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No. 4970.
Mar. 21, 1878 - Sept. 1883.

ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY
OF *A. Hagen.*
ONTARIO,
FOR THE YEAR
1878.

Printed by Order of the Legislative Assembly.



Toronto:
PRINTED BY HUNTER, ROSE & CO., 25 WELLINGTON ST. WEST.
1879.

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

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

BY

WILLIAM SAUNDERS,

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

JAMES FLETCHER,

Ottawa.

JOSEPH WILLIAMS,

Montreal.

AND

B. GOTT,

Arkona, Ont.

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REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, FOR THE
YEAR 1878.

To the Honourable the Commissioner of Agriculture;

SIR,—In compliance with the provisions of our Statute of Incorporation, I have the honour to submit to your consideration the Annual Report of the Entomological Society

of Ontario, for the year 1878. Contained in which you will find a financial statement of the Society's condition, a list of the officials for 1879, as well as many papers, which I trust will be interesting and valuable.

The Annual Meeting of the Society was held in London on the 20th September, when reports from the Montreal and London branches were read, which showed these branches to be in a healthy and vigorous condition.

We are glad to note that the subject of Entomology is claiming more attention than heretofore, especially among our agriculturists; which points to a pleasing future, when this attractive study will be generally pursued throughout our land.

The organ of the Society, *The Entomologist*, is issued monthly, and regularly appears, its pages filled with the results of new and interesting observations on insect life. The number of its subscribers is yearly growing larger, and everything in connection with the Society indicates a prosperous condition.

The Report which we now present will be found to contain many excellent illustrations in connection with the subjects treated of, many of which have been specially engraved in England for this report.

I have the honour to remain, Sir,

Your obedient servant,

JOSEPH WILLIAMS.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The eighth Annual Meeting of the Entomological Society of Ontario was held in London, at the residence of Mr. Wm. Saunders, on the evening of the 20th September, 1878. The President, Wm. Saunders in the chair.

Letters of apology for non-attendance were read from the following members of the Council: Jas. Fletcher, Ottawa; J. G. Bowles, Montreal; and J. Pettit, Grimsby.

The President reported, that in consequence of removal to Montreal a few days previous to the meeting, Mr. J. Williams had been obliged to resign the office of Secretary-Treasurer.

The report of the Montreal Branch was next read, showing that organization to be in a prosperous condition, and the members active in the work of promoting Entomology in Canada. Similar remarks may be made in reference to the London Branch which is also in a flourishing state.

On behalf of the Council of the Parent Society, Mr. Saunders reported that a number of valuable works had during the year been added to the library.

The report of the Treasurer showed that the finances were in a satisfactory condition, there being a balance at the close of the financial year to the credit of the Society of one hundred and ninety-one dollars.

ANNUAL STATEMENT OF THE SECRETARY-TREASURER, ENTOMOLOGICAL SOCIETY OF ONTARIO, SEPT., 1878.

Receipts.

To Balance from 1877.....	\$236 85
“ Members' fees, sales of <i>Entomologist</i>	186 41
“ Mdse, pins, lists, cork.....	57 49
“ Advertisements	3 20
“ Prizes	10 00
“ Interest	6 24
“ Government Grant.....	750 00

\$1,250 19

Disbursements.

By Postage	\$ 16 93
“ Petty expenses, freight, delegate to St. Louis, etc	61 67
“ Salaries	150 00
“ Engraving	107 95
“ Printing Entomologist	383 39
“ Mailing “	36 40
“ Paper for “	67 20
“ Insurance	10 63
“ Rent for 1877 and 1878.....	160 00
“ Library	15 44
“ Expenses, Annual Report.....	49 50
Balance in hand	191 08
	\$1,250 19

J. WILLIAMS
Secy.-Treas.

We certify the above to be correct.

Sept. 14th, 1878.

CHAS. CHAPMAN, }
AB. PUDDICOMBE, } *Auditors.*

REPORT OF THE COUNCIL, 1878.

It is with great pleasure that we submit our Report, at this the close of the eighth year of our existence, because it speaks only of progress in the study in which we are so much interested and of prosperity in all the undertakings of the Society. It is pleasing to us to see the number of working Entomologists increasing, and to observe the advancement of the science through their efforts.

We think it especially gratifying, that our journal *The Canadian Entomologist* has not only continued to hold its own, but that it has increased in interest and usefulness, and is being more generally recognized by the public as a medium for the dissemination of important facts on all points connected with the study of insect life, especially of those which influence our agricultural productions.

As the future of our country is so bound up in our agricultural interests, it cannot be too strongly urged that there is a great necessity for energetic Entomologists to aid in carrying on the work which has so efficiently been done by the Society.

Our contributing staff has increased, and we take this opportunity of thanking those who have so ably helped to sustain our journal up to the present time, and request that they continue to enrich its pages with the results of their future investigations.

We feel our influence extending as we daily see our subscription list enlarging. Our journal is also being recognized by eminent Entomologists as a valuable means for the diffusion of scientific knowledge and is among the first to report any advancement in our special department, and always abounds in original research.

At the Annual Meeting of the “Entomological Club” of the “American Association for the Advancement of Science,” held recently at St. Louis, our Society was represented by Mr. E. B. Reed, one of the editing staff of the *Entomologist*; many fresh and interesting facts were elicited which will have their due influence on entomology.

The branches of the Society in London and Montreal have been working constantly and much good has resulted from their labours. Frequent meetings have been held during the year, and many interesting evenings spent in discussions on entomological work; numerous papers have been read, some of which have been published in the *Entomologist*. These branches have displayed great activity as will be seen from their reports.

Submitted on behalf of the Council by

JOSEPH WILLIAMS,
Sec.-Treas.

The President then read his Annual Address.

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

To the Members of the Entomological Society of Ontario:—

GENTLEMEN,—Each revolving year brings its duties. To-day it is my privilege and a very pleasing duty to offer again to you a few words of encouragement, to refer briefly to some of the Entomological achievements of the past, and do what I can towards stimulating to further effort. The importance of the study of Entomology is yearly impressing itself more and more upon the public mind, as insect foes hitherto scarce become abundant, or as new ones invade our domain.

At present we are in danger from the approach of a new insect enemy which promises to give us a great deal of trouble. I refer to the new Carpet Bug, *Anthrenus scrophulariæ*. It was during the summer of 1874 that attention was first called by some of the newspapers in the Eastern States to the great damage being done to carpets in some of their cities on the sea-board by the ravages of an insect quite different from the well known Carpet Moth, *Tinea tapetzella*, and far more destructive; one which would attack new carpets as readily as old ones, and devour their substance with such rapidity and persistence as to raise a doubt in some minds as to whether, in case this insect becomes generally prevalent, the use of carpets could be continued at all. Two years later this pest was found common in Schenectady, N. Y., when they were shortly brought under the notice of one of our most active and thorough workers in the Entomological field, Prof. J. A. Lintner, of Albany, N. Y., who at once proceeded to investigate the life history of the insect. Up to this time little or nothing was known here in reference to it, other than that the destructive creature was a larva of some sort, nearly oval in form and about three-sixteenths of an inch long, with the body clothed with short hairs which were longer at each extremity. A number of these larvæ were collected and fed upon pieces of carpet, and their transformations carefully watched until the disclosure of the perfect insect, when it proved to be a member of that very destructive family of beetles known to Entomologists as the Dermestidæ. This insect, which proves to be a European species, has probably been imported from Europe with carpets brought to New York and Boston, at which ports its destructive efforts first attracted attention. The beetle, the parent of all this mischief, is a very small one, being not more than one-eighth of an inch long, and one-twelfth of an inch broad; it is nearly oval, black, with faint red and white markings. It does not confine its attention to carpets, but will eat any sort of woollen goods, but does not appear to injure those of cotton. In Europe it is said to destroy furs, clothes, collections of animals, insects and plants, and is sometimes very injurious to leather. A more detailed description of this insect and its workings, as furnished by Prof. Lintner's observations in his recent "Entomological Contributions," will be given in the annual report of our Society. As this insect has for some time past been committing great ravages in Buffalo, New York, it is not likely that we shall be long free from it; indeed it is altogether probable that it is already in our midst, although I am not aware that it has yet been brought under the notice of any of our Entomologists. Unfortunately it is a very difficult pest to destroy. The ordinary applications, such as camphor, pepper, tobacco, turpentine and carbolic acid, have, it is asserted, been tried without success, and no effectual means for its destruction has yet been devised.

Strange that so many of our most injurious insects have been brought from Europe, and that when introduced here they multiply to a far greater extent than in their native home. This rapid increase doubtless arises from the fact that they have numerous parasites in the place of their nativity which prey on them, and that these parasites are rarely imported with them, and hence it becomes a question of great practical importance as to whether these parasites might not by special effort be introduced, and thus materially lessen the losses which these scourges inflict on the community. We are indebted to Europe for the Codling Moth of the apple, *Carpocapsa pomonella*; the Currant Worm, *Nematus ventricosus*; the Oyster-shell Bark Louse, *Aspidiotus conchiformis*; the Cabbage Butterfly, *Pieris rapæ*; the Currant Borer, *Ageria tipuliformis*; the Hessian Fly, *Cecidomyia destructor*; the Wheat Midge, *Diplosis tritici*; the Grain Weevil, *Sitophilus granarius*; the Cheese Maggot, *Piophilæ asei*; the Cockroach, *Blatta orientalis*; the Meal Worm, *Tenebrio molitor*; the Bee Moth,

Galleria cereana; the Carpet Moth, *Tinea tapetzella*; the Clothes Moth, *Tinea vestianella*; the Bacon Beetle, *Dermestes lardarius*, and several others of lesser note.

It cannot be denied that there has been some reciprocity in the matter. We have given Europe the noted *Phylloxera vastatrix*, which has inflicted damage to the extent of millions of dollars on the vineyards there; they have also received now from us the much-dreaded Colorado Potato Beetle.

During the past season we have had a fair share of destructive insects. The Forest Tent Caterpillar, *Clisiocampa sylvatica*, has again been numerous in the district about London and in many parts west of it, but not so abundant as last year. The severe frosts in May destroyed myriads of the very young larvæ then newly hatched, and later in the season there prevailed among the nearly full-grown larvæ in some localities a strange disease which carried them off by hundreds. I myself saw large numbers of them still retaining their hold on fences and tree trunks, which, when touched, were found quite dead, and so decayed as to burst with a very gentle handling. Very many have also been destroyed in the larval state by parasites; probably one-half or more will perish from this cause alone. Birds also have devoured many of them. On one occasion the crop of a black-billed cuckoo, *Coccygus erythrophthalmus*, was brought to me packed entirely full of these larvæ. Even their clusters of eggs, which they deposit in rings upon the twigs of trees, are not free from attack. Last winter I discovered a species of mite preying upon the eggs and devouring them rapidly; many clusters were found entirely destroyed in this way, others partially so, and as each cluster would contain probably two or three hundred eggs, some idea may be formed of the benefits conferred upon us by these tiny mites.

The Colorado Potato Beetle is still spreading eastward through the Maritime Provinces, and has this year reached St. Johns, New Brunswick, but it is no longer the fearful evil at first anticipated, and our farmers battle with it confidently, knowing that with a little perseverance in the use of Paris green, they can ride victorious over this formidable foe. The use of this poisonous substance has provoked much discussion, and unnecessary alarm has been excited by some writers, who have expressed grave fears that the use of so much Paris green would eventually poison the soil to such an extent as to render it permanently unfit for the growth of other crops. Several years ago Prof. W. K. Kedzie, of the Michigan Agricultural College, when experimenting in this direction, demonstrated that water charged with carbonic acid or ammonia dissolved a certain portion of the Paris green, but that this was quickly converted into an insoluble and harmless compound by combination with the iron which exists in almost every soil. As rain water always contains more or less of these ingredients, it is more than probable that the small portion of this poison used on potato fields soon loses its poisonous properties in this manner. In any case, one pound of the green spread uniformly over an acre of soil would only amount to less than one-sixth of a grain to the square foot, so that were the poison to remain unchanged, this minute portion might be added to the soil annually for a century without producing any perceptible deleterious effects on plant growth. It is to be regretted that any one should attempt to excite needless alarm in this way. Caution should be urged in handling this powerful poison, and it is often the case that more is used than is needed; these points are important and cannot be too often referred to. Paris green is best and most economically used with water in the proportion of one teaspoonful of the powder to a pailful of water, kept well agitated and sprinkled on the potato plants by means of a hand whisk dipped from time to time into the liquid. If the Paris green is pure this proportion is ample, but too often this useful compound is largely adulterated, a practice which some dealers are tempted to adopt from the eagerness with which a large portion of the public run after cheap goods. Paris green is frequently adulterated to the extent of from twenty-five to fifty per cent, chiefly with sulphate of baryta, a cheap and harmless mineral compound. By resorting to practices of this sort dishonest dealers can supply their customers at a less price than the cost of the pure article, and at the same time make large profits. It is a matter of regret that with an Adulteration Act in force, which if properly carried out would at once put an end to these and all such impositions, the public are not better protected.

The insect enemies of the Potato Beetle are in some localities rapidly increasing in numbers. In the annual report of our Society for the year 1871, our esteemed coadjutor, Mr. E. B. Reed, contributed an excellent article on the Potato Beetle, in which he en-

umerates a number of insects which prey upon this pest in the various stages of its growth, and among them refers to a species of *Lebia*, one of the active members of that family of beetles known as Carabidæ, all of whom devour other insects. This species, *Lebia grandis*, is there said to be rare in Ontario. The first examples of this insect which I remember capturing were taken last year at sugar when trapping moths, and I believe it is the only species belonging to that family which I have ever taken in this manner; several of them were found feeding on the sweet liquid on dark nights about 10 o'clock. Early this fall I received a letter from Mr. W. E. Coldwell, of Constance, Ont., announcing the appearance in large numbers of a friendly insect, which was devouring the larvæ of the Potato Beetle, and proving a very effectual check on their increase. This letter was accompanied by specimens of the insect, which, to my gratification, I found on examination were examples of *Lebia grandis*. A few weeks later a farmer in this neighborhood called on me with the information that he had observed large numbers of an insect which he had not seen before, devouring the larvæ of the Potato Beetle. He brought no specimens with him, but from his description of the insect I have every reason to believe that it was the same *Lebia*. Since then I have occasionally met with examples of this friendly visitor hidden amongst the leaves of plants, a common place of resort for it during periods of inactivity.

The Hessian Fly, *Cecidomyia destructor*, which appeared in force in many counties of our Province last year, and which it was feared might again become a serious trouble, has happily almost disappeared. I have not heard of any serious loss from this pest during the past season. Should any of you desire, at any time, information in reference to the life history and habits of this insect, I would refer you to a very practical paper in our last annual report, by the Rev. C. J. S. Bethune; also to a more elaborate paper by the same distinguished Entomologist in our report for 1871.

The Cabbage Butterfly, *Pieris rapæ*, still continues its ravages, but does not seem to be quite so abundant this year as it was last. Water heated to near the boiling point has been used with success in destroying the larva, without injuring the cabbage. Strong decoctions of Cayenne pepper and Smartweed (*Polygonum*—?) have also been spoken highly of; but I look forward with far more confidence to a remedy provided by nature which is gradually making itself felt. I allude to that tiny little friendly parasitic fly, *Pteromalus puparum*, which is rapidly increasing in our midst. A few days since, while watching some of the full-grown larvæ of the Cabbage Butterfly which were feeding on Nasturtium leaves, I was much gratified in witnessing the method of attack which this parasite adopts. Settling herself quietly down on the back of the caterpillar, near the terminal segments, with her head towards the caterpillar's head, she paused awhile; then with a sudden movement of her ovipositor, so quickly that the motion almost escaped detection, she thrust an egg under the skin of her victim. The caterpillar seemed startled, and quivering, jerked its head and anterior segments suddenly about, and then quieted again; the little tormentor meanwhile sitting perfectly composed on the spot where she first settled. Presently another thrust was made, followed by further uneasy movements of the larva, and in this manner, in the course of a very few minutes, quite a number of eggs were deposited. The caterpillar did not seem to be conscious of the cause of its troubles, nor, indeed, of the presence of its enemy, excepting when the thrusts with the ovipositor were made. On drawing a little nearer for the purpose of better observing this interesting operation, the tiny creature took alarm and flew off. Further examination revealed the presence of several more of these little friends, busily searching for further specimens to operate on. The eggs deposited soon hatch into little grubs, which eventually devour the body of their victim, and after it has entered the chrysalis state, eat small holes through the chrysalis, and thus make their escape. It has long been an unsettled point among Entomologists as to whether this parasite operates on her victim in the larval or chrysalis state, the weight of opinion being hitherto in favour of the view that the chrysalis is pierced and the eggs deposited in it; but from the observations here detailed it would appear that the eggs are usually, if not invariably, placed in the nearly full-grown larva.

At the same time I observed an insect belonging to the true bug family, Hemiptera, with its proboscis thrust into one of the same caterpillars, quietly sucking out its contents, the half-emptied victim vainly endeavouring to escape. As this bug was immature, I was

unable to determine the species to which it belonged ; it is pleasing, however, to know that there are several friendly helpers among the insect tribes aiding man in his efforts to subdue this obnoxious insect.

The Codling Moth of the apple is less abundant than usual this year, a scarcity which may be attributed to the early hatching of the moths during the very warm days of spring, and many of them perishing before the blossoms of the apple were sufficiently far advanced for them to operate on. Attention has been called again to the curious fact already noted in Europe many years ago, that the larva of this insect is sometimes occupied by a strange parasite, a species of *Mermis*, known commonly as a hair-snake, a name probably due to the absurd belief, not yet quite extinct, that horse-hairs placed in water eventually become endued with life, and change to hair-snakes. Several instances have occurred of late in the United States of these remarkable creatures being found in the interior of apples, where they had lived as parasites on the Codling worm, and having destroyed their host, remained in the fruit about the middle, where they were in danger of being eaten.

The Plum Curculio is no longer a stranger in that once famed plum-producing district of which Goderich is the centre. So plentiful has it become there now that some plum-growers are becoming quite discouraged and ready to give up the culture of the fruit entirely. This troublesome insect has not yet been reported from the Owen Sound district, where plum-culture is still extensively and profitably carried on.

The importance of the study of natural history in our schools, especially the branch of Entomology, is beginning to be recognized, and I trust the day is not far distant when every public school will have its museum of natural history objects, where the children can be taught with the specimens before them the names and habits of the commoner mammals, birds, insects, and plants, with which they must constantly come in contact. Such studies would, in my opinion, strengthen the intellect and cultivate the memory and other faculties of the mind more thoroughly than many of the more abstract studies now specially designed for that purpose, while the practical value of such knowledge to the fortunate possessor, in after life, can scarcely be over-estimated. I am glad to state that at the Model Farm in Guelph the important study of insects injurious to agriculture is regularly taught, with the aid of a very fair collection of specimens.

The meeting of the Entomological Club of the American Association for the Advancement of Science was held this year at St. Louis, where some very interesting papers on destructive insects were read, and some curious facts in reference to insect life elicited. Our Society was ably represented by a member of our Editing Committee, Mr. E. B. Reed. It will doubtless be a source of gratification to you to learn that your President has again been honoured with the Vice-Presidency of that distinguished body of naturalists.

During the year some interesting additions have been made to our Entomological literature, which we can only now partially and briefly enumerate. Among the most valuable are the "Entomological Contributions," by J. A. Lintner ; "Descriptions of Noctuidæ," by A. R. Grote ; "Food Plants of the Tineina, with Descriptions of New Species," by V. T. Chambers, both published in the Bulletin of the United States Geological and Geographical Survey ; "Manual of the Apiary," by A. J. Cook ; on "Sexual Dimorphism in Butterflies," by Samuel H. Scudder ; also several papers by the same author on fossil insects found in the Rocky Mountains, and in the Tertiary Beds at Quesnel, in British Columbia ; "Insects Injurious to the Cotton Plant," with many plates, by Townend Glover ; "On the Butterflies and Moths of North America," by Hermann Strecker. Several additional numbers of Edwards' "Butterflies of North America" have appeared, each one rivalling or surpassing its predecessor in the exquisite beauty of the plates illustrating the species described.

The publications of our own Society have been creditably maintained. Our Annual Report to the Department of Agriculture for the past year has been very favourably noticed, and our *Canadian Entomologist* has been issued regularly, its pages being well filled, chiefly with the records of original observations. The contributors to our last volume numbered no less than forty-five, and included the names of nearly every Entomologist of note on the continent. During the year we have published two handsome lithographic plates, one on wood-boring beetles, illustrating eight species ; the other, which is printed in colours, exhibits the full-grown larva of that rare and interesting moth, *Samia columbia*. Among the most valuable papers I would mention those of W. H. Edwards, on the preparatory

stages and dimorphic forms of butterflies; and one by the same author detailing the notable discovery of secretory organs on the hind segments of the larvæ of *Lycaena pseudargiolus*, from which is discharged a sweet fluid which induces the attendance of ants, who in return for the sweets thus provided them, defend these larvæ from their enemies. Our pages have been enriched also by valuable papers on the Noctuidæ and Pyralidæ, by A. R. Grote; on gall insects and other subjects, by Dr. H. Hagen; on Tortricidæ, by C. H. Fernald; on Tineina, by V. T. Chambers, besides many others, which time will not permit me to enumerate. During the past three months we have published in three portions a translation from the German of a very valuable paper by Dr. A. Speyer, on the Genera of the Hesperidæ, which paper, we trust, will be the means of bringing about such a rearrangement of the species contained in this interesting family of butterflies as will be acceptable to Lepidopterists, and at the same time, one likely to be permanent. It is through the kindness of Prof. J. A. Lintner, of Albany, that this translation has been supplied to us.

The practice of capturing our night-flying moths by the method of trapping, known to Entomologists as "sugaring," is still persevered in by most of our more active members, and with great practical results. Species which were formerly regarded as the greatest rarities, have in many instances been taken in large numbers, while many new discoveries have rewarded the most persistent workers in this interesting field of research. As an example of the results of such work we would refer to a paper published in the *Canadian Entomologist* for November, 1877, on "Catocalæ taken at sugar, at Center, New York," by Dr. James M. Bailey.

During the past year that talented and energetic Entomologist, Prof. Townend Glover, of Washington, has, in consequence of ill-health, been obliged to resign his position as Entomologist in the Department of Agriculture. While deeply regretting the cause which necessitated the change, I am pleased to be able to record the graceful recognition of the importance of Economic Entomology by the heads of the Department in Washington, in appointing Prof. C. V. Riley to fill this high position, a man who has done so much by his valuable reports as State Entomologist of Missouri to popularize Entomology and to disseminate practical information in reference to our insect pests throughout this continent.

In our last Annual Report reference was made to the appearance of the first of a series of practical works on Economic Entomology by that renowned Entomologist, Andrew Murray, F. L. S., of South Kensington Museum, London, England. This work treated of some of the lower forms of insect life and their allies, and was to have been followed by seven additional volumes, all having a practical bearing on this subject, so important to the agriculturist. I then expressed the hope that this talented author might be spared to complete the series of useful works proposed, and thus leave behind him a lasting monument of his industry and devotion; but not long after this the sad news reached us that he had ceased from his labours—that he had been called away by death. Thus "man proposes but God disposes." It is commendable to lay our plans for usefulness in life, and to labour as opportunity offers with diligence, knowing that our time is short, and that the most useful life will soon—as far as this world is concerned—be at an end; but I love to think that when our work here is done, our happy lot may be to find in a purer state new fields of labour, where, free from the impediments which now obstruct our progress, we may study with much greater advantage the wonderful works of the Infinite Creator.

Thanking you for your kind attention,

I remain, yours very sincerely,

WILLIAM SAUNDERS.

After the reading of the Address, a vote of thanks was tendered to the President, coupled with the request that a copy be given for publication in the Annual Report of the Society.

The Election of Officers then took place, resulting in the appointment of the following gentlemen :—

President, Wm. Saunders, London.

Vice-President, Rev'd. C. J. S. Bethune, M.A., Port Hope.

Secretary-Treasurer, Jas. H. Bowman, London.

Council, E. Baynes Reed, London ; Wm. Couper, Montreal ; J. Pettit, Grimsby ; J. M. Denton, London ; G. J. Bowles, Montreal ; Jas. Fletcher, Ottawa, and R. V. Rogers, Kingston.

Editor of Canadian Entomologist, Wm. Saunders, London.

Editing Committee, Rev'd. C. J. S. Bethune, Port Hope ; E. B. Reed, London ; G. J. Bowles, Montreal, and Rev'd. R. Burnet, London.

Librarian.—W. E. Saunders, London.

Library Committee.—E. B. Reed, J. M. Denton and H. B. Bock, all of London, with the President, Librarian and Secretary-Treasurer.

Auditors.—Messrs. Chas. Chapman and A. Puddicombe.

Mr. E. B. Reed gave a very interesting account of his recent visit to St. Louis, Missouri, where he went to represent the Entomological Society of Ontario, at the meeting of the Entomological Club of the American Association, for the Advancement of Science.

Succeeding the business portion of the meeting, an instructive hour was spent in the microscopic examination of insects and plants, with the aid of three excellent microscopes belonging to Messrs. Puddicombe, Denton and Saunders. Among the objects of special interest examined were mounted slides illustrative of the anatomy of insects, also egg clusters of the forest tent-caterpillar, *Clisiscampa sylvatica*, with mites at work destroying the eggs, specimens of the new carpet bug, *Anthrenus scrophulariae*, and of the parasite on the cabbage butterfly *Pteromalus puparum*.

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

ANNUAL MEETING.

The Fifth Annual General Meeting of this Branch was held at the residence of H. H. Lyman, Esq., on Tuesday, 28th May, 1878, at 8 o'clock P.M.

The President read the following Report :—

Your Council beg to submit to the members the Fifth Annual Report of the Society's operations.

In doing so, your Council would record with pleasure the continued progress of the Society in every respect. The meetings have been interesting, and well attended ; several valuable papers have been read, and many important observations on insect life have been placed on record. The cause of regret mentioned by your Council in last year's Report, though still existing, has been to some extent removed, for during the year our membership has increased, and the new members, your Council believe, will prove to be valuable acquisitions.

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

ORIGINAL.

1. List of some species of *Geometridæ* new to Montreal. H. H. Lyman.
2. Description of larva supposed to be that of *Samia Columbia*. F. B. Caulfield.
3. Notes on *Deilephila Chamenerii*. H. H. Lyman.
4. Notes on some species of *Coccinellidæ* found on the Island of Montreal. F. B. Caulfield.
5. On the Humble Bees found at Montreal. G. J. Bowles.

6. On *Anomis Xylina*, the Cotton Worm Moth. F. B. Caulfield.
7. Notes on *Genus Saperda* occurring at Montreal. F. B. Caulfield.
8. Spring rambles of an Entomologist at Hochelaga. F. B. Caulfield.
9. Migratory Insects. G. J. Bowles.

SELECTED.

10. Rough notes on Canadian Hymenoptera, from "Zoologist." D'Urban.
 11. The Hearing of Insects. Sir John Lubbock.
- The following books have been added to the Library :

DONATIONS.

The Spiders of Norway. 2 books.
 Catalogue of Norwegian Insects. 4 books.
 Some remarkable forms of Animal Life. 1 box.
 Box Norwegian Insects and catalogue.
 The above were from the University of Christiana.
 11 Plates Lepidoptera, from W. Saunders, Esq., London.
 Hinds' Essay on Wheat Insects, from the President.
 Packard's Report, being one volume of the survey of Colorado ; from Dr. Hayden.
 Annual Report of Parent Society.

PURCHASES.

Riley's Reports, Nos. 1, 3, 6, 7, 8, 9.
 Fitch's " Nos. 1, 2, 6, 7, 8, 9.
 Psyche, Vol. I.
 Melsheimer's Catalogue of Coleoptera.
 Insects of Ancient America, Scudder.

Your Council would note, that at the request of the Horticultural Association of Montreal, two papers have been prepared by members of this Society for publication in the Annual Report of the Association for 1877. One of these, entitled "The Importance of Entomology to Fruit Growers," is by the President, the other, "On Borers," is by Mr. Caulfield. These, it is intended, will be followed by others in future Reports. Your Council trusts that the intercourse between the Association and the Society will continue, and prove beneficial to both.

Your Council would mention that one of our members, Mr. Couper, has left Montreal on a trip to the North Shore of the Gulf of St. Lawrence, for the purpose of studying the preparatory stages of the Northern butterflies, and procuring their eggs and larvæ. Your Council feel satisfied that the members will wish him every success in this effort to advance Canadian Entomology.

The compilation of the Montreal catalogue is still progressing, many species new to this locality having been added during the year. The number on the list is now between 800 and 900.

The whole respectfully submitted.

GEO. JNO. BOWLES,
President.

The Report, having been read, was received and adopted, after which the election of officers for the ensuing year took place with the following result:—President, G. J. Bowles ; Vice-President, Robert Jack ; Secretary-Treasurer, G. B. Pearson, jr ; Curator, G. H. Bowles, Council, M. Kollmar, H. H. Lyman, F. B. Caulfield.

After a very pleasant meeting, the members adjourned.

G. B. PEARSON, JR.,
Secretary.

ANNUAL MEETING OF THE LONDON BRANCH.

The Annual Meeting of the London Branch of the Entomological Society of Ontario was held at the residence of Chas. Chapman, Esq., on the evening of Tuesday, January 15th, 1878.

A communication from the Art Loan Exhibition Committee was read, requesting that some of the insects belonging to the Society be placed on exhibition at the Mechanics' Hall during the time the Art Exhibition remained open. This was unanimously granted, the members feeling glad to have the opportunity of aiding exhibitions of this sort, and at the same time of bringing some of the Society's work more prominently before the public, also of fostering any interest that might be felt in our favourite study.

Specimens of *Nephopteryx Zimmermani*, presented by Mr. Saunders caused much interest on account of the reported destruction they had caused among the white and red pine forests in some parts of the United States.

Many other subjects for discussion presented themselves during the evening, and the proceedings were closed by the election of officers for the ensuing year, with the following result:—President, J. M. Denton; Vice-President, A. Puddicombe; Secretary-Treasurer, Jas. H. Bowman; Curator, Chas. Chapman; Council, H. Bock, Wm. Saunders and Jos. Williams; Auditors, H. Bock and Wm. Saunders.

After which the meeting adjourned.

REPORT OF THE COUNCIL.

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

The Branch has had a successful season. Its meetings having been well attended by our local entomologists. We have felt the pleasure and profit there is in being able to assemble in our monthly meetings, to compare notes on our own work and to interchange our views on such new facts as are being continually brought into notice by the more ardent students in entomology.

Our spring meetings were specially characterized by many observations on *Clisiocompa sylvatica* and some discoveries made regarding the state of the caterpillar in the egg during the winter season. Interesting notes have also been brought under our notice in reference to the life histories of other insects.

During the year many specimens have been added to our already large collection. A portion of this collection was placed on exhibition during the winter in the Mechanics' Hall, at the Art Loan Exhibition, and proved a very interesting feature in the display.

The financial affairs of the Branch are very satisfactory, there being a balance, though small, in our favour. We look over the work of the year with pleasure and anticipate that of the next with like feelings.

Submitted on behalf of the Council, by

JAS. H. BOWMAN,

Sec.-Treas.

ANNUAL MEETING OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Club met pursuant to notice, at 2:30 on Tuesday afternoon, August 20, 1878, at room 17, The Lindell Hotel, St. Louis, Missouri.

The President, Mr. J. A. Lintner, of Albany, in the chair. In the absence of the Secretary, Mr. B. Pickman Mann, Prof. A. G. Wetherby, of Cincinnati, was appointed Secretary *pro tem*.

The President then delivered his

ANNUAL ADDRESS.

Gentlemen of the Entomological Club:

For the honour which you were pleased to confer upon me, at your last meeting, when I was unable to be with you, in calling me to preside over you, I am fully appreciative, and would return my grateful acknowledgments. While I well know that there are several among you who far better deserved the honour of succeeding to the chair vacated by my illustrious predecessor, yet I would interpret your selection as a tribute to my devotion to our loved science, and to my earnest desire to aid in its progress to the extent of my humble ability.

On these annual gatherings, marking the lapse of a period signalized by progress equalling, even surpassing that of a decade but a few years ago, it would seem fitting and proper that a comprehensive view of that progress should be given. But this has been so ably done by one of our number, and you have had it presented in the pages of *Psyche*, that whatever I might say in this direction, would be but repetition.

Permit me then, instead, to refer to some evidence of progress in American Entomology, shown within the recollection of several of us here present. Going back forty years, very little was known of our abundant insect fauna, except of the Coleoptera, an order which enjoyed the good fortune of being an attractive one, easy to collect in and prepare for the cabinet, and which early enlisted in its study earnest students, who have since lent honoured names to the annals of American science. Thus, in 1835, in Harris' List of the Insects of Massachusetts, the names of 994 Coleoptera are given, and but 140 Lepidoptera. Of the latter, 34 are butterflies, four of which are erroneously referred to European species: among these only three species of Hesperidæ are mentioned. Seventeen species of Noctuidæ are recorded, with the additional note of "96 unnamed species." There are also the names of 7 Geometers, 1 Pyralid, 1 Tortrix and 6 Tineids. How great an advance upon this in our knowledge of forms is shown in the Crotch Check List of 7,450 species of Coleoptera, in the Grote Check List of 1,132 species of Noctuids (already quite incomplete from the species subsequently made known), and in the Edwards' Catalogue of 506 species of Butterflies (110 of which are Hesperidæ). I often recall, as I am reminded of past progress, a request of Dr. Fitch, soon after the commencement of his Reports, for my careful attention to the Catalogues, for the authorities of the British Museum were, he thought unnecessarily, multiplying species. He did not believe that we really had over a half dozen species. To-day we number over 90 accepted species.

At the time to which I have referred, very few—perhaps not over a score (my limited knowledge of the Coleoptera must be my excuse if I err)—of the histories of our insects were known; now, we may count by the hundred those of which we know the transformations and the life histories more or less complete. Some of these, thanks to the labours of Edwards, Riley, Scudder, Walsh, and others, have been charmingly wrought out, and are honourable contributions to science.

The list of working Entomologists is rapidly enlarging, and with the consequent diffusion of a knowledge of their purposes and their results, we have reason to believe that the day is not far distant when the opprobrious prefix of "crazy" will not invariably be associated with "bug-hunter." In the last edition of the Naturalists' Directory, the names of 281 persons are recorded who are making Entomology their study in North America. It is probable that a full list would be increased by at least 25 per cent. extending the number to 350.

With so large a number of working Entomologists, we would be justified in expecting larger annual contributions to our literature. It would seem to me but a moderate estimate that one-third of the number should possess the ability of making such careful observations and of collating them in such a form that they would prove acceptable and valuable contributions to our knowledge. While we know so little of the transformations of our species, the habits of their larvæ, and imagines, their geographical distribution—in short, the numerous details entering into and composing their life histories, there is scarcely a new fact relating to these particulars which is not worthy of being placed on record in the pages of our Entomological journals, which will gladly give them place. It has been stated that there are but about thirty Entomologists in the United States and

the Dominion of Canada who are in the habit of publishing the results of their observations and studies. The last volume of the *Canadian Entomologist* presents a list of forty-five contributors; and Mr. Scudder, in his review of the work done during the year 1877, to which reference has been made, gives an account of the publications of forty-one writers, seven of whom have discussed injurious insects only. We wish that this latter number had been much larger.

A marked improvement has been shown in the number, extent and character of Entomological collections, both in public institutions and private hands. It is most earnestly to be hoped that the growing appreciation of the value of these collections may demand and ensure their proper care and future preservation. To this end it is very important that each individual possessing a valuable private collection (and there are now a respectable number distributed through the several States which contain 5,000 examples) should make such arrangements for its disposition and preservation after his decease as may, within a reasonable extent, ensure its perpetuity. The authoritative statement which has been made that the extremely valuable collections of Drs. LeConte and Horn will at some future day be added to the collection which the ability and zeal of Dr. Hagen has built up at the Cambridge Museum, is highly gratifying intelligence. And in this connexion, let me endeavour to impress upon each one of you the service which you may render to science by availing yourself of every opportunity to urge upon those who have voice in the erection of buildings devoted to scientific collections, that a primary consideration be that they be made fire-proof.

The literature of our science has already become quite respectable, and its collection on our shelves forms no inconsiderable a library. The eleven volumes of the American Entomological Society represent a large amount of earnest and thorough work. The nine volumes of the *Canadian Entomologist* are replete with interest and instruction. The numerous papers scattered through the pages of the Reports of the Peabody Academy of Science, Proceedings of the Boston Society of Natural History, Annals of the Lyceum of Natural History of New York, Proceedings of the Philadelphia Academy of Natural Science, Bulletin of the Buffalo Society of Natural Science, Proceedings of the California Academy of Natural Science, and others, fully illustrate the earnestness with which Entomological study is being prosecuted, and give large promise of a brilliant future. The exquisite illustrations of the "Butterflies of North America" are a credit to our country, being fully equal to the best work of the class in Europe. The publications of LeConte have given him high place among the honoured names of the fathers of American Entomology, while the writings of Hagen, Grote, Scudder, Packard, Horn, Cresson, and Uhler, represent no inconsiderable portion of the progress upon which we are congratulating ourselves. Nor can I omit reference to our European friends—to Loew, Osten Sacken, de Saussure, Speyer, Zeller, Mœschler, Butler, and others, who are freely lending us their valued aid in the descriptions of forms too numerous for our few hands, and in the solution of problems which require for their determination the study of the entire insect fauna of the eastern hemisphere in connection with our own.

The most gratifying feature, perhaps in the report of progress which I am able to present to you, is the aid which the General Government is now extending to Entomological explorations and investigations, in placing scientists in the field and in the publication of their results. Two years ago, the occupant of this chair felt called upon to express to you his sorrow, disappointment, indignation, that Congress had declined to accede to the memorials presented it, asking its recognition and acceptance of the service which applied Entomology was in a condition to render. Now, it is a cause of congratulation that the Department of Agriculture has selected as its Entomologist one whose training in the school of economic Entomology for the past ten years has specially qualified him for the responsible position he occupies; and we have the additional gratifying assurance that the Secretary of the Department is in full sympathy with our aims.

In conformity with a precedent long since established in Europe, our Government has honoured itself while honouring science, in seeking to add to the productive wealth of the country through a control of the insect depredations inflicted upon our people, to the extent of enormous annual losses, and at times, poverty and starvation. The two special Commissions which have been already appointed, it is understood are, ere long, to be followed by others. The published results of one year's labour of the Locust Com-

mission is on our hands. An inspection of the matter crowding its 772 pages will, I am sure, convince any one competent to judge, of the wisdom of the appropriation made for its support. The Cotton-worm Commission has already actively entered upon its work.

To Government aid we owe the publication of Packard's Monograph of Phalænidæ—a beautiful quarto of attractive typography and ample and excellent illustration; Thomas' Acrididæ of North America, with 260 quarto pages and illustrations; the Reports on Hymenoptera, Lepidoptera, Coleoptera, Hemiptera and Orthoptera in Lieut. Wheeler's Surveys west of the 100th Meridian, of 331 quarto pages and several chromo lithographic plates; and to Reports on several orders of insects by Chambers, Grote, Hagen, Osten-Sacken, Packard, Scudder, Thomas and Uhler, in the Annual Reports and the Bulletins of the Hayden Survey of the Territories.

The liberality displayed by our Government in the publication and gratuitous distribution, to those whose scientific labours render them worthy recipients, of investigations in other departments of Natural Science—in Geology, Palæontology, Mammalogy, Ornithology, Ichthyology, Botany, etc., deserves our most earnest commendation. The facility of publication thus afforded to meritorious work almost evokes the envy of some of our European friends.

In conclusion, permit me to commend to the members of the club the biological study of our insect forms. It is attractive; it is simple in many of its phases; it is of great practical utility; it is a field where all can find abundant work, and one in which some of those questions which are engaging the attention of zoologists in other departments; may best find their most ready answer. Let no one be satisfied with the simple possession of a large and well-arranged cabinet of insects. If to collect and own it be a source of pleasure, often beyond expression, then science may demand at his hands that he should aid in extending its boundaries in return; and in no better way can this be done than in working out the life histories of our species, beginning with those with which we hold the more intimate relationship. Let descriptions of forms remain, except in exceptional cases, for those who have special fitness and opportunity for the work; and systemization for him who, like the poet, *nascitur non fit*, that kaleidoscopic manipulation of genera and the higher groups may cease to bewilder, perplex and dismay.

In illustration of what may be done in the study that I commend to you, I would refer to the labours of Mr. W. H. Edwards in working out the histories of some of those butterflies which appear under different forms at different seasons of the year. Some of the results are known to you, and I am sure that you regard them as among the most valuable recent contributions to Entomology. The untiring zeal with which the work has been prosecuted and is being continued deserves the commendation which it has received from the most eminent European Entomologists, and the success with which it has been crowned.

Gentleman, I trust that our assemblage at this time may not only conduce to the interests of our science, but also render its pursuit more pleasant to us, through the privilege it affords of personal acquaintance, comparison of observations, interchange of opinion, and the strengthening of those bonds of sympathy which should (they do not always) unite those who labour in our common cause.

On the motion of Mr. A. R. Grote, of Buffalo, a resolution was passed requesting the *Canadian Entomologist* to publish the President's Address and the proceedings of this meeting.

Mr. E. B. Reed, of London, Canada, associate editor of the *Canadian Entomologist*, apologized for the unavoidable absence of the Vice-President, Mr. Wm. Saunders, and stated that the editor of the *Canadian Entomologist* would be most happy to comply with the wishes of the Club respecting the publication of the proceedings of the meeting.

Mr. A. R. Grote exhibited some insects from Georgia—*Cailosamia angulifera*, *Eacles didyma*, *Lagoa pyxidifera*, *Heterocampa obliqua*. In the South he had found that *Actias luna*, *Samia cecropia*, *Telea polyphemus* and *Saturnia io* were double-brooded, while on the contrary, *Citheronia regalis* was only single-brooded.

Prof. Wetherby stated that in his section, and in other parts also of the North-Western States, many of the above-named moths were also double-brooded.

Miss Emily A. Smith, of the Scientific Association of Peoria, Ill., submitted to the meeting a most interesting account of *Lecanium aceris-corticis*, Fitch, a bark-louse, that had

seriously damaged the maple trees, both hard and soft, in Illinois and the adjoining States. The whole life history of this pest had been most carefully worked out by Miss Smith, who also exhibited a very complete set of microscopical preparations of the insect in its various stages, and also of a parasitic *Chalcid* discovered by her. One important point noted was the migration of the bark-lice on the approach of the fall from the leaves to the trunk of the tree, on which, however, numerous they might be found together, their position was always lengthwise with the trunk. In the South the insect was doubtless double-brooded. Dr. Fitch had briefly described the insect many years ago, but Miss Smith had been enabled to work out many hitherto unknown points in its history.

Various experiments have been tried to destroy the lice, but Miss Smith had found the best success in using a Babcock or Chamber's Fire Extinguisher, charged in the usual way, with the addition of a little crude carbolic acid, in the proportion of about one large spoonful to six gallons of water. By means of the Extinguisher she was able to reach even large trees, the cost being about 20 cents per tree. The remedy should be applied before the insects become too old, otherwise a stronger preparation of carbolic acid was necessary, and in consequence the trees might possibly suffer somewhat.

Mr. Thos. Bassnett, of Jacksonville, Florida, had listened to the admirable account with very great interest, inasmuch as in the South the culture of the Orange tree, in which he was largely interested, was seriously threatened with extermination by the ravages of a bark-louse similar to that described by Miss Smith, and he was glad to hear that a remedy could be so successfully applied.

Prof. C. V. Riley, of Washington, D.C., spoke, thanking the lady for bringing this subject before the meeting, and complimenting her on the discoveries she had effected. He fully corroborated the statements made as to the extent of damage caused by bark-lice, especially those affecting the Orange in the South. He strongly advocated the use of the "Extinguisher" in similar cases, but recommended that kerosene should be tried instead of carbolic acid; it would, he thought, be found of less injury to the trees, and would destroy the insect for some time after the formation of the scale, which the carbolic acid would not do. It should not be applied in excess; the ordinary proportion should be about one part kerosene to twenty of water.

The whole topic was very fruitful of discussion, and Miss Smith was much thanked for her paper and for the drawings and microscopical preparations that accompanied it.

On motion of Prof. Riley, seconded by Mr. Reed, a resolution was carried that a committee be appointed to prepare a report, and submit it to the next session of the Club, in regard to the quorum of members necessary to transact business.

The Chairman appointed the mover and seconder and Prof. A. G. Wetherby as the committee.

Prof. Riley gave a brief abstract of some of the Entomological papers he proposed to read to the Association.

(1). Notes on the life history of the blister beetles, and on the structure and development of the genus *Hornia*, Riley.

(2) On the larval growth of *Corydalis* and *Chauliodes*.

(3) On the means by which silk-worms issue from their cocoons.

Hornia was parasitic on the common humble-bee, and had been successfully identified by careful study, although in several important points it differed from the *Meloidæ* to which it belonged.

The further larval history of *Corydalis cornutus* was given by Mr. Riley, and was most interesting, especially to those members who had listened to Mr. Riley's first descriptions of this curious insect at the Detroit meeting. Mr. Riley had been very successful in elaborating the various points of difference between *Corydalis* and *Chauliodes*.

In discussion it was stated that the somewhat peculiar name of the "Hellgrammite Fly" for the *Corydalis* had been for many years in common use both on the Upper and Lower Mississippi; and that the equally curious name of "Dobson" was given to its larva, which was largely used for bait by the river fishermen.

On the paper relating to silk-worms reference was made to Dr. Packard's recent theory on certain spines on the wings of *Bombycidæ*, which he stated were of service in assisting the exit of the insect from the cocoon.

Mr. Riley, in combatting this idea, showed how in almost every case the silk was spun in figures of 8, which would easily yield to pressure, especially as in most cases of fluid (wrongly termed bombyc acid) was emitted, and the silk thus rendered more pliable. His idea was that the peculiar make-up of the cocoon rendered it more yielding for the exit, and that though the insect usually emerged at the end of the cocoon, there seemed to be no reason why, if it chose, it could not find an egress equally well at the side of the cocoon.

Several minor matters were discussed, and the Club adjourned at the call of the chairman.

AUGUST, 21st, 1878.

The Club met in the same place at three o'clock P.M., the President in the chair.

There was a much larger attendance than yesterday of members and those interested in Entomology.

The first order of business was the reading of the Report of the Special Committee appointed yesterday. Mr. Reed presented the report.

The committee to whom was referred the question of the constitution of a quorum, beg to report as follows:—

Whereas it is most desirable in the interest of the Club that a definite and permanent character should be given to all its proceedings, and that nothing should be left undone which would tend to establish complete confidence in the manner of transacting the business of the Club;

Your committee therefore recommend that the constitution be amended by providing

(1.) That no business of the Club shall be transacted unless there are present a quorum of ten persons, who shall have been enrolled as members of the Club at least one year previous to the then session.

(2.) That when motions shall have been carried by the Club, the same shall not be rescinded at any subsequent meeting unless there be present as many members as were present at the date of passing such motions.

Your committee recommend that this report be printed and a copy sent to each member of the Club, and that it be brought up for discussion at the next annual session of the Club.

C. V. RILEY,
A. G. WETHERBY,
E. BAYNES REED.

August 21, 1878.

The report was unanimously adopted.

The Club then proceeded to the election of officers.

On motion, duly carried, the following gentlemen were re-elected officers for the ensuing year:

Mr. J. A. Lintner, Albany, N.Y.,	- - -	President.
Mr. Wm. Saunders, London, Ont.,	- - -	Vice-President.
Mr. B. Pickman Mann, Cambridge, Mass.,	- - -	Secretary.

The President returned thanks for the honour conferred upon him. He then addressed the Club, giving a most interesting description of the success that had attended his efforts and those of his co-labourers in collecting Noctuidæ during the season of 1877, by the means known as "sugaring." By reference to a list given on page 120 of his "Entomological Contributions," No. 4, it would be seen that there had been captured eighty-six species, not one of which had hitherto been taken in the Albany district. Nearly all of these had been found in the famous Center locality. He most graphically described his manner of working by this method, and strongly recommended its trial to all the members.

Prof. Wetherby made some remarks on this attractive means of capture, which was continually bringing under the notice of Entomologists specimens hitherto unknown or considered as most rare. It was a question if there were any species which are in reality

rare, their seeming rarity resulting from our not knowing when, where and how to collect them.

Miss Smith described a collecting bottle of her own device, by which, on touching a spring, the cover flew back and the insects could be readily caught in the receptacle. Its chief recommendation was that it could be managed by one hand, leaving the other at liberty for holding the lantern.

Mr. Reed advocated the fastening of the lantern to the waist by a belt, thus leaving he hands at greater freedom to use the bottles and boxes.

The President said he had found that in using the ordinary bull's eye lantern the fingers could be thrust through the wire handle in such a manner that their ends and the thumb were free for use in withdrawing, holding and replacing the stopple of the collecting bottle. The lantern in hand enabled him more readily to adjust the light, and he had found that it was often more desirable to throw the penumbra rather than the full light upon the tree, many insects often fleeing from a strong light.

Miss Smith gave an account of the damage done to the oaks in Wisconsin and Illinois by the larvæ of a little Tortrix, *Argyrolepis quercifoliata*, Fitch.

A very interesting discussion took place on the question of instinct or reason displayed by insects, and many curious instances were cited proving that instinct and reason differ in degree and not in kind.

The meeting then adjourned.

EXPERIMENTS ON THE COLORADO POTATO BEETLE.

(From correspondence in the *Canadian Entomologist*.)

DEAR SIR,—

As correspondence is invited respecting the habits, localities, occurrence, etc., of insects, I take the liberty to offer a few remarks on the Colorado Potato Beetle, *Doryphora 10-lineata*.

Wishing to ascertain if the domestic fowl were likely to be of any value in reducing the numbers of *D. 10-lineata*, I procured the assistance of a neighbour who kept fowl (I do not keep them myself), and the following is the result of our experiments:

Our first experiment was to offer both larvæ and beetles to the fowl, but they refused to touch them, and acted as if somewhat afraid. Next we mixed the insects with the corn and other food that was given them, but they refused even to eat the corn for a time; by-and-by, however, they began to eat the corn and soon lost all fear of the insects, although they still refuse to eat any. After a few days, by keeping the insects in their food all the time, some of the bravest of the hens began to eat a few insects, and it was not long before the rest joined them, and in a few days more they appeared to relish the beetles about as well as the corn. Up to this time I did not observe any of the fowls eat a beetle from the potato vines, but they now began to do so, and we were obliged to put them in their food no longer. After this the beetles were so reduced in number in this garden that they did no material damage.

It would seem from the above that although the beetles were naturally repugnant to the domestic fowl, yet an appetite for them may be acquired. If the substance of the above has been published I was not aware of it, and give it for what it is worth.

I noticed in the last report of the Entomological Society of Ontario, in the experiments on the Colorado Potato Beetle, by W. Brodie, the remark that "it is very doubtful if *Doryphora*, either in the larva or imago state, will feed on *Solanum dulcamara* or *Datura stramonium*." I have found the insect in both these stages plentifully on *S. Dulcamara* which grows quite abundantly near this place, and they wholly consumed both leaves, flowers and fruit of every plant in this vicinity. They were more abundant on these plants than on my potato plants, which were not more than five rods from some of the former.

J. E. BATES, South Abington, Mass.

DEAR SIR,—

Mr. Bates is quite right in saying *Doryphora* will eat *Solanum dulcamara* and *Datura stramonium*; they have preferred these to tomatoes in my garden. A friend found them eating *Hyoscyamus*. The present season seems exceedingly favourable to production of *Nematus* and other grubs destructive of the currants and gooseberries.

H. H. CROFT, Toronto, Ont.

SOME OBSERVATIONS ON THE BACON BEETLE *DERMESTES LARDARIUS*.

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

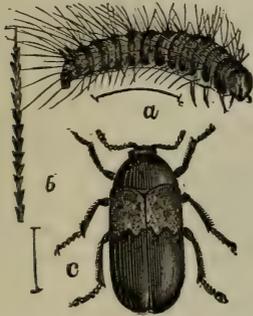
(From the *Canadian Entomologist*.)

Having read in the Report of the Entomological Society of Ontario for 1877 an article by Prof. J. T. Bell, of Belleville, Ont., entitled "How to Destroy Cabinet Pests," I thought it might not be unprofitable to record my own observations on *Dermestes Lardarius*.

In the accompanying figure 1, both beetle and larva are shown, magnified; the hair lines placed by the side of each indicate the natural size.

Early in the summer of 1876 I captured four beetles, three males and one female, and placed them in a glass jar with a piece of the meat on which I found them feeding. I observed the female deposit a number of eggs on the meat, but before any were hatched I left home, and was absent about five weeks. On my return I found a large and flourishing colony of larvæ, most of them full grown.

My object in rearing these insects was not to study their natural history, but to find out the best means to destroy them. I put a piece of camphor gum in the glass as a first experiment. The effect on them was very slight. They appeared a



little uneasy at first, but in a minute or so commenced crawling over the camphor quite unconcerned. I had heard of a clothier who rolled tallow candles up in webs of woollen cloth to preserve them from the attacks of the "moths," and I resolved to try its effects on *Dermestes* larvæ. With this view I put a small piece of tallow in the glass, and the effect was almost instantaneous. It was quite ludicrous to see the stampede which commenced. Never did insect evince more terror or disgust than did these pests. They fled pell-mell to the side of the jar, but as there was no way of escape, they were obliged to yield to "circumstances over which they had no control." The closest observation failed to detect one going near the tallow. They remained for several days huddled together by the side of the jar in a confused mass.

Satisfied with my experiment, and being very busy at the time, I put the jar away, and on looking at it about a fortnight afterward, I found but one beetle and that one *dead*, of all that large family. As all the larvæ and three of the four beetles had disappeared and "left no trace behind," I naturally concluded that they had been driven by starvation to prey upon each other. There was no possibility of escape from the jar, and my conclusion seems reasonable, even if I cannot prove it.

I have ever since kept tallow in trunks or presses where there are woollen garments, blankets or furs, and I have had nothing eaten up to the time of writing. In preparing my boxes for mounted specimens, I put bits of tallow between the strips of cork and cover with paper gummed to the sides of the box, and I have not had a single specimen injured by *Dermestes* or any other cabinet pest. As tallow is cheap and can be obtained in either town or country, I would heartily recommend it to both housekeepers and naturalists. To the former it would be much better and less disagreeable than the snuff, tobacco, pepper and other preventatives which are put on furs with such unsatisfactory results. Although such a remedy as Prof. Bell recommends might do for the cabinet, it would be neither pleasant nor safe to have about our clothing.

MAMMALS ATTRACTED BY SUGAR.

BY JAMES S. BAILEY, A. M., M. D., ALBANY, N. Y.

It has not been supposed that animal life would be attracted by sugar, but while sugaring for Lepidoptera the contrary has been proven. On a number of occasions we have taken deer mice while in the act of feeding on sugar, and more recently we have taken a flying squirrel while lapping the sweets of a sugared patch.

Not long since, in making our rounds while sugaring we discovered a skunk endeavouring to taste the sugaring, and so intent was he that our approach was unobserved until a piece of dead wood was hurled at him, when he reluctantly left. The throwing of a second missile quickened his pace and caused him to distribute his perfumery, which rendered the air rather more fragrant than Lubin's Ext. of new-mown hay. It is unnecessary to state that our recreation for the evening was at an end.

We have frequently taken at sugar tree toads and various species of Coleoptera. A Texan correspondent says it is not uncommon for him to take at sugar Scorpions, and also species of Lizards, which are numerous in that latitude.

ON WINTERING THE CAMBERWELL BEAUTY—*Vanessa Antiopa*.

BY C. G. SIEWERS, NEWPORT, KY.

This beautiful diurnal—the “Camberwell Beauty” of England, and very inappropriately styled the “Mourning Cloak” by Americans, for is it not clothed in a mantle of imperial purple, fringed with gold lace?—is well known to hibernate. It is occasionally found in stone piles in the winter, but I think its most common hiding-place is in the culvert walls of our country roads and turnpikes. It requires a cold, moist, dark place, or it will dry up.

Capturing a fine female on the 9th of October, 1876, I concluded to winter it. Placing it in a net cage with a dish of apple, sugar and water, I supposed my share of the performance over. It fed for several weeks, then fluttered a good deal and died the beginning of December. It had fairly dried up. This showed bad management. Last fall, on September 7th, passing a tree sugared the night before, I captured another female. This one I placed in a paper box eight inches square and high, removed the core of half an apple, sliced off a bit of the round side to steady it, placed it in a small two-inch dish, covered with sugar, and filled up with water. Once a week I renewed the water and sugar. It placed itself on the side of the box, directly over and within reach of the dish, and however I moved the apple I always found that it followed it round.

It evidently fed on warm days, but never opened its wings. I kept it in an up-stairs, cold room, where water would freeze, but still not as cold as out doors. It allowed me to handle it, and would lie flat on my hand without movement. In February I thought there were symptoms of weakening. It no longer perched on the side of the box, but remained on the bottom, leaning over very much to one side.

Placing it in sunshine the last week of February, it began to open its wings little by little with short jerks, as if the tendons were loosening. When half open it was put away again. On the 11th of March, a warm, cloudy day, I took it on my finger to an open window. While looking at its clear eyes the sun suddenly shone out, and the next moment it was gone. I had proposed to try and find a mate for it, but concluded to keep it till others were flying, and then take it to its old neighbourhood and let it go. As it took the direction of its place of capture I was pretty sure to see it again, and found it four days after in a sugar camp in the same woods. I recognized it at once by a bad bend in the tip of the wings caused by a jam of the dish slipping on it.

On the 27th of March, two weeks later, the first *antiopa* appeared. I have so far failed to take the larva, but have just seen several imagines in a willow thicket, which gives me hope. They are usually rare, but some years their numbers make them a nuisance. Their colour is dark purple with strong black spines. Food plants—Lombardy poplar and willow

ON A SPECIES OF BARK LOUSE AFFECTING THE TULIP TREE.

BY A. J. COOK, LANSING, MICH.

From the Canadian Entomologist.

On page 218 of the "Revised Manual," in speaking of other sources than flowers from which bees collect sweets, I remark that I have seen the bees thick about a large bark louse, which attacks and often destroys one of our best honey-trees. This is an undescribed species of the genus *Lecanium*.

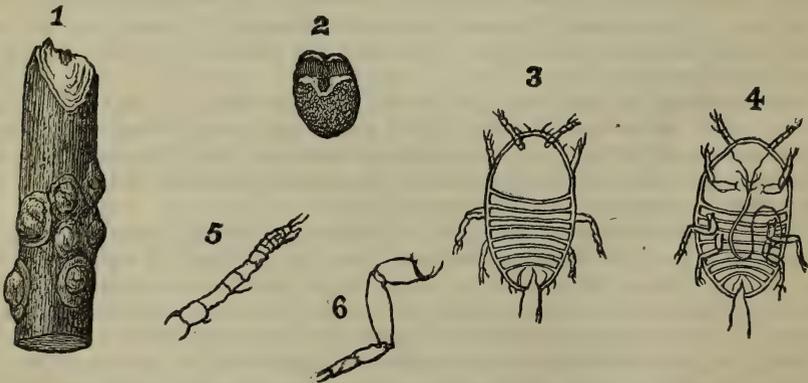
In the summer of 1870, this louse, which, as far as I know, has never yet been described, and for which I propose the above very appropriate name, *tulipifera*—the *Lecanium* of the tulip tree—was very common on the tulip trees about the College lawns. So destructive were they that some of the trees were killed outright, others were much injured, and had not the lice, for some unknown reason, ceased to thrive, we should soon have missed from our grounds one of our most attractive trees.

Since the date above given I have received these insects, through the several editors of our excellent bee papers, from many of the States, especially those bordering the Ohio river. In Tennessee they seem very common, as they are often noticed in abundance on the fine stately tulip trees of that goodly State. In the South this tulip tree is called the poplar, which is very incorrect, as it is in no way related to the latter. The poplar belongs to the willow family; the tulip to the magnolia, which families are wide apart.

Whenever the tulip-tree lice have been observed sucking the sap and vitality from the trees—there the bees have also been seen, lapping up a sweet juicy exudation, which is secreted by the lice. In 1870 I observed that our tulip-trees were alive with bees and wasps, even as late as August, though the trees are in blossom only in June. Examination showed that the exuding sweets from these lice were what attracted the bees. This was observed with some anxiety, as the secretion gives off a very nauseating odour.

The oozing secretions from this and other lice, not only of the bark-louse family (Coccidæ), but of the plant-louse family (Aphidæ), are often referred to as honey-dew. Would it not be better to speak of these as insect secretions, and reserve the name honey-dew for sweet secretions from plants, other than those which come from the flowers.

The fact that this insect is yet undescribed—that it attacks one of our best honey trees and is the source of a so-called honey-dew, leads me to append the following description, with illustrations.



NATURAL HISTORY OF THE LECANIUM TULIPIFERÆ.

The fully developed insect, like all bark-lice, is in the form of a scale (fig. 1), closely applied to the limb or twig on which it works. This insect, like most of its genus, is brown, very convex above (fig. 1), concave beneath (fig. 2). On the under side is a cotton-like secretion, common to all of the genus *Lecanium*, which serves to enfold the eggs.

Underneath the species in question are two transverse parallel lines of this white down (fig. 2); one of them, probably the anterior, is nearly marginal, and is interrupted in the middle; while the other is nearly central, and in place of the interruption in the middle it has a V-shaped projection back or away from the other line. The form of the scale is quadrangular, and not unlike that of a turtle (fig. 1). When fully developed it is a little more than $\frac{3}{16}$ of an inch long, and a little more than $\frac{2}{3}$ as wide.

Here at Lansing, the small, yellow, oval eggs appear late in August. In Tennessee they would be found under the scales in their cotton wrappings many days earlier. The eggs are $\frac{1}{40}$ of an inch long, and $\frac{1}{8}$ of an inch wide. These eggs, which are very numerous, hatch in the locality of their development, and the young or larval lice, quite in contrast with their dried, inert, motionless parents, are spry and active. They are oval (figs. 3 and 4), yellow, and $\frac{1}{23}$ of an inch long and $\frac{1}{10}$ of an inch wide. The eyes, antennæ (fig. 5), and legs (fig. 6), are plainly visible when magnified 30 or 40 diameters. The 9-jointed abdomen is deeply emarginate, or cut into posteriorly (fig. 3), and on each side of this slit is a projecting stylet or hair (figs. 3 and 4), while from between the eyes, on the under side of the head, extends the long recurved beak (fig. 4). The larvæ soon leave the scales, crawl about the tree, and finally fasten by inserting their long slender beaks, when they so pump up the sap that they grow with surprising rapidity. In a few weeks their legs and antennæ disappear and the scale-like form is assumed. In the following summer the scale is full-formed and the eggs are developed. Soon the scale, which is but the carcass of the once active louse, drops from the tree, and the work of destruction is left to the young lice, a responsibility which they seem quite ready to assume.

In my observations I have detected no males. Judging from others of the bark-lice, these probably possess wings, and will never assume the scale form, though Prof. P. R. Uhler writes me that some of the males are apterous. He says that it is very important to know and record the males, and that the genera are hardly determined without them.

REMEDIES.

If valued shade or honey trees are attacked by these insatiate destroyers, they could probably be saved by discreet pruning—cutting off the infected branches before serious injury was done, or by syringing the trees with a solution of whale oil soap,—or even common soft soap would do—just as the young lice are leaving the scales. It would be still better to have the solution hot. Whitman's Fountain Pump is admirable for making such applications.

Fig. 1 is slightly magnified; the others are largely magnified.

THE BEATING NET.

BY JAMES S. BAILEY, A. M., M. D., ALBANY, N. Y.

The uses of the beating net are obvious and can at once be appreciated in the collecting of Coleoptera and larvæ. A convenient and simple form is here presented, with directions for its construction.

This particular form of net was invented and presented to me by my friend, Mr. T. B. Ashton, of Tonganoxie, Kansas, who has not only distinguished himself as a Coleopterist, but has shown himself to be an excellent mechanic.

By grasping the net with the left hand, as shown in fig. 3, thrusting it under a shrub, and giving the bush a quick shake, or blow with a walking stick, every living thing upon it will instantly fall upon the apron of the net. If Coleoptera, they can be secured with the fingers or a small net held in the other hand for that purpose. If caterpillars, they can be gently rolled into a receptacle prepared for them.

The frame work is made of well seasoned hickory. The sides, A B and G I, are composed of strips 37 inches long and $1\frac{1}{4}$ wide at the ends A and G, and tapering uniformly until they are $\frac{5}{8}$ of an inch wide at the other ends, B and I. Each piece should

be $\frac{1}{2}$ inch thick when dressed. After these pieces are steamed or boiled in water until thoroughly pliant, the wider ends A and G can be placed together and securely fastened in a vice, the free ends B and I separated widely and a block of wood forced between at

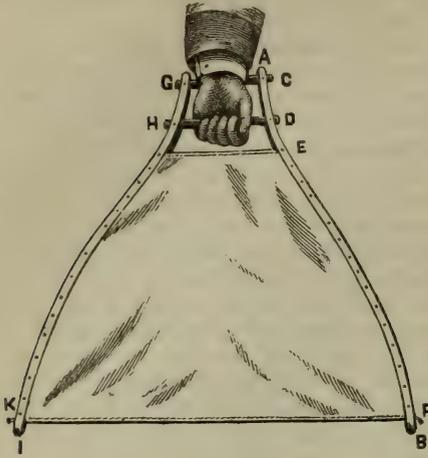


Fig. 3.



Fig. 4.

the point E, and securely fastened, while the ends B and I can be secured with a piece of strong twine until dry enough for the frame to maintain its shape. Then the sides should be sand-papered until smooth and two holes bored in each piece for the rounds G C and H D to pass through; for this purpose a half-inch bit will be sufficient, its point being inserted in the stick $\frac{3}{4}$ of an inch from the end of the widest part C G, and again $5\frac{1}{4}$ inches at D H. A round should be turned of the same material to fit the hole, and should be $6\frac{1}{2}$ inches in length. The other round must be of the same size and $8\frac{1}{2}$ inches long. One end of each round can now be fastened into one side piece by a hickory peg $\frac{1}{8}$ of an inch in diameter; the other side is fastened in the same manner, but the pegs on this side must be fitted so that they may be taken out to enable the net to be folded for transportation.

Now that the frame work is constructed, each side must be ripped centrally with a saw for 29 inches, commencing at the point B and extending to E. Through this slit a piece of unbleached domestic cloth must be drawn, a hem $\frac{3}{4}$ of an inch wide having previously been made across the ends at the points E and F. Fourteen screws are now inserted into each blade two inches apart which will hold the sheeting firmly and form the apron. The outside edges can now be cut closely to the frame work with a sharp knife. Previous to this operation a stout twine should be passed through the hem at the points F, K, and a knot tied at each end, but the twine should be an inch or two shorter than the apron, which will cause it to sag and better hold its contents. Where the twine passes through each side piece a gimlet hole $\frac{1}{8}$ of an inch in diameter must be made to accommodate the twine.

The drawing is introduced not only to assist in constructing the net, but to represent the manner of handling it when collecting. Fig. 4 represents the net folded for transportation.

OBITUARY NOTICES.

Death has of late been making serious inroads among the ranks of our fellow-labourers in the Entomological field. An old veteran among American Naturalists, Dr. J. P. Kirtland, of Cleveland, Ohio, has passed away, while recent advices from across the Atlantic announce the deaths of Mr. Andrew Murray and Mr. T. V. Wollaston. Most of the details given in reference to the lives of the two latter are condensed from memoirs which have just appeared in *The Entomologist*, of London, England.

DR. JARED P. KIRTLAND

was born at Wallingford, Conn., on the 10th of November, 1793. His youthful studies were pursued at Wallingford and Cheshire Academies, and being a bright, active boy and an earnest student, he soon made rapid and substantial progress in the classics as well as in English studies. As a boy he was enthusiastic in the study of natural objects; he knew the habits of almost every animal and bird that frequented his youthful haunts, and at twelve years of age was engaged in practical experiments in the cultivation of silk worms. About the same time he began the study of Botany, and soon applied his knowledge to a series of valuable experiments in the crossing of fruit trees with the view of improving the quality of fruits. His success in this department is well known to all intelligent cultivators of fruits in America, his hybrid cherries having won for him a fame which time can never obliterate. His grandfather was a physician in Connecticut, and at his death his promising nephew, now eighteen years of age, inherited his grandfather's medical library and a sufficient legacy to enable him to acquire a medical education. He had made arrangements to pursue his studies in Edinburgh, when the war with Great Britain prevented him. About this time the medical department of Yale University was opened, and young Kirtland was the first student on its matriculation roll. Subsequently he graduated at the University of Pennsylvania, and in 1815 returned to his native place, where he practised medicine for two years and a half, devoting all his leisure moments to the study of natural science, for which he had developed a passion which influenced all his after life. He next removed to Durham, Conn., where he enjoyed an extensive practice for several years, when the death of his wife and child again unsettled him, and he removed to Poland, Conn. Five years later he was elected to the Legislature, where he served three terms, after which he was called to fill the chair of Theory and Practice of Medicine in the Ohio Medical College at Cincinnati, which he did with distinguished ability for five years, when the duties becoming irksome to him, he resigned the position.

When in 1848 the first Geological Survey of Ohio was organized, Dr. Kirtland was appointed to superintend the natural history department, and in due time presented a series of reports which attracted general attention. He laboured diligently among the Fishes, Birds, Mollusks, Reptiles and Insects of Ohio, sketching many of them with his own pencil and describing them with an enthusiastic fidelity. During his researches he collected a large and valuable cabinet of specimens with the design of forming a State Collection, but Ohio refused the substantial aid which this enterprise required, and as his collections had been made largely at his own expense, he retained possession of them, and they were ultimately donated to the Cleveland Society of Natural Sciences, where they are now treasured as a priceless heritage.

In 1837 Dr. Kirtland had purchased a choice fruit farm five miles west of Cleveland, and had there settled, as it proved, for the remainder of his busy life. Four years after this he was appointed a Professor in the Medical Department of the Western Reserve College, in Cleveland, a position he filled with honour for twenty-one years. In 1861 Williams College conferred upon him the degree of LL.D., in recognition of his services, and many learned societies during his lifetime delighted to do him honour. Among his Entomological papers, that which perhaps attracted most attention was his Notes on the Diurnal Lepidoptera of Western Ohio.

During the summer of 1872 it was our privilege to visit this veteran naturalist. We found him enjoying his quiet retirement among his flowers, fruits and insects, actively interested in everything that was going on about him. He gave us a most cordial welcome, and we spent a delightful afternoon together scanning his botanic and insect treasures.

Although nearly 80 years of age, he retained all his faculties in apparent perfection, his eyesight being so well preserved that he could read ordinary print with the greatest ease. He died after a short illness at his home, on the 11th day of December, 1877, at the ripe age of 84 years. He was among the most genial and winning of men, with heart warm and steadfast. His temperate, well-ordered life preserved him in the full vigour of manhood far beyond the years at which men ordinarily grow old. He had no dissipation but hard work, no extravagance but lavish generosity to his friends and overflowing charity for the poor. In his seventieth year of patient labour he wrote as his motto over his desk: "Time is money; I have none of either to spare." Thus this tireless man of science laboured to the end, laying down the work he loved so well after fourscore and four years of labour and usefulness, only at the call of the Master.

MR. ANDREW MURRAY, F. L. S.

This accomplished naturalist died at his residence, 67 Bedford Gardens, Kensington, on the 10th of January last. Mr. Murray was the eldest son of Wm. Murray, Esq., and was born in Edinburgh on the 19th of February, 1812, where he resided until 1860. In his early years he manifested a fondness for natural science which strengthened as he matured. He was educated for the law, and subsequently devoted some attention to the study of medicine. During the last few years of his life in Edinburgh he laboured hard in the interests of science; in 1858 he was elected President of both the Botanical Society and Physical Society, and just previous to his removal to London he contributed an elaborate paper to the Royal Society of Edinburgh, on the "Pediculi Infesting the Various Races of Man." In 1860 Mr. Murray came to London, and was appointed Assistant-Secretary to the Royal Horticultural Society, and from this time he devoted himself to his work as a scientific Botanist and Entomologist, becoming celebrated in the former as the monographer of the *Coniferae*, and in the latter as the monographer of the *Nitidulidæ*. From 1852 to 1863 he published thirty-eight separate papers. 1866 he published his well-known work on the "Geographical Distribution of Mammals," in which he bestows especial attention on the habitat during geological as well as glacial and present epochs, with copious synonymic lists, including locality past and present, geographical classification and coloured maps of distribution, showing the result of his own careful research. In 1869 he accompanied Sir Joseph Hooker to the Botanical Congress of St. Petersburg, as one of the representatives of British Science, his services there being complimentarily acknowledged by the presentation by the Emperor Alexander of a malachite table of great beauty. In 1871 he was entrusted with the superintendence of the arrangements connected with the British contributions to the International Exhibition of Moscow of the following year. He was Secretary to the Oregon Conifer Collection Committee, and in 1873 undertook an expedition to Salt Lake and California, with various scientific objects. On his return from the West he visited Canada, and spent a few days with some relatives in London, Ont., during which time we were happy in making his acquaintance and of forming with him a warm friendship which only terminated with his life. During his short sojourn in Utah he contracted an illness which greatly increased in severity, and, indeed, almost prostrated him on his return to Europe. Subsequently he rallied and for several years enjoyed moderate health. In the course of last season further indisposition followed, and he gradually sank, but so assiduously occupied with his labour of scientific usefulness to his latest days, that few were prepared to hear of their close.

But it is with Andrew Murray as an Entomologist that we are most deeply interested. In early life he aided his relative, John Murray (Lord High Advocate,) in his wish to provide some practically useful reading for village schools by writing the little pamphlet, "The Skipjack, or Wire-worm and the Slug," which, though published without his knowledge, may be looked upon as his first contribution to Economic Entomology. He contributed many papers on Entomology to various scientific societies and publications, both home and foreign, but his great work was done in the last ten years of his life, which he devoted to illustrating the study of insects in its natural and practical bearings. It was in 1868 that the charge of receiving and arranging a government collection of Economic Entomology was placed in his hands officially, and from the first he devoted himself unceasingly to the task of making this as perfect as possible. Himself an accomplished draughtsman, and a patient worker and compiler, with a great love for the subject, he spared no pains in his work, whether in availing himself of scientific co-operation or in shaping the aid placed at his service by those less

gifted than himself in the details of field observation, and of museum illustration by coloured drawings or fac-simile modelling. This collection is already a nucleus of a very valuable, popular and illustrated history of insect friends and insect foes, the practical value of which is already appreciated and bearing good fruit for public benefit. On this collection, of which one hundred and fifty cases are more or less complete, Mr. Murray was working up to his latest days, leaving a large collection of oak-galls and illustrative drawings still in progress of arrangement. To assist in the circulation of information a series of guides to the collection were projected. These were to take the form of popular hand books to Entomology, and were to be prepared by Mr. Murray and published under government supervision. Of the eight intended volumes only one has appeared; this treats of the Aptera or wingless species, and was noticed in the *Canadian Entomologist* for July, 1877. In the midst of his busy labours he was called away. We have lost in him a man of varied accomplishments, a thorough, pains-taking Entomologist and a good Botanist. Those who knew him best will deeply feel his loss; not only will they miss the gifted naturalist, they will also grieve for the sudden removal of a friend so kind and true-hearted.

MR. T. V. WOLLASTON, M.A., F.L.S.

This talented Entomologist died on the 4th of January last, at his home in Teignmouth, Devonshire, at the age of 56, from disease of the lungs, with which he had been more or less afflicted for thirty years past. In early life Mr. Wollaston became well known for his valued researches into the Coleoptera of the Madeiran, Canarian and Cape Verd Archipelagos, which he personally explored. His valuable writings on the Coleopterous fauna of these islands, and especially his account of the insects of the Madeira group are well known to Entomologists in the "*Insecta Maderiensa*," published in 1854. Subsequently he published catalogues of the Coleoptera collected by him in these several groups of islands. His volume on the variation of species, dedicated to Mr. Chas. Darwin, and published in 1856, is well-known. His shorter papers, chiefly relating to Coleoptera, embodying the results of original research, contributed to English and foreign scientific journals, range over a period of more than thirty years. In the autumn of 1875, feeling it desirable to seek a warmer climate, he visited St. Helena, where he devoted himself assiduously to the study of the Coleoptera inhabiting the island of which work we have the record in his "*Coleoptera Sanctæ Helenæ*," lately published. This was Mr. Wollaston's last contribution to Entomological science, and is characteristic of its author in the finished elegance as well as clearness of its style. He returned to his home in the early summer of 1877, and thenceforward devoted himself to the task of arranging the valuable mass of information he had accumulated during his absence, and of which he leaves us the record in the work just referred to. He was a man of highly refined and accomplished mind, as well as of great scientific attainments, and will be much missed from the ranks of our leading naturalists, as well as by those whose progress he aided by his encouragement and counsel.

RECENT ENTOMOLOGICAL WORKS,

The following notices refer to some of the most valuable publications on Entomological and kindred subjects, which have appeared during the past year:—

Manual of the Apiary, by Prof. A. J. Cook, Lansing, Mich. Octavo pp. 286, with 110 illustrations; published by Thos. G. Newman & Son, Chicago.

We are indebted to our esteemed friend Cook for a copy of the second edition of this excellent work on Bee-culture, treating of the art in all its different branches in a clear, concise and interesting manner, showing throughout the author's thorough knowledge of the subject on which he writes. The work is divided into two parts, the first of which treats of the natural history of the honey-bee, the second on the Apiary, its care and management. It is well got up, and the illustrations are very good; we feel a pleasure in recommending it to all those interested in bee-culture. The fact that the first edition of 3,000 copies issued less than two years ago is exhausted, shows that the public have appreciated the author's efforts.

Entomological Contributions, No. iv., by J. A. Lintner.

We tender our sincere thanks to the author for an early copy of this fourth part of his admirable work, which appears in form similar to the previous issues, and occupies 144 pages.

It opens with a chapter on *Mermis acuminata*, a parasite on the larva of *Carpocapsa pomonella*; then an admirable account of the life history of the new Carpet Bug, *Anthrenus scrophulariæ*, with magnified illustrations of the insect in its several stages; following which are chapters on *Isosoma vitis*, the Lepidoptera of the Adirondack region of New York, Collections of Noctuidæ at Sugar at Schenectady, on some Lepidoptera common to the United States and Patagonia, on *Lycæna neglecta*, new species of Californian Butterflies, on some species of *Nisoniades*; descriptions of new species of *Cerura*, *Xylina*, *Hypocala*, *Acidalia*, *Cidaria*, besides a number of valuable notes on Lepidoptera illustrative of their life history and habits and geographical distribution. Every subject is treated in the author's usual thorough and systematic manner, and the work forms a valuable addition to our constantly increasing Entomological literature.

On the Tongue (Lingua) of some Hymenoptera, by V. T. Chambers. From the Journal of the Cincinnati Society of Natural History, April, 1878—8vo. pp. 13.

This paper is very interesting and instructive, and is intended as a reply to the questions—What do bees eat? and How do they eat it? An illustration of a transverse section of a bee's tongue accompanies the text.

Manuscript Notes from My Journal: Cotton and the principal insects, &c., frequenting or injuring the plant in the United States, by Townsend Glover.

This excellent contribution to economic Entomology is published uniformly with the previous portions of "Manuscript Notes from My Journal," reviewed in earlier numbers of the *Can. Ent.*, that is, in quarto form, the text written and etched by the author, and afterwards printed from stone. The admirable plates, 22 in number, constitute in this instance the most considerable portion of the work and illustrate not only the insects which injure the cotton crop, but also certain forms of fungoid disease to which the plant is subject. A work so instructive and useful as this would be to those engaged in this important branch of Southern agriculture should be widely circulated. The small edition published has been got up at the author's own expense, who has distributed the copies with the most liberal hand, free of any charge, among the libraries of the various scientific societies in the country; they are not, however, accessible to the general public. The untiring industry of this talented Entomologist is a marvel to all those who know of his work. It affords us great pleasure to find that he has so far recovered from his late severe illness as to enable him to resume those Entomological studies in which he has so long taken a prominent part.

Descriptions of Noctuidæ, chiefly from California, by A. R. Grote. Extracted from the Bulletin of the United States Geological and Geographical Survey; large 8vo., pp. 18, containing descriptions of thirty-three new species, chiefly of *Argrotis* and *Hadena*.

New Tineina from Texas, Food Plants of Tineina, and Index to the Described Tineina of the U. S. and Canada, by V. T. Chambers; also from the Bulletin of the U. S. Survey; large 8vo. pp. 88. In this pamphlet there are forty-two new species described. A catalogue of the food plants of the Tineina of America, as far as they are known, is given, followed by a very complete and useful index embracing all the described American species.

Antigeny, or Sexual Dimorphism in Butterflies, by Samuel H. Scudder, 8vo. pp. 8, from the Proceedings of the American Academy of Arts and Sciences, vol. x.

The Insects of the Tertiary Beds at Quesnel, British Columbia, by Samuel H. Scudder, 8vo. pp. 15. From the Report of Progress, 1875-76, Geological Survey of Canada, containing descriptions of twenty species of fossil insects.

Additions to the Insect Fauna of the Tertiary Beds at Quesnel, British Columbia, by Samuel H. Scudder. From the Report of Progress, 1876-77, Geological Survey of Canada, 8vo., pp. 8, containing description of six species of fossil insects.

Fossil Coleoptera from the Rocky Mountain Territories, by Samuel H. Scudder.

Extracted from Bulletin of the Geological and Geographical Survey of the territories, Vol. ii., No. 1, 8vo., pp. 10, in which are described thirty-one species of fossil Coleoptera.

Notice of the Butterflies collected by Dr. Edward Palmer in the arid regions of Southern Utah and Northern Arizona, during the summer of 1877, by Samuel H. Scudder. From the Bulletin of the Survey, Vol. iv., No. 1, 8vo. pp. 5, containing references to forty-one species. We are very greatly indebted to the author for kindly sending us copies of the above valuable papers.

ENTOMOLOGICAL INDEX TO AGRICULTURAL REPORTS.

We have lately received through the kindness of the author, Professor Townend Glover, a most valuable publication entitled "Manuscript Notes from my Journal," being an Entomological index to the names, &c., of insects occurring in the annual agricultural reports published by the Department of Agriculture at Washington from 1854 to the present time, with a list of the vegetable and animal substances injured or destroyed by them.

This work is published in quarto form, and uniform in style with the previous works of the same author on Diptera, Hemiptera and Orthoptera, noticed in the earlier volumes of this journal. The first 77 pages are occupied with an alphabetical list of the names of insects referred to in the various reports, with brief explanatory references. Following this we have a list of insects to a greater or less degree beneficial by destroying noxious insects, a paragraph on other agencies referred to as useful in the destruction of insects, concluding with a list occupying 21 pages, also alphabetically arranged, of vegetable and animal substances injured or destroyed by insects.

The compilation of this work has been attended with much labour, and furnishes another evidence of the untiring industry of the author. It will prove an invaluable help to all who desire to consult the pages of these reports for information on Entomological subjects, and it is much to be regretted that the edition is not sufficiently large to make it accessible to all who may be interested in Entomology.

NOTES OF THE YEAR.

BY WM. SAUNDERS, LONDON, ONT.

THE FOREST TENT CATERPILLAR (*Clisiocampa sylvatica*).

These troublesome caterpillars (see Fig. 5) have again been very abundant in the western section of our Province, and early in June when nearly full grown they fed

Fig. 5.



with such energy as to greatly damage the foliage of both fruit and forest trees, and became quite a terror to many. They travel with such rapidity from place to place that small trees entirely cleaned one day may be swarming with them the next, and where such trees have been newly planted and have made but small growth, a single day's neglect may result in the loss

of the entire foliage which would greatly jeopardize, if not entirely destroy the life of such specimens. There are many pains-taking cultivators of both fruit and ornamental trees who are attentive to their plantations and make it a point to visit them regularly and to destroy all the caterpillars they can find, but who are greatly perplexed and discouraged by the repeated and continued invasions they are subject to from the hosts of these hungry larvæ which swarm in the neglected orchards of careless neighbours and also among the forest trees in the woods. To meet such cases the following simple and inexpensive remedy is suggested—it has been tried and found to work admirably: Take a roll of cotton batting, open it out and cut into strips about three inches wide and tie one of these strips with a piece of twine tightly about the middle, to any part of the trunk of the tree so as to entirely encircle it. In attempting to cross this barrier the multitude of minute horny hooks which fringe the margins of the base of the thick fleshy feet of the caterpillar become so entangled among the fibres of the cotton that further progress is almost impracticable, and the hungry worm wishing to ascend will be found walking disconsolately around and around the tree looking in vain for some way over the difficult pass, as they have no means of getting into a tree other than that of crawling up it. When once the trees are cleaned, this simple remedy is most effectual in keeping them so, and its use will result in a great saving of time and labour.

When large trees are swarming with the caterpillars—a very common occurrence in plentiful seasons—such should be visited every morning and the larvæ which are then congregated in masses on the trunks destroyed, which may be readily done by the vigorous use of a common broom.

A large number of these larvæ were destroyed this season by parasitic insects, many also by birds and by an unusual disease which for a time seemed epidemic among them. The survivors spun their silky cocoons in every available spot; between the leaves of trees and shrubs, in the corners of fences, the crevices in the rough bark of trees and

Fig. 6.



other sheltered spots, and in a few days those which were free from parasites gave birth to the perfect moth, a female specimen of which is represented in Fig. 6 (after Riley), who speedily sets about accomplishing the end of her being by providing for a future generation. The well known egg cluster is shown at *a* (Fig. 6), the upper face of one of the eggs at *c* and the method of their arrangement at *d* in the same figure.

Some interesting observations have been made within the past year on these eggs including the discovery of a mite which devours many of them—these were communicated in a paper

published in the *Canadian Entomologist* for February, 1878, from which we quote the following :

Some time during the month of October last, we were informed by Mr. B. Gott, nurseryman of Arkona, Ont., that he had observed on cutting into clusters of the eggs of *Clisiocampa* that the larvæ were at that time fully formed, a fact he had discovered by the use of a magnifying lens. It was our intention to take an early opportunity of verifying this statement by examination of the eggs under higher powers of the microscope, but delayed doing so for want of time. During the latter part of November Mr. A. Puddicombe, one of the members of our Society here, a careful observer and good microscopist, independently made the same discovery by cutting into clusters of these eggs with a sharp knife. He submitted the results of his observations at a meeting of the London Branch of the Entomological Society, held early in December, when the eggs were opened and examined under the microscope. We found the interior of the eggs perfectly dry, with a pearly lustre, the larvæ fully developed and only waiting warmth before making their escape. When the upper end of the egg was removed, the larvæ would frequently push their heads out and move them actively about, occasionally crawling almost or entirely out of the shell. Examinations have thus since been frequently made with eggs both of *C. sylvatica* and *C. Americana*. In several instances where the egg clusters have been kept in a warm room for a week or two, the larvæ, mistaking the warmth for that of spring, have eaten their way out of the shells, and finding no food, have died. These details, we think, are sufficient to establish the interesting fact that the larvæ of both these species mature early in the fall and hibernate inside the egg, waiting the warmth of spring before eating their way out.

Recently we devoted an evening to the microscopic examination of these egg clusters, having previously collected a number of them for this purpose. In many instances it was found that the glutinous coating which covers the clusters was imperfect, that a piece here and there had disappeared, leaving the eggs bare, and in some cases patches of the exposed eggs were empty. To ascertain, if possible, the cause of this, some of such affected clusters were cut into, when they were found to be colonized by mites. The outside gummy matter is of a sufficiently porous texture to afford abundant shelter to these little friends, who had evidently eaten into the eggs and devoured the young larvæ, and had also consumed the missing portions of the gummy covering. In the range of a single section of an egg mass some eggs would be found uninhabited by the larvæ uninjured, while out of others would proceed several (in some cases as many as five) active little mites, who, when thus disturbed, would run in and out of their dwelling places, and keep up a peculiar drumming motion with their tiny antennæ. We found what were probably two different forms of the same species of mite, the one so small that four or five or more could find ample room and to spare within a single egg-shell, and these were very active and nearly transparent; the other much larger, of a pale red colour, with bright red eyes, sluggish in its movements and only one in each egg; indeed, one specimen nearly filled an egg. On the outside of some of the clusters were found some round pale red eggs, which we presumed were the eggs of these mites. From their structure the mites appeared to belong to the genus *Trombidium*.

We have submitted examples of these insects and egg clusters to Dr. H. Hagen, of Cambridge, Mass., and he has kindly and promptly examined them and confirmed the correctness of the views above advanced. Dr. Hagen says that he found the supposed mite eggs both empty and full of the small, active, white creatures, that these active specimens are doubtless the young of the larger red form, which latter is .04 inch long, and he is of opinion that it belongs to *Trombidium*. He further says: "In the whole European literature I have not been able to find anything about Acari eating eggs, so the fact seems new and is very important."

On almost every cluster we have examined we have found more or less of these mites, and if they are thus generally distributed over the whole district inhabited by the moths, they must prove a most efficient check to the undue multiplication of *Clisiocampa*. In No. 8 of our last volume we drew attention to the fact of the enormous abundance of the larvæ of *C. sylvatica* last year in many of the western portions of Ontario, and to the further fact that we had found a large number of the larvæ to be infested by parasites, both Dipterous and Hymenopterous. Notwithstanding this, large numbers matured and their egg clusters are numerous distributed over almost every forest and fruit tree. We have no evidence that

birds devour many of them, hence we warmly welcome this new found friend, who has doubtless been silently working in our interest for many years past. In 1868 the larva of *sylvatica* was almost as abundant as it was last summer, while in 1869 very few were to be found. By the light of these observations it is easy to see that these destructive insects may be decimated by one or two methods, or by both; in the first place, by the enormous increase of these mite enemies, or by the occurrence of a severe frost following a few warm days in spring, during which by the heat of the sun the larvæ have been incited to activity, and having left their snug winter quarters, have, while in a feeble and comparatively unprotected state, been destroyed by cold.

INSECTS AFFECTING THE VINES OF THE CUCUMBER, SQUASH AND MELON.

THE STRIPED CUCUMBER BEETLE (*Diabrotica vittata*.)

Probably during no season for many years past have the growers of the squash, melon and cucumber in the western part of the Province been so pestered with destructive insects as during the past year. The little striped cucumber beetle, fig. 7, seems to have been everywhere common and in many localities most destructive. This beetle feeds on the tender leaves of the young plants and damages the buds and young shoots of later growth, while its larva attacks the stems of the vines boring into them, and thus destroying the plants. It makes its appearance very early in the season as soon as the young plants appear, and sometimes it even penetrates the earth in search of the growing seeds. It is about a quarter of an inch long, of a bright yellow colour, with a black head and stripes of black on the wing covers, the underside of the abdomen and feet also are black. A few days later the female deposits her eggs near the roots of the vines which, in due course, hatch into tiny whitish worms, which burrow in the stems until full grown, when they are about one-third of an inch long and as thick as a good sized pin. Fig. 8 shows this larva magnified—1 showing the back, 2 a side view, the shorter lines to the left indicate the natural size. They attain maturity in about a month when they leave the plant and descend into the earth and form little cavities where they transform to chrysalids. They are less than a fifth of an inch in length, of a whitish colour; the extremity of the abdomen ending in two rather long spines. In fig. 9 is shown a front and back view of the pupa enlarged. In the course of a fortnight the perfect beetle matures when it escapes from a state of inactivity to continue its work of destruction. There are usually not less than three broods in each year, the fall brood wintering in the chrysalis state.



Fig. 7.

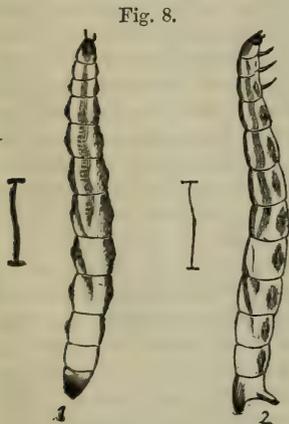


Fig. 8.

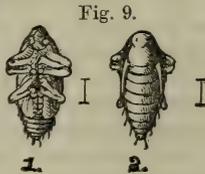


Fig. 9.

As a remedy, Paris-green has been recommended, mixed with flour, and sprinkled on the vines. A strong decoction of Smartweed is also spoken highly of by some, but the surest method of protection is to cover the vines while young with small wooden frames, covered with gauze on the top. This can be very cheaply done, and will entirely remedy the evil.

THE SQUASH BUG (*Coreis tristis*).

This insect, fig. 10, has also been very abundant and proved a serious loss to many market-gardeners by its enormous increase, and the destructive effects of the presence of so many of its young on the vines of the squash and melon.

Fig. 10.



During the winter these bugs, full grown, remain in a torpid state, secluded in nooks and crevices, from whence they issue during the first warm days of spring. As soon as the vines of the squash have put forth a few leaves, the female bug begins to lay her eggs, which she does chiefly at night, depositing them in little patches on the underside; the eggs being glued to the surface. There, in a few days, they hatch into young bugs, which at once begin to suck the sap from the leaves by means of their proboscis, which is thrust into the leaf for this purpose. The young are short and plump, of a pale ash colour, and emit the same disagreeable odour as that which characterizes the parent. During their growth they shed their skins several times, gradually developing wings and retaining their activity throughout until they attain to the perfect winged state. At first they live together in little swarms on the underside of the leaves, which in consequence of the numerous punctures of the insects, and the quantity of sap imbibed by them, soon wither and appear as if scorched by fire. When the leaves have been exhausted in this way, they are deserted for fresh ones, and thus the work of destruction goes rapidly on.

The eggs are not all laid at one time, but like the Colorado potato beetle, the eggs and young may be found in their various stages of development throughout the summer.

The perfect bug measures six-tenths of an inch in length, is of a blackish colour above, and a dirty ochre-yellow beneath, while the sharp lateral edges of the abdomen which project beyond the closed wing covers are spotted with ochre-yellow. The thin overlapping portion of the wing cover is black, the wings transparent, but dusky at their tips.

To prevent the ravages of these insects they should be sought for early in the season and destroyed before they have an opportunity of laying their eggs. To this end they may be looked for about the last of June or beginning of July, when the dusky creatures may be found under the leaves on the ground, or on the stems of the vines close to the ground. If eggs have been laid they should be sought out and crushed. A short time spent in this way early in the season will save much disappointment afterwards.

THE OYSTER-SHELL BARK LOUSE OF THE APPLE-TREE (*Aspidiotus conchiformis*).

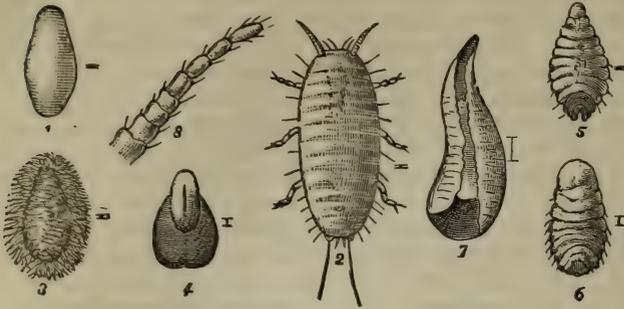
Fig. 11.



The spread of this insect which is represented in figure 11, seems to depend very much on the nature of its surroundings. If it finds its way into an orchard where the soil is damp and the drainage imperfect, and the roots of the trees consequently unhealthy, the stunted and weakened growth which naturally results, is very favourable to the spread of this pest, and in such locations it is not uncommon to see branches of trees almost entirely covered with them, while other trees on adjacent higher ground will be almost or quite free from their attacks. Within the last two or three years we have several times found them attacking the branches of pear-trees, but in these instances their increase seems limited, and they do not thrive as on the apple. In Prof. Riley's fifth Annual Report, he states that they attack the currant, plum, pear, cherry and apricot. On the twigs of the apple, when allowed unmolested possession, they multiply in amazing numbers, and notwithstanding their extreme minuteness individually, yet by their constant and combined efforts in sucking the juices of the tree, they induce such a diseased state of the branches as is very discouraging to witness.

The name "Oyster-shell Bark Louse," has in this instance been suggested by the form of the scale which closely resembles that of an elongated oyster-shell. In colour it is ashen gray, much like the bark to which it is attached. This scale is formed by the mother-insect from exudations from her body during the summer, and about the end of August or beginning of September there will be found a quantity of very minute eggs beneath each scale. Having completed her work, the parent dies, but the eggs remain under the scale all through the winter until the following spring. Early in June, but sometimes, if the season is backward, a little later, the eggs hatch and produce

Fig. 12.



a number of very small plant lice (fig. 12),—2, which during the first hot day following, leave the enclosure they have so long occupied and scatter over the branches of the tree, attaching themselves by preference to the succulent terminal twigs. For a few days they retain the power of moving about, but after they once attach themselves to any one spot and begin to suck the sap there, they never move again,

but remain as stationary as if they were a part of the twig itself. After a time each one becomes covered with a white waxy secretion, that issues from the body in the form of very fine threads (3) and which gradually results in the formation of a scale, such as is shown in the figure.

REMEDIES.—As the scale is tough and not easily penetrated, it is evident that the insect is most easily destroyed during the short time that intervenes between the escape of the young insect and the formation of the new scale. At that period, a strong solution of soap in lye applied to the branches with a brush is very effectual. During the winter and early spring months, much good may be effected by scraping the infested limbs, and thus detaching the scales, after which paint the parts with a mixture made by boiling tobacco leaves in strong lye and afterwards thickening it with soft soap to the consistence of paint. A coating of linseed oil has also been recommended. Several insects prey on these lice, a very small fly, a species of *chalcis*, feeds in the larval state on the eggs; mites also destroy them.

THE MAPLE TREE BORER (*Clytus Speciosus*.)

Fig. 13.



This destructive insect (see fig. 13), briefly referred to by Mr Bethune in our last Report, is increasing rapidly, and in many places proving very destructive to our sugar-maple trees, particularly to such as are planted along our streets. Preventive measures should be resorted to very generally, and we would strongly recommend the practice of painting the bark of the trees late in June or early in July with soft soap, reduced with strong lye to the consistence of cream. If this application is made on a warm day it soon dries and is then not easily removed by rain. An alkaline coating of this sort is extremely objectionable to the insect, who will usually, when selecting trees on which to deposit her eggs, carefully avoid placing her progeny in the way of such pernicious compounds, and even if she should err in this respect, the probabilities are that the newly hatched larva would perish in the effort to eat through the bark thus coated.

In our Report for 1872 there is an excellent article on this insect, from which, for the benefit of such as may not have access to that document, we condense the following relating to the life history of this troublesome pest. The beetles may generally be seen reposing quietly on the trunks of the trees during the day time. They are more active at night, which period they select for their excursions in search of their mates. The beetle lays its eggs upon the trunk of the maple in the months of July and August.

The larvæ hatched from these eggs are long, whitish, fleshy grubs, with deeply marked transverse incisions on the body. Their legs, which are six in number, are only rudimentary, and are of no service in locomotion; it is by means of the alternate contraction and extension of the rings or segments of the body that these little creatures force their way through the wooden tunnels in which they live, and in order to further assist their progress, each segment is furnished with fleshy tubercles capable of protrusion, and which, being pressed against the sides of their retreats, enable them to thrust forward by

degrees the other segments. As the grub has to feed upon very hard material, it is provided with strong horny jaws, and the head which is slightly bent downwards, is also covered with a strong horny skin. The grubs penetrate the bark, under which they lie dormant during the winter, and in the succeeding spring and summer they pierce further in, running long, winding galleries up and down the trunk. The larvæ probably remain more than one year in this condition, and then change into pupæ, in which state they are at first, whitish and very soft, but gradually harden and darken, until the time arrives when the beetle is perfectly matured, and forcing a passage through the outer bark, near which it has instinctively eaten its way whilst yet a grub, emerges into the open air.

Their attacks can easily be detected by the sawdust and exuvæ that they cast out of their burrows, and in the spring, whilst still near the surface, it is quite possible to kill them by means of a stout piece of wire, or the judicious use of a good sharp knife.

THE NEW CARPET BUG (*Anthenus scrophulariæ*).

As this new pest, but lately introduced from Europe, is very probably in our midst, carrying quietly on its destructive work, we have thought it desirable to present our readers with as full details of its history and methods of working as possible, so that it may be recognized wherever it appears. Since we have had no opportunity of personal investigation in this instance, the following has been condensed from an excellent report on the insect by Prof. J. A. Lintner, of Albany, N. Y., in the fourth part of his entomological contributions.

During the summer of 1874 notices appeared in various newspapers of the ravages of a carpet bug, quite different in its appearance and in the character of its depredations from the well-known carpet moth, *Tinca tapetzella*. It was said to be found beneath the borders of carpets where nailed to the floor, eating in those portions numerous holes of an inch or more in diameter. Occasionally it located itself in the crevices left by the joinings of the floor, following which entire breadths of carpet would be cut across as by scissors. In several instances carpets had been destroyed, new ones as readily as older. The insect was described as a small ovate object, about one-eighth of an inch in length, thickly clothed with numerous short bristle-like hairs, and terminating in a pencil of these, forming a tail. It was exceedingly active in its motions and when disturbed in its concealment would glide away beneath the bare boards or some other convenient crevice so quickly as in most instances to elude capture. They were found only during the summer months.

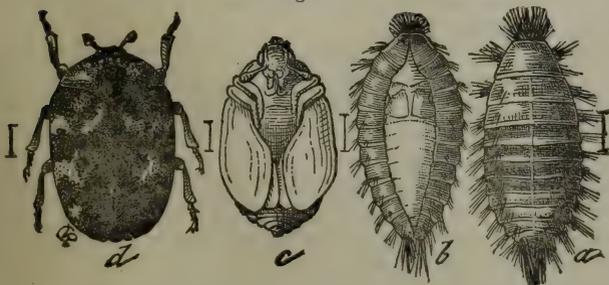
In July, 1876, Prof. Lintner secured a number of the larvæ taken under the carpets of his own residence, in Schenectady, where their presence had not been suspected until search was made; they were fed upon pieces of carpet in order to rear them. In September they had evidently matured, and had assumed their quiescent pupal state within the skin of the larva, first rent by a split along the back for the escape of the perfect insect. In October the first perfect beetles emerged, when, being new to Mr. Lintner, they were sent to Dr. Le Conte, the distinguished Coleopterist, of Philadelphia, for determination. He returned answer that they were the *Anthenus scrophulariæ*—a species well known in Europe for its destructiveness, but now for the first time detected in this country.

The accompanying figure 14, kindly furnished by Prof. Lintner, was drawn by Prof. Riley, and represents this insect in three of its stages, viz.:—*a*, the larva; *c*, the pupa; and

d, the imago or beetle. At *b* the skin of the larva, after the beetle has emerged from the fissure on the back, is shown. The figures are enlarged, the lines beside them representing the natural size.

The larva—the form in which it is usually found when pursuing its ravages beneath the carpets—measures at maturity about three sixteenths of an inch in length. A number of hairs radiate from its last segment in nearly a semi-circle, but are more thickly clustered in line with the body, forming a tail-like projection almost

Fig. 14.



circle, but are more thickly clustered in line with the body, forming a tail-like projection almost

as long as the body. This terminal pencil of hairs is not shown in its full extent in the figure, doubtless taken from an immature individual. The entire length of the insect, including the pencil of hairs, is, in the largest specimens, nearly three-eighths of an inch. Measured across the body and the lateral hairs, its breadth just equals the length of the body. An ordinary magnifier will show the front part of the body, where no distinct head is to be seen, thickly set with short brown hairs, and a few longer ones. Similar short hairs clothe the body, somewhat longer on the sides, where they tend to form small tufts. Towards the hinder end may be seen on each side three longer tufts (thrice as long) projecting laterally, but these are not always visible, as the insect, by the aid of a peculiar muscular arrangement, has the power of folding them out of sight along its sides. The body has the appearance of being banded in two shades of brown, the darker band being the central portion of each ring, and the lighter the connecting portion of the rings known as the incisure. By turning it upon its back the six little legs, of which it makes such good use, can be seen, in vigorous efforts to regain its former position—its struggles while in this condition sometimes producing a series of jumps of about an eighth of an inch in length.

Having attained its full growth, it prepares for its pupal change without the construction of a cocoon or any other provision than merely seeking some convenient retreat. Here it remains in a quiet state, unaltered in external appearance, except somewhat contracted in length, until it has nearly completed its pupation, when the skin is rent along its back, and through the fissure the pupa is seen. A few weeks having passed, the pupal skin in its turn is split dorsally, and the brightly-coloured wing-covers of the beetle are disclosed. Still a few additional days of repose are required for its full development, when the now fully matured beetle crawls from its protective coverings of pupal case and larval skin, and appears in its perfect form.

The earliest beetles emerge in the month of October, and continue to make their appearance during the fall, winter and spring months. Soon after their appearance probably, they pair, and the females deposit their eggs for another brood of the carpet-eating larvæ.

The beetle is quite small—smaller than would be expected from the size of the larva—being only about one eighth of an inch long and one-twelfth broad. Its form is almost a perfect ellipse as seen from above; its back and under surface are quite rounded. When turned upon its back, it often for a few minutes counterfeits death, with its legs so closely folded to the surface as scarcely to be seen, and in this state the ordinary observer, might be at a loss to distinguish the lower from the upper side.

It is a beautifully marked little insect in its contrasting colours of white, black and scarlet, arranged as follows: the edge of each wing-cover where they meet on the back is bordered with red (forming a central red line), with three red projections from it outwardly, one on the middle of the back, and toward each end. Take a straight line and divide in four equal parts by three cross-lines, and we have nearly the position of these projections. At the extreme tip of the wing-covers is a widening of the bordering line, making almost a fourth projection from it. The first projection, near the head, is connected with a white spot, running upwardly on the middle of the front border of the wing-cover. On the outer border of the wing-covers are three white spots nearly opposite the red projections. The intermediate spaces are black. The segments of the body beneath are covered with pale red scales and the thoracic region with whitish scales.

It does not confine itself wholly to carpets, but it also infests and injures various articles of wearing apparel, hanging in closets or laid away in drawers. It will also destroy furs, leather and natural history objects.

A convenient place in which to discover the beetle is upon the windows of the infested rooms during the day, and they are found in the greatest abundance during the month of May. Should investigation show that the beetle is drawn to the windows before the deposition of its eggs, their ready capture and destruction at this time will offer an easy method of preventing their increase.

Should this insect become generally common, it is difficult to conceive how, under such a visitation the comfort of carpets can still be indulged in within our homes. Even now when it has barely commenced its ravages, it is reported as having inflicted very serious pecuniary losses in several instances, where carpets have been entirely ruined, and such terror has its presence imparted, that not a few prudent housekeepers have already abandoned the customary nailing of their carpets to the floor, that frequent examinations

may be made during the summer months for the discovery and destruction of the unwelcome guest.

It will unquestionably prove an exceedingly difficult pest to dislodge. The ordinary applications of camphor, pepper, tobacco, turpentine, carbolic acid, &c., are powerless against it. An effectual means of destruction, and preventive of new invasions is yet to be discovered. The free use of benzine has been recommended to saturate cotton with it, and fill the joinings of the floors and crevices beneath the base boards. This is to be done during the winter months, at which time the insect will be occupying these retreats, either in its perfect beetle form, or as eggs deposited for another brood. To either of these the direct application of benzine would be fatal, but on account of its extreme inflammability it would require to be used with great caution. Kerosene oil used in a similar manner would doubtless be equally efficient.

From the serious nature of its depredations, the secrecy with which it conducts them and the extreme difficulty with any known appliance of eradicating it—it becomes very important that it should from the outset be combatted by every means which may give promise of success.

BENEFICIAL INSECTS.

BY JOSEPH WILLIAMS, MONTREAL, QUEBEC.

THE LACEWING FLY—*Chrysopa*.

This beautiful insect belongs to the order Neuroptera, of which other well-known and representative members are the Dragon flies and the Ephemerids or May flies.

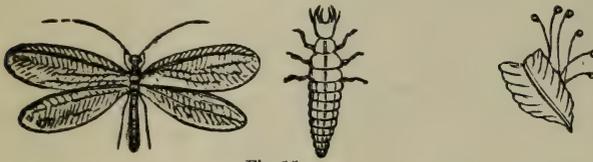


Fig. 15.

The accompanying figure gives a good idea of the form of this fly, as well as that of the eggs and larva.

The wings of the adult fly are large and broad, and pressed against the sides of the body when at rest; the antennæ are

long, delicate, and many-jointed; and the head is small, with two very prominent and rounded eyes. Although the form may be accurately given, it is impossible, in an engraving, to do justice to the wonderful and delicate beauty of the insect, about which is not one particle either black or white. Its body, head and thorax are leaf green, and its wings are wide, thin, gauzy, and glossed with changing hues of green and pink, according to the angle at which the light falls on them.

The Rev. J. G. Wood, in his "Insects at Home," gives an excellent description of an English *Chrysopa*, which is so nearly identical with ours, that we may use his graphic words in this connection.

"The chief beauty of the insect lies, however, in its eyes, which, without the aid of a magnifying glass, look like two tiny beads of burnished gold, and have earned for the insect the popular name of the 'Golden Eye,' of which the Greek word *Chrysopa* is but a translation. But if the insect be placed under the microscope, and a brilliant light be directed on the eyes, a wonderful change takes place. They are very convex in form, and the hexagonal facets are marked with extreme boldness, considering the small size of the organ. They are so clearly defined, indeed, that even with a common pocket magnifier of low power they can be easily distinguished.

"Were the eye to be simple brown or even black it would be a beautiful object, in consequence of these hexagonal lenses, but over the whole surface of the compound eye plays a brilliant combination of colour. Every separate hexagon looks like a framework of burnished gold, changing with the shifting light into various hues of rich green and carmine. In fact the whole eye looks very much like a hemispherical brooch, entirely covered with emeralds and rubies.

"It is rather hard on the insect to expose it to this strong light, which is needed to bring out its beauties, for it is a lover of darkness, and only comes out after sunset, when it may be observed fluttering with apparently aimless flight in the air. But it is impossible to see the full splendour of this magnificent object without exposing the insect to some inconvenience. A dead specimen is useless, for the colour departs alike from the body and the eye. As to the pale green of the body, it is the most fugitive colour that an insect can possess, while the more gorgeous hues of the eye vanish soon after the life departs, and very little is left of their once magnificent beauty. Would that some method could be discovered of preserving the two fugitive tints of this lovely insect. There is a specimen now before me which has only been dead some forty-eight hours, and already the tender

green of its body is fading, and the fiery splendour of its eyes is quenched. Lovely as is the insect to the eye, it can offend another sense most grievously, for it possesses a peculiarly evil odour, which attaches itself strongly to the finger that crushes it, and cannot be removed without many washings.

“The Lacewing fly is allied to the Ant-lions, of which we have no genuine representative in England. When in the larval state it is very predaceous, as is betokened by its large and curved mandibles. It feeds mostly on Aphides, of which it devours vast numbers, draining them of their juices, and then covering itself with the emptied bodies of its victims, so as to render itself scarcely distinguishable from the lichens among which it mostly lives. The neck of the larva is very flexible so that it can dart its head in any direction in order to seize its prey. It can eat two large aphides in one minute, and is so voracious that if two Lacewing larvæ meet each other they are sure to fight, and the conqueror is equally sure to eat the vanquished combatant. These larvæ are quick in their growth, and do not require much more than a fortnight before they pass into the pupal state, provided only that they can find an abundant supply of aphides on which to feed. When full fed, the larva spins a cocoon, in which it passes into the pupal and perfect stages. Like the Ant-lion, to which it is allied, it packs itself up in a wonderfully small compass, for the cocoon is only as large as a sweet pea, and very much in the same shape.

“The eggs of the Lacewing fly are quite as remarkable as the cocoon. They are generally deposited on leaves, but instead of being laid directly on the leaf, every egg is fastened to the end of a slender foot stalk about half an inch in length. The footstalk is formed from a viscous matter secreted by the female, and is delicately white and translucent. Mr. G. A. Butier, of the British Museum, told me that he has kept Lacewing flies, and often seen them lay their eggs. The end of the abdomen is first pressed against the leaf, and a tiny drop of the viscous matter deposited. The abdomen is then raised quickly, so as to draw out a thread, which becomes stiff and hard almost as soon as it comes in contact with the air. Then the insect pauses a little, and rapidly places an egg on the end of the thread, fixing it there with another tiny drop of the secretion. The eggs are always laid in groups. Some specimens in my own collection are laid along a lilac twig, and in all of them the remains of the viscous drops are apparent in the form of a partly conical footstalk, much resembling in shape and translucency the foot and stem of a wine-glass. The eggs themselves are pure white, and, when viewed through a microscope, have something of a papery aspect. They bear a curious resemblance to the capsules of certain mosses, and indeed have been described and figured in books as specimens of British moss.”

The eggs of our Canadian Lacewing fly differ in colour from those mentioned in the foregoing description; they are of a pale green colour when newly deposited, but before hatching they become whitish, and each shows two or three faint dusky transverse bands. The larva leaves the egg in about a week from the time it is deposited, through an opening which it gnaws in the summit, and the shell remains empty, supported on its stalk, somewhat shrivelled, and of a white colour.

It is the larva of the Lacewing fly which renders such valuable service as to entitle it to a foremost place among our insect friends. This larva feeds on the aphides or plant-lice, which are so abundant on our fruit and forest trees, as well as on lesser plants.

In the Report of this Society for 1877 will be found an excellent article on these aphides or plant-lice, by W. Saunders, from which we learn “that in the case of the grain aphid, the wingless females become mothers when three days old, and thereafter produce four little ones every day, so that even in the short space of twenty days, the progeny of one specimen, if all were preserved from destruction, would number upwards of two millions.” It is very evident, that were these creatures permitted to increase and multiply at their natural rate without material check, ere a few months had elapsed, every green thing on the face of the earth would be so covered with them as to cause general destruction. Now, one of the most effective enemies of these lice is the larva under consideration. Mr. Saunders says:—“the young larva begins at once to seek its food, and if it finds itself in the midst of a colony of plant lice, many of these speedily fall victims to its enormous appetite, but if not so favourably situated, a vigorous search is generally rewarded by the finding of a cluster of insects’ eggs, or some newly hatched caterpillars, either of which will furnish our young traveller with a dainty meal. The larvæ of the different species vary somewhat in colour and ornamentation, but in most instances the ground colour is of a dull reddish brown, and there are

whitish markings along the sides, and a dark central stripe. They all have long, narrow bodies, and are furnished with six rather long legs, and two long and slender, but powerful jaws, curved like a sickle, and down each side of the body is a row of tubercles, each tubercle being tipped with a cluster of spreading hairs or spines. Dr. Fitch mentions a novel use to which these hairs are put. He says that these voracious creatures often conceal themselves from view by placing the empty skins of the victims they have devoured, between their radiating bristles so that they adhere, and thus completely hide the insect from view. It is the skins of the woolly plant lice that they mostly employ for this purpose, and thus covered they resemble a little mass of white down adhering to the bark of the tree, presenting just such an appearance as does a little colony of woolly plant lice. By this device they are enabled to approach their victims without exciting their alarm, and to quietly devour them one by one."

The larva of one of the Lacewing flies is also an enemy of another pest of all orchards—the Curculio. In the "American Entomologist," vol. i., we find it stated that the larva of a *Chrysopa* was found inside a peach which had been badly bored by a Curculio, and the larva of the *Chrysopa* was actually preying on that of the Curculio, one half of which it had already sucked dry. The observer who reported this case states that he has since found over a hundred of these Lacewing larvæ engaged in the same good work.

In the autumn of 1846, Dr. Shimer observed the larvæ of a common species of Lacewing fly (*Chrysopa plorabunda*, Fitch) feeding voraciously on Chinch Bugs, which had swarmed over a field of fodder-corn, and were rapidly destroying it. The Lacewing flies were so abundant that this observer states that there were one or more of them for every stalk of the thickly sown corn, and every stroke of the cutter would raise three or four dozen of them, presenting quite an interesting spectacle as they staggered along in their awkward, unsteady flight. Dr. Shimer reared great numbers of the larvæ to the mature state by feeding them on Chinch Bugs, and his account of the operations of the larvæ when in captivity is so interesting we give it in full, from Dr. Shimer's Paper in *Proc. Ent. Soc. Phil.*, IV., pp. 209, 210.

"I placed one of the larvæ in a vial after having captured it in the field in the very act of devouring Chinch Bugs of all sizes, and subsequently introduced into the vial a number of Chinch Bugs. They had hardly reached the bottom before it seized one of the largest ones, pierced it with its long jaws, held it almost motionless for about a minute while it was sucking the juices from the body of its victim, and then threw down the lifeless shell. In this way I saw it destroy in quick succession about a dozen bugs. Towards the last, as its appetite was becoming satiated, it spent five or more minutes sucking the juices from the body of one bug. After this bountiful repast it remained motionless for an hour or more, as if asleep. Never for a single moment during the feast did it pause in the work. When not in possession of a bug it was on the search for, or in pursuit of, others. It manifested much eagerness in the pursuit of its prey, yet not with a lion-like boldness, for on several occasions I observed a manifest timorousness, a halting in the attack, as if conscious of danger in its hunting expeditions, although there was none. Sometimes, when two or more bugs were approaching rapidly, it would shrink back from the attack, and, turning aside, go in pursuit of others. At length, awakening, it would renew the assault as before. On one occasion, when it was on the side of the vial, two inches up, with a large bug in its mouth, I jarred the vial, so that it fell to the bottom and rolled over and over, but, holding on to its prey, it regained its footing and mounted up to its former position. Occasionally the Chinch Bugs would hasten to escape when pursued, as if in some degree conscious of danger."

Here we may insert the opinion of Dr. Le Baron, State Entomologist for Illinois, U. S., in his second Annual Report, which is that it is only occasionally that the Lacewings are seen where Chinch Bugs abound, and they are nowhere numerous enough to make any perceptible impression on their multitudinous host.

The larvæ of the Apple Leaf Skeletonizer (*Pempelia Hammondi*, Riley), is also preyed upon by the larvæ of some Lacewing fly, and its round, white cocoon may often be found among the skeletonized leaves. (Riley's Fourth Annual Report for State Missouri, p. 45.)

These benefits are not all to be ascribed to the larvæ of one Lacewing fly, for there are several species (*Chrysopa oculata*, Say; *C. plorabunda*, Fitch; *C. rufilabris*, Burm., &c.)

which are concerned, but they are so much alike that it requires an experienced entomologist to distinguish them.

TIGER BEETLES.

Order, *Coleoptera* ; Family, *Cicindelidæ*.

Among the many common insects to be observed on a warm sunny day, none are more noticeable than our friends, the Tiger Beetles, both from their brilliant colouring and their rapid flight. These two characters are likely to induce the observer to attempt to capture them, but this is not always an easy matter, for these insects are very rapid in their movements, and, although they cannot fly long distances without frequently alighting, yet they manage by craft to escape their pursuer unless he has considerable patience. It is noticed that when one of these insects alights from a short flight, he does so with his head to his pursuer, whom he is careful always to keep in sight. They are most easily taken by a small net.

The Tiger Beetles frequent sandy banks and roads or other spots which are fully exposed to the light and warmth of the sun and free from vegetation. They delight in the full glare of the sun, but in cloudy weather disappear, to reappear with the sunshine. The *Cicindelas* have received the common name of Tiger Beetles on account of their ravages amongst other insects, pursuing and destroying incessantly all weaker creatures they encounter. But it is this very character which renders them worthy to be classed among our insect friends, as we shall see when we come to speak of their life.

We insert here life size illustrations of some of our Canadian species:—*Cicindela vulgaris*, Say ; *C. purpurea*, Riv. ; *C. hirticollis*, Say ; *C. sex-guttata*, Fabr. ; *C. generosa*, Dej.



Fig. 16.



Fig. 17.



Fig. 18.



Fig. 19.



Fig. 20.

Cicindela vulgaris, Say (fig. 16), our most common species, is of a dull purplish colour above, and a beautiful bright brassy green underneath. On each of the elytra, or wing-covers, are three whitish irregular stripes. It is a little over half an inch in length and about a quarter of an inch in breadth, and has very long curved jaws of great power, and long slender legs.

C. purpurea, Riv., or the purple Tiger Beetle, is nearly as large as the preceding, and has markings as in fig. 17 ; its general colour is a beautiful metallic purple.

C. hirticollis, Say (fig. 18), is commonly called the hairy-necked Tiger Beetle, owing to the presence of a number of whitish hairs along the side of the middle segments of the body. It is a little smaller than *C. vulgaris*.

C. sex-guttata, Fabr. (fig. 19), is one of the most handsome of this family, its general colour being a very brilliant metallic green, and having six tiny white spots on its wing-covers.

C. generosa, Dej. (fig. 20), is a large and handsome species, occasionally found in Ontario, especially among the sand banks along the shores of Lake Huron.

In the life of a Tiger Beetle there are four stages:—The egg, the grub or larva, the pupa or chrysalis, and the imago or perfect insect ; therefore it is said to undergo complete metamorphosis, in contra-distinction to some other insects which have not the same number of stages in their existence, and are consequently said to undergo incomplete metamorphosis.

The egg is deposited by the female in some favourable spot in the ground, where the larva, when born, will be able to secure food. The egg is hatched, and the larva comes forth a truly hideous-looking grub. (Fig. 21.) Compared with the rest of his body, his head is enormous, of a brownish colour, horny, and surmounted by two tremendous, curved jaws. This creature has three pairs of legs, and on the ninth segment or ring of its body are two large tubercles, each terminating in a pair of recurved hooks, and of a yellowish white colour. The larva is very voracious, and devours great numbers of insects, which it entraps in a very artful manner. It digs a hole in diameter about as large as a lead pencil, and said to be a foot or more in depth. To do this it hoists itself round, loads its broad head with as much dirt as it can carry, and deposits it around the mouth of the hole, forming a species of pit-fall, which sets itself in motion the moment anything endeavours to pass it. The grub clambers up near the top of this hole by means of the spines on his back together with his legs, and lies in wait for its victims. As soon as an unsuspecting insect ventures within reach, it is suddenly seized in the powerful jaws of our larva and carried underground, there to be devoured at leisure. It is difficult to watch these proceedings, because these creatures are very mistrustful, and retire into their holes when alarmed. When the time arrives for the next step in its metamorphosis, the larva enlarges the bottom of the hole, stops up the entrance with earth, and awaits the change. It remains in the pupa state underground all winter, and emerges in the spring as the imago or perfect insect.

In this last or adult state, this insect is as ferocious as was the larva. It lives by continual warfare, subsisting on the bodies of weaker insects, of which it destroys great numbers. Their remarkable activity in running and their powerful jaws enable them to secure abundance of food, and thus they rid man of many insects which are, no doubt, very injurious to him, and as they are not known to injure anything that is of any advantage to us in any way, we feel no hesitation in including them among our Insect Friends, and bespeak for them the consideration of those disposed to kill them. Their bite is inoffensive, and not painful.

CARNIVOROUS GROUND BEETLES.

Order, *Coleptera* ; Family, *Carabidæ*.

The members of this family are not so nearly alike in appearances and habits as are those in the *Cicindela* family, therefore we will describe the characters of a few of the more common in detail, and mention their claims to the care and protection of all interested in the various branches of agriculture.

One of the most common species of this large family is *Calosoma calidum*, Fabr. (Fig.



Fig. 22.

22), which is commonly called the Fierly Ground Beetle, or the glowing *Calosoma*, owing to the presence on its wing-covers of six rows of spots of a glistening coppery colour. This beetle is very common in Canada, especially in the spring—May and June—when it may be found in the moist soil under stones and logs, which it prefers to hot and dry places. Its general colour is shining black, relieved by the six rows of copper coloured spots previously mentioned ; it has three pairs of long and strong legs ; and its eyes are large and very prominent, and enable the beetle to see its prey at a long distance. Its jaws are large and powerful.

This *calosoma* is a relentless enemy of other insects in two of its stages, for we find that both in its grub or larval state, as well as in its perfected state, it destroys great numbers of insect pests. The larva is, when full grown, a fat grub, slightly longer than the perfect insect, tapers gradually from the middle to each extremity, and is armed behind with two curved spines.

From Mr. Riley's First Report (Noxious, Beneficial and other Insects of the State of Missouri.) we learn that "this larva has very appropriately been called the cut-worm lion by

Dr. Shimer, of Mt. Carroll, Illinois, who gives the following account of its mode of transformation to the perfect beetle: 'The fat full grown larva of *Calosoma calidum* chooses a hard piece of ground, as a waggon road in the field, where it bores into to pass the pupa state. I have seen them many hours in boring a few inches. These fierce insects often wage terrible battles when they encounter each other, and they will eat each other as readily as cut-worms, as I found whenever I put more than one of them into my collecting box. He that would breed these insects to the perfect state must pack the dirt in his breeding box as hard as a waggon road, or he will fail, as I always did before I saw their operations in the field. In using moderately compact earth, the larva digs it over and over, endeavouring to find a suitably dense place, works up the dirt into balls, until its feet are clogged up with earth and juices from its mouth, and it sinks exhausted and dies. In a few days after it enters the grounds, the beautiful spotted, perfect beetle appears, and, strangely, the smell of the beetle is peculiar, and entirely different from the larva.' This cut-worm lion has quite a formidable appearance and is exceedingly agile. It is flattened, of a black colour, with six legs upon the breast, and a pair of sharp hook-like jaws projecting in front of its head. It pursues the worms in their retreats under the ground, and seizes them wherever it comes in contact with them. Sometimes a young cut-worm lion will seize a worm twice as large as itself, and will cling with a bulldog tenacity to its prey, through all its throes, its writhings and twistings, till at last the worm succumbs, exhausted, and the victor bites two or three holes in its skin and proceeds to suck out its juices."

Riley considers this larva the most efficient insect destroyer of cut-worms that is known, and when we consider the great ravages of these latter, we should carefully protect and foster any and every means that may prove useful in lessening their evils.

It is also well known that the perfect insect feeds on the larvæ of the common potato beetle, *Doryphora decemlineata*, Say. Our fiery ground beetle also destroys large numbers of the canker-worm, *Anisopteryx vernata*, Peck, a much-dreaded pest which attacks the elm, cherry, apple, plum and other trees. Our friend, being very active, runs over the ground in search of the soft-bodied canker-worms, and will even mount upon trunks of trees for the same purpose.

Another very destructive enemy which is devoured by *Calosoma calidum* is the army-worm, that pest which plays such havoc with wheat and other cereals in many districts.

The beneficial effects of the presence of a few fiery-ground beetles among growing plants is so clearly recognized, that many will take pains to secure them and transport them to their gardens.

The next *Calosoma* we will consider is the rummaging ground beetle, *Calosoma scrutator*, Fab. (Fig. 23.) also called the beautiful-bodied searcher, and the green caterpillar-hunter.



Fig. 23.

This is the largest and handsomest member of the family, but the beauty and brilliancy of its colouring require to be seen to be appreciated. It is larger than the insect previously described, but of the same general outline. The head and thorax are of a deep purplish colour, the latter with a greenish coppery margin; the wing covers are of a bright and shining green, with fine longitudinal lines and scattered punctures, and a broad, coppery red margin. The underside is deep shining green, varied with coppery markings. The legs are blackish brown, in some lights deep purple.

"This magnificent beetle is rather a rare insect in Canada, though found occasionally in most parts of Ontario. Collectors of insects can often find specimens in summer, after a southerly gale, on the outer shore of Toronto Island, which is a famous place for obtaining rare beetles that have been drowned in the lake and washed ashore by the waves." (Rev. C. J. S. Bethune in Annual Report of Entomol. Soc. of Ontario, 1872.)

Among the insects preyed upon by this insect friend are the canker-worm, the army-worm, and the forest-tent caterpillar, *Clisiocampa sylvatica*, Harr., which latter is well known in Canada from its ravages during the past few years.

Harpalus caliginosus, Fabr. (fig. 24) is another member of the family under consideration, and is true to its family instincts. It is narrower in outline, than the two preceding insects, and is not so handsomely marked; it is of a dull black colour. This beetle is an enemy to the Colorado Potato Beetle and the army-worm.



Fig. 24.

An allied species, *Harpalus Pennsylvanicus*, DeGeer, is more common than the last. In Fig. 25 we give an illustration of the perfect insect, and in Fig. 26, of the larva.

The larva is about an inch and a quarter in length, is of a shining brown-black colour above, and a dull-whitish beneath. According to Mr. Riley it is an efficient destroyer of the larva of the Plum Curculio, which it seeks in their underground hiding-place and mercifully devours.

In the Western States this larva has been found feeding on the eggs of the Rocky Mountain Locust, *Caloptenus Spretus*, Thomas, and another *Harpalus* larva was found engaged in the same creditable labour.

Another member of this family, the Elongate Ground Beetle, *Pasimachus elongatus*, Lec, is also one of the insect enemies of the Colorado Potato Beetle, also of the Rocky Mountain Locust, and of the Army Worm. This beetle is of rather elegant form, and is bright-black in colour, with a deep blue margin.

The last insect of the Carnivorous Ground Beetles which we will mention specially, is a little Bombardier beetle: *Brachinus fumans*, Linn., of which we give an illustration in Fig. 27.



Fig. 25.

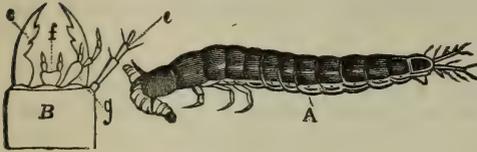


Fig. 26.

This insect with other members of the *Brachinus* family, have an extraordinary power of ejecting, from glands near the tail, an irritating fluid, which is doubtless a means of defence against its more powerful neighbours. A writer in the *American*



Fig. 27.

Entomologist, vol. 2, p. 30, thus relates his experience with one of these Bombardier beetles:—"Upon one occasion when we were collecting insects and—as often happens—saw at the same moment two rapidly running beetles, both of which we were desirous to capture, we thoughtlessly put one of the two, which happened to be a Bombardier, between our lips so as to hold him securely while we caught and disposed of the other one. Forthwith he fired away the customary discharge of blue smoke from his tail; and the next instant our lips felt as if a bottle of the strongest aquafortis had been emptied upon them. But we were not to be fooled thus. The more he blazed away the tighter we held him; and after a copious discharge of saliva from our mouth, the disagreeable sensation passed off in some five minutes, without any further unpleasant results."

This ejection of fluid is accompanied by a crackling explosion and blue smoke or vapour in which the little artilleryman makes good his escape from ordinary insect enemies.

In Kansas, the *Brachinus Kansanus*, Lec, has been found attacking the larvæ of the ubiquitous Colorado Potato Beetle.

A great deal more might be added of the services rendered to the agriculturist and gardeners by various members of the *Carabidæ* family, but we think sufficient has been given to show that they are among the most valuable of our insect friends and worthy of protection.

The *Carabidæ* are the carnivorous land insects *par excellence*, while their great voracity, their powerful physique, and their great numbers, make them one of the most efficient means of keeping insect pests within bounds. The family is very large, fortunately, and is compared by Michelet to "an immense tribe of warriors, armed to the teeth, which, under their heavy cuirasses, have a wonderful activity, are a perfect rural constabulary,

day and night, without holidays or repose, protecting our fields. They never touch the smallest thing. They are occupied entirely in arresting thieves, and they desire no salary but the body of the thief himself."

LADY BIRDS.

Order, *Coleoptera*, Family, *Coccinellidæ*.

Lady bird, lady-bird, fly away home
Your house is on fire and your children are burned.

These words are no doubt familiar to all our readers, old and young, for, as Mr. R. V. Rogers graphically says (*Canad. Entomol.* Vol. VI. No. 5): "'Of all the painted populace that live in fields, and live ambrosial lives,' there is scarcely a family better known than those which compose the last of all the tribe of Hard-shells, the Coccinellidæ. To the young and to the old, to the illiterate and to the scientist, they are equally familiar and equally interesting. Popular sympathy is extended towards them by the elders, because 'they do much good in preventing the excessive multiplication of aphides, by the juveniles, because they are very pretty little things and tamely pitter-patter to and fro, and their supposed misfortunes affect deeply sensitive little hearts, while infantile accents lisp—'lady-bird, lady-bird, fly away home, your house is on fire and your children are burned.'"

We introduce here illustrations of some of the more common of our Canadian species.



Fig. 28.



Fig. 29.



Fig. 30.



Fig. 31.

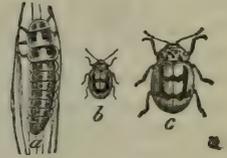


Fig. 32.

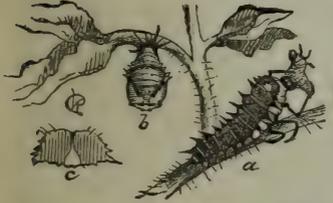


Fig. 33.



Fig. 34.



Fig. 35.

Fig. 28. Nine spotted Coccinella (*Coccinella novem-notata*, Herbst.).

Fig. 29. Plain Lady-Bird (*Coccinella munda*, Say).

Fig. 30. Spotted Lady Bird (*Hippodamia maculata*, DeGeer).

Fig. 31. Thirteen dotted Lady Bird (*Hippodamia 13-punctata*, Linn.).

Fig. 32. Convergent Lady Bird (*Hippodamia convergens*, Quer.).

Fig. 33. Fifteen spotted Mysia (*Mysia 15-punctata* Oliv.).

Fig. 34. (*Chilocorus bivulnerus*,) Mulsant.

Fig. 35. Larva of *Coccinella novem-notata*, Herbst.).

These will give a general idea of the appearance of these beetles, for they all have a strong family likeness, so much so, that entomologists are sometimes at a loss to discriminate between some species, which will not appear strange when we remember that there are over one thousand species known, of which only some thirty have as yet been taken in Canada.

The general shape of Lady Birds, when they are resting on a flat surface, may be compared to one-half a split pea—flat underneath, and convex in both directions above. As will be seen from the above illustrations, in some cases, the head of the insect scarcely projects beyond the circular outline of the body. Most of the Lady Birds are gaudy little crea-

tures, being ornamented with red, white, yellow, black and orange colours, arranged in bands or in circular and semi-lunar spots, generally placed regularly on the two elytra or wing-covers. Their legs are very short, and the insect creeps slowly; when the beetle is alarmed it withdraws its legs and remains quiet for some time; if it is climbing when disturbed, it will close its legs under its body and allow itself to fall, but sometimes will open its wings and fly off rapidly. When laid hold of, these beetles have the curious property of causing a yellow, mucilaginous liquid, of a strong, pungent and disagreeable odour, to exude from the articulations of their abdomens, and this appears to be the only means of defence possessed by these little inoffensive beings. This fluid has been held by the ignorant to be a certain remedy for the toothache, but in as many other similar cures, the therapeutic value is entirely confined to the faith exhibited, and the greater the faith the greater the cure.

Lady Birds often occur in immense swarms, as in one instance, cited by Kirby and Spence, "the banks of the Humber were so thickly strewn with the common species, that it was difficult to walk without treading upon them." These swarms often alarmed the superstitious, who thought them the forerunners of some great evil.

The eggs of lady-birds are long, oval, and yellow, and are laid in patches, often in a group of plant-lice, which the larvæ, as soon as they are hatched, greedily devour. Here we have an excellent example of instinct in the mother lady-bird, for the plant-lice are the natural food of our little insect friends.

Packard (Guide to Study of Common Insects, p, 511) thus describes the changes which take place in the common two-spotted coccinella. "The eggs of the common two-spotted coccinella *C. bipunctata*, Linn., are laid in May, on the bark of trees, and those of another brood are laid in June, and hatched July 1st. They are oval, cylindrical, orange-yellow, and are attached in a bunch of about twenty-five, by one end to the bark. They hatch out when the leaves and their natural article of diet, the aphid, appear, and may be found running about over the leaves of various garden shrubs and trees. The body is black with flattened tubercles spinulated above; on each side of the first abdominal segment is a yellowish spot, and there is a broad yellowish spot in the middle of the fourth segment, and one on each side. On June 28th we found several fully grown larvæ a quarter of an inch long, transforming into pupæ, with a freshly transformed beetle. The larva begins the operation by attaching very firmly, with a sort of silky gum, its tail to the leaf, the point of attachment not being the extreme tip, but just before it, where the tip of the abdomen of the pupa is situated, Meanwhile the body contracts in length and widens, the head is bent upon the breast, and in about twenty-four hours the skin splits open and discloses the pupa. The body of the pupa is black, the head is also black, and the prothorax is yellowish black and pink, with a black dot on each side, and a smaller black dot on each edge; the meso-thorax, wing-covers, scutellum and legs are shining black. The abdominal rings are pale flesh-coloured, with two rows of large black spots on each side, the spots being transverse; the terga of the fourth to the seventh segments are separated, the body being arched and leaving a deep furrow between. The beetle is orange-yellow, with a black head and thorax; the side of the prothorax is whitish, with a central diamond-shaped white spot, and behind it a much larger whitish spot. The beetle derives its specific name from the two black dots on the elytra. It hibernates, and might be used to clear house plants of plant-lice."

Referring to the illustrations at the beginning of this article, we may give the following short description of the various insects there figured, in order to render the illustrations more valuable:—

C. novem-notata is a nearly round insect, of a brick-red colour, with nine black spots on the wing covers.

C. munda may be easily distinguished from most of the other species, as it is of a brick-red colour, and has no markings on its wing covers.

Hippodamia maculata is a pinkish coloured beetle, with twelve large black spots.

H. 13-punctata is larger than the previous, and has thirteen black spots on a brick-red ground.

H. convergens is of a deep orange-red colour marked with black and white. Its larva (Fig. 32a) is blue, orange and black in colour, *b* shows the pupa or chrysalis suspended by the tail, and *c* the perfect beetle.

Mysia 15-punctata varies much in colour from a light grey to a deep chestnut brown, so

that an unskilled observer would scarcely imagine that the four varieties in Fig. 33 were one and the same species. It has fifteen black spots on its brownish wing-covers.

Chilocorus bivulnerus is commonly called the twice stabbed lady-bird ; it is a highly polished black beetle, with two yellow spots. It is very obese.

Perhaps the most simple plan by which to enumerate the benefits arising from the existence of the lady-birds, will be to take *seriatim* the insects upon which they are known to feed : we will begin first with the

Aphidæ or *plant-lice*.—As is well known, many of our fruit trees and flowering plants are sometimes seriously injured by the work of the minute and innumerable plant-lice. The hop is subject to the attacks of the hop aphid (*Aphis humuli*, Curtis) and so great is the ruin caused, that Kirby and Spence state, in speaking of its ravages in England, "The hod grower is wholly at the mercy of these insects ; they are the barometer that indicates the rise and fall of his wealth, as well as of a very important branch of the revenue—the difference in the amount of duty on hops being often as much as £200,000 per annum, more or less, in proportion as the fly prevails or the contrary." In this country, fortunately, the ravages of this *Aphis* do not appear to have been as serious, although many an acre of fine healthy hop plants have been scoured by these creatures, causing entire loss.

Wheat, oats and other grain are frequently attacked by the grain aphid (*Aphis avenæ* Fabr.) an insect pest introduced into this country from Europe. The cherry-tree suffers from the *Aphis cerasi* ; the apple-tree from the *Aphis mali* on its tender leaves, and the *Eriosoma pyri* at its roots ; the currant bushes from *Aphis ribis* ; the cabbage from *Aphis brassica*. Besides these, and many other plants living out of doors, conservatory and hot-house plants do not escape the ravages of plant-lice.

It is the enormous rate of increase of these tiny creatures that surprises all who have had the care of plants ; and which renders all artificial remedies of little value except in narrow limits. We may have an idea of the enormous fecundity of these creatures from a calculation by Curtis, a celebrated English entomologist, who computed that from one egg only, there would be produced in seven generations, taking thirty as the average of each brood, the enormous number of seven hundred and twenty-nine millions, so that were all permitted to live, everything on the face of the earth would in a short time be covered with them.

Before this inconceivable increase artificial remedies would avail little, but fortunately the natural enemies of the aphidæ are legion, and among the most valuable of these are our pretty little Lady Birds. As we have seen before, the female Lady Bird places its eggs among the plant-lice, and the larvæ as they grow live upon them, devouring great numbers.

Dr. Fitch relates an amusing story of a mistake which was made by one of his neighbours, whose rose-bushes were grievously invested by plant-lice. He complained, we are informed, to the doctor, that although he took the greatest pains to go over the infested bushes every morning and destroy all the "old ones," yet that his bushes were ten times as badly injured by plant-lice as those of his neighbours, who took no pains at all to war upon the enemy. On examination it turned out, that the worthy gentleman had occupied every morning in killing off all the Lady Bird larvæ that he could find, supposing that these were the mothers of the plant-lice, and that he should thus nip the evil in the bud. In other words, he had fired into the ranks of his best friends, and allowed his enemies to march where they would, and increase and multiply at discretion.

We hope none of our readers may make the same mistake, but will cherish the presence of these little beetles among their favourite plants.

The next insect pest preyed upon by our friends is that terrible scourge of grain growers,

The Chinch Bug.—This voracious creature, known to entomologists as *Micropus leucopterus*, Say, is perhaps more dreaded by grain-growers throughout America than any other of the insect enemies he has to fight against, because its work of destruction is complete. From Riley's Second Annual Report for Missouri we learn that four species of Lady Birds are known to feed on Chinch Bugs, these four are *Coccinella munda*, *Hippodamia maculata*, and two species of the genus *Scymnus*. In this report Dr. Shimer records that in a particular field of corn, which had been sown thick for fodder, and which was swarming with Chinch Bugs, he found that the spotted Lady Bird (*C. munda*) could be counted by hundreds upon every square yard of ground after shaking the corn, but the Chinch Bugs were so numerous that these hosts of enemies made very little perceptible impression among them. Notwithstanding the apparently small amount of good done in some cases, it is the duty of the intelligent

farmer and gardiner to cultivate assiduously the acquaintance of all his insect friends, for although their individual efforts may be feeble, yet combined they no doubt maintain a powerful check on insect enemies.

Another common insect which is subject to attacks of Lady Birds is the well-known and universal *Colorado Potato Beetle*. Five species of our friends are known to devour this beetle—the spotted, the nine-spotted, the thirteen-spotted, the convergent, and the icy, Lady Birds; the latter, *Hippodamia glacialis*, Fabr., is closely allied to the Convergent Lady Bird, and is found far north, and may be taken under the ice and snow. The larvæ of these are equally as voracious as the perfect beetles, but the larva of the *H. convergens* is a perfect cannibal, for when there is a deficiency of other good food, he has no hesitation in devouring the helpless pupæ of his own kind.

The Grape Phylloxera, *Phylloxera vastatrix*, Planchon, has been found to be attacked by several species of the genera *Coccinella* and *Scymnus*, whose young, thickly covered with white and evenly shorn tufts of a cottony secretion, are frequently found at their good work within the galls. The last pest we will now mention is

The Pine-Leaf Scale Insect, *Mytilaspis pinifoliae*, Fitch, a bark-louse which injures many of the pine trees, as the red, the white, the yellow, the Pyrenian, the Scotch and others. “The twice-stabbed Lady Bird may frequently be found crawling over the scale-infested trees, and is most efficient in checking the increase of the Coccids. Both the beetle and its gray and prickly larva feast upon the lice, and require great numbers of such minute animals to appease their appetites. I have often colonized a dozen or more larvæ on to a badly affected young tree, and the rapidity with which they clear such a tree is both interesting and satisfactory. Still another insect of this family, namely, the Painted Lady Bird (*Coccinella picta*, Randall), I have discovered preying on our Pine-leaf Scale. (See Riley’s Fifth Annual Report).

AN OUTLINE SKETCH OF THE CANADIAN BUPRESTIDÆ.

BY JAMES FLETCHER, OTTAWA.

Of all the enemies against which man has to contend, there are none, perhaps, which are so hard to combat, nor which deserve more attention, than those belonging to the insect world.

These tiny atoms, apparently so insignificant, in some instances so small, as to need the closest search, or even a microscope, to discover, beset him in every direction, and, if ignored, will cut, pierce, and, in some cases, utterly destroy whatever his labour produces. Not many years ago Entomology was one of the most neglected Sciences, and only considered worthy of the attention of simple people and children, as describing pretty things likely to amuse them; to such an extent was this carried, that as late as the last century a lady of high rank in France was burned as a witch, the only evidence against her being that she was seen to collect and preserve insects. Even at the present day, both in England and Canada, there is much deplorable ignorance of “La belle Science” among the very people to whom, more than any one else, a knowledge of it is of the first importance. I have frequently been greeted with smiles of amusement (which have had a good strong admixture of pity in them) from farmers and countrymen, when asking for permission to collect on their grounds, the general tenor of their answers being, “Oh, yes, I suppose you won’t do much harm;” and I have always been under a very decided impression that they looked down upon me as a poor innoxious creature that *could* do no harm. Many a quiet chuckle have I had in the deepest recesses of my sleeve, and many a quiet ramble, too, have I enjoyed, by this means perfectly immuned from all interruption by game-keepers or farm labourers, who regard the Entomologist (*Angl.*: “Fly-catcher,” *Amer.*: “Bug-catcher,”) much in the same light that they view the rooks that pick up the worms after the ploughman. These good simple fellows (not that I wish in the least to retaliate) will sometimes endeavour to encourage you, and even assist in collecting insects, which in the case of Coleoptera, are occasionally good specimens; but that is the exception, and by no means the general rule, especially with Lepidoptera. On one occasion during the past summer, I was hailed by a gardener who informed me that he had a “bug” for me, and who, after fumbling in his trousers’ pocket for a short time, produced a tin tobacco-box, and then, from beneath some very black, damp-looking tobacco, disinterred

what was once a female *Attacus Polyphemus*. "There it is," he said, looking at it with much admiration, "it is rather crumpled (it had about half of all its wings cut off by the tin box), but I daresay you will be able to straighten it out again."

Thanks to the efforts of Messrs Harris, Fitch, and Riley, in the United States; Curtis and Wood, in England; and Saunders, Provancher, and Bethune, in Canada, amongst many others, to popularize Economic Entomology, it has made great strides of late years; and the exceedingly low figure at which their works may be obtained, brings it within the power of every one to possess himself of information which will enable him to fight against most of the insect pests, likely to occur to any extent, in our Dominion. I herewith contribute my mite to the cause, in the shape of an outline sketch of the family Buprestidæ. The large number of species included even in our Canadian list of these beetles, will not allow me to more than describe the leading characteristics of the different genera with some of the more interesting species. My object is to give such an idea of the general appearance and habits of these insects in their different stages as will enable the horticulturist and farmer to distinguish them, and check their ravages. Besides my own observations, I have embodied what I considered most interesting from the works of the best authors on the subject, and as some of these are difficult to obtain, I have repeated some facts which are probably known to most Entomologists, but possibly are not to the greater number of those who will receive our Annual Report. The classification I have followed is that of Lacordaire, as adopted by Dr. Leconte in his Classification of the Coleoptera of North America, published in 1863. I have, too, used to a great extent the words of the latter, in the scientific descriptions at the end of this paper.

The Buprestidæ, form the first section of that division of Serricorn Coleoptera, known by the name of Sternoxi, or Sharpbreasted, and have the under part of the thorax (*Lat.* sternum—breast-bone) prolonged into a point.

The word "Buprestis" is an interesting one, and is one of the scarce instances in which the great naturalist, Linnæus, gave an inappropriate name; its literal meaning is "ox-burner," derived from two Greek words βόυς, an ox, and πρήθω, I inflame. Amongst the ancients the names Buprestis, Vulprestis, Bustrepis, Bubestes, etc., were applied to a poisonous insect, which, when eaten by cattle as it lay hidden in the grass, it was averred, caused them to inflame, swell, and burst; indeed, so noxious was it considered that a special law was made against its use, in the Pandects of Budeus, which was to the effect that "whosoever should administer a Buprestis, with intent to kill, should be held guilty of a capital offence and condemned to die by the Cornelian Law." Geoffroy, adopting the opinion of Mouffet, considered the "Buprestis" of Pliny to be the "Carabus" of Linnæus; but Latreille, who published a memoir on the subject in 1812, considered it to be a Meloe, the species of which live among grass and low herbage, and, moreover, possess very strong blistering properties. Following this suggestion, and assisted by Belon, who discovered an insect on Mount Athos with the same properties and called by the inhabitants "Voupristi," Kirby & Spence seem to have correctly identified the insect of the ancients as a Mylabris. The present species, which are classed under the head "Buprestidæ," have nothing whatever in common with it except the name, and that they have wrongfully usurped.

The Buprestidæ form an immense family of gorgeously-coloured insects, containing many tribes, sub-tribes, groups, genera, and in all about 1,500 species. They are pretty generally scattered over the whole world, being, however, much more numerous in warm climates. In brightness of colour they by far surpass every other family of insects; in fact Dame Nature seems to have outdone herself in the adornment of these living gems, and to have used them as experiments to see what startling effects and contrasts she could produce. As a rule their surfaces are highly polished, having the appearance of burnished metal—gold, bronze, steel or copper, and seem to be glazed with some surface-colour, which changes as they are viewed from different angles. Green and crimson are the two prevailing hues; but there is hardly any imaginable shade that cannot be found amongst them, they are particularly remarkable for metallic tints. That peculiarly beautiful green known as "beetle-green" takes its name from the elytra of certain species, which are used in India and South America for the ornamentation of ladies' dresses, baskets, fans and other objects.

The sizes and shapes presented by the different genera of this family are no less re-

markable and varied than the colours. The size varies from scarcely one line in length in *Aphanisticus puvillus* to nearly three inches in *Catoxantha gigantea*, the Goliath of his race. The shape, which, on account of the shortness of the legs, is not very graceful, embraces the following forms, viz.:—Cylindrical, conical, oval, oblong, flat, some almost triangular, and others even linear; in all the Elytra taper more or less abruptly to a point.

Westwood has mentioned some interesting particulars with reference to their geographical distribution, *ut seq* :—“ At the Cape of Good Hope is found an extensive group, having others even linear; and in all, the elytra taper more or less abruptly to a point. The conical species abound on the shores of the Mediterranean, Caspian and Black Seas, and at the Cape. Madagascar produces an extraordinary group, having the body flattened, and of a nearly rounded form; whilst in New Holland the genus *Polychroma* and several others have been exclusively found.”

As instances of some of the most striking examples I will describe three species which I have received from the East Indies.

Catoxantha gigantea is a large insect of upwards of three inches in length and nearly an inch in width; the elytra or wing-covers are metallic green with a large orange spot, surrounded by a beautiful blue band, on each; the thorax is of the same green colour, of a rather deeper shade, and has on either side a large coriaceous knob of deep chestnut; the eyes and antennæ are brown, and the legs black. The distinguishing characteristic of this genus, and from which it takes its name, is the colour of the abdomen, which is a bright orange yellow above and beneath.

Chrysochroa Buquetii is a magnificent Buprestis of about two inches in length by half an inch in width, with the head and thorax of a fiery copper, deeply punctured, the centre of the thorax is rich burnished violet; the eyes are dark brown, and the antennæ almost black; the elytra bright orange, with the tips, outer margin, and a large spot in the centre of each, of a most splendid purple; the abdomen, above, is of the same rich violet as the patch on the thorax, and beneath, Prussian blue with a metallic lustre; the under side of the head and thorax is coppery carmine, like that which adorns the upper side of the thorax, and is densely covered with a fine fulvous down.

Chrysochroa vittata is one of those, before mentioned, which is sometimes worn as an ornament; it is rather longer than the preceding species, of a deep green colour, with the base of the thorax, a stripe down each elytron, and the whole of the under surface, carmine glossed with gold.

Amongst the Canadian species, belonging to this family, bronze is the prevailing colour, although, of course, there are individuals in some of the groups which are very highly coloured. They may be at once recognised by the most uninitiated from the following characteristics: Most of the tribes have conical, wedge-shaped bodies of peculiar hardness, and the different parts so intimately connected as scarcely to show the point of

union. Fig. 36 gives a very good general idea of the outline during the different stages. The head of the imago, or perfect insect, *d* is sunk into the prothorax, or part where the first pair of legs is attached, almost as far as the elliptical eyes, the prothorax in its turn fits closely into the mesothorax, or part where the second pair of legs is attached, and the posternum is prolonged into a sharp spike-like appendage, and fits tightly into the excavated mesosternum. The head is flat, and on account of being sunk so deeply into the thorax, is not capable of much movement, so, consequently, has the mouth, which is furnished with two stout mandibles, underneath. The antennæ, which are serrate and composed of eleven short joints, are inserted in small hollows on the front; the outer joints in most cases have some minute pores, which are either diffused on the sides or collected in small hollows (foveæ) on the lower margin, or the extremity. These are of great importance in classification, and were supposed by Erichson, their discoverer, to be olfactory.

The elytra, which (in our Canadian species) are generally furrowed or granulated, are of an exceedingly hard consistency, so hard, in fact, as in some of the larger species

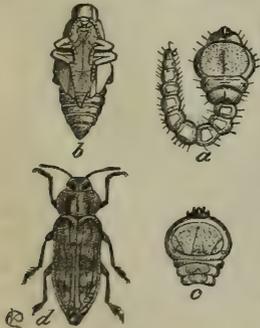


Fig. 36.

to require considerable dexterity to pierce them without turning the tip of the pin ; they nearly always cover the upper surface of the abdomen, the under surface of which is composed of five segments, and has the two first connate. Sometimes in the males there is a small sixth joint left visible, by the fifth one having a notch in the middle. The females are provided with an ovipositor, composed of three horny pieces, with which they are able to thrust their eggs into the smallest crevices of the bark of the tree, which is to form the nursery and food of the young larvæ. The legs are short, having the upper joints (*femora*) stout, and sometimes bearing a spur, the second joints (*tibiæ*) are slender, with two small terminal spines, and the tarsi five jointed. On account of the shortness of their legs, they are not at all active in running. The best authorities seem to agree in saying that they have large wings and fly quickly ; but I cannot say that my observations so far have led me to concur with this statement. The wings of all those which I have examined have been small in comparison to the weight of their bodies, not being quite so large as the elytra, and only having one small longitudinal fold at the apex. The chief protection of these beetles lies in the similarity of their appearance to the objects amongst which they are generally found. At the slightest provocation they draw their legs in tightly to their bodies and drop from the branch on which they may be resting or feeding, and, protected by their firm tegument, they can fall upon the hardest rocks with perfect safety. When they reach the ground they will lie perfectly still for a long time, and it requires sharp eyes indeed to detect them, unless the exact spot where they fell is noticed.

Notwithstanding that, on account of the number and beauty of the species, this family has always been a favourite one with entomologists, the lifehistories of its different tribes are still very incomplete ; this owing chiefly to the fact that most of the larvæ mature in living trees, which renders the study of them very difficult. The larvæ throughout the whole family, are much more homogeneous than the perfect insects, and may be described as yellowish-white, legless grubs, Fig. 36 *a*, of slender form, but having the prothoracic segment, Fig. 36 *c*, enormously widened in comparison to the rest of the body ; this enlarged division is much flattened, and protected above and beneath with horny plates. The different stages of the Agrilini are not so regular as in the other tribes, and vary in accordance with the group to which they belong.

There seems to be much difference of opinion as to the time necessary for these insects to reach maturity. I am of opinion that the normal period is a year, the eggs being laid during one summer, and the perfect insects appearing in the next. At page 399 Vol. 10 of "The Transactions of the Linnæan Society," mention is made of a curious instance of retarded development. A specimen of *Buprestis splendens*, a Swedish species bearing a close resemblance to our *Ancylolira striata*, was found by a Mr. Montague in the act of emerging from its burrow in the wood of a desk which had stood in the Office of Works, at Guildhall, for 22 years. The insect, with the piece of wood containing the burrow, was sent to Sir Joseph Banks, who found on enquiry that the makers of the desk had obtained the plank from the Baltic. But even this is not the longest period an insect has been known to remain alive in timber. Dr. Fitch describes a longicorn beetle which made its exit from the leaf of a table, made of apple-wood, 28 years after the tree was cut down.

It is in the larval state that these insects are most injurious, when burrowing in the soft sap-wood beneath the bark, especially when in great numbers, as is frequently the case, they cause the death of many young trees by completely girdling them. Some species occasionally shew great partiality for an individual tree ; e.g., in a grove of pine saplings, near Ottawa, containing upwards of 100 trees, there are two upon which, at almost any time, I could find three or four *C. liberta*, but upon no other trees in that locality have I ever taken any at all. It is a notable fact that most insects prefer injured or diseased trees, and which, on that account, have a feebler growth than would ordinarily be the case. It is to these trees then that the horticulturist should pay especial attention when hunting for them. Many remedies have been proposed for the protection of trees from the ravages of borers, but the surest mode, and the one which has to be relied on chiefly, is hand-picking. First learn which are your enemies and which your friends, and then go to work to hunt them out steadily one by one. This at first seems an impossibility, but by carefully watching at the proper time to destroy the perfect insects, and with a little experience at larvæ hunting in the fall, an orchard may soon be cleared of its pests. Steps, of course, should also be taken to prevent the beetles from depositing their eggs upon the bark of the trees. The

most effectual means is, luckily, an exceedingly simple and inexpensive one. It is a well known fact that alkalis, although so beneficial to vegetable life, are particularly obnoxious to all insects, and consequently all compounds containing these will improve the former and protect them against the latter. Common soap, it will be found, is one of the best preventatives that can be used, and no insect will lay its eggs upon trees that are treated with it. The most convenient way to use it is to boil up as much as is required to the consistency of a thick wash, and then, with a hard broom brush it well over the trunks of the trees; this should be done about three or four times during the months of June and July. I may here mention that I have used, with very great success, in England, as a remedy against the canker-worm, coarse, common, oil, painted over the bark in the same manner. I have never tried it yet for Coleopterous larvæ, but I see no reason why it should not be as useful with them as with Lepidoptera.

In Entomology, however, as in most other sciences, if the evidences can only be found, man's greatest ally is that marvellous balance of Nature which is so wondrously kept up by a beneficent Providence. When a foe appears in any locality, let it be what it may, we know that, before long, there will be some counter-acting agent provided by Nature; the only question is—what will be the best remedy to employ until that is developed? This point, of counter-agents, is an interesting one in the history of the different pests which have devastated our crops from time to time, and deserves much more attention than it has yet received. I am convinced that were parasitical insects, and insectivorous birds, recognized as friends and protected as such, there would very soon be a noticeable diminution in the ranks of our insect scourges. When by cultivation of a certain plant, man furnishes a class of insects with their favourite food, he must expect those insects very soon to appear, and should then protect and foster, or even introduce, such birds as will feed upon, and keep in check, these ruthless destroyers; but they in their turn must also be restrained: he must not protect them blindly, or he will soon find that his remedy is worse than the disease, for they will increase so much that they will be stronger than he, and will be to a greater extent bad masters than they were valuable servants before. This has actually been the case in Australia, and some parts of the United States, with the English sparrows. They were imported in large numbers to check the ravages of insects, and being protected everywhere, very soon increased so enormously that they not only devoured the insects, but also the corn which they were called in to protect, and became so impudent that they drove away all the little warblers and other singing birds which individually (as they lived entirely on insects) were more useful than themselves.

Amongst birds, there are none which are so useful to the fruit-grower as the various woodpeckers. These active, good natured, beautiful fellows, wage a continuous and relentless war, in our behalf, against those invisible legions which attack almost every tree man wishes to propagate. I have frequently stood within a few yards, watching admiringly, as with their sharp beaks and curious barbed tongues they have dislodged from their snug burrows in the trunk of a tree the fat grubs of some borer, and when they have found one, they will hold it for a second in their beaks, as if to say, "Look! see how hard I am working for you. Look at this slippery rascal which I have caught and which has eluded your closest search." Poor fellows, their bright livery and confiding nature are too often the cause of their death. It always grieves me to see thoughtless people shooting them. It is such a cowardly act, for they never attempt to avoid you, but work away, as if they had not a moment to lose, in hunting out our enemies, and will allow you to approach within a few feet of them. Many people think that by perforating the bark, in the wholesale way they do sometimes injure the trees; but it has been shown by the observations of Wilson, the celebrated American Ornithologist, that, on the other hand, it is actually beneficial to them. The absurdity of the charge of "sucking the sap," which has sometimes been brought up against these birds, is at once shown by an examination of their tongues, when it will be seen that it is a physical impossibility.

The whole of the Canadian Buprestidæ are contained in the two tribes *Buprestini* and *Agriolini*, and the greater number in the former of these.

BUPRESTINI.

In this tribe the front is not usually contracted by the insertion of the antennæ; the prosternum is angulated on the sides, behind the coxæ, and its lateral sutures are oblique;

the mesosternum is always divided, so that the cavity for the reception of the prosternum is formed both by the meso and metasternum; the side pieces of the latter are always visible, and the epimera are triangular. The hind coxæ are broader internally; their anterior margin is straight and transverse; the hind margin is oblique. The antennal pores are diffused on the sides of the joints in the first group, and concentrated in marginal foveæ in the others. The species are more or less flattened in form.

Our groups are the following:—

Epimera of Metathorax triangular, uncovered; Prosternum obtusely angulated behind the Coxæ;

Metasternum and mesosternum closely united..... CHALCOPHORÆ.

Mesosternal suture distinct BUPRESTES.

Epimera of Metathorax partly covered by abdomen; Prosternum acutely angulated behind the Coxæ;

Front not contracted by insertion of antennæ ANTHAXIÆ.

Front contracted by insertion of antennæ CHRYSOBOTHRES.

GROUP I.—CHALCOPHORÆ.

This group is represented in Canada by the sole genus *Chalcophora*, the species of which are insects of large size, readily known by the antennal pores being diffused on the sides of the joints.

Amongst the most beautiful is *Chalcophora liberta*, Fitch, which is about $\frac{3}{4}$ of an inch in length, of a beautiful golden bronze; the colour, however, varies; some I have taken being coppery, bronze glossed with green, and even black. This is a very common species around Ottawa, and can generally be found on young pine trees during the summer and fall; it usually feeds and rests on the tips of branches, with its head turned in, and then bears a close resemblance to the young cones. The broadly rounded sides of the thorax, the deep dorsal grooves and the entire sutural stria well distinguish this species.

GROUP II.—BUPRESTES.

In this group the sides of the posterior part of the prosternum are straight, or very feebly angulated, the apex is broad and obtusely rounded in most of the genera, but sometimes acute. The meso and metasternum are closely united by a transverse suture, and the former is deeply excavated through its whole length for the reception of the prosternum. The species are of moderate size and usually of elongated form: the antennal cavities are small and the front is not lobed before the antennæ; the pores of the latter are placed in foveæ situated on the inferior margin of the joints, except in *Cinyra*, where they are terminal: the elytra are not serrate in any of our species.

Our genera may be arranged as follows:

Prosternum obtusely rounded behind;

Mentum entirely corneous;

Scutellum, small, rounded DICERCA.

Scutellum, very transverse, truncate PÆCILONOTA.

Mentum, membranous anteriorly ANCYLOCHIFA.

Prosternum, acute at tip CINYRA.

DICERCA.

This genus contains many species, all of which are remarkable for the shape, which is ovoid, with the tips of the elytra prolonged into a kind of tail with the two points more or less convergent.

The following may be taken as typical species of the genus:

D. divaricata, Say, a thickly punctured beetle of a coppery lustre, sometimes brassy above, the wing-cases striated and freckled with numerous fine irregular impressed lines

and small oblong black spots, their ends prolonged and slightly spreading at the tips, where they end abruptly as if broken off; the length varies from 0.70 to 0.90; the middle of the breast is furrowed, and the males have a conspicuous tooth on the inferior margin of the middle tibiæ. This is one of the commonest of the Buprestidæ and may generally be found upon old beech or cherry trees in June, July and August. I once found a specimen on a pine tree in September, but I think it was only there by chance.

D. lurida, Fabr, is a blackish copper above, and of a much brighter shade underneath; the thorax, especially in the smaller males, is impressed on each side behind the middle; the elytra which are narrowed behind, but very little prolonged, have two teeth at their tips, the surface is rather rough with numerous irregular impressed lines or punctures and several narrow elevated black spots. The end of the abdomen in the female has three teeth, the middle one acute. Length 0.60-0.80. The larva feeds upon the hickory.

D. spreta, Lap. This is a rather rare, but very handsome species of about 0.65 in length. On the front is an irregular elevated line formed by the presence of a smooth concave callus in the middle and two smaller ones on each side; the thorax is much constricted behind the middle, with the surface very uneven at the sides; the external costæ are irregular and interrupted, and the dorsal canal is deepest at the apex, the smooth costæ limiting it are broad. The intermediate tibiæ are straight in both sexes; the under surface is densely punctured at the sides and nearly smooth in the middle, except the broad deep groove of the prosternum, which is coarsely punctured. The form is rather broader than most of the others of this genus. The bidentate elytra are deeply and boldly indented, the polished elevations having a reddish bronze tinge which is made conspicuous by the ground colour of the indentations which is a soft greenish grey, sometimes almost white in places, and gives the beetle the appearance of having been powdered and then polished on the elevations. Except in shape, which is more robust, this insect bears a close resemblance to *D. asperata*.

PÆCILONOTA.

The species of this genus present all the essential characters of *Dicerca*, except that the scutellum is very transverse and truncate, with the posterior angles well marked. Our species all have a smooth dorsal thoracic line, the antennal cavities are connected by a slight ridge, and the prosternum is hairy, characters never seen in *Dicerca*.

P. cyanipes, Say. This is a most elegant species. One I have before me, taken by Mr. Saunders, at London, Ontario, is 0.60 in length, of a greenish bronze hue above, and the same colour burnished beneath; the elytra are evenly striped, with indented lines and thickly punctured, having their divergent ends drawn out into a tail, the colour of which is carmine touched with deep blue, the legs are coppery, and the tarsi a beautiful blue, which looks green in one light, and from which the species derives its name.

ANCYLOCHIRA

This is an extensive genus containing some very beautiful species, and is very widely distributed. Most of them are of a metallic lustre and have fulvous markings.

A. Nuttalli, Kirby, is one of the handsomest of the bronze members of this genus. The length varies from 0.65 to 0.75. The elytra are deeply grooved, with longitudinal ridges, having the intervals distinctly punctured, and are marked with four unbroken bands of reddish-yellow, the outer ends of which converge so as to give the appearance of two broad circles with a cross lying on each. The thorax is broadly rounded and margined with the same yellow as marks the elytra. The prosternum has no marks; this is one of the chief points of difference between the present species and *A. Consularis*. The coxæ and femora are partly red, and the abdomen has a lateral spot on each segment.

CINYRA.

This genus is represented in our fauna by a single species, of exceedingly rare occurrence.

C. gracilipes, Mels, is a small insect measuring 0.40-0.44, with a slender, rather convex body, somewhat resembling an *Agrius*. The head is punctured, with a smooth

spot between the eyes; the lateral grooves of the thorax are less deep than the medial one, and the sides are perfectly straight. It is a brassy-coloured insect and bright copper-coloured beneath, with the elytra lightly striated and bidentate at the tips.

GROUP III.—ANTHAXIÆ.

Species of small size, usually flattened. Prosternum acutely angulated on the sides behind the coxæ, and acute at the tip; the mesosternum narrowly divided; the suture separating it from the metasternum distinct; scutellum small, rounded, or transverse; antennal pores placed in foveæ at the extremity of the inferior margin of the joints, the front not lobed before the antennæ.

There are but two genera :—

Mentum, coriaceous in front; prothorax, sinuate at base MELANOPHILA.

Mentum, entirely corneous; prothorax, truncate at base ANTHAXIA.

MELANOPHILA.

Insects of small size and sombre appearance, most of them being black; a few, however, have yellow spots on the elytra, which are more or less obscurely indented, thickly punctured, and sometimes spiniform at their extremities.

M. longipes, Say. This is by far the most active of all the Buprestidæ, running and flying with great quickness on bright days in summer. The body is black, not glossy; head minutely punctured, with a channel between the eyes; antennæ nearly as long as the prothorax; prothorax with a large impression on each side, having its sides rounded and thickly punctured; scutellum nearly heart-shaped; elytra rough, with very numerous minute granules and large shallow impressions, terminated in a sharp tip. The legs are long and slender.

ANTHAXIA.

A small family of inconspicuous insects remarkable for their sculpture, consisting on the head and thorax of shallow punctures, with the intervening lines forming a fine network.

A. inornata, Randall. Thorax densely and strongly reticulated, much wider than long, with angles at the base, and the edges rounded; the elytra are uneven and densely granulated; they have two decided margins; the sides are parallel and abruptly narrowed and rounded at the apex; the colour is black with a tinge of bronze, and shining black beneath; length 0.23.

GROUP IV.—CHRYSOBOTHRES.

Antennæ inserted at the inner extremity of two short oblique grooves, by which the front is narrowed; before these grooves it is again widened, and the anterior margin is emarginate in an angular form; the prosternum is acutely angulated on the sides behind the coxæ, and acute at the tip; the mesosternum is larger than usual, and only narrowly divided; the scutellum acuminate; the elytra are rounded or sub-angulated at the base, and enter the base of the thorax; the femora are strongly lobed. The numerous species are of rather broad and of a flattened form, with the elytra impressed in the form of bands or spots; the sexual differences are in the shape of the anterior or middle tibia.

All the species found in Canada of this group belong to the genus CHRYSOBOTHRES. Many of them are very similar, and difficult to identify.

C. Harrisii, Hentz. This lovely little species measures 0.30; the female is of a beautiful metallic green all over; the male has the legs and the sides of the thorax of a reddish bronze, and a purplish tinge towards the tips of the elytra; the thorax has a conspicuous furrow down its centre, and is marked with some irregular indentations, which are also found on the finely punctured elytra; the costæ on these latter organs are very indistinct, and the outer margins finely serrate. I have taken this at Ottawa in some abundance, on white pine saplings, towards the end of June. It is a very agile species.

AGRILINI.

In this tribe the species are generally slender, sometimes, however, very broad and flat ; in both cases the body is narrowed behind. The front is strongly narrowed by the insertion of the antennæ ; the anterior part of the head is vertical ; the mouth inferior and applied to the prosternum in repose ; the mentum is large ; prothorax lobed at the base ; prosternum broad in front, with oblique sutures, cuneate behind, and scarcely angulated behind the coxæ ; the small mesosternum is completely divided.

There are two groups in our fauna :

<i>Antennæ free</i>	AGRILI.
<i>Antennæ received in grooves</i>	BRACHES.

GROUP I.—AGRILI.

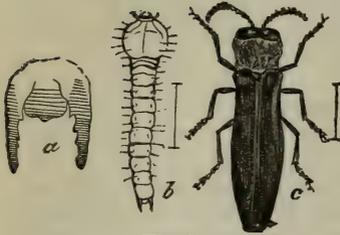


Fig. 37.

the elytra, is a beautiful line of golden pubescence ; this is very conspicuous down the middle of the back. The elytra are serrate at the apex

A. ruficollis, Fab. The red-necked agrilus, fig. 37, another member of this interesting group, is also a very handsome insect, which, in the larval state, bores into the canes of the raspberry and blackberry.

GROUP II.—BRACHES.

Body usually broad or ovate, rarely elongated ; sides of the thorax deeply grooved beneath for the reception of the antennæ ; legs very contractile, the tibiæ usually sulcate for the reception of the tarsi ; scutellum triangular. The larvæ of this group are leaf miners eating the parenchyma and transforming in the burrows. The genera are divided—as follows:—

<i>Body elongate ; prosternum pointed behind</i>	TAPHROCERUS.
<i>Body ovate ; prosternum obtuse behind ; tibiæ linear</i>	BRACHYS.

TAPHROCERUS.

Chiefly distinguished by having the body elongate and the claws simple and connate at the base, and a lobe in the centre of the prothorax.

T. gracilis, Say. A small insect, only measuring 0.14—0.21 ; of a blackish bronze colour, with patches of minute white hair on the rather coarsely punctured elytra ; the front has a wide furrow down the centre, and the elytra are sunk into a groove at the apex.

BRACHYS.

Insects of ovate form, with the thorax strongly bisinuate at the base, with the median lobe hollowed. Scutellum moderately large.

B. ovata, Weber. Measures 0.19—0.25. Head with a deep sinus and the face covered with minute decumbent hairs ; elytra beautifully variegated with blotches of gold and silver hairs and with three ridges, the external one acute and running from the shoulder almost to the apex ; of a deep purple.

NOTES OF THE YEAR.

BY B. GOTT, ARKONA, ONT.

Mutation and variation are palpably stamped upon all things terrestrial. There is nothing of and from the earth that is not more or less subject to action and reaction, to removal and change. This statement is true also of the seasons of the year; one season differs from another, comes on earlier, is more distinctly marked, or lasts longer or later than those preceding. The distinctive features of this year have been, first, a short and mild winter, and the early activity of vegetable and insect life, and consequent early maturity. So early as the 6th day of March (when in past seasons at this date all was firmly shut up in the iron grasp of winter), a beautiful balmy spring time burst upon us, which had the effect of immediately awakening into activity both vegetable and insect life to a most surprising extent. The mission work of insects, and their beneficial services to vegetation, is now very generally admitted by the ablest and best authorities on natural history, in the fertilization of plant germs, involving the useful and advantageous work of crossing and improving varieties. It would thus appear that all are necessary in their time and place; none are created uselessly or without a distinctive purpose. The seasons of spring and summer seemed throughout a month earlier than usual. Another characteristic of this year was its intense heat in July, followed by its prevalent dampness in August and September. This dampness caused the putrefaction and destruction of very large quantities of fruit and vegetable matter, and such insects as live on these decaying substances were generated in abundance, which laboured in the removal of these noxious substances from the earth.

But it is not of these useful creatures we are disposed to complain and wage war on; it is on those who trespass on our rights and privileges, by destroying the fruits and cereals we cultivate, and on which our prosperity and wealth largely depend. The abundance of some forms of insect life are largely due to the altered conditions which settlement and the clearing of the forests have brought about. By this means the equilibrium of nature in this respect has been disturbed, while the few varieties of plants and fruits we cultivate are grown in such quantities as to supply food to an unlimited extent to the insect hordes which feed upon them, and since the abundance of insect life is usually largely dependent on the supply of food, a constant warfare is necessary to keep such as are injurious within due bounds.

In this we are helped by birds, and also by friendly parasitic and carnivorous insects. In this connection the advantages of the study of Entomology are clearly manifest, since by this means we obtain an insight into the life-history of the various species, learn their habits, and, after some observation and study, are enabled to distinguish our friends from our foes among the insect tribes, and while we wage war on those which injure us, throw the shield of our protection about our tiny helpers.

1. THE HESSIAN FLY (*Cecidomyia destructor*), AND AMERICAN WHEAT MIDGE (*C. Tritici*).

In the fall of the year 1877, throughout this country and some of the States of the American Union, there was a grievous and general outcry occasioned by the ravages of the first of these wheat insects. The small dipterous insect known by this name lays its eggs quite early, and the young larva, developed therefrom in the months of October and November, feeds upon the young growing wheat plant, and robs it of nourishment and causes it to look sickly and wither away. When these insects are present in great numbers, whole acres, and even fields of wheat, will assume this disheartening appearance. It is a great and general evil, and is clearly on the increase; but the farmers this season have taken precautionary measures, and forebore to sow their wheat as early as usual, this being considered one of the remedial measures. Many other precautionary and helpful remedies are likely to be adopted. The prevalence of the second wheat fly was not very general, and was only noticed in some specimens of spring wheat. This insect, unlike the other, feeds only upon the young and tender grains. It is to be hoped for the safety of our crops that these insects may be speedily checked in their destructive work.

2. THE AMERICAN LACKEY WORMS (*Clisiocampa Americana* and *C. sylvatica*).

These worms as usual were amongst us in considerable numbers this spring, and began to work very early, but their ravages were of a decidedly mild type and were not to be dreaded as in former years. A singular mortality possessed them, for while just at their work upon the leaves many of them were seized with death and speedily changed to corruption; many others fell a prey to the larvæ of Ichneumon flies, so that really but few got through. These followed the instincts of their being, and commenced to form egg clusters on the young apple twigs as early as the 10th of July, but they are not numerous.

3. THE CURRANT WORM (*Nematus ventricosus*).

This insect proves itself to be a real pest, most persistent and destructive, and, as far as we can discern, without any redeeming qualities. They appeared and began to work unusually early (April 27th) this year, and kept up vigorously until every currant and gooseberry bush was completely stripped. Our remedy, White Hellebore, would have helped us over the difficulty nicely; but when just at the point of conquest a second brood appeared in multitudes and baffled our efforts. This is the worst insect of the season, and our three or four hundred bushes only lasted them a few days.

4. THE GOOSEBERRY FRUIT WORM (*Pempelia grossularia*).

This insect is akin to the currant worm, also a real foe, and a most insidious enemy. They appeared on the field of action quite early in the season, and in great numbers, and succeeded in filching from our grasp fully two-thirds of our promising crop. These two insects have reduced gooseberry and currant growing in this country to a very arduous and unsatisfactory experiment. We like the fruits of these familiar shrubs and would prefer to grow them, but we felt this summer almost on the verge of despair. However, we still hope that some friendly parasite will yet come to the rescue and assist in our dilemma.

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

These beetles appeared a little earlier than usual, but on account of the extreme earliness of the season were just in time. Although they came in great numbers they were not to say troublesome, for careful and constant hand picking was all that was necessary to keep them in check, so they did not do us any appreciable harm. We noticed that their work was feeble and their movements slow and dull while in the perfect state. The scare caused by their appearance is pretty well subsided at present.

6. THE PLUM CURCULIO OR WEEVIL (*Conotrachelus nenuphar*).

This old and familiar depredator is really a bad case, full of mischief and decidedly of a business turn. In locations where the soil was light he had a good chance, and the whole crop of plums were taken, notwithstanding our efforts at jarring, smoking, &c.; but on heavy and cold clay soils the plums came off victoriously, producing a beautiful crop of clean, handsome fruit. Plums this year were very plentiful and very cheap. We think we are on the whole gaining a little on this enemy of a very popular and good fruit.

7. THE APPLE FRUIT WORM (*Carpocapsa pomonella*).

No very new developments have been made during the season respecting this insect or its work. It is evident, however, that this insect has come among us to stay, and that it means to prosper to the damage of the apple crops of this country. Although the product of fruit in many places was small, very small, yet the work of this insect was plainly discernible. We attempted to capture the worms in old cloths laid in the main crochets of the trees, but succeeded only to a very limited extent. I have noticed two insects, new to me, of gregarious habit, feeding in great numbers on the leaves of the apple trees, viz.:

8. DATANA, MINISTRA AND NOTODONTA CONCINNA.

These insects are, each of them voracious feeders ; the whole brood working together on a selected branch of the tree will strip it to the tip ; they then descend and repeat the operation on another, and thus they soon defoliate a tree of moderate size. But the character of their work soon makes them very conspicuous, and they are easily destroyed by removing them from the tree as soon as observed. I have no apprehension that they will become very troublesome, or succeed to any very great extent. It is well to be cautious however.

9. THE PEA BEETLE (*Bruchus pisi*).

This insect has now become an old resident, and his appearance may always be safely calculated upon. The pea crop this season has suffered much in loss of weight from the effects of this weevil. I shall not soon forget being in one of our grain stores in September, the mass of active beetles there made it appear more like a bee hive than a grain store, the numbers of them flying about was something immense. Nothing appears to be done to check them, and our farmers consequently suffer much.

10. THE CABBAGE WORM (*Pieris rapæ*).

This importation promises to be more than a visitor, and is something to be dreaded. Its rate of increase will render cabbage growing a difficult and hazardous task, and anything but lucrative at five cents a head. The familiar white butterflies were remarkably thick during the months of August, September and October, and their vigilance in observing was something remarkable, not a solitary specimen escaping their visitation. In every case they soon rendered the fair leaves of cabbage, a mass of rags tattered and torn, as though subject lately to a heavy charge of fine shot.

11. MAY BEETLES (*Phyllopa quercina*).

This old beetle is very much on the increase, and the ground in nice, dry and warm situations is plentifully supplied with its larvæ. They are heavy feeders, and devour the roots of plants, &c., and especially are their feedings felt by potato growers ; they eating unsightly holes in those tubers, and thus very much injuring the crop. We know of no effectual remedy in this matter.

12. THE ROSE LEAF SLUG (*Selandria rosæ*).

This inconspicuous insect is growing much more troublesome, and is on the increase, and, if neglected, is likely to prove disastrous to the interests of rose growers. It matters but little how fair and lovely the variety, or how much labour has been lavished upon it, if only neglected a few days in June, it will become as though singed by fire, and every part of the green removed from the leaves, and nothing left but a sere and faded specimen of what was before a beautiful rose bush. This is the work of this insidious insect Soap suds or dressings of tobacco water are effectual, so also is hellebore and water, in removing them, and it is only the negligent and careless that are most apt to suffer.

13. WOOLLY APHIDES (*Aphis lanigera* and also the Black Aphis of the Cherry)

have been remarkably abundant and injurious from the commencement of the season. In the case of the cherry, this was very noticeable. I never saw them so badly affected from this cause. A dense mass of black, active aphid gathered rapidly and thickly upon the young growth, and fed upon the juices of the tender shoots and leaves, and caused them to curl up in unnatural shapes, and eventually resulted in a total suspension of growth, and, in short, withered away. This effect we felt most severely upon small trees and young budded stocks ; but the same was noticeable also on larger trees. The woolly aphid we complain of feeds mostly upon young apple trees, and does them much injury. The only remedies we know is anointing the parts with oil or varnish.

INSECT REGISTER FOR 1878.

- March 6th.—Weather warm and beautifully spring-like, several small insects on the wing in the bright sunshine, and the honey bees are swiftly flitting across the fields.
- March 7th.—Observed several insects in activity, both on the ground and on trees.
- March 9th.—Found some fine moths, both male and female, of what are supposed to be *Anisoptery Vernata*; also caught the first fine buzzing mosquito.
- March 21st.—Discovered mature May beetles about an inch from the surface of the ground.
- April 11th.—Observed the first young tent-caterpillars in activity on the cluster.
- April 15th.—Grape vine flea beetles observed at work on the buds of our grape vines; we commenced our war of extermination by vigilant hand picking.
- April 20th.—May beetles remarkably thick on the wing this evening; a loud buzzing is kept up by their activity and numbers.
- April 27.—Currant worms, (*Nematus ventricosus*) first observed at work on the young leaves of the gooseberry and currant bushes.
- May 1st.—Great numbers of currant worms are feeding on the bushes and threatening to totally strip them; applied powdered white hellebore in solution.
- May 2nd.—First potato beetles' eggs observed on the rising young plants. The beetles wait patiently for their appearance.
- May 3rd.—Flies, butterflies and moths on the wing in great numbers and joyful activity. Spring has certainly advanced.
- May 4th.—Young tent-caterpillars first moult; they are thriving well.
- May 5th.—Bark lice, Woolly aphid and cherry aphidians are present on young growth in great numbers.
- May 6th.—Measuring worms and leaf rollers began to work; their numbers are threatening to be great, inspiring alarm.
- May 10th.—We assisted our first Cecropia moth (*Attacus cecropia*) in its release from imprisonment and winter confinement. It is a great beauty, admired by all.
- May 15th.—The gooseberry bushes are literally alive with ravenous currant worms, totally denuding them of all their foliage. This is the *pest* of the season.
- May 20th.—Plum curculios first observed in their attacks on the young fruit. We tried jarring and smoking them.
- May 25th.—First full grown tent-caterpillar observed; these worms begin to travel, but are not nearly so numerous or so destructive as they were last year.
- May 26th.—First observed the effects of the gooseberry fruit worm, *Pempelia grossularia*, on the young gooseberries; many berries are dying and emptied of contents.
- June 15th.—First tent-caterpillar observed as a chrysalid.
- June 19th.—The pea beetle, *Bruchus pisi*, observed at work on the young peas.
- June 20th.—The second brood of currant worms hatching very thickly; they are very abundant and quite discouraging.
- June 24th.—The tent-caterpillar pupæ appear to be very generally injured by the larvæ of ichneumon flies; those flies are very abundant and very searching in their operations.
- June 26th.—Observed first perfect young tent-caterpillar moth, active and on the wing.
- June 29th.—Captured a fine hellgramite fly.
- July 1st.—Stag beetles, *Lucanus*, began to be active and abundant, especially in the evening.
- July 2nd.—Captured first grape vine beetle, *Pelidnota punctata*, on the grape vine; they are not very abundant or very injurious.
- July 10th.—Observed first new collection of tent-caterpillar's eggs on apple shoots.
- July 19th.—Codling moth larva first observed to be preparing for pupation in a old rag in a branch of a tree.
- July 24th.—Captured a fine young moth, *Sphinx quinque-maculata*, just released from its confinement.
- July 27th.—Captured some fine larvæ of the moth, *Attacus cecropia*, on young apple branches.

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- July 28th.—Found a large collection of fine larvæ of the moth, *Datana ministra*, on an apple tree.
- Aug. 10th.—Captured a large quantity of larvæ of the moth, *Notodonta concinna*, on an apple tree.
- Aug. 21st.—Found a fine and beautiful larva of a Tussock moth, *Orgyia leucostigma*, on the leaves of an apple tree.
- Sept. 25th.—White cabbage butterflies are unusually plentiful this season; are actively depositing eggs on every available specimen.
- Sept. 30th.—Captured a fine and beautiful sphinx moth.
- Oct. 16th.—Captured a beautiful butterfly flitting in the sun.
- Oct. 20th.—We have made a very fine collection of beautiful insects this season; both butterflies and moths, large and small. It is much admired.
- Nov. 1st.—Most of the insects of our acquaintance, with all their vigilance and destructiveness, their beauty of colour and form, and their wonderful mechanism of parts, have gone to rest for this season.
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ON A RARE CANADIAN BUTTERFLY.

Papilio crespontes Cram.

BY WILLIAM SAUNDERS, LONDON, ONT.

This handsome swallow-tail butterfly formerly known as *Papilio thoas* is essentially a Southern insect, quite common throughout the Southern States, where it feeds in the larval condition upon the foliage of the orange and lemon trees. When first discovered it was thought to be restricted to the South, but more thorough investigation has shown that it is much more widely distributed. It has been found in Michigan, Iowa, Kansas, Illinois, Wisconsin, Connecticut, and also in several localities in the western part of Ontario, particularly in the south-western portion of the County of Lambton, and in the neighbourhood of Amherstburg, Co. Essex, it has also been taken at Hamilton and Dundas, and has been seen on the wing at St. Thomas. It occurs throughout the month of June and also in August.

This is a very beautiful insect. The accompanying cut figure 38, in which it is very faithfully delineated was drawn and engraved by Mr. Worthington G. Smith, of London, England, from a fine specimen captured by Mr. J. M. Denton, near Amherstburg.



Fig. 38.

The wings are of a deep black colour, crossed by a band of yellow spots extending from tip to tip of the fore wings and covering also the front margin of the hind wings. The third spot from the tip is oblong, sometimes notched by encroachment of the ground colour, and surmounted by two or three smaller spots; there is also a row of three or four spots below the band, extending to the inner angle. The hind wings are also furnished with a row of six or seven yellow spots, while the anal angle has a reddish crescent with a patch powdered with blue atoms above it. The edges of these wings are notched, and more or less

fringed with yellow, the tail is black with an oval, yellow spot; the body is also black marked with yellow. When its wings are expanded it measures about five inches, sometimes more.

This stately creature is very active when on the wing and difficult to capture, but when it has alighted and is busily engaged in sucking the nectar of flowers, if cautiously approached, it may be taken without much difficulty.

Last September, I was much gratified at receiving a number of the singular caterpillars of this beautiful butterfly from Mr. S. Eccles, of St. Thomas. They were found in his garden, feeding on *Dictamnus flavinella*, a perennial herb, which is a native of Southern Europe, but cultivated in this country in gardens, as an ornamental plant. The larva is a very strange looking creature. On the first four segments of the body there is a white lateral band beginning from the head, and between that and the corresponding one on the opposite side, there is a large brown patch, marked by large brownish black spots. Behind this, about the middle of the body there is a large white spot in the shape of a lozenge, which covers the back and a part of the sides, one of the angles of which reaches the first pair of fleshy pro-legs. In the middle of that band there are some brown spots. The hinder part of the body is covered by another large white patch marked anteriorly with some brown spots; the sides of the body, between the lozenge-shaped and the last white patch are of a uniform dark brown colour. The underside is also brown as well as the feet.

This curious mixture of white grey and brown colours is so arranged as to make the larvæ closely resemble the excrement of birds. This is especially so during the earlier stages of their growth; doubtless this resemblance protects them against their enemies, especially the birds. When touched they stretch forth a reddish brown fleshy fork from behind the head, which is also used as a defence against their enemies.

For a few days, while fresh food of *Dictamnus* was at hand, the larvæ did well and grew rapidly, but the supply failing they were transferred to a young orange tree, which was enclosed in a gauze bag to prevent their escape—when they lost their vigour and activity, and although they ate more or less of the foliage every day, they lost flesh and one after another died, until only three or four remained. These lingered for a time when two of them spun up and went into chrysalis, but the chrysalids were small and one of them deformed, and finally the remainder all died. Subsequently the chrysalids became stiff and hard, and on opening them they were found dead and dry.

The chrysalis is brown, marked with blackish points.

The skill shown by this butterfly in selecting the plants and trees on which to deposit its eggs is very wonderful. The caterpillar, as far as is known feeds only on species belonging to the Rutacæ or Rue family, which comprises genera and species singularly unlike each other; yet this butterfly knows how to recognize and select them. *Dictamnus* belongs to this family, so also does the common garden rue *Ruta graveolens*. The other members found in this country are the Northern Prickly Ash *Zanthoxylum Americanum*, the Southern Prickly Ash, *Z. Carolinianum*; the hop tree *Ptelea trifoliata* and the genus *Citrus* which includes the sweet and bitter orange, the lemon, lime and citron. In the South, the larva, as already stated feeds on the various trees belonging to the latter family, in the West it feeds on the Prickly Ash, while in Kansas it is known to feed on the hop tree. Having been found on *Dictamnus* it becomes highly probable that it will feed also on Rue, although it has not yet been found on this plant.



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