop is ripe. This is the "silver-top" of wheat and barley which

is frequently to be seen about the first of July. From these maggots there comes a second brood of the flies in August which deposit their eggs on grasses and on any volunteer wheat that there may be, and finally a third brood is matured in September in time to attack the fall wheat before the cold weather sets in. The remedies which Mr. Fletcher proposes (Bulletin No. 11) are "(1) late sowing of winter wheat; (2) harrowing of stubble soon after the crop is carried, so as to start the volunteer crop quickly, this latter to be plowed in early in September; (3) the application of a special fertilizer as a top dressing when winter wheat is known to be affected, this will help the injured plants to overcome the injury."

The last insect attack to which I desire to draw your attention is, perhaps, the most formidable of all. I refer to the recent occurrence of the "Horn-fly" (*Hematobia serrata*, Rob.) in various parts of this Province. At the beginning of August it was first reported to Mr. Fletcher as attacking cattle at Oshawa, and soon after its appearance was announced at Toronto and London; during the last few days I have been informed of its presence at Bowmanville, Port Hope, Kingston, Ottawa and at Boucherville near Montreal. It has, no doubt, come to us from the neighbouring States where it has prevailed for some time. The insect is of European origin and has evidently been brought into the United States with imported cattle. It was first observed in New Jersey in 1887, and has now spread over the Atlantic States to Florida, as far west as Indiana and northward to Canada. The adult is a small gray fly, closely resembling the common house-fly in appearance, but a little smaller. It derives its name of Horn fly from its singular habit of clustering, when at rest, upon the base of the horns of cows; it is by no means confined to this situation, however, but swarms upon the back between the head and foreshoulders, and on any parts which cannot be reached by the tongue or tail of the animal. When feeding it ranges over the back, flanks and legs. The injury done by this fly is by biting with its mouth-organs the skin of the animal and sucking its blood; as it occurs in great swarms, it seriously irritates the cattle and causes them, by loss of blood, to fall off in condition and diminish the yield of milk. The eggs are laid on the fresh droppings of the cattle and the insect passes its maggot stage in these; it subsequently goes down to the earth to form its pupa from which the winged fly in due time emerges. Dr. Eiley and his assistants at Washington have carefully studied the life history of the insect, and state that "from ten to seventeen days, say two weeks, is about the average time from the laying of the egg to the appearance of the flies, and with four active breeding months, from May 15th to September 15th, there will be eight generations." We cannot then wonder at the sudden and enormous multiplication of the insect. The remedies that have been found most effective are the smearing of the horns and all the affected parts of the animal with any greasy substance to which a little carbolic acid has been added for the sake of its healing effect; train oil has been found especially useful as it keeps the flies away for five or six days after an application; common axle-grease and tallow have also been employed with good effect. In order to destroy the broods of the insect, the best plan is to throw a spadeful of lime over the fresh droppings, or if the weather is dry and sunny, to rake the fresh cowdung over the surface of the ground so that it may at once dry up and prevent the maggots from maturing; boys could easily perform this work, as there is always some place in the pasture field where the cattle gather during the heat of the day and where the dung can therefore be dealt with without much trouble. These methods should be especially employed in the early part of the year, wherever the insect is noticed, in order to prevent, or at any rate reduce, the subsequent broods.

Before leaving the subject of practical entomology I may allude for a moment to the splendid work that is being done all over North America by the Division of Entomology at Washington and the official entomologists at the various State experimental stations. The publication of *Insect Life* and the many bulletins that are issued both by the Federal and the State officials contain a vast fund of most useful and valuable information, the results of careful experiments in the field and the laboratory, and painstaking and conscientious studies of the life histories of insects. Similar good work is also being accomplished in this country by Mr. James Fletcher, the Dominion Entomologist at the

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Central Experimental Farm at Ottawa. He and I had the pleasure recently of attending the meeting of the Association of Economic Entomologists of North America, which was held at Rochester, N. Y., on the 15th and 16th of August, and of meeting there a large number of the most eminent workers in this branch of science. In England Miss Ormerod has continued her useful work and published last winter her fifteenth "Report of Observations on Injurious Insects and Common Farm Pests," in which she gave a special account of the outbreak of caterpillars of the Diamond-back Moth (*Plutella cruciferarum*, Zeller) over large areas in Great Britain, and devoted a chapter to the use of Paris Green as an insecticide. It is satisfactory to learn that this useful agent is gradually coming into use in England and that the prejudices against its employment are being removed. In India the Trustees of the Indian Museum at Calcutta are issuing a serial publication on Economical Entomology, entitled *Indian Museum Notes*, which is now in its second volume; many of the parts are beautifully illustrated, among which we may specially mention an account of "The Wild Silk Insects of India," by Mr. Cotes, with fourteen very handsome plates.

One of the most useful publications of the year is undoubtedly a work by Dr. C. V. Riley, "Directions for Collecting and Preserving Insects," published by the Smithsonian Institution at Washington. It consists of nearly 150 pages and is illustrated by nearly as many wood cuts, most of them specially prepared for the work. The directions and instructions are most complete and will be found invaluable by beginners, and full of useful hints and ideas for those who are experienced in collecting. Every entomologist is frequently appealed to by beginners to recommend them some book which will teach them how to collect and preserve specimens and how to make a start in the study of the science; hitherto one has been at a loss for a manual which will meet such cases, but now the want is admirably filled. In time we may hope that this work will be followed by a manual of North American insects, which will perform the same service for Entomology that Dr. Gray's works have done for Botany. We are glad to learn that a step is being taken in this direction by Mr. S. H. Scudder, who is now preparing for publication a book on butterflies for boys. The author's name is a sufficient warrant that it will be all that one can desire.

Since our last annual meeting we have had to deplore the loss of two of our members. On the 18th of March Mr. F. B. Caulfield died at Montreal. Since 1887 he has been a frequent contributor to the annual reports of the Society and also wrote occasional papers for the *Canadian Entomologist*; he was also a very energetic member of the Montreal branch and did much to maintain its activity and usefulness. He was a careful and diligent collector and a keen observer. His loss is deeply felt by his associates as well as his family. We sincerely sympathize with his widow and children in their bereavement.

On the 23rd of April one of our most noted Canadian entomologists departed this life. The Abbé Léon Provancher died at Cap Rouge near Quebec, in the 72nd year of his age. His earliest publications were a treatise on Botany in 1858 and a Flora of Canada in 1862. He soon afterwards turned his attention to Entomology, and after publishing a list of the Coleoptera taken at Portneuf, he began in 1874 the publication of his *Faune Entomologique du Canada*, the third volume of which was not completed till 1890. For more than twenty years also he published his well known monthly magazine *Le Naturaliste Canadien*, which was only discontinued last year. He was a Fellow of the Royal Society of Canada and a member of many other scientific associations. His name will long stand out prominently in the records of science as one of the ablest and most diligent savants that our French compatriots of the Province of Quebec have produced.

I feel that I have now sufficiently trespassed upon your time and attention and beg to thank you very heartily for the kind hearing that you have given me.

Mr. FLETCHER moved a vote of thanks to the President for his interesting and valuable address, and in doing so remarked upon the prevalence of the Zebra caterpillar (*Mamestra picta*), the destruction of the Tomato sphinx and the Green sphinx of the grape-vine (*Darapsa myron*) by parasites, and the rapid spread of the Horn-fly in Ontario and Western Quebec.

The motion was seconded by the Rev. T. W. FYLES, who expressed the pleasure he had derived from listening to the address. In the course of his remarks he referred to the injuries caused by the Onion fly, and stated that it could be prevented by the use of soot, which drove away the fly, and the affected onion was then enabled to revive and complete its growth.

Mr. DENTON gave an account of some experiences in England where a fly had caused the death of a newly born calf and also attacked sheep.

Mr. FLETCHER stated that soot was not always an available remedy in this country in consequence of the prevalent use of hard coal. He found nothing better than the application of a kerosene emulsion for the destruction of this and a great variety of other insects. He proceeded to describe the ease with which an emulsion could be made and the mode of its application, as well as its effectiveness as an insecticide.

REPORT OF THE COUNCIL.

The following report was then read and adopted :

The Council of the Entomological Society of Ontario beg to present the following report of their proceedings during the past year.

The ordinary membership of the Society has been satisfactorily maintained, while the number of associate members has been considerably increased during the year. Continued interest has been taken in the various departments of the Society, and much good work has been accomplished.

The Twenty-second Annual Report on practical and general entomology was presented to the Minister of Agriculture in December last, and was printed and distributed early in February. It consisted of one hundred pages and was illustrated with eighteen wood-cuts. The report contained, among other interesting matter, a full report of the proceedings at the annual meeting of the Association of Economic Entomologists, and a valuable list of the birds of Middlesex County.

The Council are pleased to gratefully acknowledge the promptitude with which the report was printed and distributed by the Department, and also the advantage the Society has received from having the reports distributed from Toronto.

The *Canadian Entomologist* has been regularly issued at the beginning of each month, and completed its twenty-third volume in December last. It consisted of 292 pages, an increase of fifty over the usual number. Of the current volume eight numbers have so far been published, and the ninth (for September) is almost ready for distribution, the numbers have averaged over twenty-four pages each, and will make the volume at the close of the year larger than any of its predecessors. There is still a steady demand for the back volumes, which involves the occasional reprinting of a number.

Some valuable additions have been made to the Library during the past year, among which may be mentioned a set of Miss Georgiana E. Ormerod's coloured diagrams of insects injurious to vegetation, which will be found most useful for illustrating popular lectures and addresses to farmers' meetings. The Society's collections of specimens have been carefully looked after by the Curator, Mr. Moffat, many additions have been made to the Lepidoptera, and good progress has been made in the arrangement of the European Coleoptera. The Council would here express their continued satisfaction with the careful and conscientious manner in which Mr. Moffat discharges his duties towards the Society.

The Sections of the Society in the departments of Botany, Geology, Microscopy and Ornithology have been in active operation during the past year. The reports of their proceedings are submitted herewith. It is earnestly to be hoped that the interest awakened in these branches of Natural Science will not be allowed to flag, and that the number of their adherents will steadily increase.

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From the Treasurer's report it will be seen that there is at present a balance on hand of \$319.13, which is a larger amount than usual. The greatest care has been taken to keep the expenditure within due limits, as hitherto the amount remaining at the time of the annual meeting has not proved sufficient to carry on the work of the Society till the close of the year, during which time little or no money is received by the Society. The amount now on hand will all be required for necessary expenses before the annual subscriptions begin to be paid in January.

The Society was represented at the meeting of the Royal Society of Canada, which was held at Ottawa at the end of May, by your President, Dr. Bethune, who was subsequently elected a Fellow of the Society. During the present month of August important meetings were held at Rochester, N. Y., at which the Society was represented by the President and Mr. Fletcher. It is gratifying to record that the former was elected first Vice-President of the Association of Economic Entomologists of North America, and President of the Entomological Club of the American Association for the Advancement of Science for the ensuing year.

All which is respectfully submitted.

(Signed) CHARLES J. S. BETHUNE, President.

ELECTION OF OFFICERS.

The following were elected officers for the ensuing year :

President—W. HAGUE HARRINGTON, Ottawa.

Vice-President—J. M. DENTON, London.

Secretary—W. E. SAUNDERS, London.

Treasurer—J. A. BALKWILL, London.

Directors—Division 1, JAMES FLETCHER, F.L.S., F.R.S.C., Ottawa.

Division 2, Rev. Dr. BETHUNE, F.R.S.C., Port Hope.

Division 3, GAMBLE GEDDES, Toronto.

Division 4, A. H. KILMAN, Ridgeway.

Division 5, J. DEARNESS, London.

Librarian and Curator—J. ALSTON MOFFAT, London.

Editor of the "Canadian Entomologist"—Rev. C. J. S. BETHUNE, M.A., D.C.L.
Port Hope.

Editing Committee—J. FLETCHER, Ottawa ; H. H. LYMAN, Montreal ; Rev. T. W. FYLFS, South Quebec ; J. H. BOWMAN, London.

Delegate to the Royal Society of Canada—THE PRESIDENT.

Auditors—J. H. BOWMAN and W. E. SAUNDERS, London.

The reports for the past year of the various sections of the Society were next read by their respective secretaries.

REPORT OF THE BOTANICAL SECTION OF THE ENTOMOLOGICAL
SOCIETY OF ONTARIO.

This Section was organized for 1892 on the 16th of April, with Mr. J. A. Balkwill as Chairman and Mr. J. Dearness as Vice-Chairman.

The meetings were held regularly up to August, with considerable interest manifested.

An outing to Komoka on the 24th of May, and one to the "Swamp of Death" Oxford Co., were indulged in by some of the members.

Messrs. Dearness, Bowman, Stevenson and Althouse were very energetic in field work.

The following rare plants have been collected :

	Collector.	Locality.
<i>Anagallis arvensis</i>	Mr. Moffatt	Campbellville.
<i>Poterium sanguisorba</i>	"	"
<i>Valerianella olitoria</i>	Mr. Dearness	Twenty Mile Creek.
<i>Viola rotundifolia</i>	"	"
<i>Corydalis glauca</i>	Messrs. Dearness and Bowman ..	Pine Pond (Swamp of Death).
<i>Dalibarda repens</i>	"	"
<i>Lepidium campestre</i>	" Twenty Mile Creek.
<i>Barbarea vulgaris</i>	"	"
<i>Viola carnina</i> var <i>rupestris</i>	"	"
<i>Cassia Marilandica</i> (3 ft. high)	Mr. Dearness	Tp. of Howard.
<i>Symphoricarpos occidentalis</i>	"	"
<i>Actinomeris squarrosa</i>	"	"
<i>Polygonatum giganteum</i> (7 ft.)	"	"
<i>Silphium perfoliatum</i> (7 ft.)	"	"
<i>Euphorbia preslii</i>	"	"
<i>Lophanthus scrophulariaefolius</i>	"	"
<i>Negundo aceroides</i> (2 ft. diameter) ..	"	"
<i>Lythrum alatum</i>	"	Walpole Island.
<i>Polygala sanguinea</i>	"	"
<i>Baptisia tinctoria</i> (fields)	"	"
<i>Silphium terebinthinaceum</i>	"	"
<i>Tradescantia</i> sp (?)	"	"
<i>Galium verum</i>	Mr. Bond	Port Stanley.
<i>Bidens beckii</i>	Mr. Stephenson	Port Frank.

During the year a large number of plants have been carefully mounted, the total number now in the herbarium amounts to about 500. Mr. Balkwill has done much of the mounting. The Section intends continuing the work during the coming winter.

Early in April a fine collection of plants was received from Mr. Wm. Scott, B.A., Mathematical Master of the Ottawa Normal School. The plants were in good condition and very acceptable, as they were collected in a district very different from that surrounding London.

The Section purposes continuing its explorations, and hopes to publish a list of the plants found in this district at some future time.

C. B. EDWARDS, Sec.

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REPORT OF THE GEOLOGICAL SECTION.

Regular meetings have been held by the members of the Geological Section throughout the year, and they have been, on the whole, well attended. Interest in geological work has not diminished, and the meetings have often been the scene of lively discussion.

The course of study has been based on Professor Geikie's geological works, and articles in newspapers and magazines have received careful attention. The work has been agreeably helped forward by the fact that the fine collection of specimens belonging to our Chairman has always been open for the use of the Section, and they have proved invaluable for the purpose of illustrating the subjects before the section.

The members have frequently been out on excursions and have secured many interesting specimens. One of the most interesting outings occurred a short time ago, when the members were accompanied by Professor Seaborne, of Hellmuth Ladies' College, who gave some interesting and valuable hints as to the best methods of working up the geology of the London district. Those of the members who spent their holidays away from home took the inevitable hammer with them, and secured many interesting examples of the life of former ages. The Chairman particularly worked up the Niagara Falls locality, and promises to furnish the Section with his observations. There are now few parts of the district immediately around London that have not been explored.

London is in an interesting district from the fact that it appears to be directly in the line of the great stream of ice which swept the northern part of the continent in the Pliocene age, and the detritus from many different geological areas are scattered plentifully around. The age to which the rocks here belong is the Devonian, but they have been covered so deeply with the glacial drift that they reach the surface in but few places. Probably the finest specimens of the trilobite, *Phacops bufo*, found in Canada have been procured here, while the race of *Orthoceratidæ* is well represented in this immediate vicinity. Corals are especially abundant and some fine specimens have been secured.

One of our members contemplates the arrangement of a list of Devonian fossils found around London, and hopes to be able to present it to the Society at the next annual meeting.

It is with pleasure that we learn that Mr. Johnson Pettit, to whom this Society is so much indebted, is now turning his attention to geology, and we hope to have his co-operation in the future.

S. WOOLVERTON, Chairman.

J. L. GOODBURNE, Secretary.

REPORT OF THE MICROSCOPICAL SECTION.

I have much pleasure in presenting the annual report of our Section for the year ending August 31st, 1892:

It is now two years since this Section was organized, and we can look back with pleasure upon the work of the past. Although our membership has not increased to any great extent during the last year, yet great interest is still manifested by all the members, who are rapidly gaining experience in the manipulation of the microscope and the preparation of objects.

During the past year public interest in our Section has greatly increased, as the report of our outside meetings will show. On March 3rd the Section was privileged to give a microscopical demonstration at the annual meeting of the East Middlesex Teachers

Association. The Section was again invited to the Hellmuth Ladies' College and was highly appreciated. Mr. Merchant, at the request of some of our members, very kindly granted us the use of the magnificent projecting microscope belonging to the Collegiate Institute.

The Principal gave a very interesting lecture on projection, explaining and illustrating the elementary laws of light and their application to projection.

Thirteen meetings were held last season. Total membership is 12; average attendance 9; visitors 8.

The subjects of the various evenings during the season were as follows:

Oct. 30th: Fertilization and Growth of Ferns.—Mr. FOOT.

Nov. 13th: Examination of the results of an outing, all taking part.

Nov. 27th: Examination of Fungi. Family Erysiphæ.—Prof. DEARNESS.

Those studied were *Erysipha Lamprocarpa* on *Hydrophyllum*.

Uncinula clintonii on leaf of Basswood.

Phallactinia on leaf of Dogwood.

Dec. 11th: Examination of Fungi was continued on six other specimens.—Prof. DEARNESS.

Dec. 26th: How to find and classify Diatoms.—Prof. BOWMAN.

Jan. 15th: Life, History and Classification of Diatoms.—Prof. BOWMAN.

Jan. 29th: Methods of mounting Diatoms.—Prof. BOWMAN.

Feb. 5th: Fertilization and Growth of the Phanerogams.—Mr. RENNIE.

Feb. 19th: Mounting of Seeds and Pollen.—Mr. RENNIE.

Mar. 5th: Light and its application to the Microscope.—Prof. DEARNESS.

April 1st: Microscopical Projection.—Principal MERCHANT.

April 15th: Examination of Frog Spawn.—Prof. BOWMAN.

April 29th: Fungi.—Prof. DEARNESS.

All which is respectfully submitted.

WILLIAM H. FOOT, Secretary.

REPORT OF THE ORNITHOLOGICAL SECTION FOR THE YEAR 1892.

Mr. President and Members of the Council:

During the past year the Ornithological Section has held a number of meetings, at which many interesting facts have been noted and some new ones brought to light. During the spring months a combined record was kept of arrivals from the south, showing that 37 species were observed by the members in the first three months, 42 in April and 58 in May, against 36, 38 and 40 respectively for the year previous.

Several of the most interesting notes of the year I may perhaps be permitted to refer to briefly. First in order is the winter visitation of Crossbills. These were observed by all the members in March, April and May, the 30th of May being the last date of observation, when ten were seen. This influx included not only Red Crossbills, but also the rarer Whitewings in quantity, and one lot was seen, and two taken, of a larger form, *Loxia curvirostra*, Bendirei, which is regarded as a variety intermediate between the Mexican and the Red Crossbills, and has not, we believe, been recorded for Ontario before.

Another rare species which was noted in some quantity is the Bay-breasted Warbler, which is usually scarce, but this year appeared in good numbers, being first discovered by one of our most energetic members right in the city, and subsequently found on several

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morning excursions. It is probable we should be able to report the breeding of the Least Bittern in our county had it not been for the rapacious boy, who captured the pair. They were observed June 4th, and captured a few days later, and on visiting the locality, a thorough search by one of our members showed a nearly finished nest, probably of this species. The take of the season, however, was the Cape May Warbler, hitherto unknown in Middlesex County, though eagerly sought for during many years. The first specimen was discovered in the High School grounds, by the energetic member previously referred to, who studied the bird with creditable zeal for many minutes, and subsequently selected the species from a series of unnamed skins, only to be the more sorry he could not secure it when he was informed of its identity. All doubts which might have been cast on this record were cleared up by the capture of a pair, male and female, by a boy with a slingshot the next day near the same place. The members of section regard this as the most important record of the year, and are proportionately proud of it. Our Plover Mills representative, with the assistance of Mr. Joseph Beck, secured a number of specimens of Lincoln's Sparrow, which had hitherto been claimed for the county on the strength of a single specimen taken years ago in the fall. Possibly it may prove, like the Fox-colored Sparrow, to be not so very rare now that we are getting acquainted with it.

Less interesting because somewhat out of the Section's range was the result of a visit of a member to Lake Wawanosh, near Sarnia, where he secured two specimens of the short billed Marsh Wren, of which probably ten or a dozen specimens were seen. They had not been previously reported in such numbers from anywhere in Ontario, although once erroneously reported near Ottawa.

In nesting records, the only one of special interest is the finding of a nest of the Carolina Rail on the outskirts of the city, with seven eggs; this being the only addition we have to make to the list of birds known to breed in Middlesex county, which was submitted with our last annual report. During the coming year we hope to open a large ledger for the birds of Middlesex in which all the notable occurrences with regard to each species shall be inscribed, thereby getting the result of our work into permanent form and making a good basis for any special investigations the Section may take up in the future.

W. E. SAUNDERS, Chairman.

MONTREAL BRANCH OF THE ENTOMOLOGICAL SOCIETY.

The following is the Nineteenth Annual Report of the Council of the Montreal Branch of the Entomological Society of Ontario:

The Council beg to submit the following report of the Branch for the year 1891-92.

During the past season nine meetings have been held, most of which were well attended, and the following papers have been read:

1. Notes on *Nematus pallidiventris*—Rev. T. W. Fyles.
2. Some little known Canadian Coleoptera.—J. F. Hausen.
3. Occurrence of *Platynus rugiceps* at Montreal.—J. F. Hausen.
4. *Hepialus thule*.—H. H. Lyman.
5. Notes on some species of *Halisidota*.—H. H. Lyman.
6. Notes on the genus *Lithophane*.—A. F. Winn.
7. Entomological Questions.—A. F. Winn.
8. *Pamphila Manitoba* and its varieties.—H. H. Lyman.
9. *Danais Archippus*.—A. F. Winn.
10. Notes on rearing *Pyrameis Atalanta*.—H. H. Lyman.
11. The genus *Grapta*.—H. H. Lyman.
12. Notes on Hemiptera.—J. F. Hausen.

Two new members have been added to our roll, viz., Messrs. Lachlan Gibb and J. W. Cushing, but three of our old members have resigned owing to continued absence from the city, and the death of our esteemed vice-president, Mr. F. B. Caulfield, has caused a great gap in our ranks which it will be difficult to fill. He was one of the founders of this Branch, and has taken the greatest interest in its welfare through all its vicissitudes during the past nineteen years. At our meetings he has read over forty original papers, and being an enthusiastic and pains-taking entomologist, the loss to the Branch is a very heavy one.

The Council would again urge the members to do all in their power to increase the interest in our meetings by getting as many new members as possible, and by bringing to the meetings specimens and notes on insects.

A large amount of work might easily be done during the coming summer on the neglected orders, Neuroptera, Hemiptera and Diptera, and we would suggest that each member should study at least one order besides his specialty and thus aid in increasing our knowledge of some of the many very common species of which at present we know little or nothing.

The report of the treasurer shews a balance on hand of \$17.08.

Submitted on behalf of the Council,

H. H. LYMAN, President.

The following officers were elected for the ensuing year: President, H. H. LYMAN; Vice-President, W. C. ADAMS; Secretary-Treasurer, A. F. WINN; Council, J. F. HAUSEN, CHAS. JACKSON.

After the reading of the foregoing reports was completed Mr. HARRINGTON gave an interesting account of a visit which he and Mr. Fletcher had made to Sudbury this summer, and exhibited some rare and remarkable specimens that they had found in that locality.

Mr. FLETCHER gave an entertaining description of a trip to Nepigon, north of Lake Superior, in quest of eggs of the butterfly, *Chionobas Macounii*. No eggs of that species were obtained, but many interesting observations were made. Eggs of *Nemophila selwynii* were secured, and the larvæ bred from them were described. *Grapta faunus* was bred from larvæ found on *Alnus viridis*, *Salix discolor* and *Betula papyrifera*, and an undescribed parasite was also reared. *Grapta prognus* was also reared from larvæ on *Betula papyrifera*. *Colias interior* was mentioned, and the food plant was stated to be willow (from the observations of Mr. T. E. Bean in the Rocky Mountains). Mr. Fletcher was of the opinion that it was also *Vaccinium*. Specimens of two western species of *Argynnis*, *A. cipris* and *A. electa* were taken at Nepigon, and the occurrence there commented on. *Lycæna lucia* was taken and an addition made to its food plants in the flowers and seeds of *Acer spicatum*. *Carterocephalus mandan* is not uncommon at Nepigon in roadways running through low woodlands. Eggs had been secured on grasses and several larvæ were being bred. *Nisoniades icelus*, common at Nepigon, was being bred from eggs laid on the upper side of the leaves of *Salix cordata*. The larvæ were found to exhibit different temperaments, one particular specimen being described as "very bad tempered." Some beetles had been collected, and the oviposition of *Myodites zschkii* in the unopened flowers of *Solidago canadensis* was described. An interesting *Mordella* had been taken on a white fungus growing on an old wharf, but the species did not seem to answer to any of those in the available literature. Species of *Donacia*, *Leptura* and some *Carabidæ* had been collected. *Trichabda convergens* had been found abundantly on asters and solidagos. Of Hymenoptera many interesting species had been secured, *Abia kennicottii* amongst them, and several specimens of *Trichiosoma triangulum*.

The meeting adjourned at 10 p.m.

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none were in pe fly is said to at Bermudas by a load of oranges Bethune had (1) *Chærocampa* this beautiful h it is of a light-b wedge-shaped ye (2) *Phlegethont* wings shaded v abdomen. It i Sweet potato an taken by Mr. D pests to farmer *decollata*, Linn), truncate. It se

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THURSDAY MORNING, SEPTEMBER 1ST.

The meeting was called to order by the President at half-past 9 o'clock.

The Rev. T. W. FYLES gave an account of a gall that he had found upon a White Aster (*Diplopappus umbellatus*). Mr. Fletcher in commenting upon it expressed the hope that Mr. Fyles would be able to work up its life history completely.

A paper by Mr. H. H. LYMAN, of Montreal, on a "Trip to Mount Washington in New Hampshire" was then read by the President (see p. 32.)

Mr. FLETCHER described some of the many difficulties which beset the entomologist in his efforts to rear larvae from the egg to the imago state. An interesting discussion upon galls was then entered upon, in which most of the members present participated.

The President, Dr. BETHUNE, gave an account of his observations of insect life in Bermuda during the month of March last. He stated that he was most struck by the remarkable absence of insects of all descriptions. Not a single butterfly was to be seen and only one or two moths; after a diligent search under stones, etc., the only beetle that he found was the red and black Dung-beetle so common in Canada (*Aphodius fimetarius*), which he found in some cow droppings in a pasture field. Cockroaches (*Blatta Americana*), were abundant, having been brought, no doubt, in ships to the islands; a much larger species, *B. Maderensia*, was also occasionally seen. The common wasp (*Polistes Canadensis*), was found making its comb, without any protecting nest, on the leaves or branches of trees; honey bees were numerous and several species of ants, but no other Hymenoptera were observed. Mosquitoes and house-flies were common but not sufficiently numerous to be annoying, and several kinds of spiders. Great complaints were made of the difficulty of growing peaches on the islands owing to the attacks of an insect; in "Insect Life," vol. iii, p. 6, this is stated to be the maggot of a Dipterous fly (*Ceratitis capitata*, Wied.) The fruit was observed in all stages of growth at the same time, but none were in perfection except a few that had been protected with gauze netting. The fly is said to attack oranges also, but this fruit has been virtually exterminated in the Bermudas by a Scale-insect (*Chionaspis citri*), which was accidentally introduced in a ship-load of oranges some years ago. Through the kindness of the Rev. W. G. Lane, Dr. Bethune had obtained three specimens of Sphinx moths, which he exhibited, viz.: (1) *Cherocampa tersa* Drury, found also in the Southern States and West Indies; this beautiful hawk-moth is distinguished by its graceful shape and long pointed body; it is of a light-brownish yellow colour, the hind wings being black with a marginal row of wedge-shaped yellow spots. The larva is said to feed on Button-weed (*Spermacoce glabra*.) (2) *Phlegothontius (Sphinx) cingulata*, Fab., a large grey hawk-moth, with the hind wings shaded with rose colour and five spots of the same colour on each side of the abdomen. It is found in the West Indies and northwards. The larva feeds on the Sweet potato and Convolvulus. (3) A large White Sphinx, probably *S. tetrio*, which was taken by Mr. Douglas Hollis in his garden at Hamilton, Bermuda. One of the greatest pests to farmers and gardeners on the Islands is the "Broken-tail Snail" (*Rumina decollata*, Linn.) which has a singular elongate spiral shell with the smaller end abruptly truncate. It seems to swarm everywhere and is very destructive to vegetation.

Mr. MOFFAT presented a paper on "The power of insects to resist the action of frost" (see p. 35.)

The following insects were exhibited by Mr. FLETCHER:

1. *Liparocephalus brevipennis*, several specimens. This is an extremely rare Staphylinid, which had been received among other varieties from Rev. J. W. Keen, of Massett, Queen Charlotte Islands. The opinion was expressed that this and the other described species of the genus *L. orbicollis* were merely color varieties of one species. Specimens differing in color had been named under both names by Lieut. Casey, U.S.A., but he said he thought that they were probably identical, and this opinion was also concurred in by Dr. John Hamilton, to whom some of Mr. Keen's specimens had also been sent. Previous to Mr. Keen's collection these two species were only represented by the unique types.

2. *Sphaerites glabratus*, *Pelates latus*, two Sylphids, also from Queen Charlotte Islands.

3. *Myodites Zeschii*, from Nepigon.

4. *Gortyna immanis*, the collar worm of the Hop, several specimens, male and female, of the moth together with pupæ and larvæ preserved in alcohol, were exhibited and a statement made of injuries done to hop gardens in Prince Edward county.

5. *Cantharis Nuttalli*, a beautiful blister-beetle from the North-West Territories, where it had been abundant and injurious in the perfect state during last summer, but probably did good service in the larval condition by feeding on locusts' eggs.

After spending some time in the examination of specimens brought by members, and contained in the Society's cabinets, and in comparing notes on various matters of entomological interest, the meeting, which was greatly enjoyed throughout by those who were present, was brought to a close.

A VISIT TO THE CANADIAN HAUNTS OF THE LATE PHILIP HENRY GOSSE.

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

One stormy night in the winter of 1863 I was visiting at a friend's house in Laprairie when amongst the books on the table I found a copy of the *Canadian Naturalist*. I took it to my room and was fairly carried away with it. I forgot the lateness of the hour; I heard not the beating of the storm upon the roof and window; I was transferred in imagination to the township of Compton, and wandered with Gosse along Bradley's Brook, and into the Brulé, and on the banks of the Coaticook. On my return to Montreal I acquired a copy of the work, which became, for a time, my constant companion.

In the *Canadian Naturalist* are to be found, as might be expected, many mistakes and imperfections; but it is, notwithstanding these, a charming work. The author seems to have thrown his life into it, and to awaken with a magic touch responsive feelings to his own in the reader's bosom; and—to speak after a heathen fashion—the book is redolent with the worship of Pan.

My interest in Gosse was increased during eleven years residence in Cowansville, in the Eastern Townships; for, during the greater portion of that time, I had for my near neighbor, and intimate acquaintance, Mr. G. E. Jaques, with whom Gosse came from Newfoundland, and with whom he lived in the summer seasons of his stay in Canada.

Of his residence here are rapidly disappearing. It has been thought well, therefore, that I should place on record such reminiscences of him as I have been able to gather.

I made my first visit to Compton in 1864. The building in which Gosse taught the "Winter-school" was then much as it was in Gosse's day; and it is still substantially the same. It is a frame structure, in the ordinary village style, painted red, "picked out" with white. It stands at the outskirts of the village on the Hereford road. While I was examining it on the occasion referred to, I was joined by Mr. Logee—commonly called "Major Logee." We fell into conversation, and I asked him if he had known Gosse. "Why, yes," he said, "He boarded at my hotel. Come to the house!" The house was within sight, a few rods distant, and standing alone.* It was a commodious two-story building with a double verandah.

Mr. Logee spoke of Gosse's quiet and studious habits, and evidently entertained a pleasant remembrance of his young boarder of long ago; "but," said he, "the people here used to speak of him as *that crazy Englishman who goes about picking up bugs.*" One sentence in the *Canadian Naturalist* shows that Gosse was quite at home in the

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major's hospitable dwelling. On page 45 we find him saying, "It is pleasant to think that we have a comfortable home and a cheerful fire to look forward to." In the long winter evenings he here recorded the observations made in the course of the day. We can fancy that we see him, in the retirement of his chamber, holding the candle at the window, and noticing the white flakes descending in the "darkness visible" (see *Can. Nat.* page 30), or musing over the "frosted flowers" on the panes (p. 29), or on the sudden formation of ice-needles, in the chilled water on the wash-stand, when agitated by the immersion of his hands (p. 351).

A few days ago I went to see my friend Quartus Bliss, Esq., of Compton, with the express purpose of gaining information concerning Gosse. We drove through the village of Compton but could then learn of only two persons who remembered him. One, a lady, was unfortunately from home; the other, when I mentioned Gosse, said, "Oh, yes! I remember him. I went to school to him. *He* couldn't teach school *any*, to suit this country." "Is that so?" I said, "but why?" "Why?" he retorted. "Well, one day when it was snowing, he took a slate and caught the snow-flakes and made drawings of them." And youthful impressions were so strong in the man, and the act had appeared so ridiculous to him in his youth that, at the remembrance of it, he laughed—and laughed—and "laughed consumedly." And the ludicrousness of this man's laughing at Gosse made me laugh, and my friend Bliss laughed for sympathy. At length, by way of creating a diversion in Gosse's favor, I said, "I think I can show you a copy of the drawing he made that day." And I took the *Canadian Naturalist* from my pocket and shewed him the cut on page 27. He seemed somewhat taken aback that anything Gosse had done should be reproduced in a book, but he soon returned to the charge: "In his garden at Smith's Mills he planted poison-poke!" (p. 233). I was, of course, duly silenced. The character of a man who could plant poison-poke in his garden was beyond redemption. I might have told of gardeners setting out plants of the pickled-cabbage order for effect: but where would have been the use?

I had given Mr. Bliss a list of the places I wished to see. As we were driving through a stretch of lowland he said, "This that we are coming to is Spafford's Bridge (p. 103). Yonder was Robinson's farm (p. 188). On the hill facing us was the Pierre Barker place, (p. 298): the house is still standing; the farm was the best in the neighbourhood in Gosse's day. To the left, here on the flat, lived Adolphus Barker a brother of Pierre, and a notorious scoundrel. The foundations of his house can still be traced."

Having ascended the hill, and passed the old Pierre Barker house, and the fine modern residence of Mr. Vernon to whom the surrounding properties now belong, we came to a turn in the road. "Here" said my friend, "was the Well's place, formerly owned by Mr. Jaques; and yonder you can trace the old main road to Sherbrooke, which has long been abolished." It was all before me: The road we were on was the "village road" (p. 2), the road that the horseman in the vignette of Gosse's title page is pursuing. Looking down from that road, immediately to the right, in the corner unmarked in Gosse's sketch, I saw the shattered foundations (overgrown with moss and lichen,) of the house in which he lived with Mr. and Mrs. Jaques. It had been a frame cottage, 30 by 24 ft. in size, and had stood five rods from the road. The barn, still standing, but much dilapidated, is eight rods from the site of the house. The foundations of Gosse's log barn can also be seen. Through "the marshy spot below the barn" (p. 116), from which he heard the "Breke-kekex koax-koax" of the frogs, the Grand Trunk Railway now runs, cutting the farm in halves. The maple-grove (p. 227) has been felled, but stumps of the trees remain. No traces of the orchard are left. The whole of the farm is now in pasture.

The bridge over the Coaticook at the bottom of the farm, which he speaks of as "our bridge," has quite disappeared. It is remembered in the neighborhood as the "Wyman Bridge." Its position can be told only from the break in the old road at the river banks. On the rising ground beyond the river, and to the left of the old road, may still be seen the house in which dwelt Mr. Bill, (p. 267).

Pursuing our way we crossed Bradley's Brook (p. 297). To the left between the hills are the remains of the thicket through which Gosse forced a road to the Brulé beyond (p. 297). The hill (p. 303) which he ascended, and from which he saw Smith's mills and

Tilden's tavern, is now bare of trees, and is known as Flander's Hill. Tilden's out-buildings may still be seen from it; but the tavern itself was burned some years ago. Smith's mills are standing yet, dwarfed and hidden by more imposing structures. Hollis Smith, to whom these mills belonged, moved into Sherbrooke, and became the member of Parliament for that city. He has been dead for some years. The village of Waterville with its churches, public schools, post office, railway station, manufactories, etc., has grown up since Gosse left the country.

Only one man in Waterville, as far as I can learn, remembers Gosse. This is Captain Parker, (a descendant of the famous Admiral Parker), whose father owned the adjoining lot to that of Tilden's. The Captain when a boy, met Gosse in the Brulé net in hand. He remembers two things concerning him: (1) that he was clad in rough frieze cloth; (2) that he wore remarkably clean linen. "Biled shirts" were not common in that neighbourhood at that time.

In Waterville I parted with my friend Mr. Bliss.

Returning to the Gosse farm after a night spent at the village hotel, I found that there had been a hard frost in the night—one of those early frosts that Gosse complained of (p. 110). This had whitened the meadows and the foliage. The sun however rose bright and warm. On my way to the farm I came to a dip in the road (p. 180) with willows growing thick on either side. As I passed there was a constant pattering on the dead herbage beneath—the sun gaining strength was thawing the frost on the leaves, and drops fell

"like the first of a thunder shower."

A little rannel tinkled and bubbled over the stones by the road-side, hastening to join the Coaticook in the valley. Its banks were thick with moss. The slight sounds that arose seemed but to intensify the calm that booded around. From the groves beyond the river were heard the whistle of the robin, and (softened by the distance) the cry of the blue jay. This spot in Gosse's day was prolific in insect life; as, I dare say, it is still. It was here that he captured the Baltimore Fritillary (*Melitoea Phaeton*), pictured on page 227 of his work.

When I reached the higher ground I turned; and what a glorious view was presented to me! A lovely rolling country opened towards the north, its rounded hills tufted with maple woods. Columns of white steam and dun smoke, rising amidst hills of more mountain-like formation, showed where the mining works of Capelton were located. Between the spot on which I stood and those distant hills was the rise, forming the middle distance, on which Tilden's tavern formerly stood. Around the spot, as in the days of Gosse, but more restricted, and now of second growth, is a stretch of woodland, which in the many hues of autumn, and lit by the brilliant morning sun, was very beautiful. The poplars were clad in richest chrome; the maples and beeches in various hues of ochre, sienna, Indian red, and crimson; while here and there a tamarack (lonely survivors of the *Nematodus* raid) stood pale yellow amid the more richly coloured trees.

In the valley near me the placid Coaticook pursued its even way. The light green of the willows that fringed its banks formed the basis of a mass of foliage rising with the hill-side, in which was blended the brown-green of the white cedar, the sombre hues of the black spruce, and the brighter Brunswick green of the balsam. Here and there the bosage was broken by farm buildings and russet pastures.

Near the railway, not many rods from Gosse's farm and at a bend in the stream, was a small neglected burial-ground in which the white rounded head-stones rose amidst a tangle of brambles, golden-rod and everlastings. I walked over to it and found it recorded on one of the stones that Henry Learned died August 13th 1837. (Gosse may have attended his funeral). He was laid beside "Lovy" his wife,

Returning I found the point of view on which Gosse stood when he drew the sketch of his farm. The property having been added to a larger one, and seemingly used for pasturage only, is probably very much in the condition in which Gosse left it. The land is not particularly good—in the division Jaques seems to have had the better share.

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Along the road-side are a few fine maples, doubtless the same represented in the view, increased in bulk by their fifty-three years subsequent growth. A few small clumps of cedar and spruce somewhat relieve the dreariness of the stretch of pasture land ; but the farm to-day is not one that would be chosen either for beauty or fertility.

Melancholy feelings come over one as he contemplates a ruined homestead, and thinks of the human interests that once centered therein. What aims and hopes actuated the builders of it ! Within its walls what scenes of homely mirth were witnessed, what hours of anxiety were spent, what plans for improvements were made, what disappointments were experienced ! Everything around had its uses and its history ; and now all is gone. The owners ! Their place knows them no more. Their belongings ! They are dispersed or have perished. Their habitation ! Its moss-grown foundations are all that remain of it.

With such feelings, tempered with the reflection that it was well for science that Gosse should have been disappointed, I looked upon the scene on which he entered full of high expectations. Here he toiled. Here he slowly learned the hard lesson that he had mistaken his vocation. Hope of acquiring an independence through his farm left him ; and he was at length glad to sell out at any sacrifice. The reasons for his failure are not hard to find from his own statements. Instead of dividing his land into meadow and pasture, and purchasing young stock to raise and sell at a profit, keeping only small portions of land successively under the plow—just so much at a time as he could manure thoroughly and work with comfort ; he plowed up much unenriched soil, and laid out for himself much unprofitable labour. I have often wondered what he intended to do with his two acres of turnips (Life of P. H. Gosse, p. 92), without storage for the preservation of the produce, or stock to consume it, or any available market—for his neighbours would grow what they wanted of such like crops for themselves. The people immediately around him were generally of an unsatisfactory class, who would ridicule his mistakes, and endeavour to profit by his inexperience. They were "vulgar and sordid, sharp and mean." (Life of P. H. Gosse, p. 96). They were even worse than all this—they were criminal. A notorious band of desperadoes, counterfeiters and thieves, made the Tilden tavern their rendezvous. Dark hints of mysterious disappearances were whispered round. The dispersion of this gang was brought about in this way : Near Compton village resided a miserly old couple named Witcher, who had saved, what for those days was a large sum of money, \$3,000. They had this secreted in a trunk, in an upper chamber of their house. The fact in some way became known to the gang ; and by means of a ladder access was gained to the room, and the spoil was secured. The old lady, hearing a noise which she imputed to the mice in the chamber, arose, opened the stair-case door, and thrust in the cat. She then retired contentedly to bed. The robbery caused a great commotion ; and one loose character, who left the neighbourhood during the stir, was followed up and induced to turn King's evidence. Several of the gang, having had timely warning, fled to the States ; but Adolphus B. Ker was tried, convicted, and condemned to death. The sentence was commuted to imprisonment for life, and he was confined in the jail at Three Rivers. After his incarceration his wife told of his coming home one night on horseback with a dead body in front of him, which he took to the woods and buried ; but as she had become demented (which was not to be wondered at, poor thing !) no great heed was given to her statement. She soon afterwards died. Her story however was enough to cause the neighbours—the young especially—to regard the empty house with dread. One circumstance in regard to it is still narrated : I have said that the house stood back in the field. A person passing along the road one night noticed a pale unearthly light in one of the windows. He hurried away in fear. The light was seen by others on subsequent nights ; and at length a few of the boldest of the neighbours resolved to investigate it. They came to the gate leading to the house. And certainly, there in the window was the light ! They brought their courage to the sticking point and made a rush to the building ; but, as they drew near, *the light vanished !* They could hear no sound, nor could they find next day any traces of visitors, earthly or unearthly. It was not till some time afterwards that they discovered that the mysterious light was only seen when a certain room in another house in the distance was lit up—that it was, in fact, a mere reflection.

After fourteen years' imprisonment Barker was released. About the same time was liberated a French-Canadian woman who had occupied an adjoining cell. This woman Barker sought out and married, and the pair crossed over into the States. It is said that by loosening the bolts which secured the ends of a large box stove built into the partition wall they had been able to keep up an acquaintance for some time previous to their liberation. The jail arrangements of those days were of a primitive order. I have been told that, in the States, Barker resumed his nefarious practices, and eventually paid the penalty of his crimes on the scaffold.

In the Life of Gosse, page 103, we read, "During the autumn" (of 1837) "he was vexed and disturbed by having to appear in court to give evidence in a criminal case against one of his few neighbours." Could this have been the case I have been recording?

Gosse alludes, in the preface to the Canadian Naturalist, to the "stormy politics and martial alarms of the times." A few words will shew the condition of affairs in his neighborhood. It was the period of the rebellion, and as an inroad of American "sympathizers" was expected, the loyal inhabitants of the Townships felt called upon to adopt precautionary measures. At a meeting of militia officers held at Frost Village, at which Colonel Knowlton presided, it was resolved to send three of the leading men of that part of the country as a deputation to solicit supplies of arms and ammunition from the military authorities at Montreal. Accordingly Colonel Knowlton, Major Wood and Abijah Wood were sent, and their errand was completely successful. Large supplies were shipped (by way of the St. Lawrence and the Richelieu) to Philipsburg, on Missisquoi Bay. Here they were met by numerous teams driven by the yeomen farmers of the district. Good men and true from all the country round turned out to guard the valuable consignment. Night came on, and under cover of the darkness, an armed force of sympathizers from Swanton, Vermont, attacked the convoy at More's Corner. The enemy were, however, beaten off and dispersed. Volunteer companies, equipped with the arms thus acquired, were soon formed in all that section of country. Captain Wood, of Shefford, had under his command a body of cavalry numbering 85 men. Captain Savage, of the same place had 100 infantry. Captain Becket, of Sherbrooke, had a troop of horse and Captain Gilman, of Stanstead, another. In the quota of men sent from Compton Gosse's friend, Amos Merrill (p. 40) was sergeant. It is rather to be wondered at that Gosse, amidst the general enthusiasm, did not take a more active interest in the military movements of the times. Perhaps it was with him as with that good bishop in the middle ages, against whom his knights and censitaires complained, that he was "a man of peace and not at all valiant." The action of the United States authorities at this crisis was prompt and judicious. Troops from the Southern States were brought up and stationed along the American side of the border, and this doubtless prevented much harm. The troops stationed at North Troy, Vermont, were brought from Florida.

Two retired English officers were sent to superintend operations and watch the line on the Canadian side. These men knew but little of the country, and amusing reminiscences of them are still told in our country houses. For instance: One of them was spending the night (a clear, cold winter night) at Hatley—the *Charleston* of Gosse (p. 95). He heard repeatedly that sound (familiar enough to Canadian ears,) which accompanies the sudden loosening of a shingle-nail by the frost. The gallant colonel arose in consternation and dressed himself in haste, convinced that because of his august presence sympathizers were firing upon the house.

One of the young men who drove a team at More's Corner, and who afterwards joined Captain Wood's troop of cavalry, was Mr. Calvin L. Hall, a son of one of the leading men of East Farnham. Mr. Hall being well mounted was chosen as a body guard for the English officer above mentioned, and in this capacity did some hard riding. On one bleak day he, on horse-back, accompanied his superior, without stoppage, from East Hatley to Frost village, a distance of 36 miles. The Englishman, well wrapped up in buffalo robes, drove his team "at the jump," and viewed every piece of bush that he passed with suspicion. Mr. Hall is now Lt.-Colonel Hall, of the 52nd "Brome" battalion of Light Infantry.

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Of Compton people contemporary with Gosse, besides Major Logee, I saw on my first visit to the village, Colonel Pomeroy, magistrate; A. V. Kendrick, merchant, and Nathan Merrill, hotel-keeper. All are now dead—as are all whom Gosse mentions in his book. Of these the last survivor was Mrs. Bill, who died at Waterville about six years ago. Ann Heap, widow of G. E. Jaques, died on December 30, 1891 in her 84th year. Her husband had died on the preceding 12th of July, aged 84 years. The remains of this worthy couple rest in Mount Royal cemetery.

I have said that in Gosse's work there are many mistakes. One of the most remarkable of these is his supposition that the piping of the tree-frogs in early spring was produced by lizards (p. 94). He describes the frog (p. 266), but seems to have rejected the idea that this creature produced the sound, and many persons still, having read his book, have strong faith in the lizards. Good old Bishop Oxenden once spoke to me of the "whistling lizards." I begged to assure him that the "whistling" was produced by frogs—that I had kept the creatures and knew certainly that this was the case. I even showed him drawings I had made of the frog with its throat distended preparatory to the emission of the sound. But all was of no avail. Gosse had said that he believed the sound to be that of lizards. Gosse was once contradicted to his face by believers who did not know him personally.* That my statement should stand for a moment beside an expressed opinion of his was not to be thought of. And the good old bishop in his last work, the "History of my Life," page 142 (by a double error; by a strange transposition of sight for sound) says, "There" (i. e. in Canada) "are few reptiles, excepting lizards, which seem to take pleasure in exhibiting their antics in public."

Gosse must often have listened to the chorus from the swampy spot below his barn; the *peep-peep* of the tree-frog, the *croak* of the meadow-frog, the *tr-r-r-r-r-ill* of the toad and the *bomp-bomp* of the bull-frog. A lady-friend of mine compares the reptile assembly to a noisy household, in which the little children are crying to be put to bed, and the elder ones scolding, while the mother endeavours to still their clamour with a *hu-s-s-s sh*, and the father expostulates with a grumpy voice.

From the Fauna of Compton County some of its most interesting forms have vanished since 1838. The caribou (*Cervus tarandus*) and the Virginian deer (*Cervus Virginianus*) have long disappeared, and with them their natural foes the wolf (*Canis lupus*) and the puma (*Felis concolor*). The moose (*Cervus Alces*) approaches no nearer than the swampy portions of Megantic County, and the black bear (*Ursus Americanus*) than Mount Orford and the neighboring hills of Sutton and Bolton. The cry of the lynx (*Felis Canadensis*) is seldom heard. The last pair of beavers were shot in the Brulé fifty years ago. That objectionable animal, the skunk, (*Mephitis Americana*), so admirably delineated on page 254 of the Canadian Naturalist is, however, still quite sufficiently abundant. Gosse evidently, was well acquainted with it. By way of affording a contrast to his distressful account, I may say that a year ago a clergyman from England came to see me. He was fond of natural history and was seeking information. In the evening, happening to go to the door, I found that a skunk had crossed the lawn in front of my house. I called my friend and said, "Here is a perfume that you should know of." He sniffed and exclaimed eagerly, "What is that? What is that? *Do you know I rather like that.*" The otter (*Lutra Canadensis*) and the salmon (*Salmo salar*) are gone from the St. Francis, the Coaticook and the Massawippi. The "Salmon River" no longer bears an appropriate name, but the bald eagle (*Falco leucocephalus*) still haunts the lakes, and the snowy owl (*Strix nyctea*) and the great horned owl are still occasionally heard. The cry of the former resembles *Bomp-bomp*, that of the latter is very accurately given by Gosse as *Ho! Oho! Oho! Waugh ho!* (p. 177). The sound—so mysterious to Gosse (p. 92)—of the saw-whet owl (*Nyctale acadica*) still rises from the woods in the summer evenings. I have not seen the passenger pigeon (*Columba migratoria*) since 1864, and the scarlet tanager (*Tanagra rubra*) has become scarce.

*On one occasion, I recollect, at Livermead, we came across a party of ladies who were cackling so joyously over a rarity they had secured, that curiosity overcame our shyness, and we asked them what they had found. They named a very scarce species, and held it up for us to examine. My father, at once, civilly set them right; it was so-and-so, something much more common place. The ladies drew themselves up with dignity, and sarcastically remarked that they could only repeat that it was the rarity, and "Gosse is our authority."—*Life of P. H. Gosse*, p. 288.

None of the insects mentioned by Gosse, as far as I can identify them, would now be considered rarities, except the "Chequered Skipper" (p. 219), the "Pearly Eye" (p. 246), and the "Dragon Moth" (p. 248).

From the index to the *Canadian Naturalist* we find that Gosse was acquainted with 26 of our butterflies and 43 of our moths, besides a variety of beetles, bugs, flies, etc. The Lepidoptera are given below under the names used by Gosse and (as far as I have been able to identify them) the names in the "Toronto List."

Names used by Gosse.

Tiger Swallow-tail (*Papilio Turnus*.)
 Black Swallow-tail (*P. Asterius*.)
 Clouded Sulphur (*Colias Philodice*.)
 Grey-veined White (*Pontia Oleracea*.)
 Archippus Butterfly (*Danais Archippus*.)
 Pearl-border Fritillary (*Melitœa Myrina*.)
 Pearl-crescent Fritillary (*Melitœa Tharos*.)
 Silver-spot Fritillary (*Argynnis Aphrodite*.)
 Great Spangled Fritillary (*Argynnis Cybele*.)
 Green Comma (*Grapta Progne*.)
 Orange Comma (*Grapta C. Album*.)
 Grey Comma (*Grapta C. Argenteum*.)
 Violet Tip (*Grapta C. Aureum*.)
 Camberwell Beauty (*Vanessa Antiopa*.)
 Forked Butterfly (*Vanessa Furcillata*.)
 Compton Tortoise (*Vanessa J-album*.)
 Banded Purple (*Limenitis Arthemis*.)
 Eyed Brown (*Hipparchia Transmontana*.)
 Pearly Eye (*Hipparchia Andromache*.)
 Copper (*Lycœna Phleas*.)
 Spring Azure (*Polyommatus Lucia*.)
 Black Skipper (*Thymele Brizo*.)
 Chequered Skipper (*Pamphila Paniscus*.)
 Yellow-spotted Skipper (*Hesperia Peckius*.)
 Tawny-edged Skipper (*Pamphila Cernes*.)

Twin-eyed Hawk-moth (*Smerinthus Geminatus*.)
 Zebra Hawk-moth (*Sphinx Kalmia*.)
 Grey Hawk-moth (*Sphinx Cinerea*.)
 Six-spotted Blue Hawk-moth (*Alypia Octomaculata*.)
 Humble-bee Hawk-moth (*Sesia Pelasgus*.)
 Belted Hawk-moth (*Ægeria*—)

Buff Leopard (*Arctia Isabella*.)
 Muff (*Lophocampa Tessellaris*.)
 Panther (*Spilosoma Acria*.)
 Brindled (*Biston Hirtarius*.)
 Streaked Hooptip (*Platypteryx Erosa*.)
 Lemon Beauty (*Angerona Sospeta*.)
 Pea Green (*Chlorissa putataria*.)
 Grandee (*Geometra Clemataria*)*
 Rhinoceros (*Herminia*—)
 Belle (*Spilosoma Virginica*.)
 Ruby Tiger (*Pragmatobia Fuliginosa*.)
 Rose-breasted (*Dryocampa Rubicunda*.)
 Snowy (*Spilosoma*—)

Names according to the Toronto List.

Papilio Turnus, Linn.
P. Asterias, Fab.
Colias Philodice, Godt.
Pieris Oleracea, Bd. var *Frigida*.
Danais Archippus, Fab.
Argynnis Myrina, Cram.
Phyciodes Tharos, Drury.
Argynnis Aphrodite, Fab.
Argynnis Cybele.
Grapta Faunus, Edw.
Grapta Comma, Harr.
Grapta Progne, Cram.
Grapta Interrogationis.
Vanessa Antiopa, Linn.
Vanessa Milberti, Godt.
Grapta J-album, Bd.
Limenitis Arthemis, Drury.
Satyrus Nephele, Kirby.
Debis Portlandia, Fab.
Chrysophanus Americana, D'Urban.
Lycœna Lucia, Kirby.
Thanaos Brizo, Bd.
Carterocephalus Mandan, Edw.
Pamphila Peckius, Kirby.
Hesperia Taumas, Fab.

Smerinthus Geminatus, Say.
Sphinx Kalmia, A & S.
Sphinx Chersis, Hubn.
Alypia Langtonii, Coup.
Hemaris Thysbe, Fabr.

Pyrrharetia Isabella Abb. & S.
Halisidota tessellata, A. & S.
Leucarctia acraea, Drury.
Eubyja cognataria, Guen.
Platypteryx arcuata, Walk.
Angerona crocaotaria, Fab.

Procherodes clemataria A. & S.

Spilosoma virginica, Fab.
Phragmatobia rubricosa, Harr.
Dryocampa rubicunda, Fab.
Hyphantria textor, Harr.

*I have taken *P. transversata* Drury, in the Townships but not *P. clemataria*.—T. W. F.

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Names used by Gosse.

Angleshades (*Phlogophora Meticulosa*.)
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 Silver-spotted Buff (*Pygæra Gibbosa*.)
 Gamma (*Plusia Gamma*.)
 Royal Tiger (*Arctia Virgo*.)
 Dragon (*Hepialus Argenteo-maculatus*.)
 Cerulean (*Ctenucha Latreilliana*.)
 Pink Arches (*Thyatira Scripta*.)
 Twin Goldspot (*Plusia Iota*.)
 Clifden Beauty (*Xerene albicillata*.)
 Spotted Lemon, or Lemon Beauty.
 Drab Plume (*Pterophorus*—)
 Vapourer (*Orgyia Antiqua*.)
 Gold and Silver (*Plusia Festucae*.)
 Green Gold (*Plusia Chrysitis*.)
 Spangled Orange (—)
 Furbelow (*Calyptra Libatrix*.)
 Griseous (*Cerura Hastulifera*.)
 Apple Moth (*Tethea*—)
 Green Emperor (*Saturnia Luna*.)
 Eyed Emperor (*Saturnia Polyphemus*.)
 Crimson Underwing (*Catocala*—)
 Winter (*Cheimatobia Vulgaris*.)

Names according to the Toronto List.

Trigonophora periculosa, Guen.
Crambus Girardellus, Clem.
Crambus,
Edema albifrons, A. & S.
Plusia precatiosis, Guen.
Arctia virgo, Linn.
Hepialus argenteo-maculatus, Harr.
Ctenucha virginica, Charp.
Habrosyne scripta, Gosse.
Plusia bimaculata, Steph.
Rheumaptera ruficillata, Guen.

(Pterophorus marginidactylus.)
Orgyia nova, Fitch.
Plusia Putnami, Gr.
Plusia balluca, Gey.
(Calopistria monetifera.)
Scoliopteryx libatrix, Linn.
Cerura cinerea, Walk.
Cacocia rosaceana, Harr.
Actias Luna, Linn.
Telea Polyphemus, Cram.
Catocala concumbens Walk.
Operophtera borealis, Hubn.

The Entomological portions of the *Canadian Naturalist* are the weakest. If Gosse had had a little more knowledge, had taken a little more pains, and had scrupulously pared away all such provoking passages as "I shook off a black Sawfly (*Tenthredo*), two green Waterflies (*Perla Cydippe*), two Cimbices (*Pentatoma*—), several Chrysomelids with soft horn-colored elytra (*Crioceris*—), and another very little species of a metallic purple (*Phyllodecta Kitellina*)," (p. 184), which, while they have a show of knowledge, really betray the lack of it, men would have delighted to place the *Canadian Naturalist* with such classics as Kirby and Spence's Entomology, White's Natural History of Selbourne, etc. As it is, it is hardly likely that a re-print of the book will be called for; though the copies of it that remain with us are highly valued.

NOTES ON THE RARER BUTTERFLIES OF THE PROVINCE OF QUEBEC.

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

At the annual meeting of the Entomological Society of Ontario, held in October, 1885, I read a paper on such of the Butterflies of Quebec as were then known to me. Other species have since come under my observation, and I beg to offer a few remarks upon them. The first in order is:

COLIAS INTERIOR, Scudder. I took this insect, in September, 1891, on the Heights of Levis. It seemed to be rather plentiful. I looked for it carefully in the spring of this year, but not a specimen was to be seen, nor have any since made their appearance. One would suppose that a chance irruption of the species had occurred—that prevailing winds had brought them southward. *Interior* differs from *Philodice* in that it lacks the row of reddish brown dots near the hind margins, on the underside of the wings. The black spot on the fore wings of *Philodice* is represented by a faint oval ring in *Interior*; and in the females of the latter the black border to the secondaries is wanting. † I took one or two albinos of the species.

ARGYNNIS FREYA, *Thunb.* I captured, in the middle of the Gomin swamp, in September, 1887, one specimen of this rare insect. I am inclined to think that it was a straggler from some mountain swamp to the north of us. The only other specimen that I know to have been taken in Quebec Province was shewn to me, many years ago, by the late Mr. Caulfield. He received it, if I am not mistaken, from Mr. Bowles, who was then living in Quebec. My insect is in good condition, but is less bright than one of the same species from the North-west, shown to me by Mr. H. H. Lyman. I have noticed that western insects generally are of somewhat more vivid colouring than those of the same species in the east. The markings on the under-side of the hind wings of *Freyia* are angulated and very intricate. The silvery embellishments are few and have a bluish tinge. One of them near the inner edge of the wing takes the form of an elongated X.

GRAPTA GRACILIS, *Gr. & Rob.* In August, 1888, I saw a butterfly escaping from its chrysalis case which was attached to a branch of a currant bush. I captured the insect which proved to be *G. gracilis*. The chrysalis was four-fifths of an inch in length, one-fourth of an inch in width of thorax, and the same in depth where the wing-cases terminated. It had numerous pointed projections. The color was light brown, mottled with dark brown over the abdomen. The butterfly in colouring is very distinct from *Progne*. On the upper side it approaches more nearly to *Faunus*. Beneath, the basal portions of wings are of a rich warm umber with some bluish-grey patches. Beyond in striking contrast, and extending through both primaries and secondaries is an irregular pearly grey band, shaded off into the dark umber of the hind margins. The arrow-heads seen so plainly near the lower portion of the hind margin in the primaries of *Progne*, are almost deleted. The silvery curve in the hind wings is very conspicuous and forms the edge of a scallop in the dark portion of the wing.

Last year, on the 12th of June, I saw *Gracilis* ovipositing on Red Currant. I found the egg. It was cone-shaped, but slightly flattened at the top; green—of the same shade as the leaf to which it was attached,—and it had divergent longitudinal ridges of a lighter hue. I cut the twig that I might have the egg under observation; but it did not hatch, it seemed to dry up with the leaf.

DEBIS PORTLANDIA, *Fab.* In a paper entitled "A Day in the Woods," which appeared in the Society's 22nd Annual Report, I recorded my first capture on the 6th of August, 1890, of this beautiful butterfly. On July 3rd, 1891, I took a very perfect specimen of the species on Mount Royal. It fluttered down from a tree and lit in the fern a few yards from me. On July the 22nd of the present year I took a pair *in coitu*, at the spot on which I made my first capture. These also fluttered down immediately before me in the same heedless manner. *Portlandia* may be readily distinguished from our other "Browns" by the delicate purple blush on the underside. In size it comes between *Nephele* and *Canthus*.

CHIONOBAS JUTTA, *Hubner.* In 1885 I had not discovered the locality for *Jutta*. Of the means by which I found it and the successful efforts I made to rear the insect, accounts appeared in the *Canadian Entomologist*, Vol. XX., p. 131 and Vol. XXI., p. 13. Mr. Scudder in his important work on the Butterflies of the New England States and Canada mentions my success, but asks, "Does the pupa undergo its transformations in a cell as in *O. semidea*, or hanging like ordinary Nymphalids?" and he adds "Fyles does not tell us." He must have overlooked my second paper in which I said "The chrysalids were naked, unattached, and lay on the surface of the sphagnum." Under the head of *DESIDERATA* he asks, "Where in a morass mostly under water can the half-grown larva find a suitable place to hibernate, and where in the still higher waters of Spring can the caterpillar securely pupate?" These questions are easily answered as regards the Gomin Swamp. *The sphagnum rises with the water and is never submerged.* The visitor sinks in it, to the ankles in a dry season, and to the knees in a wet one; and their are parts of it that it is well for him to avoid.

The individuals of this species that I brought to perfection passed the winter in the larval state and turned to pupæ in the Spring. Further experiments have shown that some larvæ hibernate after the second or third moult—their growth having been retarded.

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This was notably the case last winter which was a remarkably open one. It may be that the larvæ have susceptibilities and powers of reservation which enable them to accommodate themselves to seasonal variations. It remains to be shewn whether the remaining stages of the backward larvæ are hastened in the Spring, that the imagos may present themselves at the usual period, or whether the larval condition of the insect is sometimes prolonged over a second season. Larvæ that I have reared to their full growth this season became sluggish in the first week of October, and by the middle of the month were quite torpid.

THECLA LÆTA, Edw. A specimen of this pretty little butterfly was taken in May, a few years ago, by Mr. Winn, on Belœil Mountain.

THECLA TITUS, Fab. On the 22nd of July last I had a stroke of good fortune. During thirty years of close observation of the insect world in this Province, I had not seen half a dozen specimens all told of *T. Titus*; but on this day, in a neglected meadow near St. David's, I came upon quite an assembly of the insects. They were fluttering about over the Hawkweed blossoms, and I captured a full series of very perfect specimens.

CHRYSOPHANUS EPIXANTHE, Bd. This is a swamp insect, and appears in the Gomin about the 23rd of July. I have not met with it in any other spot in Quebec Province. It appears in goodly numbers and lasts about a fortnight. It is not difficult to catch, for if the collector gets between it and the sun, the light shining upon the silvery under surface of the wings renders its flight very perceptible.

LYCENA COUPERI, Grote. On June 13th of last year I took on the Heights of Levis a lovely specimen of this charming insect. I had seen two of the kind the year before, but was unable to capture them. This year the insect has not come under my notice. On the upper side its wings are smalt blue with dark borders and white fringes. The under side, brownish grey set with white ringed, black dots, reminds one of the English *P. Acis*.

CARTEROCEPHALUS MANDAN, Edw. Under the name of the "Chequered Skipper" [*Pamphila Pansicus* (?)], Gosse in the *Canadian Naturalist* records the capture at Compton, P. Que., of this pretty butterfly. I have in my cabinet a specimen taken near Fort No. 2, Levis, in 1889 by Mr. Robert Maxwell, a promising young entomologist whose early death is to be lamented. On June 16th of this year Mr. Hanham took a specimen in good condition in a meadow near Bergerville. It was flitting low down amidst the stalks of herd's-grass. *Mandan* very closely resembles the European *Pansicus* in color and markings; but it is a smaller insect. Morris gives the expansion of wings of *Pansicus* at "about an inch and a quarter." My specimen of *Mandan* has an expansion of one inch only. Its contour too is different—more trim and slender.

PAMPHILA MANITOBA, Scudder. As this pretty skipper was taken some years ago by Mr. Couper, at Riviere-du-Loup *en bas*, only 116 miles from South Quebec and on the same side of the river, I have been expecting its advance for some time. On the 9th of September I captured my first specimen near Fort No. 2, Levis. On the 16th of the same month I took another, and on the 19th a third. The insect appears after the other skippers have vanished. I netted my specimens as they were reposing on the blossoms of Gnaphalium. A few days afterwards the insect was found in abundance by Mr. Hanham at a spot on the other side of the river, nine miles north from Quebec. As this is the only skipper we have in Quebec Province having the under sides of the hind wings *sage green with two irregular rows of white patches*, it can easily be distinguished.

PAMPHILA METACOMET, Har. I have two female specimens of this (with us) rare insect. They were taken on the Heights of Levis. In color they are of a sober brown and the primaries have a dark transverse streak on the upper side.

I have one specimen each of *PAMPHILA EGEREMET, Scud.*, and *AMBLYSIRTES SAMOSET, Scud.*, taken by myself in the Eastern Townships, and one of the latter taken by Mr. R. Maxwell at Levis.

The butterflies that with us are extremely "local," being confined, as far as I know, to one or two places only, are *Chionobas Jutta*, Hub., *Thecla Augustus*, Kirby, *Thecla*

Niphon, Hub., and *Chrysophanus Epixanthe*, Bd. and Lec. I have not found *Eudamus Tityrus*, Fab., nor *Lycena Comyntas*, Godt., east of Montreal.

The Entomologist should work his own locality thoroughly, and unexpected prizes will be very sure to reward his diligence. Two years ago a pair of *Melitæa Phaeton*, Drury, were seen flitting along the banks of a *ruisseau*, right in the town of Levis.

No doubt, as the numbers of our Entomologists increase, and new fields are brought under our observation, other haunts of our rarer species will be discovered, and names of new and advanced kinds added to our lists.

A TRIP TO MOUNT WASHINGTON.

By H. H. LYMAN, MONTREAL.

On July 18th, 1891, I left Montreal on a trip to Mount Washington for the purpose of securing, if possible, the eggs of *Chionobas Semidea* and a goodly supply of the imagos. I expected to reach the summit that same evening, but the train was late and missed connection with the mountain train.

The next day was only partially fine, but a walk was taken along the carriage road which runs from Fabyan's to the base of the mountain, as far as the falls of the Ammonoosuc and back by the railway track, but nothing of any special interest was seen, as it was too early for *Grapta Gracilis*, and the only butterflies seen were *Argynnis Atlantis*, *Pieris Rapæ*, *Neonympha Canthus*, and a few common skippers.

All day the mountain had been covered with clouds, but as I was prepared to spend a week up there if necessary, this did not deter me; so I went up by the train that afternoon, and on arrival at the summit received a kindly greeting from Mr. Scudder, who had been up two days and already had females caged.

I, however, was in luck, for though we had turned in with the fog as dense as ever, the ringing of a bell about four o'clock the next morning announced that a sunrise could be well observed from the platform in front of the hotel. As I had never seen a sunrise from a mountain, I got up and joined the shivering contingent, for it was horribly cold (only 49°), and with a keen wind. The day was fine, however, and promised well entomologically.

As soon as possible after breakfast we sallied forth, and as Mr. Scudder was anxious to look for *A. Montinus* we started for the head of Tuckerman's Ravine. We had not gone very far down the rock strewn slope before I had netted my first specimen of *Semidea*, and as it was a female it was promptly boxed. We entered the ravine and descended almost to the bottom of the main slope without seeing any sign of *Montinus*, and as I was confident it was not on the wing, I concluded I was wasting my time, so we parted company, Mr. Scudder going on to the bottom where the snow arch forms, while I retraced my steps to the slope above the ravine, and then struck across to Bigelow's Lawn to hunt for *Semidea*. In a few minutes I found an excellent locality, where there was a narrow sedge slope tolerably free from rocks and interspersed with clumps of the Mountain Sandwort (*Alsine Grœnlandica*) and other flowers, and somewhat sheltered from the wind then blowing. There I took up my position and collected a good many fine specimens, besides securing half a dozen or more living females for my cage.

Here I may pause to make a short reply to Mr. Grote, and I would say that I think he is unnecessarily alarmed when he says, "What time, on 'Bigelow's Lawn,' I see the ill-advised collector, net in hand, swooping down on this devoted colony, of ancient lineage and more than Puritan affiliation, I wonder if, before it is too late, there will not be a law passed to protect the butterflies from the cupidity of their pursuers."*

* "A Colony of Butterflies," by A. R. Grote.

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This species is, as Mr. Scudder says, exceedingly abundant, and many thousands must fly upon the mountain every season. Then the number of entomologists on this continent is so small, and so few are able to visit the mountain, and most of those who get there can only stay such a short time on account of the expense; so few days are favorable for collecting, and so many are bad; the rock strewn slopes are such difficult collecting grounds, and so few of the butterflies one starts up are secured, that there is really very little cause for alarm lest they should fail to maintain themselves in their mountain fastness. But when I attend an entomological meeting in a city of over half a million inhabitants, and find ten or a dozen men gathered around a table, while the great world outside cares for none of those things, I have more fear for the extermination of entomologists than for that of any but the rarest of the objects of their study.

When I began catching this species I treated it with my usual care for fear of damaging the specimens; but I soon found that, in contrast to such species as *Macounii* and *Chryxus*, such care was quite unnecessary, and that it was quite possible to take them by their closed wings between the thumb and fingers and examine the genital organs before consigning them to the cyanide bottle or pill-box without causing any damage whatever. Returning to the summit with my catch, my first care was to prepare a cage, which I did by planting a small sod of the carex upon which the species feeds in an empty tomato can. I made the mistake of using a couple of wires crossing each other to support the net, the disadvantage being that any eggs laid upon the wires were practically lost, as I found it impossible to remove them without destroying them; whereas they could have easily been removed from sticks or twigs. In the afternoon another visit was made to Bigelow's Lawn, but with less success than in the morning. Mr. Scudder remained near the summit and was so fortunate as to find a nearly mature larva in the last stage, and he also stocked two cages out of doors on growing sedge as mentioned in his paper on "Experiments with Alpine Butterflies." *Psyche* VI., 129.

Next day, the 21st, Mr. Scudder being very anxious to find out whether *A. Montinus* was on the wing or not, we walked down the stage road to the fifth mile post where we separated, Mr. Scudder going down to the Lodge while I struck across the slope towards Huntington's Ravine, where I had seen and taken it in 1889.

We were both unsuccessful in our search for this butterfly, but I took a specimen of *Colias Interior* and saw several other individuals which probably belonged to this species.

In the afternoon we first examined Mr. Scudder's cages in the open air, three eggs being found in the one near the stables of the stage line but none in the other where the sedge was very long and rank in growth. The whole of the twelve females were then placed in the cage near the barn and handed over to my care, and then we went on down to the Alpine Garden but met with little success, though Mr. Scudder had found *Semidea* swarming there the day before. We looked for eggs to learn, if possible, how they were laid under natural conditions but none were found.

Next morning, the 22nd, Mr. Scudder went down by the early train, carrying his small flower-pot cage with him, and I took charge of the one near the barn and added a few more females to those already in it and also to my tomato-can cage.

That morning I again collected on Bigelow's Lawn, and in the afternoon spent over an hour searching for larvæ of *Semidea* but without success. Afterwards I took a walk over to the summit of Mount Clay and saw a few *Semidea* at different points on the way. One that I started up on the shoulder between Washington and Clay flew with the wind and I made sure it would be carried down into the Great Gulf, but just after being carried over the edge it dropped in a wonderful way into a comfortable nook on the sheltered slope, which shows, I think, that they are not so helpless in a wind as is sometimes supposed.

I examined the cages several times that day but could see only a very few eggs, and began to fear that I should secure but few, but the next morning, the 23rd, I saw at a glance that a large number had been laid in the one out of doors and a number in the small cage also.

I left the large cage undisturbed as long as possible, collecting in various directions and in several orders, but at no great distance from the summit, but about noon began to dismantle the cage with the following result :

Eggs laid on green blades of sedge.....	2
“ “ “ dead “ “ “	21
“ “ “ stiff brown moss	45
Total.....	68

Those laid on the brown moss were particularly conspicuous.

At 2 p.m. I started down the mountain by train carrying the small cage with me and watched the behaviour of the imprisoned butterflies but could not see that they evinced any distress as we descended to the valley. A certain amount of restlessness was observed among some of the individuals, but nothing more than would be likely to be caused by the jarring of the mountain railway.

On arriving at the Mount Pleasant House four individuals were liberated and flew readily a distance of forty or fifty feet before alighting, which is quite as far as they often fly on the mountain.

That evening the weather turned wet and stormy, and an interesting question arises in this connection. Why were so many eggs laid that morning when so few had been laid during the two previous days? Can we suppose that the butterflies discerned the approach of bad weather and hastened to accomplish their oviposition before the weather changed?

Next day, the 24th, I went to the Profile House carrying the cage with the rest of the butterflies with me, and the following morning, the 25th, ascended Mount Lafayette taking six of them with me, as I was anxious to try the experiment of establishing the species on that mountain, the highest of the Franconia Range and rising above the Alpine limit, but I made an unfortunate mistake in putting them into too small a box, which resulted in their becoming so much enfeebled that when released they were quite unable to fly. I placed them upon a good sized patch of the same sedge that the larvæ feed upon on Mount Washington and left them to their fate; but as a tremendous hail storm occurred in the early afternoon there could hardly be any doubt of what their fate would be.

Later in the afternoon I went to Littleton, still carrying the cage, and the next morning, Sunday, the 26th, let them go. One flew about thirty feet, one flew a few feet and one fluttered to the ground. In the afternoon three more were taken out but were too feeble to fly.

Next morning, the 27th, the cage was dismantled and the following eggs, many of which had unquestionably been laid after my descent from the mountain, were secured :

Laid loose or came off gauze	6
“ on left hind leg.	1
“ “ wire supports	18
“ “ gauze	6
“ “ brown moss and attached to it.....	3
“ “ “ but loose.....	20
“ “ dead blades of sedge	7
“ “ the tin can	1
Total	62

I have also a memo. of three collapsed eggs, but whether or not these were in addition to the above number I cannot now say.

I had thus from these two cages a rich harvest of no less than 130 eggs, of which only two were laid upon green blades of sedge, while the large majority were laid upon the brown moss or the wire which was about the same color as the moss. Most of the

eggs were of a distinct lilac shade and were mailed to the collector, which were sent to him retained.

The first was taken on the 7th, giving an idea of its retention on the mountain. It retained its vitality until it emerged from Mr. Scudder's cage the morning of the 14th, the parasite must have had one emergence.

Being unwell myself, but upon the mountain it found its way to Mr. L. Scudder, after the matter how in the specific case of *Telonomus*, as Scudder's 'Butterfly' it."

I was troubled with the larvæ with the food plant matter they ate it and their growth was checked. The length of the head of the larvæ succeeded in completing the second moult. The success of Mr. Scudder's 14th of July. On the 26th, giving an idea of which is probably even less successful moult.

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eggs were of a creamy white color when laid, but two from my small cage were of the distinct lilac shade, which they assume before the hatching of the larvæ. About fifty eggs were mailed to Mr. W. H. Edwards, but of these he said that only about fifteen or twenty hatched, which I could not understand, as nearly all I kept disclosed the larvæ. Others were sent to Mr. Scudder, Mr. Fletcher, and the Rev. Mr. Fyles, and a good share was retained.

The first eggs in my cage were laid July 22nd, and the first larvæ hatched on August 7th, giving an egg period of sixteen days, but whether or not this stage is more extended on the mountain I am, of course, unable to say. One of my eggs failed to hatch though it retained its color and shape, so careful watch was kept on it and on August 13th a tiny parasite emerged through a small circular opening near the base. This was one of the eggs from Mr. Scudder's cage and must have been laid and parasitized either on the 22nd or morning of the 23rd, so that the cycle of life from egg to imago of this interesting little parasite must have been twenty-one or at the most twenty-two days. Mr. Scudder also had one emerge on the same day but lost it.

Being uncertain how such tiny specimens should be mounted, I did not attempt it myself, but upon a subsequent visit to Boston toward the end of the month Mr. Scudder mounted it for me in balsam. This, however, was unfortunate, as I afterwards learned from Mr. L. O. Howard, who wrote, "I very much regret that you, or rather Mr. Scudder, attempted to mount the parasite in balsam, as these hard-bodied creatures, no matter how minute, can be better studied if mounted on an ordinary paper tag. As it is, the specific characters of the insect are entirely indistinguishable. It belongs to the genus *Telonomus*, and, so far as I can see, differs from the two species which are mentioned in Scudder's 'Butterflies of the Eastern United States,' but I should not attempt to describe it."

I was travelling around a good deal from August 16th to September 3rd and carried the larvæ with me everywhere, feeding them on grass. I even had some of their regular food plant mailed to me in a tin box from Mount Washington, but as I could not see that they ate it any more freely than ordinary lawn grass I did not send for any more. Their growth was exceedingly slow, and they were very sluggish, generally remaining at full length head downwards on the edge of a blade of grass. The mortality was heavy, but I succeeded in carrying about half-a-dozen past the first moult, but all these died before the second moult. This year again (1892), I have had eggs of *Semidea* through the kindness of Mr. Scudder, who sent me about twenty eggs laid between the 11th and 14th of July. The first one hatched on July 25th and most of the others on the 26th, giving an egg period this year of fourteen days, or two days less than last year, which is probably to be accounted for by the greater heat this year. Unfortunately I was even less successful this year than last, as I did not succeed in getting any past the first moult.

ON THE POWER OF INSECTS TO RESIST THE ACTION OF FROST.

BY J. ALSTON MOFFAT, LONDON, ONTARIO.

If the experiments with the larva of *Larva Rossii*, as related in Mr. Lyman's paper, entitled, "Can Insects Survive Freezing," were scientifically conducted, it demonstrates that some of them can.

There is an endless diversity in the manner in which frost affects different living organisms, some can survive where the mercury freezes, whilst others succumb to the slightest touch of frost. There is a great difference in the degree of frost required to freeze different substances, and yet it is only a question of degree when all known substances may be frozen.

It is a well-known and generally conceded principle in science, that "Life in nature is adapted to its environment,"—a comprehensive expression which implies a great deal. It generally implies that long continued association has brought the life and the conditions into perfect harmony; which may imply that it has unfitted that life for a different condition. How little of the life of the temperate zones can endure the conditions of either the arctic or the tropic zones, so that what would be true of the life in one would not be true if tried in the other. In considering this subject, then, we must take into account the conditions to which the life we are dealing with has become adapted; it would never do to subject the life of temperate latitudes to the conditions of the Arctic regions, and draw our conclusions from the result.

If any form of life, from whatever cause, changes its locality, it must accommodate itself to its new conditions or perish. "There are a few forms of life that can withstand the extremes of heat and cold, but there are for every form average conditions, geologic and climatic, which are most favorable for its attaining to its fullest development." We know that some forms of life can accommodate themselves to altered conditions with comparative ease, some, with great difficulty, and some, not at all. If they succeed, they may have to undergo considerable change in life, form, colour or habit, to bring them into harmony with their new environment, hence what we have to discover specially, is the powers of resistance to frost that are possessed by the insects of our latitude.

It will enable us to attain to a clearer comprehension of the subject, if we keep before the mind, the distinction that exists between warm and cold blooded animals. The one by their internal heat and external covering, can maintain an almost uniform temperature regardless of the state of the surrounding atmosphere, whilst the other has seldom any external covering, has little internal heat, and parts with that little readily whenever the external temperature goes lower.

It has been stated as a general principle in physiology, that, "wherever there is life there is heat." This may be true of active life, but there is such a thing as inactive life. For instance a tree may be frozen to the core and yet not be dead; there is no manifestation of life, but that is simply the result of unfavorable conditions. A more correct principle, and one I believe of universal application, is "that wherever there is respiration there is heat." For example, active vegetation respire; and the vegetative process is known to be productive of heat in some measure. The chemical combination by which heat is produced and maintained in warm-blooded animals, is, in great measure, well known and easily understood. Heat is the result of combustion. Combustion is obtained by a commingling of oxygen with carbon. The food taken into the stomach supplies the carbon, the air breathed into the lungs provides the oxygen, the blood flowing through the lungs is exposed over a superficial surface of from a hundred to a hundred and fifty square feet, it is thereby oxygenized, then carried in the veins to the remotest parts of the organism, and when liberated unites with the carbon of the tissues; combustion ensues, and calorification is the result. Wherever there is combustion there is waste, so waste matter is thrown off, and its place taken by fresh material. Then again, activity produces heat. Physical exertion produces rapid respiration and circulation, which produces more rapid combustion; consequently more heat. But most animals have a regulating apparatus of some kind for equalizing their temperature; when this heat is excessive, the pores open and evaporation produces refrigeration; when cold comes, these close and their heat is economized. With those of them that hibernate, the same principles are in operation. During summer time they have been laying in a supply of carbon in the shape of fat; on the approach of winter they retire to their hibernacula, settle themselves down and become somnolent. Being inactive, respiration is reduced to the minimum, consequently combustion is slow, and their heat is correspondingly reduced, but they are always warm, if alive, and they invariably leave their winter quarters greatly reduced in flesh. Now mark the contrast with cold-blooded animals, to which insects belong. They have but little heat to begin with, some requiring the most delicate instruments to detect the existence of any. Not being endowed with any regulating apparatus to save it, they part readily with what little they have as soon as the surrounding temperature goes lower, activity with them does not maintain heat, their activity depending entirely upon

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the condition of the surrounding atmosphere. And when they go into hibernation, respiration is completely suspended, consequently there is no combustion and therefore no waste, and they emerge from their period of torpor, be it short or long, months or years, without the slightest perceptible loss in flesh. We are all aware of the difficulty of obtaining reliable information on scientific subjects from popular sources, even experts are often discovering that what appears to be is far from being what is. A fine illustration of this is given in connection with the controversy about the revivification of desiccated pond life.

Near the residence of a Professor Zacharias, is a granite block with a cavity holding from two to three litres of water, which evaporates in from two to six days according to the weather. There has been living therein for fifty years, by actual observation, a particular kind of Rotifer, and various Protozoans whenever the conditions were favorable. And this same fauna persisted in spite of complete desiccation, thousands of times repeated; and it was referred to as proof that the dried individuals revived. This persistence aroused the curiosity of Prof. Zacharias, and he went to work to investigate it, and he soon discovered that when the Rotifers and Protozoans were allowed to dry, they invariably died, but the eggs were preserved by encystation, and were ready to emerge when the rain came. And after long and careful investigation in other departments, he arrived at the conclusion that there was probably no such a thing as desiccated animal revivification.

The exact observations made by Dr. Hamilton, as recorded in the *Canadian Entomologist*, vol. XVII, beginning on page 35, are conclusive that certain beetles can resist the action of frost to a very great degree. Others have recorded similar observations in Lepidoptera. I have handled the pupæ of *Cecropia* and *Polyphemus* moths when exposed to 10, 15 and 20 degrees of frost and they were not solidified, the cocoon could afford them little or no protection, and the mystery is, wherein lies the power of resistance? A mystery which yet remains unsolved. I quote the following extracts—authority not stated: "Protoplasm in certain cases can endure a temperature of zero or lower; and in others can live at 90 degrees or higher temperature. This is a remarkable fact which neither physiologists nor chemists can explain. . . . The less active the life the less vulnerable it is, cold kills a great number of the lower organisms by reason of the disorganization of the tissues which takes place when congealed, and this disorganization is complete in proportion to the amount of water the tissues contain." May we not here be on the verge of an explanation of the mystery? We know that there are oils and spirits that resist a great degree of frost. May not the protoplasm of insects, larvæ and pupæ especially, be composed of fats with no water in their tissues for frost to act upon? Chemical analysis ought to be able to decide.

That a caterpillar is found in a cube of ice, is not proof that it is solidified. I have more than once seen the larva of *Arctia Isabella* embedded in ice, but as I did not investigate them as to their condition in that respect, I can add nothing; but going back upon what has been already said, it seems reasonable to suppose they were not frozen. On the approach of winter they took refuge under a board, stick or stone; when the cold increased they became torpid, snow fell; then a thaw set in, but the heat did not reach them to rouse their faculties into action; the water flowed in upon them, they could not drown, for respiration was completely suspended; frost returns, the water is congealed around them, the ice is not any colder than the air would have been, so if they could resist the action of the one, they also could that of the other. And here I would remark, that by such considerations, we get the natural explanation of how the beetles survived the winter inundation without injury, as related by Dr. Hamilton, in the article already referred to.

It is a well-known fact in medicine, that poisons act slowly, and may even be quite harmless when the temperature is low. I daresay we are all familiar with the different action of the same cyanide under different temperatures, and feeble respiration is well known to secure insects for a length of time against the poisonous fumes of cyanide. And there can be little doubt, but that by one or other of these causes, or both combined, the life of Dr. Hamilton's *Lixus Concavus* was insured against the action of alcohol. I have

taken recently transformed beetles out of decayed wood, that showed unmistakable signs of life, but were very lethargic, and they have resisted the fumes of strong cyanide for three days—no doubt the result of feeble respiration—although some claim that it is difficult to kill some insects at any time, until they have fulfilled the functions of their existence. But then again I have seen water beetles in a pond where cattle were watered, quite lively under the ice, and when the ice was cut, the pressure above produced a rush of water that brought beetles with it, and when they were tossed out on the ice they were dead instantly. That could not have been the result of contact with the ice, but from exposure to the frosty air. Dr. McCook in his "American Spiders and their Spinning Work," gives an account of some experiments made by him, with a view to discover the effects of low temperature upon them, from which he draws the following conclusions:—Vol. II, p. 435: "It would seem, therefore, first, that the hibernation of spiders, of this species at least, is not accompanied with a great degree of torpidity; second, they preserve their activity and spinning habit while exposed to cold ranging from the freezing point to zero Fahr.; third, that after long and severe exposure the recovering of complete activity, when brought into a warm temperature, is very rapid, almost immediate; and fourth, that on the return of spring, even after a prolonged and severe winter, they at once resume the habits of their kind."

"In all the above specimens the abdomens were full, indicating perfect health. Other spiders hung upon their webs with shrivelled abdomens, quite dead. . . . The living individuals were all characterized by the plump abdomen, as though there had been little or no absorption of tissues for nourishment of life. There appeared to be no growth during hibernation."

It is quite evident that a great increase to our knowledge, obtained by careful observations, is yet required before any general conclusions can be safely drawn, yet this much seems to be clearly established: That there are many insects, in some stage of their existence which can and do successfully resist the action of the severest frosts to which they are exposed in our latitude.

That these could be congealed by severer frost is quite probable; but that they would survive such freezing is yet open to doubt. That some are solidified by severe frosts and yet survive, is quite possible, but the evidence on this point is still defective.

I copy the following from the Smithsonian report for 1887, article Zoology, p. 479, and give it for what it is worth. It is entitled: "Minimum Life Temperatures." "A series of experiments upon various animals have been made by Dr. H. Von Thering in extension of Professor Pouchet's researches on the resistances which animals may offer to cold. About two dozen worms, arthropods, and mollusks, were made the subject of investigation. The results have been summarized in the following terms:

- (1) "Lower animals become frozen at temperatures varying greatly in the different genera and species, the resistance varies with the actual body-heat of the animal, with its size, structure, and protective covering, with the freezing point of blood, etc."
- (2) "The resistance usually increases with progressive development, but sometimes the adults are more sensitive than the young."
- (3) "Nothing can be directly inferred from the geographical distribution."
- (4) "Perfectly frozen animals are never revived."

Shall we add, "In his latitude?"

But there is an important economic side to this subject, as well as one of purely scientific interest. The opinion prevails extensively amongst those that are most liable to suffer from the depredations of insects, that steady severe frost in winter will greatly reduce their numbers, and thereby save them labor and loss the following summer; which is far from being the case. Those that have given the matter consideration know that such a winter is protective of insect life; it is mild, open winters that are most injurious. A large number of Lepidopterous insects pass the winter in the egg and pupal stages, and when warm weather in winter is sufficiently prolonged to start these toward

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maturing, by just so much have their powers of resisting the action of frost been reduced and their liability to be injuriously affected by succeeding cold increased. Hence it is in the spring of the year that they suffer the most. A period of mild weather in early spring, followed by a protracted one of cold and wet, even when the frost is not severe, may be, and often is the cause of death to myriads of them. This is one of nature's methods of reducing their numbers. Coleopterous insects are not so liable to be injuriously affected by this cause, the reason for this is clearly and beautifully placed before us in Dr. Hamilton's paper. It is to be regretted that so little careful observation has been given to this interesting subject.

FOURTH ANNUAL MEETING OF THE ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.

The fourth annual meeting was held in the University building, Rochester, N. Y., on Monday and Tuesday, August 15th and 16th. The President, Dr. J. A. Lintner, of Albany, N. Y., occupied the chair, and Prof. F. M. Webster, of Wooster, Ohio, filled the office of Secretary. The following members were also present:—C. V. Riley and L. O. Howard, Washington, D. C.; D. S. Kellicott, Ohio; John B. Smith, New Jersey; E. B. Southwick, New York; H. E. Weed, Mississippi; M. V. Slingerland, New York; H. Osborn, Iowa; J. Fletcher and C. J. S. Bethune, Ontario; C. H. Perkins, Vermont; P. H. Rolfs, Florida; S. A. Forbes, Illinois.

Owing to the ill-health of the President, the annual address was delivered by the Vice-President, Prof. FORBES, in which he treated especially of the work that has recently been done on the contagious diseases of insects, and the satisfactory results that have thus far been obtained. He also referred to the successful importation of several insect parasites, and drew the attention of the meeting to the desirability and importance of studying the aquatic insects of America and their relation to fish culture. This able and highly interesting address was subsequently reported upon by a special committee who warmly commended it and urged upon the attention of Economic Entomologists the recommendations in regard to "Aquatic Entomology" and its bearings upon fish culture.

Prof. KELLICOTT read a paper upon "Hypoderus Columbæ," a mite which is parasitic upon pigeons.

A paper by Mr. C. H. TYLER TOWNSEND was read on "The possible and actual influence of irrigation on insect injury in New Mexico," in which he showed that in that region of the country irrigation may be made to exert a valuable influence as an adjunct to the proper use of arsenites and kerosene.

Prof. KELLICOTT read "Notes on *Ægeriadae* of Central Ohio, No. II.," which is published in the *Canadian Entomologist*, September 1892, p. 209.

Prof. SMITH said that adults of the Squash Borer (*M. ceto*) from last year's larvae were then flying on Long Island, and that all stages of the insect might be obtained in the same field. The moths assemble in the evening on the upper sides of the leaves and are collected in great numbers by the farmers. Messrs. Forbes, Slingerland and Smith stated that in their experience the *Ægerians* were not attracted by electric light.

A paper on "The Bean Weevil (*Bruchus obsoletus*)" was read by Mr. M. V. SLINGERLAND, in which he described the mode of ovipositing and gave a brief account of the life history of the insect. He stated that bi-sulphide of carbon will destroy the insect in all stages. He also read a paper on "*Drasteria erectea*" in which he stated that in 1889 over two thousand specimens were taken by means of trap lanterns at Ithaca, N. Y. Last year he bred a number of specimens, and as a result of the study of the material thus obtained, together with about three hundred specimens from all sections of the country,

he came to the conclusion that there are two species, about equally common, included under the name *erecta*, and that these should be called *D. erecta*, Cram, and *D. crassiuscula*, Haworth, with *ochrea* and *distincta* as varieties of the latter. He then proceeded to describe the differences between the species, and recommended the plowing of the infested fields in order to destroy the larvæ and pupæ.

A paper by Mr. T. D. A. COCKERELL, of Kingston, Jamaica, on "*Orthozia insignis* as a garden pest," was read by the Secretary. The writer stated that the insect was first observed on a variety of exotic plants in the hot houses at Kew and elsewhere, and that he now found it injurious to several garden plants in Jamaica.

A paper by Dr. F. W. GODING on "The Food Plants of North American Membracidae," was next read. This was followed by Prof. J. B. SMITH's paper, "Notes of the Year in New Jersey," in which he referred to the principal insect attacks that had come under his notice. In the discussion that followed, remarks were made by Mr. L. O. HOWARD, Prof. H. OSBORN, Dr. LINTNER and Prof. F. M. WEBSTER.

Prof. WEBSTER drew attention to the occurrence of *Phytonomus punctatus* to an injurious extent in north eastern Ohio, and of *Hylastes trifolii* attacking peas in northern Ohio. He stated further that *Otioryhncus ovatus* was found feeding upon the foliage of musk-melons.

A paper on "Two Serious Pear-tree Pests," was read by Mr. M. V. SLINGERLAND, of Cornell University.

1. The Pear-tree Psylla (*Psylla pyricola*) This insect is described as one of the most serious pests that pear growers have to fear. It had appeared in the valley of the Hudson in enormous numbers during 1891. Orchards which had given promise of 1,200 barrels of fruit having perfected less than 100 barrels. The pear-tree Psylla when mature is scarcely 3 mm. in length, shaped like a miniature cicada. The nymphs are oval and very flat and produce a great deal of honey-dew which renders the trees unsightly. There are three and perhaps four broods in the year and it is in the perfect state that the insect hibernates. As a remedy Mr. Slingerland had found that the nymphs were easily destroyed by a very weak kerosene emulsion (two per cent.) Washing the trees in winter to destroy the adults was also recommended.

2. The Pear-leaf Blister-mite (*Phytomyces pyri*) was alarmingly on the increase in the United States and Canada. It is a very small mite which hibernates beneath the bud-scales of the pear tree and comes out when the leaves expand in spring and forms blister-like galls on the foliage. Spraying the trees during the winter with kerosene emulsion had been found successful.

Prof. LINTNER stated that *P. pyri* was very abundant in eastern New York.

Prof. F. M. WEBSTER had also found it abundant in Ohio. Spraying with Bordeaux mixture had shown no effect in reducing the leaf-blisters.

Prof. J. B. SMITH had found that in orchards sprayed with the ammoniacal solution of carbonate of copper mixed with London purple, the pest was perceptibly lessened.

Mr. SOUTHWICK read a paper upon *Depressaria heracleana*, the Parsnip Web-worm, and gave an interesting account of the war waged upon it by the "Potter wasp" (*Eumenes fraterna*) and stated that he had bred from it a Hymenopterous parasite, a species of *Limneria*.

Mr. HOWARD read the following paper on "An Experiment Against Mosquitoes," which was listened to with great interest:

AN EXPERIMENT AGAINST MOSQUITOES.

BY L. O. HOWARD.

One of the most reasonable of the recommendations which have been made from time to time, and which look toward the reduction of the mosquito plague during the summer months, is the application of kerosene to restricted and fishless breeding ponds. Although this remedy has often been suggested, I know of no careful records of actual experiments, and consequently deem the following account of a recent experience worthy of publication.

On the porch of this cottage in the month of June water in the tank was so serious an annoyance on my own part that I was about to attempt the surface of it.

Upon the tank I obtained 60 specimens for observation and after a few days the almost coincidental effect of coal oil and next morning the departure of the life, containing

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On the 5th of July of the present year I noticed for the first time a few mosquitoes on the porch of my cottage, in the Catskill mountains of New York. The elevation of this cottage is about 2,500 feet, and mosquitoes have hitherto been rare visitors. The month of June, however, was very wet, and as I had noticed several pools of surface water in the immediate vicinity, the presence of these mosquitoes caused me some anxiety, as I feared they would continue to breed throughout the summer and prove a serious annoyance later in the season. One of the surface pools mentioned was situated on my own grounds, and upon first noticing the mosquitoes I walked out to this spot. It was about dusk, and about a dozen or more female mosquitoes were found buzzing about the surface of the water. I immediately sprinkled four ounces of coal oil upon the surface of the pond.

Upon the following day I carefully measured the little pool and found that it contained 60 square feet. From day to day until July 15th, when I returned to Washington, observations were made. Severe rain-storms occurred on the 8th and 10th of the month, and after the first of these the pool lost the glassy iridescent surface effect given by the almost continuous but infinitesimally thin layer of kerosene. Nevertheless the insecticidal effect of the latter did not seem to diminish, although I could no longer perceive any coal oil odor. Many dead insects were found floating upon the surface of the water the next morning after the application, and these increased rapidly up to the time of my departure. The pool, which upon the evening of the 5th had been teeming with animal life, contained no living insects during the following ten days.

The actual good accomplished is shown by the following facts: All aquatic larvæ, including those of the mosquito, were killed. The kerosene, curiously enough, seemed to exercise no deterrent effect upon the adult female mosquitoes. They still continued to attempt to deposit eggs and in this attempt were destroyed. This is, in my opinion, a most important point, and one which has hardly been anticipated.

On the tenth day after the application a careful count of the dead insects floating upon the surface of the water was made over a restricted portion, and from this count the entire insect surface contents of the pool was estimated, with the following result:

Entire number of dead insects floating on the surface	7,400
Number of mosquitoes	370
Number of <i>Epirrita inclinata</i> , Walker—a small Geometrid moth	148
Number of <i>Heterophleps triguttata</i> , H.S.—another small Geometrid	42
Number of <i>Chrysops hilaris</i> , O.S.—a common gad fly of the region	27

These were the most conspicuous. The others were mainly minute Nematocerous Diptera, although there were a large number of small Heterocerous Lepidoptera, a few aquatic Coleoptera—the largest species being the Dytiscid *Agabus gagates*, Aubé—and also a few specimens of Cryptocerate Heteroptera.

It is difficult to say how certain of the non-aquatic species, particularly the Lepidoptera and the Chrysops, happened to be caught. They may have visited the pool to drink, or they may have been attracted to its shining surface.

The observation, it seems to me, possesses interest not only as proving definitely the efficacy of the remedy and as showing that adult mosquitoes are killed as well as their early stages, but also as affording an indication as to the amount of kerosene which will prove effective for a given surface of water, and also as affording some indication of the length of time for which a single application will be operative. It is true that upon this last point the observations were not complete, owing to my departure after ten days, but as already indicated, the influence of the kerosene outlasted all ocular or odorous evidence of its presence, and there is every reason to suppose that it would have continued for some days longer.

As a general thing, in larger ponds, which are of a more permanent character, the presence of fish is a check upon the multiplication of the mosquito. These insects breed mainly in marshy lands, where small pools, surrounded by wet soil, adjoin each other, and such spots, where accessible, can be readily and economically treated with coal oil.

The economy of the operation is shown by a simple estimate from the data which I have given, that 5 gallons of coal oil, costing say 60 cents, will treat 9,600 square feet of water surface, or, to carry the computation still further, a barrel of kerosene, costing \$4.50 will treat 96,000 square feet of water surface.

With this remedy and with the drainage of swamp lands where practicable, with the introduction of fish into ponds in which they do not already occur, and with the careful watching of rain-water barrels and tanks, the mosquito plague in many localities can be readily and greatly lessened. Where mosquitoes breed, however, in the long succession of brackish marshes on the seacoast, remedial work is practically hopeless. I anticipate not the slightest practical outcome from Mr. Robert H. Lamborn's dragon fly proposition, and believe that relief in such cases will only come from extensive improvements at the public expense in the way of filling in and draining the marshes.

One word more in reference to water tanks. The use of kerosene is of course out of the question in such receptacles. A note was published in *Insect Life* (vol. iv., pp. 223-224) to the effect that the introduction of carp into water tanks in the Riviera was productive of the best results. This is a pertinent suggestion for trial in this country. The U. S. Fish Commission can doubtless furnish a limited number of carp for this purpose. All water tanks and barrels should, however, be tightly covered, and only opened occasionally for the purpose of aerating the water. When thrown open for this purpose it will not be difficult to ascertain whether larval mosquitoes (wrigglers) are present, and if so, and the tank is not too large, they can be removed by means of a fine-meshed hand net.

Interesting notes of the year were read by Prof. HOWARD EVARTS WEED.

With regard to the Horn-fly Prof. SMITH stated that it was not more abundant in New Jersey than the ordinary Cattle-fly (*Stomoxys calcitrans*).

Prof. KELLICOTT said that his son had found it very abundant in Central Michigan.

Mr. WEED thought that dark coloured cattle were most subject to attack. He also recorded that the insect now occurred in Louisiana.

Dr. BETHUNE stated that the Horn-fly had that month been noticed for the first time in the Province of Ontario, at Oshawa, Toronto and London, and was creating some alarm among stock owners.

Mr. P. H. ROLFS had found the Horn-fly in Florida.

Mr. OSBORN read Notes on Injurious Insects in Iowa. For want of time the discussion on this interesting paper was deferred.

Prof. C. V. RILEY read a paper on Rose saw-flies in which it was shown that there were three distinct species attacking roses.

AFTERNOON SESSION.

On reassembling the following members were elected :

Prof. P. H. Rolfs, of Florida; Mr. H. A. Gossard, of Iowa; and Mr. C. F. Baker, of Colorado.

A paper on Plant Faunæ by Mr. T. D. A. COCKERELL, of Kingston, Jamaica, was read.

Mr. JAMES FLETCHER read a paper on Injurious Insects of the Year in Canada; this gave rise to a long and interesting discussion on several points brought up in this paper, particularly with reference to the life history of *Gortyna immanis*, the different kinds of knapsack sprayers, and the most practical remedies for the Horn-fly.

Prof. WEBSTER read a paper on the aphidivorous habits of the common slug (*Limax campestris*), which was discussed by Messrs. Riley, Smith and Howard.

Dr. BETHUNE had found slugs upon trees he had sugared for moths.

The following officers were elected for the ensuing year :

President—Prof. S. A. FORBES, of Illinois.

1st Vice-President—Dr. C. J. S. BETHUNE, of Canada.

2nd Vice-President—Dr. J. B. SMITH, of New Jersey.

Secretary—Prof. H. GARMAN, of Kentucky.

And the meeting then adjourned.

The Entomological Society held under the presidency of Dr. Bethune, and the full address is published in the full report of the thirty persons who attended. Dr. Bethune's address to the Club for the year is in connection with the Club for the year.

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ENTOMOLOGICAL CLUB OF THE A. A. A. S.

The Entomological Club of the American Association for the Advancement of Science held its annual meeting at Rochester, N.Y., August 17th to 19th, 1892, under the presidency of Mr. E. A. Schwarz, of Washington, D.C. The President's address is published in the *Canadian Entomologist* for September, 1892, pages 213-224, and the full official report in the October and November numbers; to these the reader is referred. The meeting was very interesting and successful, and was attended by over thirty persons. The Entomological Society of Ontario was represented by its President, Dr. Bethune, and Mr. James Fletcher, of Ottawa. The former was elected President of the Club for the ensuing year, when the meeting will be held at Madison, Wisconsin, in connection with the gathering of scientists at the World's Fair in Chicago.

SOME INJURIOUS MICRO-LEPIDOPTERA.

BY J. ALSTON MOFFAT.

The difficulty experienced in obtaining mature examples of some of these tiny creatures is often very great. The evidence of their work may be unmistakable by the injury that is being done by their larvæ in the effort to appease the craving of their appetites, and yet it may be almost next to impossible to secure a specimen in the form that originated the mischief.

There are two good reasons to account for it, one is that many of these moths are active only at night, and secrete themselves most effectually during the day; another is the extremely brief existence of many of them in the mature state. The females generally come into the world with their eggs full size, requiring only to be fertilized before depositing. The male, as a rule, emerges first, and is awaiting the appearance of the females; when fertilization is completed he dies. The eggs are then laid by the female, which may be all done in one night's time, and when that is finished she also dies of exhaustion. Hence the necessity for rearing them in confinement, so as to obtain conclusive evidence of the particular moth that laid the eggs that produced the larva that we see is doing so much mischief. And as this requires a great deal of time, close observation and experience to accomplish successfully, we see the need there is that some should be put in a position to be able to devote their whole time to it, that thereby the community may reap the benefit of the knowledge thus obtained.

A good illustration of the truth of these remarks is got in the case of the Codling-moth, *Carpocapsa pomonella*, Linn. (Fig. 14). Almost everyone has heard of it, and knows with more or less distinctness that it is the cause of the unfortunate worminess of the apples they grow or have to use, and yet how few have ever seen the moth, or would know it if they did see it? During all the years of my collecting I have never found it in its natural locations. My first specimen was given to me by a friend who took it on his cellar window. My next were obtained by enclosing a few infected apples in a box, and not until the latter part of June, 1889, did I secure a satisfactory supply of good specimens. I was stopping in the country at a place where an old house was used as a

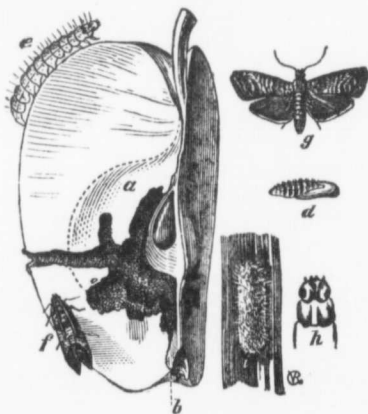


Fig. 14.

store room ; in the spring the apple barrels had been removed from the cellar to this store room, with the remains of the winter's fruit. The warm weather was then maturing the Pomonellas, and the south windows of the old house were literally swarming with them, large sized and in perfect condition. I took three dozen and might have taken as many hundreds.

The sequence and nomenclature of the following species is in accordance with the most recent decision of the authorities.

Pyralis, Linn. *Asopia*, Tr. *costalis*, Fab. *fimbrialis*, S. V.

Pyralis costalis, Linn. The Clover hay-moth (Fig. 15.) Expanse of wings, about three-fourths of an inch ; varies considerably in size. Colors: Front wings glassy purplish brown and golden yellow ; hind wings lighter. An introduced species.

For full description of its nature and habit^s see the Twelfth Annual Report of the Entomological Society of Ontario. It was quite plentiful in some of the hay lofts of London last summer. The figures represent it in its various stages.

Mr. T. H. Hill, of London South, secured a very remarkable form of it last summer. The ground colour is a rich apple green, which, combined with the golden yellow of the spots, margin and fringes, makes it an exceedingly attractive object to contemplate.

Mineola, Hulst. *Phycis*, Haw. *indigenella*, Zell. *nebulo*, Walk.

Mineola indigenella. Zell. The Apple leaf crumpler (Fig. 16). Expansion of wings about seven-tenths of an inch. Colors: Pale brown and silvery white ; hind wings brownish white. Introduced. (See Fourteenth Annual Report).

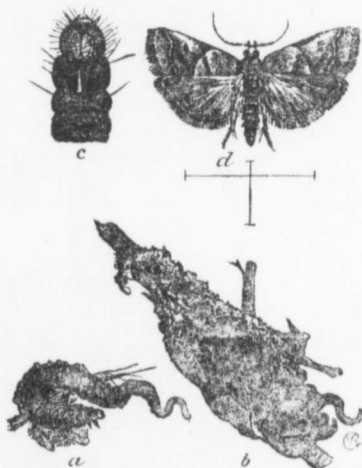


Fig. 16.

Zophodia, Hub. *Dakruma*, Grote. *grossulariæ*, Pack. *convolutella*, Hubn.

Zophodia grossulariæ, Pack. The Gooseberry fruit worm (Fig. 17). Expanse of wings, nearly an inch. Colors: Pale gray with darker streaks and bands. (See Second, Seventh and Nineteenth Annual Reports).

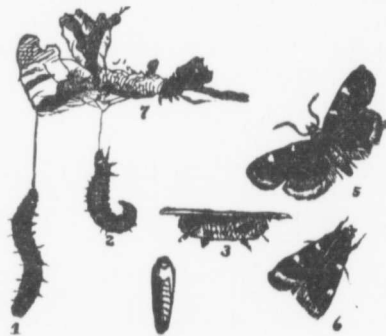


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Fig. 21.

Retinia (miner. Fig.

Canarsia, Hulet. *Pempelia*, Hub. *Hammondi*, Riley.

Canarsia Hammondi, Riley. The Apple-leaf skeletonizer (Fig. 18). Expanse of wings, not quite half an inch. The cross lines in the figure under the moth indicate the natural size. Colors: Deep purplish gray, and two silvery gray bands on the front wings, with a glossy surface.

The Larva (Figure *a*, natural size) eats the green pulp from between the veins on the upper surface of the leaf, causing it to assume a blighted appearance; *b* and *c* in the figure are portions of the larva greatly magnified.

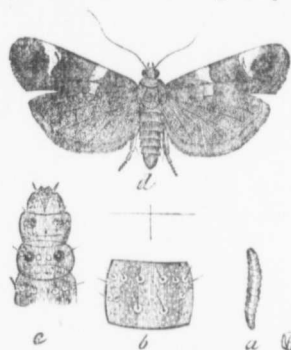


Fig. 18.

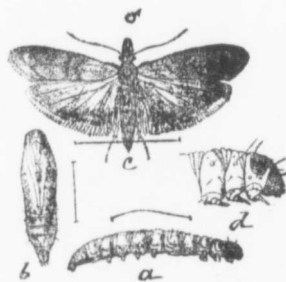


Fig. 19.

Plodia, Gn. *Ephestia*, Gn. *interpunctella*, Hub.

Plodia interpunctella, Hub. The Dried-fruit moth (Fig. 19). Expanse of wings, about half an inch. Colors: Yellowish and reddish purple. (See Twentieth Annual Report).

A few years ago I saw a half barrel of dried apples that had remained undisturbed for some time, in an upstairs chamber, and this moth had found it to be a convenient breeding place. The mature insects were in surprising numbers, resting on the inside of the barrel, and when disturbed would dart down and hide themselves amongst the pieces of apple which were completely infested with the larvæ in all stages of growth.

Cacæcia, Hub. *Loxotænia*, Steph. *rosaceana*, Harr.

Cacæcia rosaceana, Harr. The Oblique-banded leaf-roller (Fig. 20). Expanse of wings about an inch, but varies greatly. Colors: Front wings cinnamon brown, with markings of darker brown; hind wings yellow.

A very general feeder. (See First, Second, Third, Fourth and Twenty-second Annual Reports.) This moth was unusually abundant here last summer. In a bit of open woods near the city, with a thick undergrowth of oak and hazel about four feet in height, they could have been seen during the latter part of July and the first part of August, resting on the upper surface of the leaves so thickly as to arrest the attention of the most unobservant, and when a bush was jarred they would rise from it in dozens.



Fig. 20.

Cacæcia Hub. *cerasivorana* Fitch. *Cacæcia cerasivorana* Fitch. The cherry-tree leaf eater. Fig. 21.



Fig. 21.

Expanse of Wings, about three fourths of an inch.

Colors: Front wings a rich reddish yellow, with much the shade of fresh bees-wax and darker shades with cross-bands of pale leaden blue. Hind wings, pale ochre yellow.

Retinia Gn. *comstockiana* Fern. *Retinia comstockiana*, Fern. The Pitch-pine branch miner. Fig. 22.

Expanse of wings about three-fourths of an inch.

Colors: Front wings, rusty brown, with white and leaden-hued markings crossing the wings. Hind wings, greyish brown.

The figure shows the chrysalid magnified, also the larva, and its manner of working in the branches, with the effects produced in the injury and disfigurement of the tree. (See Fourteenth Annual Report.)

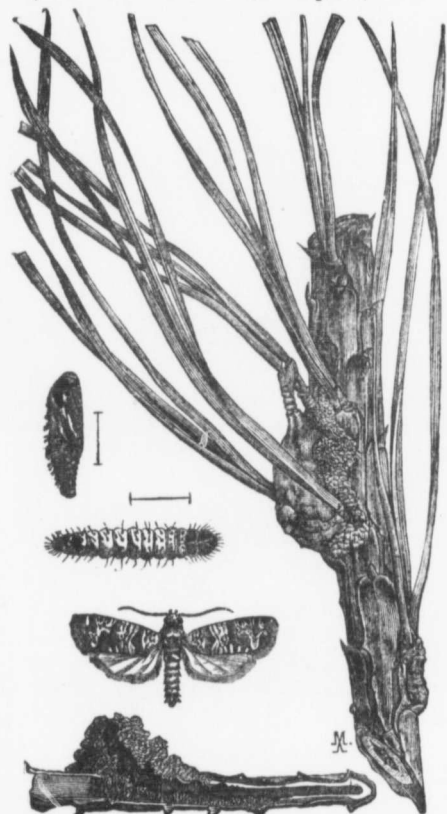


Fig. 22.

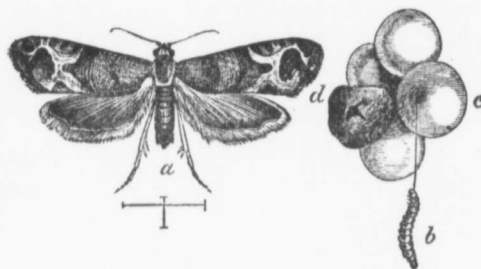


Fig. 23.

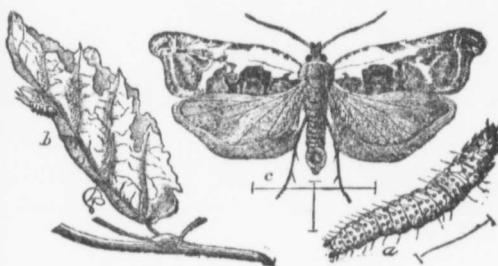


Fig. 24.

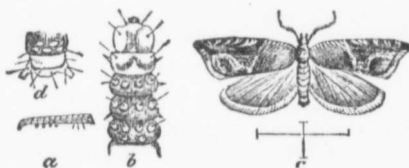


Fig. 25.

Eudemis Hub. *Penthina* Fitch. *botrana* Schiff. *vitivorana* Pac. *viteana* Clem. *Eudemis botrana*, Schiff. The Grape berry moth. Fig 23.

Expanse of wings about half an inch.

Colors: Front wings dull bluish of different shades with a metallic lustre. Hind wings, dull brown; an introduced species. (See Thirteenth and Fourteenth Annual Reports.)

Phoxopteris Tr. *nubeculana* Clem. *Phoxopteris nubeculana* Clem. The Apple-leaf sewer. Fig 24.

Expanse of wings about half an inch.

Colors: Front wings white with brown markings; hind wings light gray.

I have taken this moth only in the woods, but I do not find it so generally abundant as some of its congeners which have not yet been reported as injurious. It seems to have found the apple leaf quite to its liking, and the conditions in the orchard favorable to its increase.

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Phoxopterus Tr. *Anchylopera* Wal. & Riley. *comptana* Frol. *fragariae* W. & R.
Phoxopterus comptana Frol. The Strawberry leaf roller. Fig. 25.

Expanse of wings about half an inch.

Colors: Front wings reddish brown, marked with black and white; hind wings dusky. An introduced species. (See Third Annual Report.)

Aspidisea Clem. *splendoriferella* Clem. *pruniella* Clem. *sacotella* Pack. *Aspidisea splendoriferella* Clem. An apple leaf miner. Fig. 26.

Colors: Front wings leaden gray, with a metallic lustre, with golden and silver spots and streaks; Hind legs gray with yellowish brown fringe.

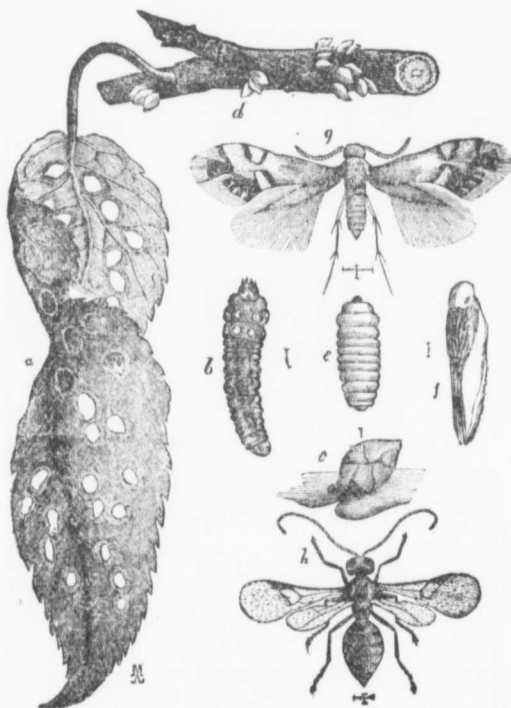


Fig. 26.

a shows the work of the minute larva in the leaf; the line at *b* gives its length; *d* illustrates the cocoons attached to the branch, and *h* is a parasite greatly enlarged. The cross lines below indicate the natural size.

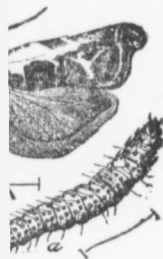
Coleophora Zell. *malivorella* Riley. *multipulvella* Cham. *Coleophora malivorella* Riley. The Apple-tree case-bearer. Fig. 27.

Expanse of wings about half an inch.

Colors: Wings brown, dotted with white; thorax and abdomen white, dotted with brown. The parent moth deposits her eggs in July, the larva feeding on the underside of the leaf during August and September. On the approach of the cold weather they desert the leaves and fasten their cases to the twigs, as represented at (a) where they pass the winter. When the warm weather returns in spring they detach themselves and move about, feeding on the swelling buds, when they do the greatest injury; maturing about the beginning of July to commence another cycle.

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Bucculatrix Zell. *pomifoliella* Clem. *pomonella* Pack. *Bucculatrix pomifoliella* Clem. An apple leaf feeder, as the name indicates. Fig. 28.

Expanse of wings about three-eighths of an inch.

Colors: Pale yellow and brown; *a* in the figure represents a twig with cocoons attached, *b* a cocoon detached, *c*, the moth greatly magnified.

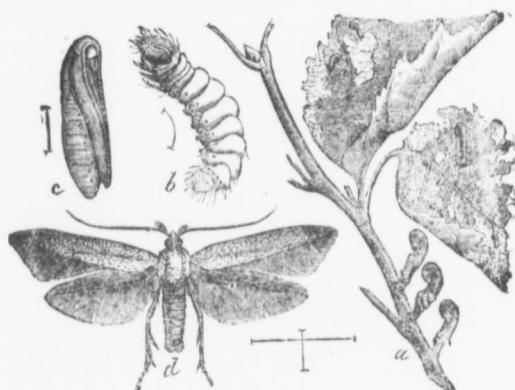


Fig. 27.

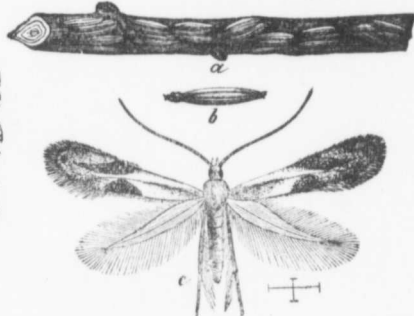


Fig. 28.

Gelechia Zell. *pinifoliella* Cham. *Gelechia pinifoliella* Cham. The Pine tree leaf-miner. Fig. 29.

Expanse of wings about three-eighths of an inch.

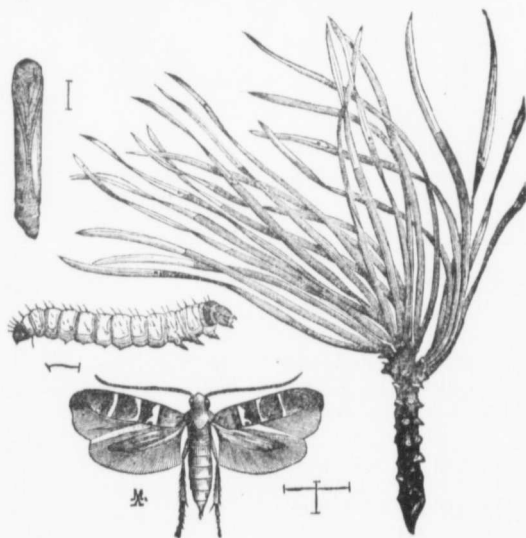


Fig. 29.

Colors: Front wings brownish yellow, dotted with fuscous, the lines crossing the wings white; hind wings pale gray.

The figure represents the insect in its various stages greatly magnified, and a terminal shoot showing the mischief done by this tiny creature. (See Fourteenth Annual Report.)

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THE HORN-FLY. (*Hæmatobia serrata*, Rob.-Desv.)

BY JAMES FLETCHER, F.L.S., F.R.S.C.

During the past summer a new pest of the farmer has made its appearance in Canada in the shape of a small blackish fly which appeared suddenly in enormous numbers on cattle, and was first noticed in Canada towards the end of July at Oshawa, Ont., by Mr. Elmer Lick, who sent specimens to me for identification. Almost simultaneously it was recorded all along the boundary line, from Essex County, Ontario, as far east as Boucherville, P.Q., below Montreal. The flies appeared in such enormous numbers, and their attacks upon the cattle were so severe that farmers in the districts invaded at once recognized the losses they might incur by neglecting to take steps to protect their stock. Letters of inquiry came in from all directions asking for remedies and information concerning the habits of the fly. Much alarm was felt by stock-owners, and grossly exaggerated statements received wide circulation as to the injuries which had been inflicted upon cattle of all kinds by the fly. Such complaints as the following, which are

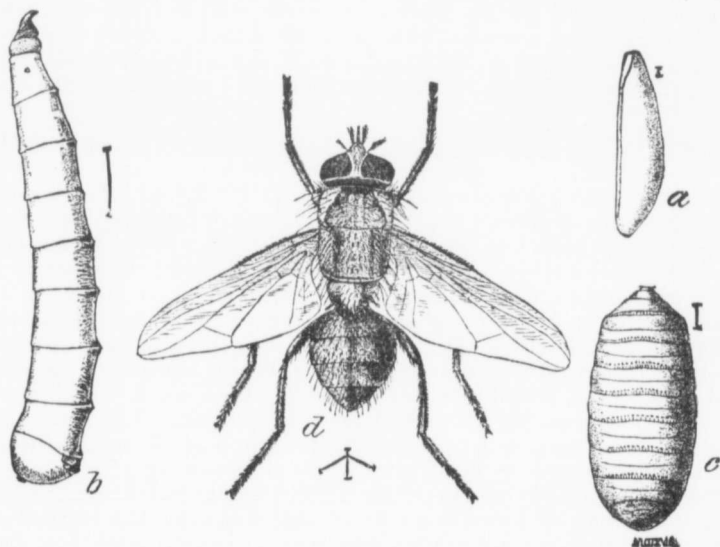


Fig. 30.

The Horn-fly. *a*, egg; *b*, maggot; *c*, puparium; *d*, adult fly in biting position—all enlarged. (Figure kindly lent by the United States Entomologist.)

actual reports I received, were by no means rare: "All the cattle in this district are being destroyed," "cows through the country are dying by hundreds," "several farmers have lost their cattle entirely," and a great many reports stated with more precision, that "neighbors" had lost from two to twelve (the favorite number being seven). Whenever these reports came in, I endeavoured to find out the name of the "neighbor," so as to trace up the true history of the case; but in no instance could I find a man who had actually lost a single animal from the attack of the flies. It was always "some other neighbour" or "I did not lose any myself, but I was told that someone else had." In fact, although this insect was undoubtedly the cause of much loss of revenue to farmers, as stated above, I have been unable to hear of even one instance where an animal was killed by its attacks. However, these exaggerated accounts of the possible loss served a very useful end, by stirring up negligent farmers to take some steps to protect their animals from the irritating attacks of their troublesome enemies. There was much cor-

respondence in the newspapers, and the irrepressible "practical man" (self-styled) came bravely to the front with useless suggestions, and, as usual, very soon showed the true nature of the occupant of the lion's skin. Inaccurate statements as to the life history of the insect gained wide credence. Of these the following is a sample: "The eggs are laid either on the horns, into which the maggots bore and then penetrate the skull, or in the holes which they eat through the hide, lay eggs therein, which hatch out in large numbers, and proceed with their boring operations until the vital portions of the cow are touched and death ensues." None of this is founded upon fact. The complete life-history has been worked out, and at once shows us the absurdity of such theories. The maggots do not feed upon flesh at all, but upon the manure of the cattle, and on this only while it is in a fresh and moist condition.

It is in the perfect state alone that the Horn-fly is troublesome to stock, and the only injuries are those which result from the irritation of its bites. These, however, are sometimes considerable, for the flies occur in such enormous numbers, and worry the cattle so incessantly, that these fall off rapidly both in flesh and yield of milk, this latter product being reduced in some cases from one third to one half. The appearance of this insect amongst our Canadian herds is, therefore, a very serious matter, and one that demands the attention of all stock-owners, so that prompt steps may be taken early in the spring to wage an incessant and systematic warfare against it upon its first appearance. There are certain simple and easily-applied remedies which may be used successfully to mitigate the attack, and if all would apply them, its numbers could be controlled with comparative ease.

For the intelligent application of suitable remedies, it is most important that the true and full life-history of the pest should be understood. It is briefly as follows:

The eggs, (Fig. 30a) which are about 1-20 of an inch in length, are laid singly on the freshly-dropped dung of cattle. They are brown in colour, and from this fact, not easily seen where they are laid. The young maggots hatch in less than 24 hours and at once burrow down a short distance beneath the surface of the dung, where they remain until full grown, that is, about a week, when they are about $\frac{3}{8}$ of an inch in length, white, and shaped as shown at fig. 30b. When full-fed they burrow a short distance into the ground and assume the pupa form (fig. 30c.), when they are $\frac{1}{2}$ of an inch in length. In hot weather the pupa state lasts only four or five days; but the last brood of the season, from eggs laid in September, passes the winter in that condition a short distance beneath the surface of the ground, and the flies emerge the following spring. The perfect insect (fig. 30d, male) is shaped very much like the common Cattle-fly (*Stomoxys calcitrans*) with which it is closely related, or the House-fly (*Musca domestica*). It is, however, much smaller, being only $\frac{1}{8}$ of an inch in length or about $\frac{1}{3}$ the size of those insects. With regard to the common Cattle-fly (*S. calcitrans*) there is an idea which is quite erroneous, but which is very prevalent among those who do not understand much about insects, that this is merely the common House-fly, which towards autumn acquires the bad habit of biting. It is much more abundant in autumn and from its annoying bites and frequent occurrence in houses is sometimes called "Biting House-fly." The true House-fly (*Musca domestica*) never bites, having only a sucking tongue with a flat disk at the tip, whilst the Cattle-flies have a sharp-pointed proboscis, which is really a case containing a slender lancet, with which they penetrate the skin of animals and suck their blood. When not in use this shining black dagger is carried projecting forward beneath the head, but when in use is turned down straight beneath the head of the fly and inserted into the tissues of the animal which is being attacked. The details of this complicated organ are fully explained and illustrated by Prof. J. B. Smith in Bulletin 62 of the New Jersey Agricultural Experimental Station.

The Horn fly is, without any doubt, a new pest in Canada, which has come to us from the United States. It is a European insect which was first brought to the notice of the U.S. Division of Entomology in 1887, and was probably imported with cattle from Europe, where it has been known since 1830. In 1889 its complete life history was worked out by Prof. Riley and his assistants, Messrs. L. O. Howard and C. L. Marlatt. This was published in "Insect Life," vol. II., pp. 93-103, and in the annual report of the

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U.S. Entomologist for 1889 and 1890. Prof. J. B. Smith, of New Jersey has published a very full account of his investigations of the same subject in New Jersey Agricultural Experimental Station Bulletin No. 62. The figures used in this article have been very kindly lent for the purpose by Prof. Riley.

The color of the Horn-fly is dark gray with yellowish sheen, and the body is covered with black bristles. The head consists almost entirely of the dark-red silvery-edged eyes. It will be at once distinguished from the common Cattle-fly by its darker colour, smaller size, greater activity and, above all, by the characteristic habit from which it takes its name, of gathering in clusters upon the horns of cattle, particularly upon the upper side. When very abundant the flies form a more or less complete ring around the horn, sometimes extending two or three inches from the base towards the tip, as shown in fig. 31. This clustering on the horns seems to be peculiar to the species, and is probably due to some special characteristic. They merely settle there, however, as a convenient resting place, from which they cannot be easily dislodged by the animal; for the same reason, they also congregate in clusters at the base of the tail and on the neck. Strange to say, while the closely allied *Stomoxys calcitrans* bites the legs of cattle very much, the Horn fly very seldom settles there, and while the *Stomoxys* bites men, dogs and horses, the present

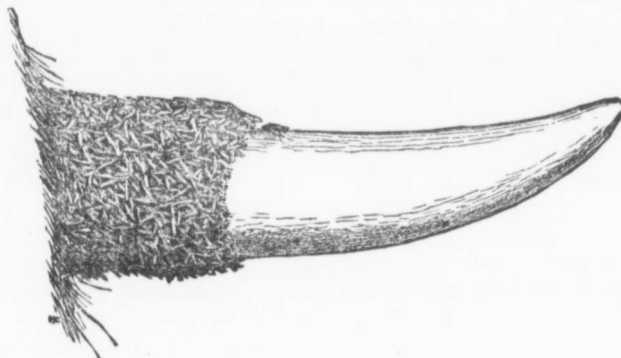


Fig. 31.

Cow-horn showing band of resting flies—reduced.

(Figure kindly lent by the United States Entomologist.)

species has not been recorded to give trouble in that way. A milkman, however, told me that on one occasion he was much bothered by Horn-flies biting his bare arms when milking, and that the bite was much more severe than that of the common Cattle-fly. It is probable that they will occasionally bite human beings, particularly when, as in the above instance, working with bare arms among cattle, and thus getting their odor on the skin.

Cattle of all breeds are subject to annoyance from this pest, but I have observed very great differences in susceptibility to injury, not only in different breeds, but also in individual animals of a given breed according to the health of the animals, temperament or the texture of their skins.

When feeding, the flies work their way down through the hairs until they can pierce the skin of their victims with their short beaks. They are exceedingly agile, and when biting keep their wings partly spread, ready to take flight at the least disturbance. A slash of the tail or a swing of the head of a bitten animal only disturbs its tormentors for a second, when they will rise in a cloud but to settle again and resume the operation of torture the next instant. The bites seem to produce great irritation, and sores are frequently formed on the necks and bodies of animals by their rubbing themselves against posts or trees or by licking bitten places, where the irritation cannot be allayed by rubbing, as inside the thighs, around and on the udder and along the milk vein.

This insect has great powers of increase. It appears early in the spring from the pupae cases, having passed the winter under ground, and also probably some specimens pass the winter in the perfect state. It breeds rapidly, only about two weeks being required in summer for each brood to mature, and there are probably six or eight broods in a season. Mr. L. O. Howard found that, at Washington, the time required from the laying of the egg to the appearance of the fly was from 10 to 17 days, and that the fly breeds from the middle of May till the middle of September.

Although only brought under my notice in July last, from enquiries made I have no doubt that this pest has been present on our Canadian stock farms throughout the summer. It was introduced into the United States only six years ago and has spread in all directions over many States of the Union and has now invaded Canada also. It has reached the most southern States and lately as far west as Texas. Curiously, however, long before it had ever reached Texas it was spoken of by farmers as "the Texas fly," and to-day in Canada more enquiries are made concerning it by this name than any other.

REMEDIES.

Notwithstanding the great loss which will undoubtedly result to stock-owners if they neglect to attend to this new enemy, there is no reason why it should not be kept within control by simple, cheap and well tested remedies. It is a most important matter and one that should be taken up by all Farmers' Institutes and Dairymen's Associations, so that if possible some united effort might be made to control it while the numbers are small in spring, and eventually to stamp it out. All that is necessary is for everyone to try first of all to learn what the true life history is, and in accordance with this to apply the best remedy and try to induce his neighbors to do the same.

The remedies are cheap and easily applied; but will require constant attention to make them effective. They are of two kinds, (1) *preventive*, or such as keep the flies from biting the animals; (2) *active*, or such as aim at the destruction of the insects either as maggots or flies.

1. *Preventive*. Almost any greasy substance will keep the flies away for several days. Lard, train oil, tanner's oil, fish oils, with a little sulphur, carbolic acid or oil of tar added, will keep the flies off for from five to six days. The two latter will have a healing effect on any sores which may have formed. Carbolic acid and oil of tar will mix sufficiently well with fish oils if the two substances be placed together in a bottle and well shaken. One ounce of either may be added in two quarts of oil. Axle grease and tallow have been also used to advantage. It may not be amiss to point out that no injury whatever results from the flies settling on the horns, as they only go there to rest, and cannot possibly do the horn any injury. Tar has been largely used to put on the horns of cattle, but it answers no better than the greasy substances mentioned above, and makes the animals in a horrible mess; moreover, if the flies are driven from the horns they merely fly to the animal's body, where they can do much more harm.

The remedy of this class which will eventually be found to be the best, is the mixture known as the Kerosene Emulsion, which consists simply of a mixture of soap-suds with twice the quantity of ordinary coal oil, made as follows: Boil two ounces of common soap in one quart of rain water until the soap is dissolved, then turn it into two quarts of coal oil and churn it violently with a syringe or force pump for five minutes, when it will be of a smooth, creamy nature. This gives the stock emulsion, which must be diluted before using with nine times its measure (that is 27 quarts) of water. It will mix much more easily with the water if done at once, before the stock emulsion cools. This mixture may be applied to the animals either by means of a sponge, or, what will certainly be found most convenient where there are many animals to treat, by means of a force pump and spraying nozzle. This can be done in a few minutes after milking, and one or two pints will suffice for each animal.

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2. *Active.* Of applications to destroy the perfect flies, several have been recommended, as pyrethrum powder, tobacco dust, etc., but these are little if any better than the kerosene emulsion, which when sprayed over cattle killed all the flies reached and prevented others from coming for from three to seven days. But these remedies for the destruction of the perfect flies are only to be advised for use upon the first appearance of the pest in a new locality, or early in the season for the destruction of the first brood. The true way to fight this enemy is by the treatment of the cattle droppings so as to destroy the eggs and larvæ. The maggots can live in the dung only while it is in a moist condition. Any means, therefore, which will ensure its drying up will destroy them. For this purpose, lime, land plaster, and wood ashes are suggested. The last named of these will probably be found the best, not only from its strong alkaline properties, which are destructive to insect life, but also from its great value as a fertilizer, and the ease with which it can usually be obtained on every farm.

Messrs. Riley and Howard state that "throwing a spadeful of lime upon a cow-dung will destroy the larvæ living in it. If the evil should increase, it will well repay a stock raiser to start a load of lime through his fields occasionally, particularly in May or June, as every larva killed then represents the death of very many flies during July and August. We feel certain that this course will be found in many cases practical and of great avail, and will often be an advantage to the pasture besides."

I believe that Canadian wood ashes would be far superior to lime, and if neither of these were easily obtainable, a good shovelful of dry earth or road dust would soon absorb the moisture necessary for the development of the larvæ.

Of all the remedies I have tried or seen suggested, the one which commends itself to me as the most practical is by Prof. J. B. Smith, who says: "By sending a boy over the pasture every other day with a shovel to thoroughly spread out the cow-droppings, all eggs and larvæ would be destroyed." I think if this were done twice a week it would be sufficient, and the remedy would be equally effective in wet weather, when the substance would be washed away, as in dry when it is dried up.

SPREAD OF THE HORN-FLY.—A correspondent in Uniontown, Pa., writes us that the Horn-fly has made its appearance in that vicinity, having first been noticed last season and having become very abundant the present summer. While spending a few weeks in Greene County, N.Y., we noticed this insect in comparative abundance, but not yet numerous enough to attract attention by the habit of congregating upon the horns. Another new locality has been given us by Mr. J. H. Woodruff, of Watertown, Conn., who has found the fly to be very abundant in his vicinity, and still another locality is Waller County, Tex. We are indebted to Mr. F. W. Thurow for specimens from this region. During the month of August complaints have also come in from quite a number of correspondents, among others from the following: Elisha Slade, Bristol County, Mass.; Miss E. J. Phillips, Cuyahoga County, Ohio; George L. Oliver, Otsego County, N. Y.; Devoe and Shumway, Montgomery County, N. Y.; T. C. Ross, Jefferson County, Iowa; B. F. Koons, Tolland County, Conn.; I. N. Rauls, Citrus County, Fla. — *Insect Life*, Sept., 1892.

CLOTHES MOTHS.

By JAMES FLETCHER, F. L. S., F. R. S. C.

In a northern climate, with such winters as we *enjoy* in Canada, furs and woollen clothing are indispensable. Only too well known to all housekeepers are the miserable little creatures which in their various forms and different species are grouped under the name of Clothes-moths. There are few indeed who have not felt the irritation of finding at some time irretrievable damage had been committed in the family supply of winter clothing, particularly of woollen underclothes, socks, mitts and furs, which it was thought had been "peppered and put safely away last spring before the moths appeared," to say nothing of the stripped patches of carpet under the piano and sofas, or even of the little

holes which had appeared suddenly in the pater-familias' dress suit, that had only been left out "for a few days after he came back from his summer holidays." All of these ills are only too well known to most people, and it is one of the grim satisfactions of careless people that at any rate the most careful get sometimes caught.

There has been very great confusion concerning the proper identification of the different caterpillars of moths which injure clothes in houses, and this confusion has been much added to by the absurd name Buffalo moth or Buffalo carpet moth, which has been given to the imported carpet beetle, *Anthrenus scrophulariae*. In an account given in our Annual Report for 1873, there are evidently two species confounded. The whole matter was carefully revised by Prof. Fernald in 1882, and the synonymy given, together with descriptions of the three species which are found in North America, in CANADIAN ENTOMOLOGIST, Vol. XIV, p. 166. There is also an excellent illustrated article by Prof. C. V. Riley in *Insect Life*, Vol. II, p. 211. Figs. 32 and 33 used in that article have been kindly lent by Prof. Riley.

Of the three species mentioned, two only have come under my notice in Canada as household pests. Of these by far the commonest is the small creamy white or buff coloured moth, *Tineola biselliella*, Hum.

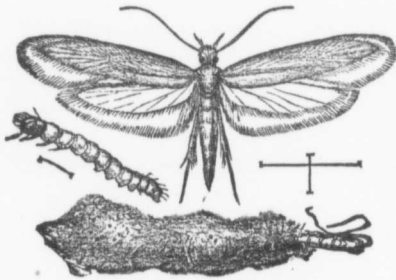


Fig. 32.—*Tineola biselliella*.

This species Prof. Fernald tells us, was separated from the genus *Tinea* by Herrick Schaeffer because of the absence of the maxillary palpi. The small moths (Fig. 32), less than a quarter of an inch in length, are extremely active, flying and running rapidly to hide when disturbed. The head is dull ochreous yellow; the forewings paler and of a silvery sheen without any spots. The under wings are of a slightly different shade of color. The minute yellowish eggs are laid upon the substance which is afterwards to be the food of the young caterpillar. Immediately upon hatching, the tiny caterpillar spins a silken path upon which it travels in search of food. It never, however, forms a case, as is done by the next species to be described, until it is full fed, when it makes a cocoon generally of portions of the material upon which it has been feeding. The food of this troublesome insect is very varied, but consists mainly of fabrics composed of animal hairs; any clothes packed away in a soiled condition are much more liable to attack than those which have been well shaken and brushed. Carpets are often attacked, particularly in darkened rooms and under heavy pieces of furniture which cannot be easily moved, and where therefore frequent sweeping is not possible. Dust in the cracks of floors and under skirt-boards provides a constant supply of food for this insect, and the active little moths penetrate drawers and boxes through very small fissures. Sable-hair paint brushes seem to be a special delicacy for these little fiends, to which, however, few things in the shape of animal hair come amiss. Some instances of their injuries which have been reported to me are the following: the felt facings of the dampers and hammers of a piano were so destroyed in a single summer as to necessitate a complete renewal; another instance of considerable injury from this little enemy was the cutting of the woollen cord by which a large and valuable picture was suspended; the picture fell and was not only injured itself, but did considerable damage to other objects beneath it.

Frequently collections of insects suffer from the depredations of *Tineola biselliella*, and I have in my collection not only *Lepidoptera*, of which the wings have been destroyed, and several locusts, to which it seems very partial, but what seems to me very remarkable, a large greasy specimen of *Necrophorus orbicollis*, of which the interior has been eaten out, and the only indication of the marauder is its empty pupa case, protruding between the head and thorax of the beetle.

The white grub-like caterpillar of this species never forms a true case as does that of another species, *Tinea tapetzella*, which makes for itself a silken gallery mixed with

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fragments of the material it is destroying; but it spins a more or less complete silken tube through the hair when attacking fur.

Although the moths appear throughout the summer, it is stated that there is in the north only one brood in the year, but I think this can hardly be the case, and, although I have this season failed in rearing the young caterpillar from the egg, a brood hatched early in June contained some specimens which were 4.50 mm. by the middle of August, when the whole of them died without any apparent cause; and the perfect insects were to be found flying from the month of May until September the 28th. The caterpillar attains full growth in autumn, when it builds for itself a close cocoon in which it remains unchanged until spring. For this purpose it occasionally takes other materials than those it has been feeding on. I have one cocoon composed of asbestos fibres which were in a drawer with some paint brushes that had been destroyed, but the asbestos fibre alone had been used in the formation of the cocoon. Another cocoon is composed of fibres of cotton wadding and the caterpillar had apparently subsisted almost entirely upon the gummy coating with which the surface of the wadding had been dressed.

Tinea pellionella is thought by Prof. Riley to be the commoner species in northern regions, but this has not been my experience. In fact, it has only been sent to me from Nova Scotia, New Brunswick, and on one occasion from Toronto. In this latter case, it had certainly been recently imported from England. In Prof. Riley's interesting account

in *Insect Life*, its habits are thus briefly described: "The small light brown moths distinguished, as shown at Fig. 33 by the darker spots at intervals on the wings, begin to appear in May, and are frequently seen flitting about as late as August. They pair, and the female then searches for suitable places for the deposition of her eggs, working her way into dark corners and deep into the folds of garments, apparently choosing by instinct the least conspicuous places. From these eggs hatch

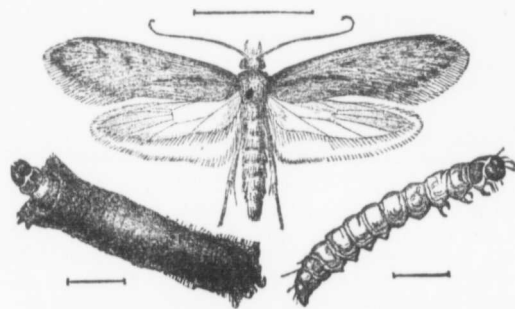


Fig. 33.—*Tinea pellionella* — enlarged. — adult; larva; larva in case (after Riley).

the white soft-bodied larvæ (Fig. 33), each of which begins immediately to make a case for itself from the fragments of the cloth upon which it feeds. The cases are in the shape of a hollow roll or cylinder, and the interior is lined with silk. As they grow, they enlarge these cases by adding material to either end and by inserting gores down the sides which they slit open for the purpose. The larva reaches its full growth toward winter and then, crawling into some yet more protected spot, remains there torpid through the winter within its case, which is at this time thickened and fastened at either end with silk. I have known these larvæ in autumn to leave the carpet upon which they had fed, drag their heavy cases up a 15-foot wall and fasten them in the angle of the cornice of the ceiling. The transformation to pupa takes place within the case the following spring. The heat of a dwelling-house does not seem to affect the development of the pupæ, but the caterpillars remain unchanged till spring even in a highly heated office."

With the exception of the difference in making their cases, the habits and injuries of these species are very similar, and the same remedies will apply for both. A most interesting experiment, demonstrating the manner in which the case of *T. pellionella* is made, can be tried by providing the young caterpillars with different colored materials for making their cases. I have cases showing rings formed from scarlet and black wool, blue peacock's feathers and white lamb's wool.

Perhaps the most remarkable result of the work of any insect which has ever come under my notice, was a piece of a pillow-case which was sent to me by Miss Lucy C. Eaton, of Truro, Nova Scotia. The specimen at first sight has the appearance of beau-

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tifully soft grey velvet or short plush. The surface is perfectly even and very smooth to the touch. Since the specimen was received I have shown it to a great many, and until placed under the microscope together with one of the feathers with which the pile was made, it has proved altogether too much for anyone's credulity to believe that it was the work of insects. When magnified, however, the identity of the minute threads of the pile with the portions of the plumules of the feathers with which the pillow-case had been formerly stuffed, is made quite evident. The pillow-case was made of ordinary strong cotton ticking, conspicuously striped with wide blue, and narrow black and red stripes. After the remarkable operation described below the blue and red stripes were entirely obliterated, and the black stripes could only be discerned faintly through the feather felting. Miss Eaton gives the following particulars with regard to this new fabric:

"The pillow was made in the fall of 1889 and was filled with turkey feathers, which as you probably know are very downy near the base, and it is with portions of this down that the pillow is covered. The pillow was made in 1889 and I opened it in the winter of 1891, during that time it had very little actual use. People who slept on this pillow made no remarks about it; but I found it in the morning more often on the floor than in the bed. It remained for about six months in an unused room, when one day thinking nothing of the matter I placed it on my own bed and I found that I actually could not sleep for the noise, which was like something crawling slowly back and forth. I turned it over several times; but it always seemed right under my head. Then I began to think that I had discovered the reason why other people had thrown it on to the floor so often, and I myself threw it out of bed. I then left it alone for about six weeks and tried it again; but the noise was still there. I then put it on one side thinking that when I had time I would open it and get the insects for my collection. It was some time before I found a convenient opportunity, I then took it into an empty room, put a sheet on the floor and cut open the pillow-case and was much surprised to find it in the condition you see by the specimen I send you. The feathers were entirely stripped of their down. It was the insects I was looking for though, so I stirred the feathers up with a stick and the fine particles of down rose in such a cloud, that I was obliged to tie a towel over my nose and mouth to keep from being choked. From the noise that I had heard and the destruction, I looked for an insect about the size of a grasshopper at least; but saw nothing but the little thing I send. There were about a hundred; but I saved only a few. I could not believe that I had found the right insects, I thought they must be larger. I did not actually see the insects alive amongst the feathers but only found the cocoons."

Miss Eaton kindly forwarded me specimens of the injured feathers and also cocoons of the moth *Tinea pellionella*, which she had taken from the pillow. These cocoons show under the microscope that they, like the felting of the pillow-case, are also composed of the debris of the injured feathers.

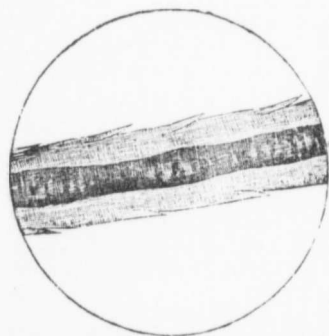


Fig. 34. Beaver fur magnified 250 diameters.

The minute bristles of the plumules of feathers, when examined under a microscope show plainly their barbed nature by which they serve so admirably the purposes required of them in causing the plumules to adhere lightly to those touching them in the feather to which they belong; but at the same time allowing the plumules to be separated without injury, and then binding them together again. It is owing to these very barbs on the particles, that the felting of the cotton pillow-case was possible, the feathers having been cut up into fine morsels, these are rendered sufficiently rigid in proportion to their length to work their way through the feathers little by little, every time the pillow is moved, by reason of their barbs which all point one way, until the pillow-case is reached, here, if short enough, they work their way a short distance into the cotton cloth and remain fixed there by their barbs. The beautiful evenness of the pile is, I imagine, due to the fact that unless the particles are very short they will not be

rigid enough to character is found of felt as well. This is fully explained by Mr. Beaver in Mr. only this, but a

Miss Eaton States Entomology some interesting occasionally seen of the felting could be said to have been and the inside of the breaking up a Dermestid beetle fine specimen of *Tinea pellionella* membered in the action of the felting up into small pieces of the pillow held by their barbs accidental felting commercially used in the America another instance destroyed by the growth of down sembles; it is

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rigid enough to work their way through the feathers and into the cloth. This barbed character is found also in the hair of many animals, and is taken advantage of in the making of felt as was formerly done from the hair of the beaver, for making the shapes of hats. This is fully explained and a magnified illustration, (Fig. 34.) is given, of the hair of the beaver in Mr. Horace T. Martin's new and excellent work "CASTOROLOGIA" where, not only this, but almost every other imaginable information about the beaver is to be found.

Miss Eaton also sent some specimens to the Smithsonian Institution and to the United States Entomologist. In *Insect Life* Vol. IV., p. 404 the matter is referred to and some interesting data are given of similar work by other insects, as follows: "There is occasionally sent in to the National Museum or the Department of Agriculture, a sample of the felting of bits of feathers into the substance of bed ticking or pillow-casing which is said to have been done by some insect. This felting is frequently very beautifully done, and the inside of the cloth next to the feathers appears like a velvet tissue. Ordinarily the breaking up of the feathers which results in this felting, is done by *Attagenus piceus*, a Dermestid beetle which is particularly fond of feathers. We have just received a very fine specimen from Lucy C. Eaton, of Truro, Nova Scotia, in which the work was done by *Tinea pellionella*, one of the commonest of the northern clothes moths. It must be remembered in these cases that the felting is not done by the insects, but by the mechanical action of the feather barbules themselves. When the feathers have once become broken up into small bits by the action of the insects, then through the constant pressing together of the pillow they gradually work themselves into the cloth covering in which they are held by their microscopic retrorse serrations. To one who looks at a fine specimen of this accidental felting, there can not fail to come the suggestion that feathers could be commercially used in this way. The matter has been occasionally referred to in print, notably in the *American Naturalist* for December, 1882, and in *Insect Life*, Vol. II., pp. 317-318, another instance is given of the felting of a pillow-case from duck feathers which had been destroyed by Dermestid beetles. It is described as being 'entirely covered with a fine growth of down as evenly and thickly as the fur on a mole-skin, which it very much resembles; it is firmly attached, the down breaking rather than pull off.'

The editor of *Insect Life* stated at that time: "Pillows in which this felting of the ticking occurs have been infested by one of the Dermestid beetles, (in all of the cases with which I am familiar it has been *Attagenus megatoma*) whose work has resulted in the comminution of the feathers, and the felting results from the subsequent mechanical action. The small feather particles are barbed, as you are aware, and, whenever caught in a cotton fabric by their bases, become anchored in such a way that every movement of the pillow anchors them still further."

In addition to the above the following interesting information is given :

"A similar bit of ticking was exhibited at the Philadelphia Academy of Natural Sciences, April 5th, 1883, and elicited the information that one of the members had some years previously examined a similar material known to have been formed from the fragments of gull feathers, and that a cloak had been made from it which wore well."

With regard to the distinctive differences between these three troublesome immigrants from the old world, it may be well to mention the following points :

1. *Tineola biselliella* is the same insect as has been frequently treated under the name of *Tinea flavifrontella*. This is the commonest species in Canada. The caterpillar spins only a silken path or tube over the surface of, or through, the article attacked. The moth is pale yellow without spots, and when at rest, it holds its wings slanting. Fig. 32.

2. *Tinea pellionella*. The caterpillar of this species from the very first lives within a case, which it carries about with it; the moth is darker in colour with a few black spots on the wings, which lie flat on the back when the insect is at rest. Fig. 33.

3. *Tinea tapetzella*. The caterpillar of this species spins for itself a silken gallery mixed with fragments of the material it is attacking. It remains at all times hidden within this gallery. The moth is easily distinguished from the others by the front wings which are black from the base to the middle and white or gray beyond.

Remedies. With regard to remedies for these troublesome insects, there is nothing better than giving the clothes, furs, etc., a thorough beating and brushing, and then packing them away in spring, if possible before the moths appear. They should be folded neatly and wrapped in strong paper; of course if the edges are pasted, so much the safer. I have seen in the City of Detroit large paper sacks prepared specially to keep out moths, in which dresses can be hung up without folding. In *Insect Life*, Vol. II, page 214, a plan of Mr. L. O. Howard's is recommended: "He buys for a small sum from his tailor a number of paste-board boxes in which they deliver suits, and his wife carefully folds and packs away all clothing, gumming a strip of wrapping paper around the edges of the cover so as to leave no crack. These boxes will last for a lifetime with careful use. Others use for the same purpose ordinary paper flour sacks or linen pillow-cases, which answer well. The success of these means depends entirely on the thoroughness of the preliminary work."

As many have found to their sorrow, camphor, pepper, cedar chips, and that abominable malodorant naphthaline, do not kill the insects and are only partially successful in keeping them away.

When carpets are found to be attacked, the furniture should be removed, the carpet thoroughly swept and the edges of the room freely sprinkled with benzine or gasoline. But as both of these liquids are extremely inflammable, great care must be taken, not to take a light into the room until some hours afterwards or until the room has been thoroughly aired. In the case of upholstered furniture or carriage linings, these may be sprinkled freely with gasoline, which will destroy the insects in all stages, and the unpleasant odor soon disappears when the articles are left in the open air. Prof. Riley recommends for carriage linings sponging them with a dilute solution of corrosive sublimate in alcohol, made only just strong enough not to leave a white mark on a black feather. The extremely poisonous nature of this substance, however, demands that the greatest care should be exercised in its use.

For clothes which may have to be used only occasionally during the summer, it is well when the house is known to be infested, to hang them in some place where they will not be forgotten and will be frequently moved.

THE WEB-WORM TIGER (*PLOCHIONUS TIMIDUS*, HALD).

BY MARY E. MURTFELDT, KIRKWOOD, MO.

It would seem appropriate that this hitherto somewhat rare and inconspicuous little carabid should be brought to notice in its new *role* of a benefactor.

I have been observing its habits for two years, and am confident that to it, more than to any other agent, do we, in the neighborhood of St. Louis, owe our present comparative freedom from the Web-worm nuisance. Whereas formerly almost every other tree would, at this season of the year, be infested with one or more of the disfiguring nests, they are now so few and far between that it requires some search to find one. I was particularly struck with the difference, in this respect, between this section and the Atlantic slope, on my journey to Washington last August, the eastern woods and orchards being in many places almost defoliated and presenting a very unhealthy and unsightly appearance from the ravages of this insect.

It is impossible, of course, to ascertain just when or how the beetle under consideration acquired the habit of preying upon the Web-worm; but I think it could not have been much previous to its discovery. In 1888 *Hyphantria* was abundant in Kirkwood, and for the purpose of obtaining fresh specimens of the moth, as well as of its usual parasites, I transferred a colony from a box elder tree to the rearing cage. From these a large number of perfect insects were bred and also parasites of two or three species, but no larvæ or imagines of *Plochionus* were observed.

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Early in June, 1890, I had been struck with the wasting away of one or two colonies of *Hyphantria* and was about to examine into the causes, when I received from Mr. J. C. Duffey, the Horticulturist of the Shaw Botanical Garden, a note informing me that larvæ of a small carabid had been found in a nest of Web-worms, upon which they were evidently feeding. Accompanying this communication was a box containing one of the infested colonies. Unfortunately the box had been broken in transit, and when I called for my mail the Web-worms were pervading the office, and the distracted postmaster was engaged in a vain attempt to confine them in a newspaper, and expressing himself with some emphasis concerning the sort of mail posted by entomologists. Undoubtedly many of the predaceous larvæ escaped with the caterpillars, but upon examination, after reaching my study, I found seven or eight of the larvæ in the fragments of the web and a sufficient number of Web-worms to afford them sustenance. Placing them on fresh leaves in a small rearing cage on my desk, I soon had ocular verification of Mr. Duffey's interesting observations.

The *Hyphantria* larvæ had all passed the last moult and many were nearly full grown; the carabids were also nearly mature, varying in length from one-fourth to one-third inch, somewhat alligator-shaped, the head provided with sharply pointed trophi, with rather long and strong legs, the body above dark and horny; they had quite a formidable aspect. By preference this larva attacks its victim from the front, biting into the under part of the thoracic segments; but in many cases I have seen it seize hold of the side of a caterpillar, into which it would soon almost bury its head, and not the most violent contortions on the part of its prey were of avail to dislodge it. By the time its appetite was appeased the Web-worm would be fatally injured and a fresh one would be required for its next meal. In this way one beetle larva was capable of destroying a great number of the worms in the course of its development. The two species, web-worm and carabid, reach maturity about the same time, the period of carabid adolescence being about one week less than that of the insect on which it preys. The change to pupa takes place both on the surface of the ground and in the remnants of the web on the tree—in the latter case it (being very soft and white and not enclosed) is subject to destruction by birds and other insects. The beetle appears in from eight to ten days after the change to pupa, and requires a day or two to acquire its dark brown color and the firmness in texture of maturity. It is very swift and furtive in its movements and remains hidden as far as possible during the daytime, but is, even in the rearing cage, quite active at night, using its wings freely. It feeds, sparingly, on aphides and similar soft insects. This season I found it in considerable numbers in the two web-worm nests that occurred in our orchard, and to test its destructive capacity I placed thirty-six three-fourths grown *Hyphantria* larvæ in a large glass jar, with three nearly mature *Plochionus* larvæ. A large number of the caterpillars were killed in the course of the following week, and from the three dozen larvæ I bred seven parasites (*Meteorus hyphantria*) and but three moths; the remainder had evidently succumbed to their coleopterous foes, all three of which developed into fine beetles.

I believe the perfect insect occurs sparingly in many sections of the country, but it may not in every locality acquire the habit of preying on *Hyphantria*. It is to be hoped, therefore, that the divergent type will slowly spread from State to State until it, in connection with other predaceous and parasitic species, will practically relieve us of one of our most prominent arboreal pests.

NOTES ON KILLING, PRESERVING AND RELAXING INSECTS.

BY JAMES FLETCHER, OTTAWA.

There is perhaps no statement more frequently made to entomologists by observant travellers, or those who live in localities far removed from civilization, than "O! I wish

you had been with me, I so often saw lovely insects; but I did not know how to save them for you." From novices the enquiry often comes, "What is the best way to relax specimens after they have become dry."

Killing and Preserving. Having collected a specimen the first thing, of course, is to kill it. For beetles and hard-bodied insects nothing is simpler than to drop them for a second or two in scalding water; they must be taken out again at once and dried on blotting paper, or upon a cloth. The easiest way, however, for killing all insects is to make a "cyanide bottle." This may be made either by placing a small quantity of cyanide of potassium in the bottom of a wide-mouthed bottle and pouring in sufficient wet plaster-of-paris to cover it; or a hole can be hollowed out in the cork and a piece of cyanide inserted. This can be kept in a place either with a plug of cotton wool, or a piece of chamois leather or linen may be tied over the cork. It must be remembered that the active principle of cyanide of potassium being prussic acid it is intensely poisonous—any left on hand after the bottle is made should be at once destroyed.

Insects put in this bottle will be killed in a few seconds by the poisonous fumes given off by the cyanide of potassium; they should then be taken out and packed away whilst soft and pliable. After a few days they become dry and are very easily broken. If there are only one or two specimens these may be wrapped in soft paper or cotton wool, and put away in a suitable box. If the collector, however, is likely to get several specimens, it will be well to prepare a box or bottle on purpose. Beetles or bugs may be preserved for a long time in clean saw-dust dampened with alcohol; grasshoppers, ants, wasps, bees, flies, etc., although they are far better preserved by being pinned at once after killing, may be packed away like beetles and bugs in tubes of paper. These are made by winding two or three thicknesses of a strip of paper one and a half inches wide around a lead pencil, leaving about one-quarter inch over the end, which is turned in and pressed flat before taking the case off the pencil. Into this short, hollow tube drop the specimens and turn in the other end with the tip of a pencil, or fill up the mouth with a plug of cotton wool. Several specimens, according to their size, may be placed in each tube, and the date and locality having been written on the outside they are ready to be packed away in a dry place. Being slightly elastic and very light they pack closely, and a large number can be sent by mail at the same time.

Moths, butterflies and dragon-flies may be killed in the ordinary "cyanide bottle," and then placed in three-cornered envelopes made by taking small squares of paper and folding them across, almost in the middle, so as to make a triangular form with one flap a little smaller than the other; when the insect is placed between the two flaps, the two edges of the larger one are folded over the lesser, and the specimen is then ready to have the date and locality written on it and to be packed away where it will not be disturbed.

Relaxing. The easiest way to soften insects is simply to place them in a covered jar upon damp sand for from twelve to fourteen hours. A few drops of camphorated spirits dropped on the sand will prevent mould from forming on the specimens. Pinned specimens can be either placed in the sand jar or pinned upon a piece of cork and floated on water in a closed jar, or in a basin with a damp towel over the top. Butterflies and moths stored in the envelopes mentioned above are best relaxed by putting the envelopes carefully without opening them, between the folds of a damp towel placed between two sheets of glass. The cloth should be wetted and then wrung out as dry as possible with the hands. Fold it smoothly and spread out the envelopes separately between the folds. Small butterflies and moths will relax in twelve hours and the largest in twenty-four hours. Beetles and bugs in paper tubes may be dropped into warm water and will be ready for setting in a few minutes; wasps, bees and flies should be placed in the sand jar to soften. Mr. W. H. Harrington, who uses these tubes extensively for all kinds of insects, finds that specimens can be conveniently relaxed by putting the tubes on a piece of wet blotting paper in the bottom of one saucer with another inverted over the top. The advantage of this plan is that if specimens should be accidentally forgotten, or it should be inconvenient to mount them at once, the small amount of moisture soon evaporates, and there is no danger of mould.

In the larval form of his "pet"

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THE MOLE CRICKET—GRYLLOTALPA BOREALIS.

BY E. W. DORAN, COLLEGE PARK, MD.

In the Report for last year, page 87, Mr. James Fletcher had an interesting article on his "pet" mole cricket (Fig. 35). At his suggestion I send a few notes upon the larval form of the same species.

On January 4 last, Mr. A. I. Hayward, connected with our State Experiment Station, brought me five larvæ of the mole cricket, which were found in rather a peculiar situation. He had a number of men putting up ice. The ice had been removed from a considerable space, when, wading around in the water with tall rubber boots on, he found the young mole crickets swimming around upon the water. It seems there was no connection between the open space and the land; besides, as the weather was very cold, they could not live upon or near the surface of the ground.

The only reasonable theory in regard to the matter is that they were buried in the mud at the bottom of the pond, which is a temporary one, having been flooded with water only a month or two. The wading through the mud dislodged them, when they at once came to the surface. However, there are some difficulties in the way of accepting this hypothesis. For example: Could the crickets exist beneath the water in the soft mud so near the surface for so long a time? Westwood says in regard to the European mole cricket, *G. vulgaris*, that the villose coating of the body and wings appears to protect them from the water. Our species has a similar coating of fine hairs; but in the larvæ especially it seems scarcely sufficient to protect it from the effects of the water in a prolonged submersion. Besides, could it live so long entirely surrounded by water, cut off from the air? They must have been in the thin mud very near the water to have been thus stirred out.



Fig. 35.

They seemed very little affected by the cold or their bath; in fact, they were as "lively as a cricket," and were apparently very much at home upon the water.

The life history of our American species, *G. borealis*, seems not to have been studied extensively. At any rate I have been unable to find figures or descriptions of the preparatory stages. It is stated that *G. vulgaris* requires three years to come to maturity, and *borealis* seems to be very slow in growth. When these specimens were taken they were but little more than half an inch in length. They are at this time (March 15) about .7 inches long. In two and a half months they have increased in length but little over one-tenth of an inch, though they have been kept in a warm room and supplied with plenty of food, consisting chiefly of the roots of growing wheat, earthworms, etc. As the female deposits her eggs in early spring, they are probably nine or ten months old now. The mature insect is an inch and a half long, while these are but little more than a third as long. Westwood says that *vulgaris* is inactive in winter. These have been active at all times; that is, not in any sense torpid, nor were they when taken.

When I first secured them I put them in a jar of earth, and gave them no further attention for several days. In the meantime one disappeared, and probably served to satiate the appetite of the rest, as they are known to devour their own kind sometimes when they can obtain no other food.

Since then, in exhibiting another before my class, it was accidentally injured and died. I shall try to rear the remaining three to maturity, and figure the various stages. I cannot say what stages they have already passed through. The larvæ of *vulgaris* are white before the first moult. These were dark velvety, and had moulted once or twice, I suppose. They have not moulted since.

I have written these notes in the hope of calling out other observations upon the early stages of the insect. And I should be glad to know of any one who has studied or figured the preparatory stages.

THE SONGS OF OUR GRASSHOPPERS AND CRICKETS.

BY SAMUEL H. SCUDDER.

Everyone is familiar in a general way with the songs of our common meadow grasshoppers and of our crickets. But not everyone is aware that much as with birds each different species may ordinarily be distinguished by its peculiar note or call, if sufficiently close attention is paid to it. Moreover, just as one may recognize in a strange song the general group to which a bird belongs, so in many cases one may tell the group to which a given insect belongs whose note is heard for the first time. Indeed every vocal family of animals utters its distinctive cry. In general the crickets have the highest pitched notes and the short-horned grasshoppers or Acridians the lowest, the long-horned grasshoppers or Locustarians falling between them.

Thus each large family group of the Saltatorial or stridulating Orthoptera* may be recognized by the peculiar pitch of its note. This is perhaps due to the extent of the delicate vibrating membrane of the wings which is brought into action, since this is largest in the crickets and smallest and much broken in the Acridians.

But there is not infrequently some difficulty in distinguishing the song. Indeed in some cases the notes are too shrill to be heard by some ears; they are beyond their limits of audition. "Crossing the Wengern Alp with a friend," writes Tyndall in his work on Sound, "the grass on each side of the path swarmed with insects, which, to me, rent the air with their shrill chirruping. My friend heard nothing of this, the insect world lying beyond his limit of audition." So when I first went to Europe and heard the song of an Orthopteran new to me, I asked a distinguished student of Orthoptera, walking with me by the bush from whence a volume of strident song burst forth, what genus it was; but he could hear no sound whatever.

Or, again, the notes may be very feeble and be overwhelmed by the volume of other shrilling in the neighborhood. To distinguish them clearly, one must bring his ear to within a few feet, or even inches, of the insect during its stridulation—a process which requires great caution lest the shyness of the little violinist should overcome his egotistic love of song. The observer must walk quietly toward the sound until it ceases, and wait motionless for its renewal; the direction of the chirping can then easily be determined, although its distance is deceptive. After drawing an imaginary line towards the spot from whence the sound proceeds, cautious steps must be taken around the arc of a wide circle until another line is fixed at about a right angle to the first, and the location of the songster approximately determined. Then walking quickly but quietly to within five or six feet of the insect, the observer will fall upon his hands and knees, and produce a quill edge and file, which, on being rubbed together imitate, with great exactness, the note he has just heard. He will begin his mock stridulation after a short delay; at first the sounds must be subdued and separated by considerable intervals, then loud and repeated in quick succession; usually a response is heard before a minute has elapsed, and sometimes it comes at once. When the insect has forgotten his fears and begins to stridulate violently, the observer may cease operations and carefully approach him. In this way one can place himself within a few inches of any species living in the grass.

Orthoptera stridulate in four different ways: first, by rubbing the base of one wing-cover upon the other, using for that purpose the veins running through the middle of the wing; second, by a similar method, but using the veins of the inner part of the wing; third, by rubbing the inner surface of the hind femora against the outer surface of the wing covers; and fourth, by rubbing together the upper surface of the front edge of the wings and the under surface of the wing covers.† The insects which employ the

* Very few other Orthoptera stridulate at all.

† A modification of this is given below under *Dictyophorus reticulatus*.

fourth method belong the crickets of Acridians. may say:

Crickets
Locustarians
Acridians

In the following species in this order. It is clearer by the notation is employed the time limits always at one (flute), there is, the bird, and a second of tin note ♪, or a sixteenth rest. reduced a new for a measure.

Gryllotalpa usually begins actively at about three o'clock; and the more so in its burrow, cricket (*Gryllotalpa*) (*plerumque sub* air in chanting tone, as if produced which is twice to two hundred surface, is easily could be heard, sound, like grü-

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three minutes, and the notes are usually many are singing; it gives a single character of the chirp. When most active its full swell, and steadily gains its

fourth method stridulate during flight, the others while at rest. To the first group belong the crickets; to the second the Locustarians; to the third and fourth certain kinds of Acridians. With few exceptions the males alone stridulate. In general terms one may say:

Crickets shrill and creak.

Locustarians scratch and scrape.

Acridians shuffle, rustle and crackle.

In the following pages we propose to pass in review what is known of our American species in this particular, beginning with the crickets and treating the species in systematic order. In doing this we shall have occasion to make our statements perhaps a little clearer by the introduction of a few illustrations, in which a peculiar system of musical notation is employed. It should first of all be explained that this is done only to express the time limits of the song and the rapidity of the successive notes. As the notes are always at one pitch (which, when specified, has been determined by the aid of a piccolo flute), there is, properly speaking, no *song* at all; but it is to the insect what song is to the bird, and so this tropical use of the word may here be allowed. Each bar represents a second of time, and is occupied by the equivalent of a semibreve; consequently a quarter note ♩, or a quarter rest ♪, represents a quarter of a second; a sixteenth note ♪, or a sixteenth rest ♫, a sixteenth of a second and so on. For convenience's sake I have introduced a new form of rest (▬ or ▭), which indicates silence through the remainder of a measure.

GRYLLIDAE.

Gryllotalpa borealis Burm. This insect, our common mole cricket (Fig. 35, page 61) usually begins its daily chirp at about four o'clock in the afternoon, but stridulates most actively at about dusk. On a cloudy day, however, it may be heard as early as two or three o'clock; this recognition of the weather is rather remarkable in a burrowing insect, and the more so as it does not appear to come to the surface to stridulate, but remains in its burrow, usually an inch below the surface of the ground. The European mole cricket (*Gryllotalpa vulgaris*), is said to chirp both within its burrow and at its mouth (*plerumque sub terrâ*, Fischer says), and it may be that our species sometimes seeks the air in chanting; but the chirp, as far as I have heard it, always has a uniformly subdued tone, as if produced in some hidden recess. Fischer says that the European species which is twice as large as ours, cannot be heard more than from one hundred and fifty to two hundred feet (*ultra spatium 20-30 passuum*). Ours, when certainly beneath the surface, is easily distinguished at a distance of five rods; and one would presume that it could be heard, if above ground, nearly twice as far away. Its chirp is a guttural sort of sound, like grü or grëü, repeated in a trill indefinitely, but seldom for more than two or



Figure 36—Note of *Gryllotalpa borealis*.

three minutes, and often for less time. It is pitched at two octaves above middle C, and the notes are usually repeated at the rate of about 130 or 135 per minute, sometimes, when many are singing, even as rapidly as 150 per minute. Often, when it first begins to chirp it gives a single prolonged trill of more slowly repeated notes, when the composite character of the chirp is much more readily detected, and afterward is quiet for a long time. When most actively chirping, however, the beginning of a strain is less vigorous than its full swell, and the notes are then repeated at the rate of about 120 per minute; it steadily gains its normal velocity. Zetterstedt compares the chirp of the European species

to the song of *Hyla arborea*. The note of our own sounds like the distant croaking of toads (*Bufo*), at spawning season, but is somewhat feebler. McNeill says he has "been struck with the resemblance of its note to that of *Æcanthus niveus*. To my ear the only discernible difference is that of pitch. This song is a simple chirp, very low in pitch for an Orthopteran, repeated at intervals of about a second." I have also observed its resemblance to that of *Æcanthus*, where the latter is heard at some distance.

Gryllus neglectus Scudd. The note of this common cricket, which Saussure regards as only a form of *G. pennsylvanicus* Burm, is *cr-rur-ri*, or *crrri*, or *krrrá*; the rapidity with which it is uttered seems to vary very much even in a single strain by one insect. Sometimes the notes are produced as slowly as two per second, but they may be twice as rapid; the mean seems to be the usual rate. The note is sharp and shrill and is apparently pitched at E natural, two octaves above middle C.



Fig. 37.—Note of *Gryllus neglectus*.

In listening one night in midsummer to the chirping of insects, I heard two choirs, one on either side of me, separated by a garden fence. The individuals of each chirped together at the rate of about two notes per second, but whether owing to the influence of a warmer situation, or a fuller exposure to the moonlight, one choir invariably chirped a trifle faster than the other, and fourteen seconds elapsed between the perfect accord of the choirs and their complete discord; from this, fourteen seconds more to their former synchronism. These cycles occurred twice per minute, and followed each other with remarkable regularity for about an hour.

The first notes of *Gryllus* (species undetermined), were heard in Cambridge, Mass., in 1867, on June 15; in 1868 on June 13; but in 1880 (if *Nemobius* was not mistaken for it), on May 16. I think that in New England all fully developed males that go into hibernation die during the winter and that the earliest stridulation comes from those which have hibernated as pupae.

I may add that when in Cairo, Egypt, early in the month of November, I heard a *Gryllus* chirping in the early evening when the thermometer was about 67° Fahr. at the rate of about 230 notes per minute; when three weeks later at the same hour, the thermometer standing at 61° Fahr., the notes were produced by what was apparently the same insect at the rate of only 130 per minute.

Nemobius vittatus Harr. The chirp of this cricket is very similar to that of *Gryllus* and can best be expressed by *ru* or *rruu*, pronounced as though it were a French word.

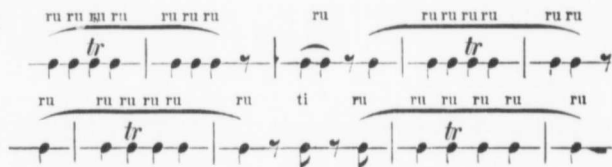


Fig. 38. Note of *Nemobius vittatus*.

The note is trilled forcibly and lasts a variable length of time; sometimes for several seconds, at others it is reduced to a short sharp click.

I once observed one of these insects singing to its mate. At first the song was mild and frequently broken; afterward it grew impetuous, forcible and more prolonged; then it decreased in volume and extent till it became quite soft and feeble. At this time the male began to approach the female, uttering a series of twittering chirps; the female ran

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away, and the male, after a short chase, returned to his old haunt, singing with the same vigor as before, but with more frequent pauses; at last, finding all persuasion unavailing he brought his serenade to a close. The pauses of his song were almost instantly followed by a peculiar jerk of the body; it consisted of an impulsive movement backward, and then as suddenly forward, and was accompanied by a corresponding movement of the antennae together and then apart. The female was near enough to be touched by the antennae of the male during the first movement, and usually started in a nearly similar way as soon as touched.

The tegmina of the male are held at an angle of about twenty degrees from the body during stridulation, and perhaps at a slightly greater angle from each other. Even when most violent, the sound is produced by the friction of the inner edges of the tegmina only, and not by the whole surface.

In different years I have noted the first time in spring that I have heard this creature stridulate in the vicinity of Boston, Mass. In 1869, June 13; 1874, May 31; 1875, May 26 (and the same year at Compton, N.H., June 1); 1878, May 18 (on the summit of Blue Hill, Milton); 1879, May 31. July and August, 1867, were spent north of the White Mountains, at Jefferson, N.H., and no *Nemobius* was heard there before Aug. 7.

Mr. W. T. Davis says that on Staten Island there is a small form of this species, perhaps distinct, in which the stridulation is "a continuous rolling whirr, instead of the ordinary creak, creak, creak."

Nemobius fasciatus Scudd. I have noticed no difference between the chirp of this species and that of the preceding, of which it is probably only a long winged form.

Ecanthus niveus Serv. The song of the common tree cricket (Fig. 39), consists of a continuously sustained, equable, creaking roll, which varies much in intensity and differs by day and by night. Dr. Harris speaks only of their song by night, remarking: "When arrived at maturity the males begin their nocturnal serenades at the approach of twilight and continue it with little or no intermission till the dawn of day. Should one of these little musicians get admission to the chamber, his incessant and loud shrilling will effectually banish sleep."



Fig. 39.

The day song of this insect is exceedingly shrill, and may be represented by the accompanying figure, though the notes vary in rapidity; when slowest they are about sixteen a second. The song is of varied length, sometimes lasting but two or three seconds, sometimes continuing for a minute or two uninterruptedly; it is a nearly uniform, equally sustained trill, but the insect often begins its note at a different pitch from the normal one—the fourth F above middle C—as if it required a little practice to attain it. When singing the tegmina are raised at fully a right angle to the body. The night song consists of *thrrr* repeated incessantly, three parts of song and one of rest in every three seconds.

Fig. 40. Note of *Ecanthus niveus* by day.

McNeill remarks that the day song indicated by the musical notation given above "seems to be the song of *fasciatus*, while the night song certainly resembles that of *angustipennis* more than the song of *niveus*." These different species were not recognized by me when I made my earliest notes, represented by the notation above, so that a revision of the "score" of our *Ecanthus* seems desirable.

Davis describes the note of this species as a "beat, beat, pulsating sound." Riley says the chirp "is intermittent, resembling a shrill 're-teat, re-teat, re-teat' with a slight



Fig. 41. Note of *Ecanthus niveus* by night.

pause between each." McNeill calls it "the well-known *trrrr ree, trrrr-ree*, repeated without variation or pause sixty or seventy times a minute," or as he says in another place "*t-r-r-r-r-e-e, t-r-r-r-r-e-e*, repeated. . . . about seventy times in a minute," and adds:

"In the vicinity of Davenport, Iowa, this song is heard as early as the twenty-third of July and it continues until the persistent little songsters are killed by the heavy frosts of the late fall. This song is heard only at night and occasionally on cloudy days, but in the latter case it is only an isolated song and never the full chorus of the night song produced by many wings whose vibration in exact unison produces that characteristic 'rhythmic beat'—as Burroughs has happily phrased it. It is this effect of many united songs that has lead the same author to speak of 'purring' crickets. Thoreau calls it the 'slumbrous breathing' and the 'intenser dream' of crickets, but Hawthorne has given it a more spiritual interpretation than either Burroughs or Thoreau. He describes it as an 'audible stillness,' and declares if 'moonlight could be heard, it would sound like that.'"

Fitch writes of this insect in New York as follows: "In the southern part of our State the song of the flower cricket begins to be heard as early as the first of August, but it is a week later before it commences in the vicinity of Albany, and later still in the more northern parts of the State. Perched among the thick foliage of a grape vine or other shrubbery, some feet up from the ground, and as already stated, remaining in the same spot day after day, its song begins soon after sunset and before the duskiess of twilight arrives. It is distinctly heard at a distance of several rods, and the songster is always farther off than is supposed. Though dozens of other crickets and katydid are shrilling on every side at the same time, the peculiar note of this cricket is at once distinguished from all the rest, consisting of repetitions of a single syllable, slowly uttered, in a monotonous, melancholy tone, with a slight pause between. The children regard the cricket as no votary of the temperance cause; they understand its song to consist of the words *treat—treat—treat—treat*, which words, slowly uttered, do so closely resemble its notes that they will at once recall them to the recollection of almost every reader. And the song is thus continued without the slightest variation and without any cessation, I think, the whole night through. I, however, have sometimes heard it at the first commencement of its evening serenade uttering three syllables resembling the words *treat, treat, two; treat, treat, two*—as though the songster was supplicating a libation for his voiceless mate as well as himself—a longer pause following each third note. This prelude is probably performed in limbering or otherwise adjusting his organs, preparatory to performing the regular carol, which is struck into in a few moments."

Ecanthus fasciatus Fitch. Of this species McNeill says: "The song is a high trill continuing usually for several minutes with the intervals between the trills of very irregular length. It sings all day as well as all night, apparently in the bright sunshine as well as on cloudy days and in the dusk of evening." Davis calls the song "a long and comparatively loud, continuous whirr often lasting several minutes." My notes, which probably refer to this species, make the chirp to be at a somewhat lower pitch than that given by me for the preceding species, namely, at the third B above middle C, and the song itself is described as more rapid and vigorous. See also the notes under *E. niveus*.

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Oecanthus latipennis Riley. Riley describes the note as follows: "The shrill cry of *latipennis* is continuous and recalls the trilling of a high-pitched dog-whistle in the distance. The key varies, however, and is sometimes much less high and more musical than at others. The commingled shrills of the species recall also the distant croaking of frogs in the spring. The broad wings are thoroughly elevated during the act, or even bent forward, and the vibration is so rapid that there appears to be no motion." McNeill says: "Its song has been described as a 'continuous, high-keyed trill, continued for fifteen minutes or more.' This is exactly the song of *fasciatus*. Since there has been so much confusion in the species of this genus, there is a chance that the song described above is mistakenly referred to *latipennis*."

Oecanthus angustipennis Fitch. McNeill says of this species, that it "has a song which resembles that of *fasciatus* in some degree, but it is very much fainter and lasts for about five seconds, with an equal interval between the trills." Davis says its song is "a faint continuous whirr, lasting only about five seconds, with an equal interval of rest." See also the notes under *E. niveus*.

Anaxipha exigua (Say). Perhaps the same as *A. pulicaria* (Burm.) The only one who has spoken of its song is Davis, who simply says it "has a particular silvery tone."

Orocharis saltatrix Uhl. Riley writes: "The stridulation of this cricket is a rather soft and musical piping of not quite half a second's duration, with from four to six trills, but so rapid that they are lost in the distance. The key is very high, but varies in different individuals and according to moisture and temperature. It most resembles the vibrating touch of the finger on the rim of an ordinary tumbler when three-fourths filled with water, repeated at intervals of from two to four per second, and may be very well likened to the piping of a young chick and of some tree frogs. As the species is very common in the south-west, its chirp is everywhere heard, and is so distinctive that when once studied it is never lost amid the louder racket of the katydids and other night choristers. It is also frequently heard during the day time when the weather is damp and cloudy."

LOCUSTIDAE.

"These," writes Riley, "are the merry choristers that make our woods and valleys ring with their pleasant songs during the evenings of late summer and early fall. They are chiefly nocturnal in their habits, but not entirely so, for each afternoon during the courting time, and long before the sun has disappeared in the west, a few of them may be seen flying about from place to place, while others are occasionally heard in their retreats as though tuning their instruments preparatory to the grand evening concert."

Scudderia angustifolia, (Harr). This insect is more noisy by night than by day, and the songs differ considerably at these two times. The day song is given only during sunshine, the other by night and in cloudy weather. I first noticed this while watching one of these little creatures close beside me. As a cloud passed over the sun, he suddenly changed his note to one with which I was already familiar, but without knowing to what insect it belonged. At the same time all the individuals around,

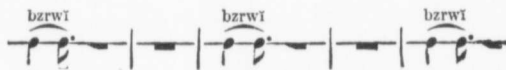


Fig. 42.—Note of *Scudderia angustifolia* by day.

whose similar day song I had heard, began to respond with the night cry. The cloud passed away and the original note was resumed on all sides. Judging that they preferred the night song to that of the day from their increased stridulation during the former period, I imitated the night song during sunshine, and obtained an immediate response in the same language. The experiment proved that the insects could hear as well as sing. So on another day, at 4 p.m., the sun suddenly beclouded, I heard four or

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five individuals close beside me immediately change their note from the day call to the night call.

This species is exceedingly shy, and the observer must be patient who would hold converse with it. One insect which I had disturbed and beside which I was standing could not at first decide to resume his song; he was afraid of the intruder, but, enticed by a neighboring songster, gave utterance several times to a barely discernible short

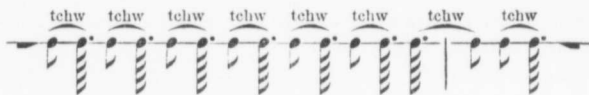


Fig. 43.—Note of *Scudderia angustifolia* by night.

click or *tī*; after five or six of these efforts his desires overcame his fears. The note by day is *tzip* or *bzrwī*, and lasts for a third of a second. The night song consists of a repetition, ordinarily eight times, of a note which sounds like *tchw*. It is repeated at the rate of five times in three-quarters of a second, making each note half the length of the day note.

In 1867 this species and *Orchelimum vulgare* were the first Locustarians to sing at Jefferson, N.H., where I first heard them on July 28.

This species is the *Phaneroptera curvicauda* of my previous notes on stridulation.

Scudderia curvicauda (DeGeer)—Of this species Riley writes: "The shrill of the male is by no means so loud as of the oblong-winged species [*Amblycorypha oblongifolia*], in which its sound is always drowned in the woods. It consists of a softer *zeep, zeep*, sometimes uttered singly, but generally thrice in succession. The call is occasionally responded to by a faint chirp from the females, produced by stretching out their wings as if for flight, and is as often heard in the day as at night."

McNeill says: "Its note is not generally heard until the middle of the afternoon. The note cannot be supposed to represent more than the first two syllables of the 'Katy-did' or 'Katy-didn't' of its congeners. It is made but once and the rasping, jerky sound has been very well represented by Mr. Scudder as *bzrwī*," (but this refers properly to *S. angustifolia*, as noted above).

Scudderia furcata Brunn. McNeill says that the note of this species is indistinguishable from that of the preceding species, but is much less frequently heard.

Amblycorypha oblongifolia (DeGeer) Stal. Harris says of this insect that "when it flies it makes a whizzing noise somewhat like that of a weaver's shuttle," but the noise is very feeble and subdued. He adds: "The notes of the male, though grating, are comparatively feeble." I have not studied its note attentively, and only recorded that according to my then recollection it gave three rapid notes in succession like the true katydid, but feeble. One observed subsequently, confined in the house, emitted two notes close together every few seconds, resembling *tch-tch*. McNeill also says that "its note is a quick shuffling sound which resembles 'Katy' or 'Katy-did' very slightly."

Amblycorypha Scudderæ Brun.—Bruner says: "Like *oblongifolia*, this katydid produces the peculiar *chick chick* noise which is so characteristic a sound, in our groves during the months of August and September."

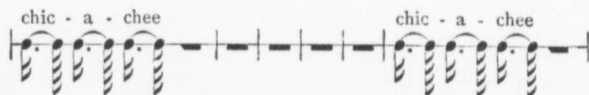
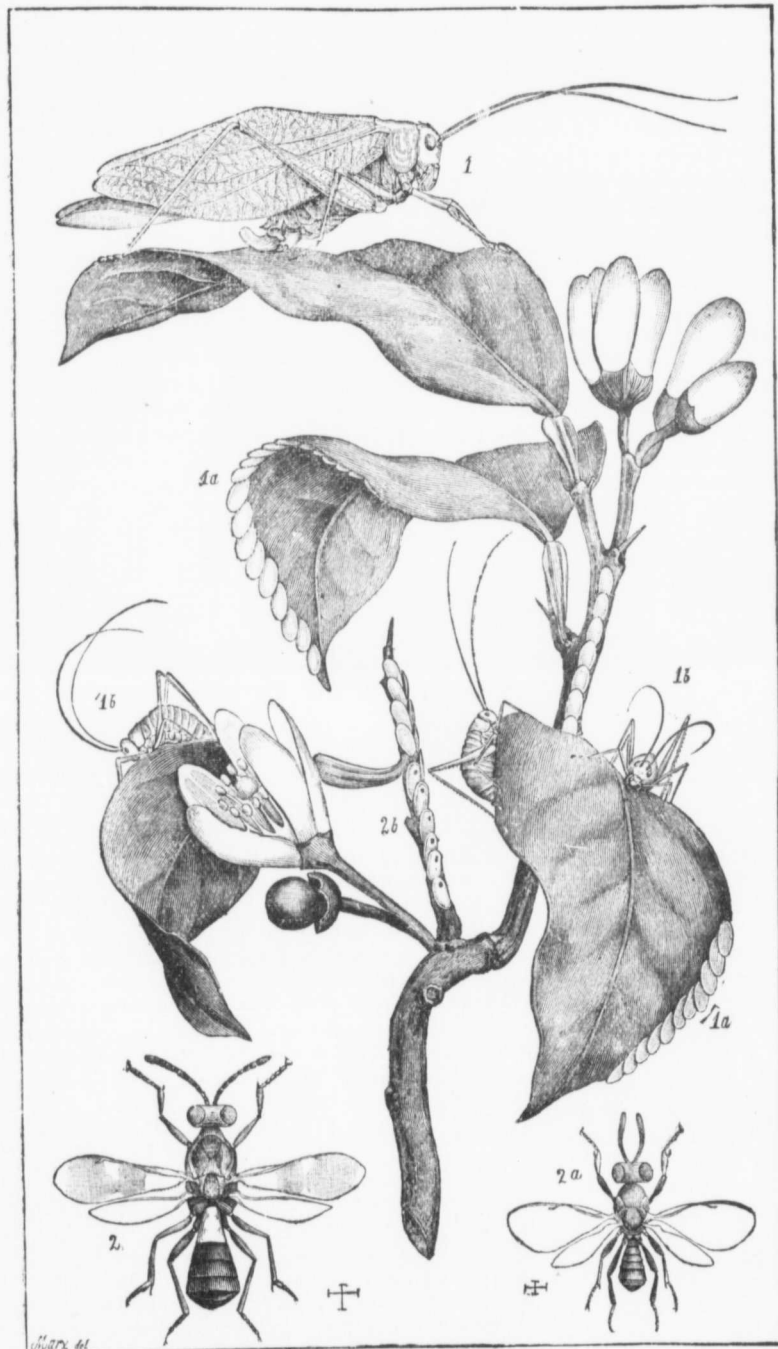


Fig. 44.—Note of *Amblycorypha rotundifolia*.

Amblycorypha rotundifolia Scudd.—This insect stridulates both by day and by night and without variation. The song consists of from two to four notes—almost



[Fig. 45.—1, represents the mature winged Katy-did, *Microcentrum retinervis*; 1b, the immature young; 1a and 2b, the eggs, deposited on twigs and leaves, overlapping each other; 2 and 2a, a small chalcid fly parasitic on the eggs, *Eupelmus mirabilis* Walsh.]

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invariably three and almost never four—sounding like *chic-a-chee*, repeated rapidly so as to be almost confounded, and when three requiring just one-third of a second; the song is repeated at will, generally once in about five seconds for an indefinite length of time.

Microcentrum laurifolium (Linn.) McNeill says the note of this grasshopper "may be represented by the syllable *tic* repeated from eight to twenty times at the rate of about four to the second."

Microcentrum retinervis (Burm). Fig. 45. Riley gives an admirable account of this insect in his Sixth Missouri Report, from which the following statement regarding its song is taken:

"The first notes from this katydid are heard about the middle of July and the species is in full song by the first of August. The wing covers are partly opened by a sudden jerk, and the notes produced by a gradual closing of the same. The song consists of a series of from twenty-five to thirty raspings, as of a stiff quill drawn across a coarse file. There are about five of these raspings or trills per second, all alike, and with equal intervals, except the last two or three, which, with the closing of the wing-covers, run into each other. The whole strongly recalls the slow turning of a child's wooden rattle, ending by a sudden jerk of the same; and this prolonged rattling, which is peculiar to the male, is universally and instantly answered by a single sharp 'chirp' or 'tschick' from one or more females, who produce the sound by a sudden upward jerk of the wings."

"Both sexes are for the most part silent during the day, but during the period of their greatest activity their stridulations are never for an hour remitted, from the time the great setting sun hides behind the purple curtains of the west till he begins to shed his scarlet rays in the east—the species being so numerous that the sound as it comes

from the woods is one continuous rattling, not unlike the croaking of the frog, but set to a higher key. . . . I have noticed no particular difference in the day and night note, except in the greater intensity of the latter."

Davis says of the same species that it "produces two somewhat different songs, or perhaps more correctly, varies the same song in time or extent of utterance, so that unless the same individual is listened to for some time, the notes might be attributed to different species."

Cyrtophyllus concavus (Harr.) Since I began to study the character of the notes produced by different species of Orthoptera, it has been my fortune to hear that of this the true katydid (Fig. 46) but once or twice. This insect lives in tree tops, one or two only in a tree, in little colonies scattered here and there over most of the United States east of the Rocky Mountains. One such colony I encountered in the heart of the city of Springfield, Mass., and spent an evening endeavoring to reduce the notes to scale. The insects which I observed were from fifteen to twenty rods distant, perched in the tops of maple, cherry and elm trees, not far above my window. They ordinarily call "Katy," or say "She did" rather than "Katy did;" that is, they rasp their fore wings twice, more frequently than thrice; these two notes are of equal (and extraordinary) emphasis, the latter about one-quarter longer than the former; or, if three notes are given, the first and second are alike and a little shorter than the last; the notes are repeated at the rate of two hundred per minute; and while the interval



Fig. 46.

between two series of notes varies to a certain degree, it is seldom greater than two and one-third seconds, or less than a second and a quarter; usually it is between one and seven-eighths and two seconds.

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The note, which sounds like *xx*, has a shocking lack of melody; the poets who have sung its praises must have heard it at the distance that lends enchantment; in close proximity the sound is excessively rasping and grating, louder and hoarser than I have heard

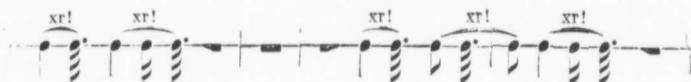


Fig. 47.—Note of *Cyrtophyllus concavus*.

from any other of the Locustarians in America or in Europe, and the Locustarians are the noisiest of all Orthoptera. Since these creatures are abundant wherever they occur, the noise produced by them, on an evening specially favorable to their song, is most discordant. Usually, as I have said, the notes are two in number, rapidly repeated at short intervals; perhaps nine out of ten will ordinarily give this number; but occasionally a stubborn insect persists in sounding the triple note; and as katydids appear desirous of defiantly answering their neighbors in the same measure, the proximity of a treble-voiced songster demoralizes a whole neighborhood, and a curious medley results; notes from some individuals may then be heard all the while, scarcely a moment's time intervening between their stridulations, some nearer, others at a greater distance; so that the air is filled by these noisy troubadours with an indescribably confused and grating clatter. This renders special observation of the notes of any individual all the more difficult, and it is only by great patience and careful selection that it can be accomplished, unless one places himself upon the outskirts of a colony.

Harris gave us the first account of this insects' song. He says in his classical Report: "The musical organs of the male consist of a pair of taborets. They are formed by a thin and transparent membrane stretched in a strong half-oval frame in the triangular overlapping portion of each wing cover. During the day time these insects are silent, and conceal themselves amongst the leaves of trees; but at night they quit their lurking places, and the joyous males begin the tell-tale call with which they enliven their silent mates. This proceeds from the friction of the taboret frames against each other when the wing covers are opened and shut, and consists of two or three distinct notes almost exactly resembling articulated sounds, and corresponding with the number of times the wing covers are opened and shut; and the notes are repeated at intervals of a few minutes, for hours together. The mechanism of the taborets, and the concavity of the wing covers, reverberate and increase the sound to such a degree, that it may be heard, in the stillness of the night, at the distance of a quarter of a mile. At the approach of twilight the katydid mounts to the upper branches of the tree in which he lives, and as soon as the shades of evening prevail, begins his noisy babble, while rival notes issue from the neighboring trees and the groves resound with the call of 'Katy-did, she-did' the livelong night."

McNeill writes of it in Illinois: "This is the true 'katydid,' common wherever there are trees. Its song is better known, and the insect itself less known, because of its arboreal habits, than either of the other katydids. This species moves about so little, that it is not unlikely that in many cases an individual spends its whole life upon a single tree. I have listened to the song of one katydid on a certain tree every evening for more than two months. I have noticed repeatedly that on any evening when they are singing, there are the same number of individuals as indicated by the number of songs. . . . So far as I know this is the only species of Orthoptera in which the male is not smaller and more active than the female. It is the only green-winged Locustid with which I am acquainted that does not have the wings longer than the elytra. These facts are not improbably mutually related. It may be surmised that, in the evolution of species, the katydid that developed in the greatest degree its musical apparatus had the least need of hunting up his partner when the mating season came round, and as it was so well protected by its form and color and arboreal habits as to

have little need of wings, these organs have gradually degenerated into a musical and protective apparatus. As the male was released from the necessity of hunting up the female, he would naturally lose after a time his slighter but more active body; it is easy to see how arboreal habits once acquired may react upon the entire organization."



Fig. 48. Note of *Conocephalus ensiger*.

Fernald says: "I cannot imagine what ingenious person first discovered that their song resembled the words "Katy did," instead of some other words; for many persons besides myself fail, upon hearing them for the first time, to recognize them by their sound."

Conocephalus ensiger Harr. This insect has but a single song and stridulates only by night or during cloudy weather; it begins its song as soon as the sky is obscured or the sun is near the horizon; it begins with a note like *brw*, then pauses an instant and immediately emits a rapid succession of sounds like *chwī* at the rate of about five per second, and continues them for an unlimited time. Either the rapidity of the notes is variable, becoming sometimes as frequent as twenty-three in three seconds, or else there is some deceptive character in its song. In a number of instances I have counted the notes as rapid as the highest rate given above, but on a nearer approach to verify them the rate was invariably reduced to five per second; it is doubtful whether this was due to alarm at my approach, for this is one of the least shy of our Locustarians.

McNeill says "its song is a loud rasping *zip-zip-zip* repeated indefinitely. It does not begin to sing until dark," and in another place he compares the song to the first staccato part of the song of *Orchelimum vulgare*.

Davis writes of it on Staten Island that it is the first *Conocephalus* to be heard, "and with *ik-ik-ik*, as if sharpening a saw, enlivens low bushes and particularly the corn patch. This insect seems to especially delight in perching near the top of a corn-stalk and there giving forth its rather impulsive song. I have often watched one crawl, with many a spiral turn, up the stem, fiddling all the while. My notes on its first heard stridulation show considerable uniformity, and the average date may be taken as July 15."

Conocephalus nebrascensis Brun. Of this species McNeill writes: "If *ensiger* may be said to sing the first part of the song of *Orchelimum vulgare*, the well-known *zip-zip-zip-ze-e-e-e*, *nebrascensis* may be said with equal truth to sing the last part of the song, that represented by the *ze-e-e-e*; but the sound is much more resonant, being really in quality much more like the song of a Cicada, but not so loud and without a swell. It begins to sing earlier in the evening than *ensiger*."

Conocephalus robustus Scudd. This grasshopper is exceedingly noisy and sings equally, and I believe similarly, by day and night. The song resembles that of the harvest fly *Cicada canicularis*. It often lasts for many minutes, and seems, at a distance, to be quite uniform; on a nearer approach, one can hear it swelling and decreasing in volume, while there is a corresponding muscular movement from the front of the abdomen backward, two and a half times a second. This is accompanied by a buzzing sound, quite audible near at hand; it resembles the humming of a bee, or the droning of a bagpipe.

McNeil says of this species that "its song is indistinguishable from that of *dissimilis*,"

but the song of that of *C. nebrascensis* it certainly resembles. "lives both up and down while the sun is out, and found it in Mi-

Davis says of it on sandy ground. Along the sea shore when approaching

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but the song of the latter has never been described as far as I know*; perhaps he means that of *C. nebrascensis*, which is described by him, as above, in the same paper and which it certainly resembles, to judge from the description. He says further that *C. robustus* "lives both upon trees and in the grass; but while its song may be heard in the grass while the sun is high, I have never heard it from trees until after dark." I have never found it in Massachusetts except in grass or in corn-fields.

Davis says of it on Staten Island that it "resides for the most part mid the grass on sandy ground near the sea shore, though an occasional individual finds its way inland. Along the sea beach they stridulate in early afternoon, especially if slightly cloudy, and when approached they have a curious fashion of dropping to the ground."

Conocephalus exiliscanorus Davis. "Its stridulation," says Davis, "as well as its form, resembles that of *ensiger* more than any other native *Conocephalus*. We cannot count with any accuracy in *ensiger* the number of times one wing is drawn over the other as indicated by the rise and subsidence in the song, but *exiliscanorus* is such a slow singer that this estimate can be easily made, one wing being rubbed on the other about one hundred and fifteen times in a minute." And in another place: "The sound produced when stridulating is very faint, not louder than that made by *Gryllus abbreviatus*, and I was much surprised to hear such a faint song come from so large an insect. I have, in consequence of this faint song, named it the 'slightly musical' *Conocephalus*."

Orchelimum nigripes Scudd. McNeill says the song of this species "is difficult to distinguish with certainty from that of *vulgare*, but usually the *zip-zip* is repeated once or twice very rapidly and the *ze-e-e-e* does not continue so long. The earliest recorded date for it here [Illinois] is the 1st of August."

Orchelimum silvaticum McNeill. "Its stridulation," says McNeill, "is quite distinct from that of *vulgare*. It consists of the same two elements, but the *zip* is repeated many times very rapidly so as to make almost a continuous sound and the *ze-e-e* is comparatively short and very constant, lasting about eight seconds. The first part of the song lasts from three to five seconds."

Orchelimum volantum McNeill. McNeill says of this: "The song has a new note in it. It may be represented as follows: *zip-zip kr-ze-e-e kr-ze-e-e*, the last part of the song not lasting more than a half to three-quarters of a second and is always preceded by the sound which I represent imperfectly by *kr*."

Orchelimum vulgare Harr. With *Scudderia angustifolia* this is the earliest Locustarian to sing in northern New Hampshire; one year it sang there for the first time on July 28; the following year I heard it in the vicinity of Boston July 15. When about to sing on a hot, sunny day, the male mounts a stalk of grass to about a foot from the ground where it clings with its four front legs, allowing its hind legs to dangle on either side the stalk that they may not interfere with the movement of the tegmina. Its song is more complicated than that of our other Locustarians. Beginning with *ts* it changes almost instantly into a trill of *zr*; at first there is a crescendo movement which reaches its volume in half a second; the trill is then sustained for a period varying from one to twenty seconds (generally from six to eight seconds), and closes abruptly with *p*. This strain is followed by a series of very short staccato notes sounding like *jip!* repeated at half second intervals; the staccato notes and the trill alternate *ad libitum*. The staccato notes may be continued almost indefinitely, but are very rarely heard more than ten times in direct succession; it ordinarily occurs three or four times before the repetition of the phrase, but not more than two or three times when the phrase is not repeated. I have known it to be entirely omitted, even before the repetition of a phrase. The interval between the last *jip!* and the recommencement of the phrase never exceeds one quarter of a second. The night song differs from that of the day in the rarer occurrence of the intermediate notes and the less rapid trill of the phrase; the pitch of both is at B flat.

*Davis says of *C. dissimilis*: "I have found this insect stridulating when its head was gone, picked off perhaps by some vagrant chick!"

HARRIS says of it: "During the evening, and even at other times in shady places the males make a sharp clicking noise, somewhat like that produced by snapping the point of a pen against the thumb nail, but much louder."

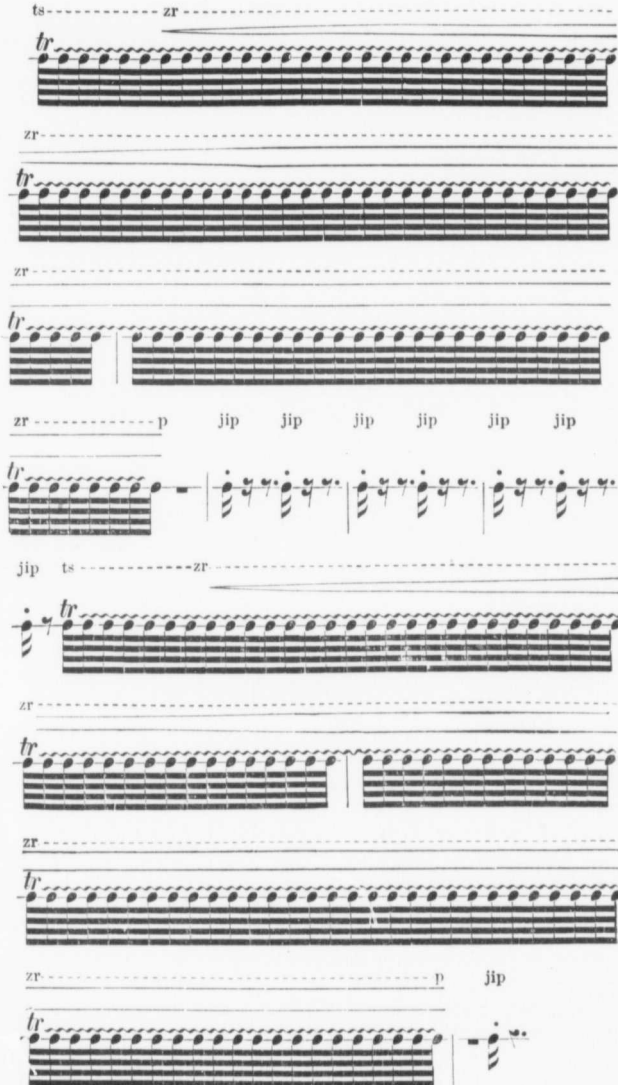


Fig. 49. Note of Orchelimum vulgare.

McNeill, writing of Illinois, says: "I have heard its note as early as the 21st of July. Its song is the familiar *zip-zip-zip-zip-ze-e-e*. The staccato first part is repeated about four times, usually about twice a second; the *ze-e-e* continues from two or three to twenty or more seconds."

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Xiphidium fasciatum Serv. The note of this species resembles that of an *Orchelimum*, but is very faint. McNeill says of it: "Its song is a faint echo of that of *Orchelimum vulgare* with the *zip-zip* omitted. . . . Its faint little quaver is the first note of the great chorus that sounds in all the meadows from the first of August until the first of October or until cold weather."

Xiphidium nemorale Scudd. "The song," says McNeill, "is louder than that of *fasciatum*; it consists of two parts, the first a short abrupt note which is very well represented by the syllable *zip*, the second is the familiar *ze-e-e* which lasts about half a second and is made from one to five times; the *zip* is not repeated."

ACRIDIDAE.

Dictyophorus reticulatus. Many years ago I received a couple of females of this bulky species alive from the south and kept one of them for some time. In the sunshine she stridulated by raising her tegmina directly upward against the half opened wings, making a rough scratching sound which was repeated rather rapidly, but variably, from two to ten times.

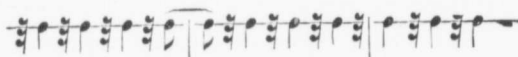
Subsequently Dr. Shufeldt figured this insect in *Science* (vol. 2) and gave an interesting account of it from observations in southern Louisiana. He says: "The only sound that I ever heard this grasshopper give vent to is now indulged in by the male. It consists simply of a series of peculiar hisses (this word expresses it better than anything else) and is only heard when we seize and handle one of them, or during their mating. The sound seems to be produced largely by the [fore] wings; for these members are elevated at this time, as I have shown them in my plate, where the male exhibits his beautiful hind-wings,—a relief to his otherwise sombre tints that is only to be experienced on such occasions." And later: "Whatever part of the entertainment these sable gentlemen [the males] entered into, they constantly kept up a very audible buzzing racket with their [fore] wings, which they elevated and lowered at few seconds' intervals, showing the inferior carmine pair each time they did so, with telling effect."

Melanoplus femur-rubrun. At Andover, Mass., I once observed on Oct. 5 a pair of this species, male and female, near together alternately answering each other with a slight quick movement of the hind legs on the tegmina as if in stridulation. I made no note of whether any sound was actually produced and do not now recall any.

Chloëaltis conspersa Harr. The song of this insect is of varied rapidity, according to the amount of sunshine; in the sun this insect makes from nine to twelve notes, at the rate of fifty-three in fifteen seconds; the usual number of notes is ten. In the shade the

Fig. 50.—Note of *Chloëaltis conspersa* in the sun.

rate falls to forty-three in fifteen seconds, the number of notes remaining the same. The femur is evidently scraped gently upon the tegmina to produce the sound, for frequently, at the beginning, two or three noiseless movements are made, the leg failing

Fig. 51.—Note of *Chloëaltis conspersa* in the shade.

to touch the tegmina. I once found three males singing to a single female, who was busily engaged laying eggs in a stick of wood, her abdomen plunged into a hole she had bored to the depth of half an inch; two of the males were near enough each other to cross antennae.

Stenobothrus curtispennis Scudd. When about to stridulate, these insects place themselves in a nearly horizontal position, with the head a little elevated; they then raise both hind legs together, the hind tibiae bent back snugly against the femora during the movement, and grate the thighs against the outer surface of the tegmina. The first one

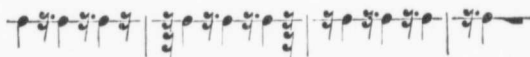


Fig. 52.—Note of *Stenobothrus curtispennis*.

or two movements are frequently noiseless or faint. In sunny weather the notes are produced at the rate of about six a second, are continued from one and a half to two and a half seconds, and when undisturbed are repeated with intermissions of from five to six seconds. When the sky is overcast, the movements are less rapid.

Gomphocerus sp. "The males of several species of this genus," says Riley, "produce a loud rattling or hissing sound, somewhat resembling the rattle of the large gray rattlesnake, by rubbing the inside of the thighs against the elytra." The reverse resemblance is indeed so close that I once stooped to search for the stridulator when I heard the warning of a rattlesnake, but fortunately discovered my error in time to withdraw precipitately. In an undetermined species discovered near Georgetown, Colorado, July 17, the note sounded like *tch*, repeated with exceeding rapidity, while the legs moved very quickly over a very short arc; the repetition was so rapid as to seem like one note, and it lasted from one to two and a half seconds; it was always fainter at the start and strongest just before the end.

Boottettix argentatus Brun. Bruner says this insect produces "a sharp stridulating sound," resembling "that produced by some of the *Stenobothri*."

Arcyptera gracilis Scudd. This is a very shy insect, but it stridulates more loudly than other *Tryxalinae*; its note can be heard at a distance of fifty feet. It usually makes four notes, but the number is sometimes greater. The first, a quarter of a second in

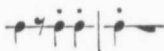


Fig. 53.—Note of *Arcyptera gracilis*.

length, is duller than the others, and is followed by a pause of a quarter of a second; the other notes are of the same length, but sharply sounded and follow each other rapidly.

Arphia sulphurea (Burm) Stal. This insect sometimes crackles when flying, but undoubtedly the power of doing so is under control.

Chimarocephala viridifasciata (DeGeer) Scudd. This insect usually produces a shuffling or rattling sound uniformly during the whole of its undeviating flight; but the power of making the sound is apparently under control, for it may be frightened into silence.

Encoptolophus sordidus (Burm). Precisely the same may be said of this species as of the preceding.

Tropidolophus formosus (Say) Thom. This crested locust has a short, rather feeble straight flight of about three or four rods in length, the insect rising at once to a height of about six or eight feet from the ground and gradually settling, going with the wind, the distance of its flight being partly determined by the force of the same. During this flight it makes, as if it were not at all under control, a continuous and regular very subdued clicking sound, like the very rapid but somewhat muffled ticking of a watch.

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Dissosteira carolina (Linn). Townsend describes what he regards as an act of courtship in this species, as follows: "On the 14th of August last, in the afternoon. I saw one of this species fly up from the dry parched grass, and remain nearly stationary about two feet in the air for some time, by means of a rapid beating of the wings. Presently it flew back to the ground. In a few minutes another one, which had witnessed the performance at a short distance, flew quickly over and alighted by the side of the performer. They ran by each other several times, occasionally touching each other, but did not make any further manifestations, and finally the last one flew away, leaving the other motionless in the withered grass. Though it is probable that the females are attracted by these performances of the males, and that the males vie with each other in their exhibitions, still I think that the two just spoken of were both males, and were disposed to fight from a feeling of rivalry, the one that flew off having been beaten."

"On the 24th of the month I noticed the same thing over again. An individual performed three times in succession, and then another alighted on the ground by its side; they ran by each other several times, apparently clasping, probably in conflict, for I am quite sure they were both males. At last one of them flew away, and the other soon after renewed the performing. I regret to say that I did not capture specimens to ascertain the sex; but, judging from size, I do not think I have seen any but the males taking active part in the aerial exhibitions. In going through with the performance they rise at first generally about three or four feet, making a light purring or beating sound, and then, rising higher, change the motion of the wings, when a curious, sharp, see-sawing sound is produced. Some rise even higher than six feet in the last act; others rise only one or two feet. Of course some excel others in the beauty and ease with which they accomplish the feat; many do not remain in just the same place while hovering, but vary, falling or jerking about while endeavoring to keep the same point in the air. I am of the opinion that the females are sensitive to the grace with which this is performed."

I have repeatedly witnessed this ascent from a single spot, and hovering thereover so well described above, during which an interrupted crackling sound is produced, evidently at will, with particular movements of the wings, but the sound is a muffled one, though decidedly louder and sharper than that heard during its ordinary flight. I have seen it rise to a height of ten feet, particularly when in face of a bank, and it often remains a considerable time in the air nearly stationary or moving slightly up and down.

Spharagemon aequale (Say). This insect stridulates only during intervals of flight, having evidently perfect control in the matter; at nearly every turn it makes in its somewhat wayward flight, it accompanies the swoop with a crackle which lasts but a portion of a second.

Spharagemon bolli Scudd. According to McNeill this locust acts like *Dissosteira carolina* in remaining "stationary a few feet above the ground and in some manner produces a dry rustling note."

Lactista gibbosus. According to Coquillett this grasshopper "sometimes makes a rattling noise while on the wing."

Trimerotropis vinculata. Coquillett makes precisely the same remark of this as of the preceding.

Trimerotropis perplexa Brun. Bruner says "this is a noisy insect and produces a very decided clatter when upon the wing, showing that it is not distantly removed from the various members of the genus *Circotettix*."

Trimerotropis citrina Scudd. A species which is either this or very closely allied to it was heard by me at Garland, Colorado, making a dull continuous muffled *therr* during its short flight.

Trimerotropis columbia Scudd. (Ms.) This dark locust (allied to and perhaps not distinct from *T. suffusa* Scudd.) I heard in Wyoming making during its flight a clacking sound lasting from a quarter of a minute to a minute and a half, made up of a succession of sharp clacks, usually about five per second, but occasionally, and especially just before alighting, hurrying to six per second.

Circotettix verruculatus (Kirby) Sauss. This insect stridulates at will during flight, and is the noisiest of our eastern Acridians. At each turn in its flight, it accompanies the movement with a swoop-like curve, and emits a crackling sound. The sound is like



Fig. 54.—Note of *Circotettix verruculatus*.

kl or *kla* (the *a* having the sound of a in fat), the former at a distance, the latter nearer by; it is repeated at the rate of about five per second; just before alighting, it crackles more rapidly and frequently.

Circotettix carlingianus (Thom.). This Acridian is the noisiest of the family known to me. I have had my attention drawn to it by its obstreperous crackle more than a quarter of a mile away. In the arid parts of the west, it has a great fondness for rocky hill sides and the hot vicinity of abrupt cliffs in the full exposure to the sun where its clattering rattle is re-echoed from the walls. Its noise is like that of the preceding species vastly intensified,—a bold and defiant challenge to the collector, who will find him nimbler and warier than he cares for on a hot day.

Circotettix lapidicolus Brun. This is another of the noisy tribe, according to Bruner, who says that “during the hottest, brightest hours of noonday” it “is to be seen and heard in the air, producing its clattering music, which is anything but soothing.”

Circotettix maculatus Scudd. This species is a remarkable contrast to the others of the genus. It is much the smallest form and is far from noisy. The sound it makes is similar to that of the other species but very much subdued, so as greatly to surprise me when I first captured it at Truckee, California. I could not at first believe it to be that of a *Circotettix*.

I have notes of the stridulation of several other western Acridians, but the species are not yet definitely determined and therefore not mentioned here.

AN INSECT DESTRUCTIVE TO SQUASH VINES.

BY SAMUEL H. SCUDDER.

During the month of August the leaves of our squash-vines often present a riddled appearance, disclosing the presence of an enemy. If we examine the edges of the holes we shall find the plump, rounded larva of a beetle feeding sometimes on the upper though generally upon the under surface of the leaf. It belongs to the family of *Coccinellidæ* or lady-bugs; and although, as a general rule, the species of this group are of positive benefit to vegetation in destroying large numbers of plant-lice which blight our fruit and shade trees, a few are herbivorous in nature, and among them the insects of which we are speaking. In the larval state, during which they inflict almost all the injuries of which they are capable, they are of a bright yellow color, covered above with long, branching black thorns, sometimes tipped with white, and arranged in six longitudinal rows. The space between the two middle rows is widened anteriorly by the more lateral insertion of the three first spines. Behind the thorns of the first segment, there is a transverse row

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of short, fine, black-tipped hairs. The head, the legs, and the under side of the abdomen are covered with short fine hairs; the tips of the legs are black. When fully grown, the larvæ are about three-eighths of an inch in length, by little less than half an inch in breadth. They crawl but sluggishly, using their terminal segment as an additional leg; and live in large numbers on the squash-vines, where their voracity is attested by the rapidity with which their cast-off skins increase in size and number. These skins are white, transparent pellicles, covered with the characteristic thorns, and preserving in some measure the shape of their former inhabitants.

Toward the latter part of August, or the first of September, the larvæ are fully grown, and begin to change to their pupal state; they stop eating and crawl to a suitable place, generally upon the top of a leaf, where they can fasten themselves by their terminal segments to one of the veins; then slough their skin and appear as pupæ.

The pupa is of the same general color as the larva; the eyes are dusky and the stumpy feet crowded together on the breast. The whole body, but more especially the head, thorax and appendages, is covered with short, simple, black spines. The outer portion of the posterior edge of the first thoracic segment is bordered with black, as are also both edges of the elytra, or wing-covers, though the color fades away before reaching the tips. There are two other black bands upon the elytra, parallel to the first, and nearly uniting as they approach the tip. Between the elytra, at their base, are two little black dots. The edge of the first abdominal segment is marked by two black bands, nearly meeting in the centre, and having each end bent forward; the second, third and fourth segments have a short, black dash upon either side of the outer posterior edge; the fourth and fifth segments are darker than the others; the last segment is furnished with two long, fleshy protuberances, by which the pupa clings to the old, wrinkled, larval skin which still conceals that portion of the body lying beyond the tip of the wing-covers. All the markings which have been described, excepting the two dots between the elytra and the black dashes of the second, third and fourth abdominal segments, are frequently wanting. Out of a large number of specimens which I obtained in Connecticut, scarcely one had any of these markings, while they were invariably present in those examined at Cape Cod.

No similar differences were apparent in the perfect insects reared from the different kinds of larvæ. The pupæ are about one-third of an inch in length by one-fifth in breadth and one-eighth in height, and remain but a few days in the pupal state. When they emerge they do not seem to be possessed of a roving disposition, but may still be seen for several days on the plant where they have spent their lives, and for whose leaves they have still a relish.



Fig. 55.

In the perfect state these beetles (Fig 55.) are of the same general color as before, although the shade is darker. The elytra have two transverse rows of roundish black spots, five in number, the first row extending across the basal portion, the second traversing the central region; the middle spot in each of these rows is divided by the suture of the wings. In the centre of the remaining apical portion of each elytron is another larger, round black spot; there is a black spot upon the thorax, in the middle of the posterior border; and three other spots, smaller and sometimes fainter, are placed one upon the middle of the anterior edge and the others upon either side of the thorax. The eyes and end of the jaws are black, and the under side of the body is occasionally quite dusky. The whole body is minutely punctured and closely covered with short, fine hairs, invisible to the naked eye; its length is one-third, and its breadth one-fourth of an inch.

This beetle was first described by Thunberg under the name of *Coccinella borealis*, but is now placed in the genus *Epilachna*. Being of so large a size, and affording such evident indications of its presence, this insect can be readily destroyed by hand-picking. There can be no excuse for those who complain of its ravages if they fail to make use of this simple, rapid and effectual expedient—the more rapid and effectual the earlier it is put into practice. Where squashes are grown on a large scale for marketing purposes, it will be advisable to destroy this insect when it appears, by the use of a weak mixture of Paris green and water sprinkled upon the affected leaves.

MISCELLANEOUS NOTES.

AN EXPLODED REMEDY FOR THE PLUM CURCULIO.

We are surprised to notice still going the rounds of the press an account, often with editorial endorsement, of a curculio remedy which has long since been proved unavailing. It consists in tying corncobs soaked in molasses on the branches of the tree to be protected, and the theory is that the insect will lay its eggs in the sweetened corncobs in preference to laying them in the fruit!

Another of those utterly worthless pseudo-remedies which, we regret to say, has found space in some of our most valuable journals, is of practically the same nature, except that in place of corncobs the writer advises the use of tomato cans filled with a mixture of molasses, vinegar and water.—*Insect Life*.

SUCCESS OF VEDALIA IN EGYPT.

Rear-Admiral Blomfield, to whom we sent several consignments of Vedalia for use against Egyptian Fluted Scale, and whose letters announcing the success of the later consignments we have published from time to time, has written us that the beneficial Australian insect has recently made its appearance in a garden in Ramleh, a distance of more than three miles from the original trees upon which the first specimens were reported. The experiment is evidently turning out very successfully.—*Insect Life*.

ON THE CARBON BISULPHIDE REMEDY AGAINST STORED GRAIN PESTS.

Allow me to add an important item in the method of keeping weevils and rats out of a corn crib, by the use of the vapor of bisulphuret, or bisulphide of carbon.

The improvement I expect to make this year is to place on the floor of the bin an oblong box made out of two 12-inch boards, the upper part coming to a sharp point. The box is to be long enough to run two-thirds through the bin, boxed up at the inner end to give it support. There is to be for a few feet from the inner upper edge an opening cut out about half an inch wide to give free vent for the vapor to penetrate the corn. The necessity of this arrangement is, after the bisulphide has disappeared by evaporation, to replace it with a fresh supply. This is to be done in particular to keep out rats the year round. One good fumigation of the vapor is sufficient to kill the weevils, but it will take somewhat a continuation of the evaporation to keep out rats.

As you are aware, the bisulphide of carbon is a highly volatile fluid, and the contents in an open bottle will readily disappear by evaporation. To replenish the fluid by the use of the long box, say every few months, would be all that is required, and instead of using several bottles at once imbedded in the corn, I would use but a single bottle at a time. By this method the experiment would be brought to a successful issue, and the expense of protecting a bin of corn is not materially increased, but rather diminished.

To place a bottle of bisulphide in the box described, take a wooden shovel with a little box attached to the end of it to snugly hold the bottle. Let the handle be about an arm's length shorter than the box. Before introducing the fluid I would close up the bottle with a few layers of muslin, and by the aid of the shovel place it inside of the box nearly at the inner end, leaving the shovel with the bottle inside; then close up the entrance at the door with old bags or something of the kind.

I learn that some have apprehensions as to the personal safety in using the bisulphide of carbon, and the effect it may have on the corn. As I have ascertained by experiments, the line of ignition is close to the body of the fluid itself, therefore there is no danger in taking a light into the bin. As to the effect on the corn, everything is in its favor. My last year's corn treated with the carbon proved that hardly a kernel failed to germinate, and the shucks were eaten by the stock, I thought, with unusual relish. The

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cause of this is obvious. The corn grew rapidly and with vigor, and was considered the best in the neighborhood. Whether the bisulphide had anything to do with it, I will not say; but I am somewhat inclined to think it had. We know that solutions of some of the metallic salts have a tendency to stimulate favorably the growth of seed that is immersed in it.

I only know of one great danger in handling the bisulphide, in which I nearly lost my own life. The experimenter may pour it into the opening of an ants' nest to destroy them, and safely ignite it at the hole with a match. After the explosion it leaves for a while an invisible flame at the opening. If he is tempted to recharge the opening from a full bottle of the fluid in his hands it will explode and send him without a moment's notice into the other world!

It is supposed that nearly 50 per cent. of the corn in Texas is annually destroyed by weevils and rats. The destruction is so great that nearly all the corn used in this part of the State comes from Kansas.—G. P. Hachenberg, M. D., Texas, in *Insect Life*.

WIREWORM REMEDIES.

In answer to a question in relation to destroying wireworms, the larvæ of click beetles, of which there are a large number of species, elaborate experiments by Prof. Comstock, of Cornell University, N. Y., shows that the beetles can be easily attracted to baits of clover which have been poisoned by wetting with one of the arsenicals—Paris green water for instance. These baits consist of small bunches of the freshly cut plant, about one-fourth pound in weight, distributed throughout the field and protected and kept moist by being covered with boards.

As an indication of the efficiency of this method it is stated that a series of twelve traps yielded in three days 482 beetles, or an average of more than forty per trap. These traps should be put out during the early summer, and the beetles killed in a majority of cases will not have deposited their eggs and the consequent depredations of their larvæ, the wireworms, will be greatly diminished. It frequently happens that the infested areas are rather limited in extent, and do not cover the entire field, and where this is the case the labor of distributing bait will be greatly lessened. The bait should be renewed once or twice per week during the early part of the summer. In place of the clover, cornmeal dough and sliced potatoes are used, but clover has proved itself the most valuable. Where a field has become extensively infested by the worms there is little which can be done so far as any actual experiment has shown.

The wireworm is the larvæ of a beetle, commonly known as the click-beetle. This is a small brown or black beetle, and is sometimes recognized from the fact that when placed in any unnatural position it regains its feet by throwing itself into the air by an action of the body which produces a short, sharp, clicking sound. There are, of course, many species of click-beetles, the number being co-extensive with the different varieties of wire worms.—*Prairie Farmer*.

ELECTRICITY *versus* CATERPILLARS.

Edison originated electrocution on a practical scale when he waged successful war on cockroaches. We are greater believers in the humanity of electricity as a destroying agent when thus applied than when used punitively for man. We now hear that Edison's original device has been greatly improved upon, and applied to prevent caterpillars from climbing up trees. Alternate wires of copper and zinc are run around the trunk of the tree, at the distance of about half an inch apart. The casual caterpillar begins to mount the trunk of the tree, and unlithers himself with the confidence and vigor born of an impending feast. Presently he reaches the copper wire, pokes his nose over it, and lets another kink out of his backbone. Half an inch further up his front feet strike the zinc, the circuit is completed, and the unfortunate larva is a martyr to science.—*Science Gossip*.

INSECTICIDES AND FUNGICIDES.

Many experiments have been conducted with a view to combine substances which are known to have both insecticide and fungicide qualities. While the results have been variable, it would appear on the whole that the combination of an insecticide does not add to the efficiency of a fungicide, but often detracts from it; but the reverse of this does not hold true, as experiments have proved that while Bordeaux mixture combined with arsenites does not act well as a fungicide, it is decidedly beneficial as an insecticide, as the arsenites can be used so much stronger. Professor Maynard found that one pound of Paris green in 500 gallons of sulphate of copper solution proved very injurious to his trees, but that one pound of Paris green in 200 gallons of Bordeaux mixture secured a very large crop of plums while other trees not treated lost their fruit from curculio. He also decided that black knot was less upon the trees sprayed with this latter mixture.—*Dr. C. V. Riley; Address before the Massachusetts Horticultural Society.*

ARSENITES IN THE ORCHARD.

Recent experiments made at a few of our experiment stations, which have sufficiently competent Entomologists, have thrown much light on the comparative value of different arsenical mixtures as insecticides, and as to the relative injury they do the foliage of different trees. The testimony of some experimenters would indicate that the peach is more susceptible to the influence of London purple than to Paris green, and that there is less danger of injury when the leaves are young than when they are old. The cause of injury by London purple is doubtless due to excess of soluble arsenic. Professor Bailey found that heavy spraying with one pound of Paris green to three hundred gallons of water did not injure the foliage. But perhaps the most valuable results obtained are those given by Professor Gillette, who states that London purple used with Bordeaux mixture in the proportion of one pound to fifty gallons was entirely harmless to the peach and plum; that the oldest leaves are most liable to injury; that dews and probably direct sunlight increase injuries done by arsenites to foliage; that leaves kept perfectly dry can hardly be injured by them; that leaves suffering from fungous disease are more susceptible than healthy ones; that freshly mixed and applied London purple is most injurious, while freshly mixed and applied white arsenic is least injurious to foliage, but the longer the mixed white arsenic stands the greater the danger of injury; that lime added to London purple or Paris green in water lessens the injury they will effect on foliage, while lime added to white arsenic in solution increases the liability to injure the same unless the poison is wholly dissolved, when the opposite effect is produced; that London purple can be applied without injury, eight or even ten times as strong, if combined with common Bordeaux mixture instead of water; that arsenites cannot, by ordinary methods, be mixed in a kerosene emulsion; that they mix readily in rosin compounds and seem no more injurious than when applied in water; that when put into strong, soapy water they do much more harm than in clear water; that they mix readily in carbonate of copper solution and are as harmless as when in clear water; that London purple in sulphate of copper solution is vastly more harmful than when in water only.—*Dr. C. V. Riley; ibid.*

THE FLUTED SCALE.

No more striking event has happened during the past two years than the extermination of this insect, most destructive to the orange growing interests in Southern California. It is difficult for one unfamiliar with the facts to realize that this scale, which two and a half years ago hung like a blight and plague over leaf, branch and trunk of all citrus, and many other kinds of fruit trees and shrubs of Southern California, has been so effectually swept away by the little Australian lady bird, *Vedalia cardinalis*, which was imported for this purpose. In the language of Assistant Secretary Willits, "It seems almost like an entomological romance." The history of this scale *Icerya purchasi*, has made everything pertaining to the genus interesting and during the past year four other

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species have come to my knowledge. The *Icerya rose* from Key West and limited in its range; *Icerya Ægyptiacum*, from Alexandria, Egypt; *Icerya Montserratensis* occurs on the island of Montserrat, W.I., and *Icerya Palmeri*, found by Dr. Edward Palmer, in 1887, upon a grape vine in the province of Sonora, New Mexico, but only on the Muscat of Alexandria variety. The practical lesson to be learned is, that our fruit growers of Florida, Texas and California should take every care to quarantine all plants from infected foreign points until examination shows them free from such pests.—*Dr. C. V. Riley; ibid.*

USEFULNESS OF TOADS.

At Greeley, Colorado, two species of leaf-roller moths were very abundant and destructive in their attacks upon fruit and other trees. Mr. Gillette in closing his observations upon them says: "While speaking of the remedies for leaf-rollers, I should do wrong not to mention the valuable services of the toads. One of the most interesting sights that came under my observation in Greeley last summer was the large number of well-fed toads that hopped lazily about on the walks under the trees from morning to night, looking for leaf-roller caterpillars that were dropping on every side. The rollers were usually snapped in by the toads even before they could reach the ground. As many as fifty of these toads were counted under a single tree, and it was not uncommon for people to take the middle of the street to avoid the toads along the walk. Toads seldom do harm and feed almost entirely upon insects, and should be carefully protected as they are decidedly beneficial."—*Colorado Bulletin No. 19.*

BOOK NOTICES.

A TEXT BOOK OF AGRICULTURAL ENTOMOLOGY: Being a guide to the Methods of Insect Life and means of prevention of Insect Ravage. For the use of Agriculturists and Agricultural Students. By Eleanor A. Ormerod. Second Edition—London: Simpkin, Marshall & Co., 1892. One vol., pp. 238; 164 figures; Crown 8vo.

About nine years ago Miss Ormerod delivered a series of ten Lectures for the Institute of Agriculture in England, and afterwards published them in book-form as "A Guide to Methods of Insect Life." This proved to be an excellent and highly useful work, but was not in much demand until recently, when it was found to contain the information that was required in this department of agricultural instruction, and accordingly the necessity of a second edition speedily arose. The result is the work before us, in which the authoress has expanded her original lectures and produced an admirable text-book for the use of students and others interested in Economic Entomology.

The first two chapters of the book give an account of the structure and transformations of insects, describing their varied conditions of life in the larval, pupal and perfect states, and a brief explanation of the various orders and their characteristics. Any intelligent reader will get a very fair elementary idea of Entomology by studying these two chapters, and they are written so clearly and in such simple language, as free as possible from technicalities, the few employed being always explained—that they can be fully grasped by any one of the most ordinary attainments.

The next two chapters deal with Flies (*Diptera*) and Fleas (*Aphaniptera*). The principal species that cause injury to the farmers by their attacks upon his crops and livestock are treated in detail, and the best modes of opposing their ravages are clearly and succinctly given. In describing the Wheat Midge (*Cecidomyia tritici*) the authoress says: "In Canada, or where the weather can be reckoned on and the date of appearance of the Wheat Midge can be reckoned on also, injury from attack is avoided by sowing so that the wheat shall flower *before* or *after* this special time. In one case the young grain is too firm for the Red Maggot to hurt it; in the other, the flower and germ is not far enough advanced for there to be anything to attack until the Wheat Midge has passed

away; consequently the corn is safe. We sometimes benefit in this way here [in England] by accidental circumstances, but we cannot depend on being able to arrange it as in less changeable climates."

"Our best method of prevention is to destroy the Red Maggot (or the Chrysalis, if it has turned to it) in its winter shelter. Deep plowing, such as will turn infested stubble thoroughly down, will act well, for once deeply buried the Gnat-fly either will not develop or cannot come up again. It is not enough considered in these matters that we may by our own common knowledge often guide ourselves. If a weak small grub (so small that we can scarcely see it) has a weight of earth put on it, somewhere about as much as if at least thirty or forty yards deep of earth were placed on one of ourselves, it is very unlikely that, where it is not specially supplied with powers for piercing the ground, it will come up again as a grub; and the Gnat-Midge, if it does develop, certainly cannot make its way through."

"This is one of the points that show us how to keep insects in check; we need often merely to consider just what is before our eyes and act on it. Once down, and left down (for, of course, if we bring the grubs up again by a second *equally deep plowing* we lose our labor), we have, in all probability, buried the coming attack safely away."

But while giving such information as this on methods of prevention of insect attacks the authoress distinctly disclaims any intention of making the book a Manual of Economic Entomology, and expressly states that the details of treatment are given in order to impart the principles on which the treatment is based. "There are certain habits," she says; "certain times when the creature is inactive; certain treatment which will get rid of it equally in the egg, or the chrysalis state, and so on. Therefore, though I hope the short histories may be serviceable for field use further on, yet now these points are entered on chiefly as showing general methods of treatment that we may apply to all similar kinds of attack."

From the account of the Ox Warble-fly (*Hypoderma bovis*) we extract the following: "The yearly loss from this attack is enormous. Firstly, there is the loss on milk, and on many other points of damage consequent on the wild gallop of the cattle when terrified by the fly. Secondly, there is the loss on condition of the infested animal. Every warbled hide is a sign of so much out of the farmer's pocket, for the food he spent in feeding grubs in his cattle's backs, which should have gone to form meat and milk, instead of being wasted in foul maggot-sores. Thirdly, there is the loss falling mainly on the butchers, consequent on damage to surface of carcase known as 'licked beef' or 'butcher's jelly.' Fourthly, there is a great loss on the injured hides." In proof of this she quotes some returns from dealers in hides; one from Newcastle-on-Tyne states that "in a period of twelve months, 102,877 hides passed through the market; of these 60,000 were warbled. Loss estimated at £15,000."

"The above loss, in all its details, is wholly unnecessary. By the use of simple measures we have now found, from the experience of our leading farmers, cattle-owners and veterinary surgeons, during about nine years, that the attack may to all practical purposes be stamped out."

"Squeezing out the maggots is a sure method of getting rid of them; but they may be destroyed easily and without risk by dressing the warble with any thick greasy matter that will choke the breathing pores of the maggot, or poison it by running down into the cell in which it lies and feeds. . . . To prevent fly-attack in summer, train-oil rubbed along the spine, and a little on the loins and ribs, has been found useful; so has the following mixture: 4 oz. flowers of sulphur, 1 gill spirits of tar, 1 quart train-oil; to be mixed well together and applied once a-week along each side of the spine of the animal. With both the above applications it has been observed that the cattle so dressed were allowed to graze in peace, without being started off at the tearing gallop so ruinous to flesh, milk, and, in the case of cows in calf, to produce." (The above would, no doubt, prove valuable as deterrents to one new pest, the Horn-fly).

The fifth and sixth chapters are devoted to Beetles (*Coleoptera*), and contain a clear outline of their classification with short descriptions and excellent figures of a large number of representative injurious species, and the best modes of dealing with them.

The next account of measures to be adopted in these and various other attacks, involving need has long been sure in its action all sorts of measures may have been damaging the our fruit-growing leafage with Canada." To introduced to that the success urging in her emulsions, an many quarter

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The next chapter treats of Butterflies and Moths (*Lepidoptera*). After giving an account of many different species with their varied modes of attack and the special measures to be adopted in each case, the authoress goes on to say: "But for the most part these and various other means of prevention or remedy have to be applied, not as broad measures of treatment, but as *special* measures for each *special* attack, involving necessarily *special* outlay. For these reasons the pressing need has long been felt of having some kind of application at hand which is cheap and sure in its action, and which can be brought to bear at once, when required, on any or all sorts of Moth-caterpillars together (whatever their various natures or previous histories may have been), and will kill the whole collection of ravaging hordes at once, without damaging the leafage; the experiments have been made, which have resulted, in some of our fruit-growing districts, in the successful introduction of spraying caterpillar-infested leafage with Paris-green, which has long been found serviceable in the United States and Canada." To Miss Ormerod, indeed, it is due that the British fruit-growers have been introduced to the use of arsenites, that their prejudices have been largely overcome, and that the successful experiments have been carried out. For several years she has been urging in her Reports the adoption of spraying with these poisons and using kerosene emulsions, and now the good results of acting upon her advice have become apparent in many quarters.

Chapter eight treats of Saw-flies, Ichneumons, Wasps and other members of the order *Hymenoptera*. Especial attention is paid to the beneficial species of Ichneumons that are parasitic upon various insects of all kinds. The next chapter deals with the Bug tribe (*Hemiptera*), including the Aphides and Scale-insects (*Homoptera*) and the Plant-bugs (*Heteroptera*); and the last chapter with Slugs, Eel-worms, Millepedes and Red-spider. In this concluding chapter there is given much sensible advice for ordinary people as to the way in which they should observe insects and deal with their attacks. We may make one or two quotations: "With a slight knowledge of the habits of insect life, added to his own of the agricultural measures that could be used to destroy the pest, or at least lessen the effect of its ravages, each grower would be fairly able to cope with attacks as they occurred; whereas if he depends only on advice, besides the damage from delay, he is very likely to get suggestions not suited to the particular circumstances. The farmer may not know the history of the insect; but on the other hand, the Entomologist very seldom knows the practical workings of growing a crop, which it is necessary to know before advising measures which can be depended on to answer at a paying rate."

"In many cases the different items of treatment which go to make up good farming will of themselves keep down a great deal of insect attack. By good cultivation of the soil, and proper as well as liberal manuring, by rotation of crops, and clearing fields and borders of useless trash and weeds, we turn out a great quantity of the pests which are harboring in the ground, and also ensure a good, healthy growth, such as will support the crop under moderate attack; and by the rotation of crop and absence of weeds we are often able to present starvation to our grubs, as many of them will only (or, perhaps, we should say, *can only*) live on special food. These are the broad principles which are sure to be of use. We shall not be free from insects any more than we shall be free from weeds; and we need a great deal more solid field information about the habits of crop insects (and experiences of paying means of prevention) before we can think we have them thoroughly in hand. Nevertheless, the last few years have added enormously to our information, and have shown us how at least we may greatly diminish the amount of injury our crops suffer."

This stock of information, as far as Great Britain is concerned, has been almost entirely brought together by the unselfish labors and painstaking enthusiasm of Miss Ormerod herself. While aided by a large number of practical observers scattered over the country, she stands alone among hundreds of collectors of insects, and many eminent students of entomology, in devoting her talents, her knowledge, her time and her means to the most useful and patriotic pursuit of the study of the science in its economic aspect.

C. J. S. B.

SPECIAL REPORT OF THE STATE BOARD OF AGRICULTURE on the Extermination of the *Ocneria Dispar*, or Gypsy Moth. Boston: Wright & Potter Printing Co., 1892.

This official pamphlet gives an interesting account of the very remarkable and unique efforts that are being made in the State of Massachusetts to exterminate the Gypsy Moth. This insect, imported from Europe, was accidentally permitted to establish itself about twenty years ago, and has now multiplied to such an extent as to be a serious pest throughout a considerable area of the State. In March, 1890, the Legislature passed an Act appointing three Commissioners to "provide and carry into execution all possible and reasonable measures to prevent the spreading and secure the extermination of the *Ocneria Dispar* or Gypsy Moth in the Commonwealth;" the sum of \$25,000 was also appropriated for the work. Last year the Commission was merged into the State Board of Agriculture, and a further grant of \$50,000 was made to it. The Report before us gives the details of the work carried out and the modes adopted for waging war against the insect. They were very largely under the direction of Professor Fernald, as Entomological adviser, and Mr. Forbush, as Superintendent of Field Work. The number of men employed varied with the season, and at one time, in June last, was as many as 242. The work began with the destruction of the eggs; when these proceeded to hatch out, spraying the caterpillars with insecticides was adopted, and towards the close of the season the eggs were again made the objects of attack. An enormous number of the insects were destroyed, and a perceptible diminution in the amount of injury was observed in some places. We shall look forward with great interest to the result of the present year's operations, and hope in time to be able to record a great victory in this field of practical Entomology.

C. J. S. B.

INSECTS INJURIOUS TO FOREST AND SHADE TREES, by Alpheus S. Packard, M.D., Ph.D. (Fifth Report of the Entomological Commission of the United States). 1 vol., 8vo., pp. 957. Washington: Government Printing Office, 1890.

About ten years ago (in 1881) what was then called the Entomological Commission, consisting of Messrs. Riley, Packard and Thomas—three very eminent men—issued a work by Dr. Packard on "Insects Injurious to Forest and Shade Trees" (Bulletin No. 7), a goodly volume of 275 pages, well illustrated and replete with valuable information. Recently a revised and much enlarged edition of this publication has been issued by the Department of Agriculture at Washington, bringing the original work more nearly down to date, and furnishing, as far as possible, a complete manual on the subject. The new volume is more than three times the size of the former edition, consisting of no less than 950 pages, illustrated by over 400 wood cuts and forty plates, twelve of which are colored. Some idea of the extent of the work, as well as of the importance of the subject, may be found from the fact that descriptions are given of over three hundred species of insects that affect the oak, and the names of nearly one hundred and fifty more are mentioned; sixty-one are described as attacking the elm, and thirty more mentioned; one hundred and fifty-one described that affect the pine, and a list of twenty more given; and so on for a large number of other trees. Economic entomologists for the most part devote their attention to the insects that attack fruit trees, crops and vegetables, as these most directly affect the public; but surely no more important matter can be studied than the preservation of our forests, which are annually being depleted for the purposes of commerce, as well as by fire and insects. It is high time that more attention was paid to this matter, and that people generally should be aroused to the dangers that will surely result if we allow our country to be stripped of its woods and forests. In some countries of Europe, notably in Germany, a very rigid oversight of the forests is maintained by the government, and no wanton or careless destruction is permitted. In connection with this, they encourage scientific men to devote their studies to the insect enemies of trees, and as a result some magnificent books have been published, chief among these are the grand work of Ratzeburg and the perhaps less widely known publications of Kalténbach. Alongside of these Dr. Packard's book will assuredly take its place, as his work is very carefully and completely done. The life-history of each insect described is as far as possible fully given; the best published descriptions of each stage are quoted and references given wherever the author

has not made personal observations himself, or wherever he thinks that some one else's record is better or fuller than his own. Thus the work is made complete to date, and succeeding observers will know what investigations have been made, and what remains to be done in this vast field of entomological research. The colored plates are beautifully and accurately done, and the wood cuts and other illustrations give careful details or full representations of a large number of the insects referred to in the text. Such a publication ought to encourage our own Government to follow the noble example set them in this respect at Washington.

C. J. S. B.

A SERIES OF THIRTY COLORED DIAGRAMS OF INSECTS INJURIOUS TO FARM CROPS.
 Drawn from nature by Miss Georgiana E. Ormerod. W. & A. K. Johnstoe,
 London, England, 1891.

These diagrams are beautifully and accurately executed, and will be found most useful by anyone who is called upon to lecture to classes in entomology, or give addresses to farmers' institutes. They are sufficiently large, being thirty inches long and twenty-two wide, to be seen at some distance in a hall or class-room, and will serve to illustrate descriptions of an economic character. Though intended for England, nearly all of them are equally applicable to this country. They are divided into five sets of six each, which deal with the following objects:—(1) Common Insect Attacks: Ox Warble Fly, Horse Bot-fly, Large White Butterfly, Cockchafer, Turnip Flea-beetle, Onion Fly; (2) Insects affecting Various Kinds of Crops: Surface Caterpillars, Daddy Long-legs, Eel-worms, Plant Bugs, Hessian Fly, Wire-worm; (3) Insects Affecting Particular Crops: Mangold Fly, Hop Aphis, Bean Beetle, Corn Thrips, Gout Fly, Corn Saw-Fly; (4) Insects affecting Fruit Crops: Winter Moth; American Blight (Aphis), Gooseberry and Currant Saw-fly, Apple Blossom Weevil, Codlin Moth, Magpie Moth; (5) Insects Affecting Trees: Pine Beetle, Pine Weevil, Pine Saw-fly, Goat Moth, Spruce Gall Aphis, Leopard Moth. The diagrams are sold singly at one shilling and sixpence each, or in sets. On each is shown the natural size of the insect as well as the greatly enlarged picture, a very necessary matter, as otherwise most erroneous impressions are formed by the ignorant of the real dimensions of the creature referred to. There is also printed on each a general description, by Miss Eleanor A. Ormerod, of the life history of the insect depicted, and of the best remedies to be employed against it.

C. J. S. B.

A MANUAL OF NORTH AMERICAN BUTTERFLIES, by Charles J. Maynard: 8vo., pp. 226.
 Boston, DeWolfe, Fiske & Co., 1891.

We are always glad to welcome the publication of a new book which is likely to render more easy, and consequently to popularize, the study of entomology. The author of the work before us has, no doubt, had this object in view when preparing this manual, in which are brought together "for the first time, descriptions of all the species of butterflies which occur in North America, North of Mexico." He has evidently taken a great deal of pains in the execution of his task, and expended much labor upon the descriptions of over six hundred and thirty species of butterflies, and in the preparation of the illustrations, for "not only is a colored plate given of one species of nearly all the genera, but wood cuts are given of some portion of about two hundred and fifty species, illustrating some peculiar character by which the insect may be known; both plates and wood cuts have, with a single exception, been drawn and engraved by the author himself." The wood cuts, giving a wing or a portion of a wing, of a number of closely allied species, will be found very useful helps by any one employing the book for the identification of his specimens, and are much superior to the coloured plates. Anyone with a large stock of specimens on hand, and with a few named in different genera to start with, will find this book a very useful and handy manual for the naming of his material, but this, we fear, is the extent of its value. The author has adopted the comparative method in his descriptions, which involves a constant reference to some other species, which the beginner in the study may chance not to have, and be woefully puzzled in consequence. There are no synopses, or comparative tables, of either genera or species given, but the author selects a species as his "type" and compares the other members of the genus with it. If the student possesses a specimen of this typical

species his way will be fairly easy, but without it the investigation will be sadly difficult, if not hopeless. Another very serious defect in the book is the entire absence of all reference to the preparatory stages of the insects, and consequently to their food-plants, habits, dates of appearance, etc. We trust that the author may be enabled to issue a second edition of the work, and make it a thorough and complete "manual" by remedying the defects we have referred to. That this may be done in a concise form and in a most useful manner is admirably proved by Stainton's "Manual of British Moths and Butterflies," which we would commend to our author as a model for imitation when he enters upon the preparation of his next edition.

C. J. S. B.

OBITUARY.

THE ABBÉ PROVANCHER.

It is our painful duty to record the death, in his 72nd year, of the Abbé Léon Provancher, who for many years, despite great discouragements and disadvantages, laboured zealously and assiduously to develop and disseminate a knowledge of the natural history of Canada, and especially of his native province. He was born in 1820, at Beçancour, Que., and for some years was Curé of Portneuf, and one of his earlier entomological writings was a list of the Coleoptera of that district. Compelled by enfeebled health to relinquish the regular and more active duties of the ministry, he removed to Cap Rouge, near Quebec, and devoted his remaining time and strength almost entirely to the study of the natural sciences. In 1869 he commenced the publication of the *Naturaliste Canadien*, and, notwithstanding many discouragements, completed in 1891 the 20th volume, when its issue had reluctantly to be abandoned through the Quebec Government refusing to continue the scanty annual grant it had received. As early as 1858 Provancher published an elementary treatise on botany, and in 1862 his *Flore du Canada*. Subsequently he devoted his attention specially to entomology, and in 1874 commenced his *Faune Entomologique du Canada*—Vol. I., treating of the Coleoptera, was completed in 1877, with three supplements in 1877, 1878 and 1879. Vol. II. was commenced in 1877 and completed in 1883, and contains the Orthoptera, Neuroptera, and Hymenoptera. In 1885-1889 he published *Additions aux Hyménoptères*, and issued Vol. III. upon the Hemiptera, which was completed in 1890. He was also an enthusiastic conchologist, and his last publication was a treatise upon the univalve molluscs of the Province of Quebec. His writings include the account of a pilgrimage to Jerusalem, an excursion to the West Indies, treatises on agriculture, etc. He will be best known, however, by his entomological work, and as he described a large number of new species and genera, particularly of the Hymenoptera and Hemiptera, it is sincerely to be hoped that his collections may be placed where the types will be carefully preserved and be accessible to students of entomology. There is a disposition on the part of some American students to ignore the work of Provancher, and to accuse him of want of care, etc., in the determination of genera and species. The enormous disadvantages under which he labored must, however, be considered, for he was remote and isolated from libraries, collections and fellow-workers, and in his writings he often laments the fact that so few could be found to take any active interest in his pursuits, or to assist him in his labors. His entomological work would have been more exact and complete had not the publication of the *Naturaliste* greatly interrupted his investigations, and forced him to spend much of his time in other directions. His labors had the result of starting natural history collections in some of the colleges in the Province of Quebec, but our French citizens do not appear to have any special leaning to the sciences he loved, and he has left behind him no entomological student of any distinction. Above all, Provancher was an ardent Canadian, strongly imbued with love of his race, language and religion, and often in his writings he impresses these sentiments upon his readers. A few years ago he was elected a Fellow of the Royal Society of Canada, and he was also a member, active or honorary, of many other societies.

W. H. H.